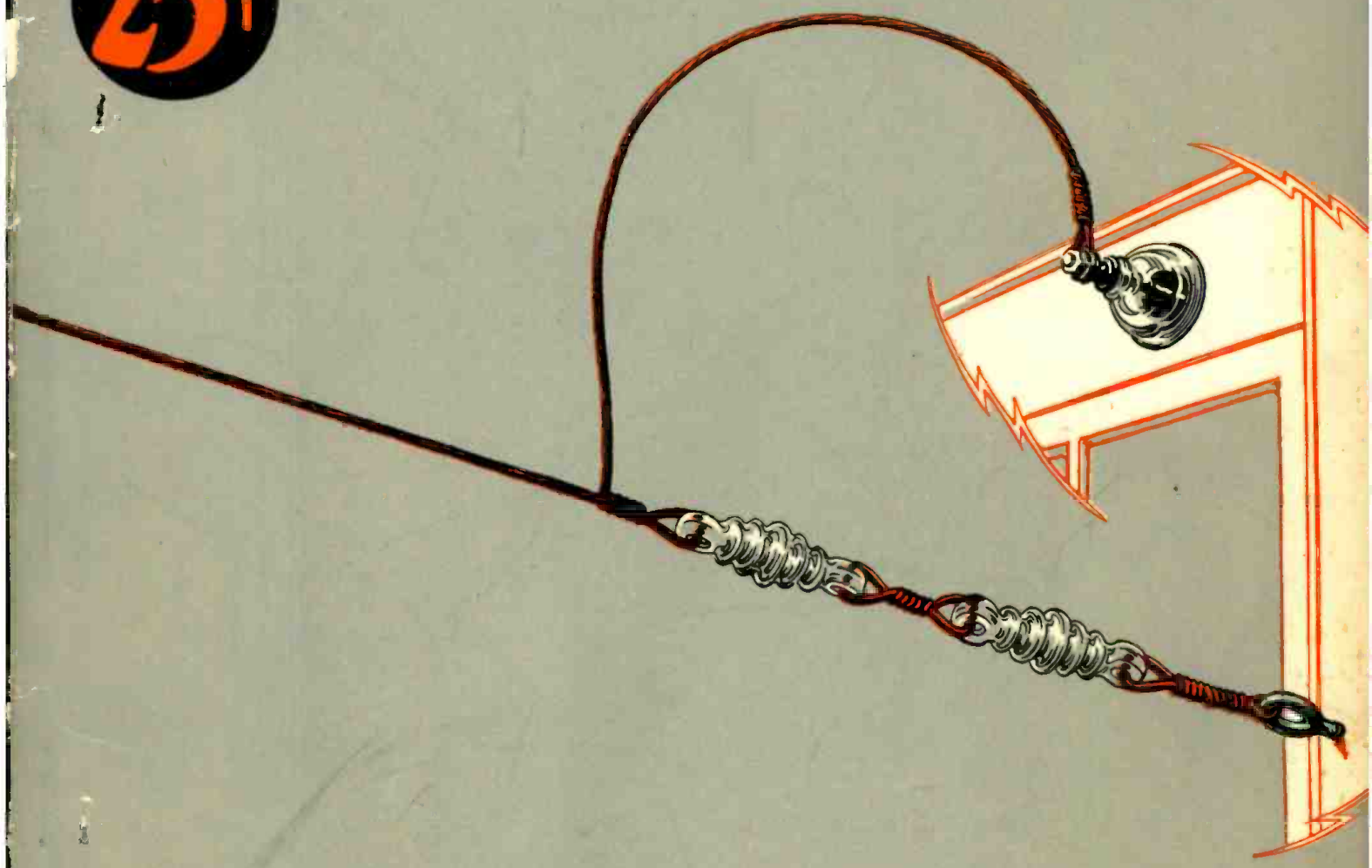
Popular Radio

NOVEMBER
1926

25¢



For the Set Owner and Experimenter

How to Patent Your Radio Invention
Practical Pointers for Buying Parts
Inside Information on New Radio Receivers
How to Build the LC-Senior Power Pack

many times better than in 1921

WITH four times less drain on your "A" batteries than the storage battery tube of five years ago, the filament of a Radiotron UX-201-A throws across to the plate five times as many electrons—a steady stream of tiny electrical charges that carry the song and speech. This is a big increase in efficiency!

And the Radiotron UX-201-A does not burn out—unless you apply a huge, excessive voltage. It does not die gradually, but keeps its efficiency almost to the very end of its life.

These are but a few of the advances in vacuum tube making that have come from the laboratories of RCA and its associates—General Electric and Westinghouse. Unceasing research brings continual improvement in RCA Radiotrons, making possible ever better reception—at lowered cost.

RADIO CORPORATION OF AMERICA

New York Chicago
San Francisco

to get more power

—put an RCA power Radiotron UX-120, UX-171 or UX-210 in the last audio stage of your set.

to get more distance

(on a storage battery set)

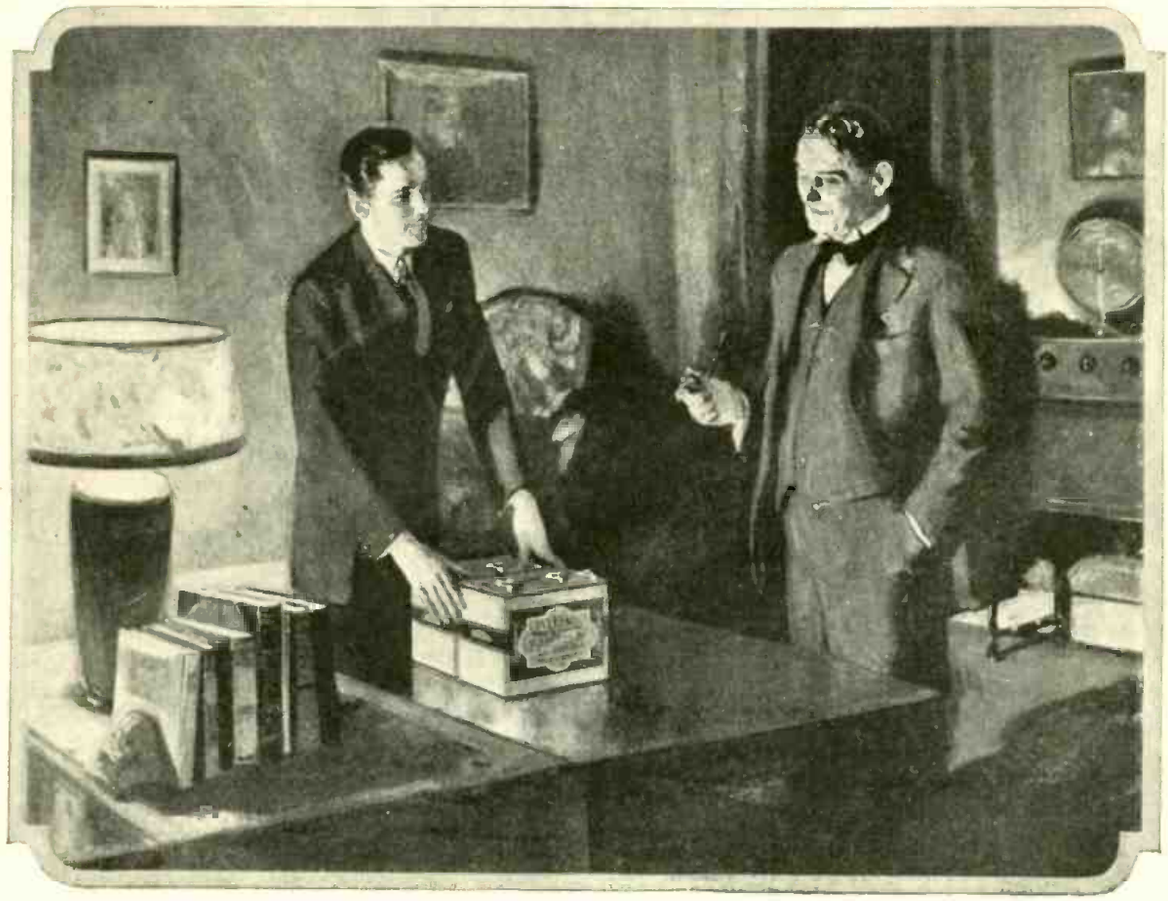
—put the new special detector Radiotron UX-200-A in the detector socket.

. . .

RCA is not only making Radiotrons steadily better—but is further improving reception with these new special Radiotrons. Keep your set up to date.

RCA Radiotron

MADE BY THE MAKERS OF THE RADIOLA



Here's the most economical "B" battery ever built for radio

IN THE production of Heavy-Duty radio "B" batteries Eveready has established a new standard of "B" battery life and economy.

Eveready Heavy-Duty 45-volt "B" Batteries will outlast any Light-Duty 45-volt "B" two to one regardless of the number and kind of tubes used! Moreover, though lasting twice as long, they cost only one-third more!

To cap the climax of "B" battery economy, in Eveready Layerbilt No. 486, Eveready has perfected a Heavy-Duty "B" battery of unequaled endurance and dependability—positively the greatest "B" battery in service and satisfaction its price can buy.

You can make no mistake in buying Eveready Layerbilt No. 486 for *any* set using normal voltages (45 to 135 volts).

You will be buying the utmost in dependability of "B" power—the greatest "B" power operating economy—D. C. (direct current) in its purest form, which insures pure tone quality.

With colder evenings at hand, radio reception is vastly improving. Equip your set now with Eveready Layerbilt No. 486, the greatest "B" battery ever built for radio.

LEFT—*Eveready Layerbilt No. 486.*

RIGHT—*No. 711 Eveready Dry Cell Radio "A" Battery, 1½ volts.*

EVEREADY
Radio Batteries
-they last longer

Manufactured and guaranteed by

NATIONAL CARBON CO., INC.
New York San Francisco
Canadian National Carbon Co., Limited
Toronto, Ontario

Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

WEAF—*New York* WGR—*Buffalo* WGN—*Chicago*
WJAR—*Providence* WCAE—*Pittsburgh* WOC—*Davenport*
WEEI—*Boston* WSAI—*Cincinnati* WCCO—*Minneapolis, St. Paul*
WTAG—*Worcester* WTAM—*Cleveland* KSD—*St. Louis*
WFI—*Philadelphia* WWJ—*Detroit*
WRC—*Washington*

Popular Radio

EDITED *by* KENDALL BANNING

FOUNDED 1911

VOLUME X | November, 1926 | NUMBER 7

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(Cover design by Frank B. Masters)

DEPARTMENTS

VOLUME X | NOVEMBER, 1926 | NUMBER 7

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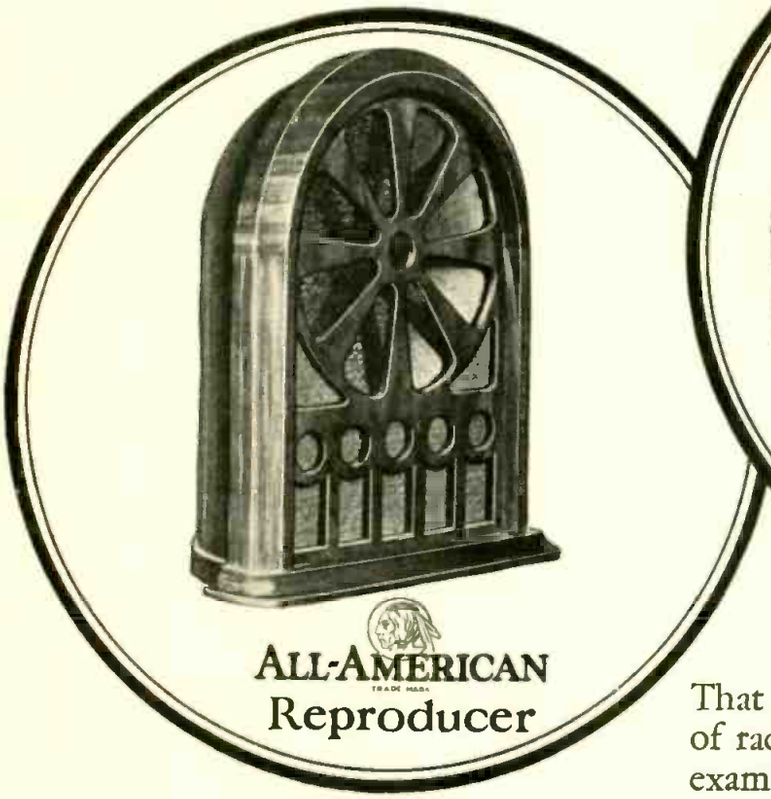
LAURENCE M. COCKADAY, *Technical Editor*
CHARLES L. REESE, Jr., *Managing Editor*
E. E. FREE, Ph.D., *Contributing Editor*
JOHN V. L. HOGAN, *Contributing Editor*

"—remarkably good!"



ALL-AMERICAN
Reproducer

ALL-AMERICAN
Constant-B
Battery Eliminator

That is the judgment, without exception, of radio experts and enthusiasts who have examined and tested these two fine units.

They mean *better reception.* Both have a great deal to do with finer tone-quality. You owe it to your own enjoyment of radio, to know the facts about these fine-quality accessories.

ALL-AMERICAN *Reproducer*

For purity of tone this handsome product is outstanding among reproducers. It combines ingeniously all advantages of good cone-type reproducers —and the improved quality provided by a special sounding board and sounding chamber. A highly sensitive unit which reproduces voice and instruments naturally and clearly. Perfect uniformity is maintained over the entire musical range, whether amplifiers are turned to full volume, or down to a whisper. Absolute freedom from "inherent pitch" prevents low throaty tones or twangy nasal effects.

Price $25.00

ALL-AMERICAN *Constant-B*

An attractive compact unit of silent efficiency —insures a dependable supply of uniform plate current. Five output taps; negative, +45, +67, +90, and a power tube tap adapt "Constant-B" to all requirements. A "Detector" control provides voltage variation between 10 to 60 volts. An "Amplifier" control allows a variation of 10 to 120 volts on the intermediate tap, without affecting the 90 volts supplied to first audio stage. A High-low switch adapts "Constant-B" to receivers of various current requirements.

Price $37.50 Complete with Raytheon Tube

Prices are slightly higher West of the Rockies

New 1927 Radio Key Book

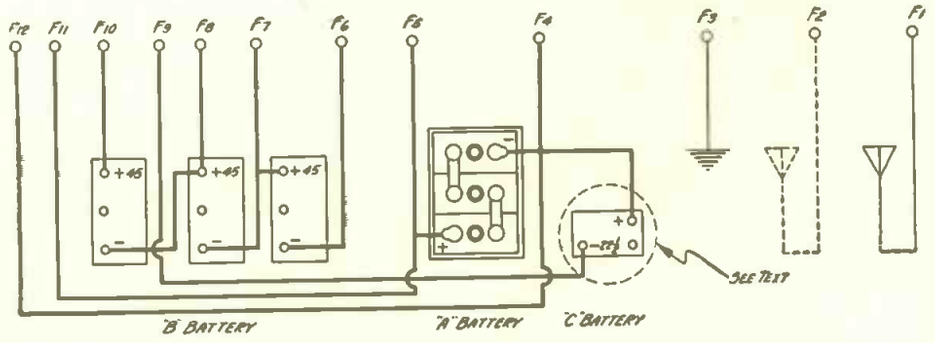
Learn more about the fundamentals of radio. This *new* 48-page book contains an interesting analysis of radio in language anyone can understand—also complete constructional details of the leading types of circuits. Sent for 10c (coin or stamps) to pay for postage and mailing.

ALL-AMERICAN RADIO CORPORATION

4207 Belmont Avenue, Chicago, Illinois

OWNING AND OPERATING STATION WENR ~ 266 METERS

A Page With The Editor



A Correction

In the diagram of battery hook-up for the LC-27 Receiver, shown in Figure 11 on page 556 of the October issue of Popular Radio, *the "C" battery terminals were, incorrectly, shown reversed. The proper connections are given above.*

One of the compensating features of every catastrophe—such, for example, as the tornado that struck Florida September 18—is the evidence of self-sacrifice and heroism that is invariably displayed by individuals.

* *

This quality was shown in a striking manner by radio amateurs in and near the path of the recent storm; to their unselfish spirit of service as well as to their technical skill much suffering and doubtless several lives were saved.

* *

What your radio amateurs did on that tragic occasion was reported briefly in a special dispatch by radio from Tampa, dated September 21, to the New York *Times* in the following words:

* *

"The Tampa papers lost contact with the outside world in a large degree Saturday afternoon and asked W. P. Moore, operating 4IZ, to try to get news for them by radio. An emergency transmitter was placed in service and press received and transmitted to Atlanta. No stations south of Tampa could be raised.

* *

"Early Sunday morning Amateur Radio Station 4KJ, operated by J. Y. Heisch of Miami, succeeded in getting an emergency station in operation. He raised Station 4IIZ of Jacksonville and for hours they handled hundreds of relief messages.

* *

"Yesterday at noon Heisch said his arm was numb from operating and he could send no longer. But after a break of half an hour he was back at it again. There is no doubt but that his efforts saved many lives.

* *

"After learning of the destruction at Moore Haven, the Pierce Electric Company of Tampa equipped Fred Frick, a well-known Tampa amateur operating station 4BN, with a dry-battery-operated 40-meter transmitter. With American Legion men he left Tampa at 1 o'clock yesterday for Moore Haven to establish communication between Tampa and the Lake Okeechobee section.

* *

"For the last several miles the men must wade waist deep through water and carry the equipment on their backs. At 8 o'clock tonight they had not arrived at their destination, but contact is expected at any moment. The contact station of Frick is 4IZ of Tampa."

* *

Needless to add, Popular Radio immediately instituted a detailed inquiry into the activities of these radio amateurs; as soon as authoritative reports are received of their services "in the alleviation of human suffering or in the saving of human life," they will be presented for consideration to the committee of awards of the Popular Radio Medal for Conspicuous Service.

* *

On page 700 of this number of Popular Radio the new department "The Beginner In Radio" makes its first appearance.

* *

This new department, which has grown out of the expressed needs of those of our readers who are just entering the magic realms of radio, is conducted by Mr. Armstrong Perry, who is well and affectionately known to many thousands of boys and young men throughout the country, as the expert in charge of the radio activities of the Boy Scouts of America for many years.

* *

There are probably only a few of our readers who did not listen in on the broadcast reports of the Dempsey-Tunney fight on the evening of September 23; the able commentator who officiated before the microphone on that memorable occasion was America's most popular ringside reporter, J. Andrew White, whose contributions to Popular Radio appear so frequently that he is regarded as a member of the Popular Radio family.

As a broadcast program feature, a ringside report of a world's heavyweight championship prize fight is, by all reports, the most popular and consequently the most stimulating and beneficial to the radio industry.

* *

Thousands of receiving sets and a vast number of parts are bought immediately before an event of this kind; even those who profess no interest in the standard radio programs justify their purchases of receivers by their desire to listen in on events of special moment to them—ranging from Presidential conventions to boxing bouts, from college fraternity dinners to stock market reports.

* *

"Street Crowds were Small" states the headline on a New York daily on the morning after the Dempsey-Tunney fight. And the obvious explanation followed; everyone stayed at home to listen in on J. Andrew White's broadcast reports!

* *

To what extent a professional prize fight is a "sporting event" may be a matter of opinion. But there is no question about its value to radio. It is hot stuff!

* *

Commander Stanford C. Hooper, who contributes the article, "Radio Transmits Weather Maps to Ships" on page 655 of this issue, is on duty with the Bureau of Engineering of the Navy, and is regarded as one of the foremost radio engineers in the country. He participated in the experiments with the Jenkins apparatus, and thus obtained his information at first hand.

* *

The September issue of Popular Radio had been on the newsstands less than twenty-four hours when the first of the letters submitted in the prize contest for the best answer to the question "How can radio broadcast programs be improved?" arrived at the editorial office.

* *

The last line on page 660 should read "(*Continued on page 676*)," instead of *673*. Unfortunately, a part of this issue was printed before the error was discovered.

* *

The prize-winning letter will be published in this magazine as soon as the judges have come to a decision after the close of the contest.

Kendall Banning

Editor, Popular Radio

tone reality need not be expensive

You don't need an expensive set to get faithful reproduction. Resistance coupling gives even amplification of all tones. And it has the added advantage of costing little, and consuming less "B" battery current.

Micadon 640 A is the Dubilier resistance coupling unit. It is a fixed condenser of the famous Micadon type, designed and patented by Dubilier to provide unvarying capacity with the lowest dielectric loss—so essential for the true reproduction of sound.

Used with the silent Dubilier Metaleak, Micadon 640 A will give you the foundation for an amplifier unit with all the tone quality found in the best radio sets.

Send 10c. for our booklet showing fourteen ways to improve your set with simple applications of fixed condensers.

Dubilier

CONDENSER AND RADIO CORPORATION

The Masterpiece of Masterpieces!

New and Improved FRESHMAN MASTERPIECE

—the thing that makes it wonderful is its tone quality. The large cone speaker has been designed to exactly match Freshman's new QUALITY radio receiver. This special cone speaker easily handles the full power that this new set delivers. Yet, in spite of its ability to handle great volume, when the power is reduced the softest and mellowest tones come forth in a manner never before achieved by any sound producing device.

Simplicity

Its ease of operation, with its three distinct controls, allows any novice to tune in the station wanted day after day at the same points on the dials. This efficient means of operation eliminates the overlapping of wave lengths, which assures distinct separation of one broadcasting station from the others.

Write for our new booklet illustrating and describing the entire line of Freshman Masterpiece Receivers and other apparatus.

Model 6-F-11 $119.50

Slightly Higher Denver and West

THIS "Masterpiece of Masterpieces" startles and surpasses all expectations. It is the most perfect radio that has ever been designed. It is massive—it is beautiful. It is just what you want for your home. For no matter how exquisite your furnishings are, this artistic genuine mahogany upright console will lend additional beauty. And yet, it is priced so moderately that almost every family can easily afford to own one.

Genuine R C A Radiotrons

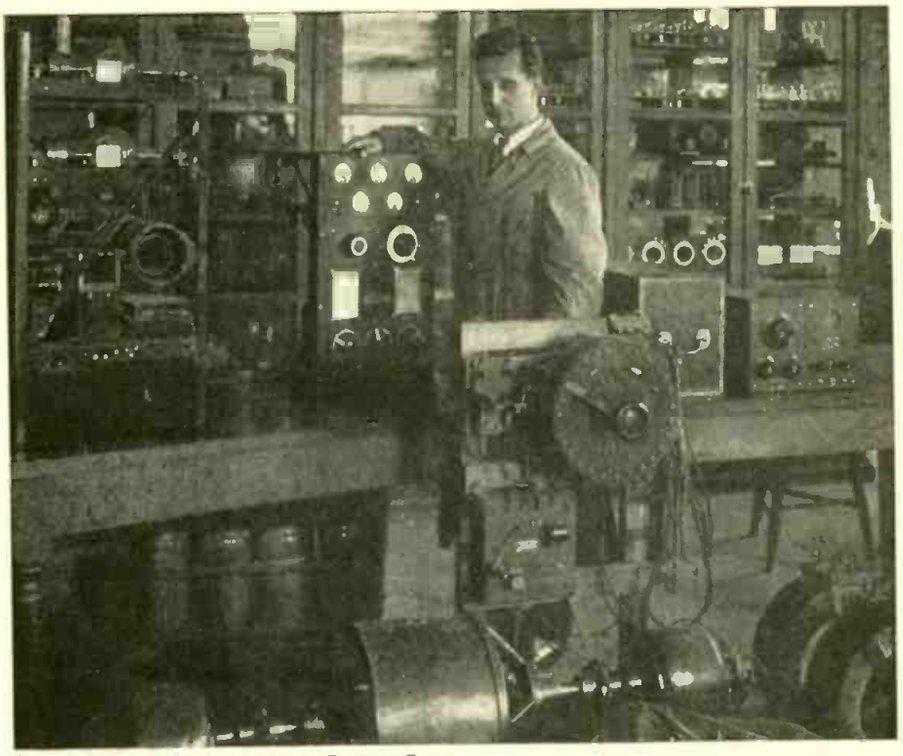
are recommended for use with Freshman Masterpiece Receivers. A special package containing—1 UX-112 power tube, 1 UX-200A detector tube and 3 UX-201A amplifying tubes—matched and tested for the set in which they are shipped; is sold by Authorized Freshman Dealers.

Sold [on] Convenient Terms by Authorized Freshman Dealers

CHAS. FRESHMAN CO., Inc.

Freshman Bldg., New York 2626 W. Washington Blvd., Chicago, Ill.

The Most Perfectly Toned Radio Ever Produced

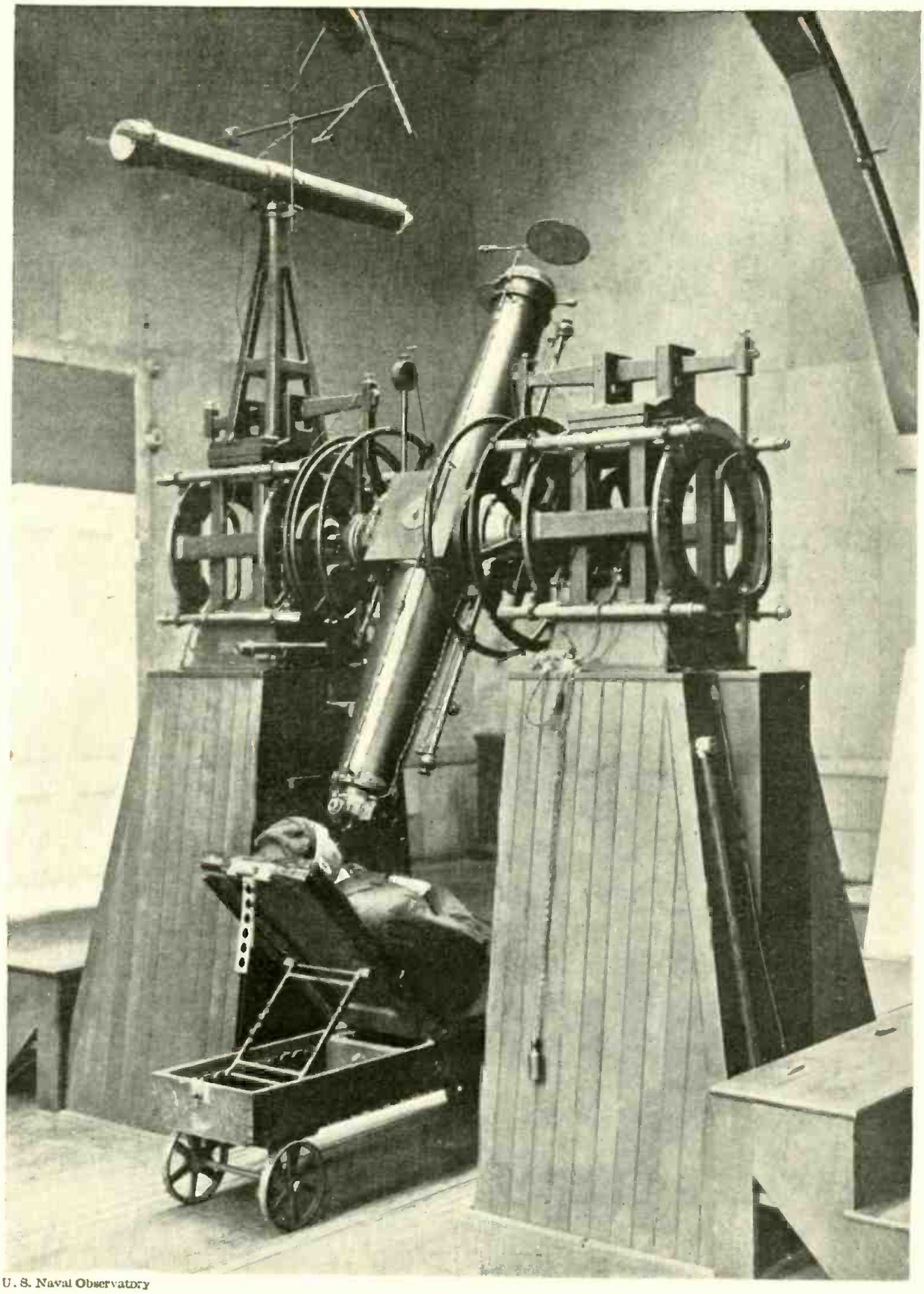


From a photograph made especially for POPULAR RADIO

The Wonderful Work That Is Being Done by POPULAR RADIO

"FOR several years I have strongly felt that the American public's enjoyment of radio could be greatly increased by an appreciation of the wonderful actions taking place in their receiving sets. It is not to be expected that this appreciation can be attained by reading the treatises of radio authorities, written for trained engineers; in supplying this appreciation the BONA FIDE *radio magazine finds its task. I feel that* POPULAR RADIO *is doing a wonderful work in this field; dependable articles, written in attractive style, are nearly always found between the covers of the magazine. There are radio magazines which publish material much more lurid than dependable but such comment cannot be made of yours. May you continue to have success!"*

J. H. Morecroft



U. S. Naval Observatory

The Ether Problem Is Bound Up With Time

This telescope is used at the United States Naval Observatory, to determine the exact instants at which selected stars pass overhead. This corrects the clocks which send out the daily radio time signals; if there is a slip of the ether past the earth (as described in Dr. Free's article), this slip should affect the precision with which the time stars seem to pass across the telescope. Ether waves might be bent by the slip. No such effect has been detected, although often sought.

Popular Radio

VOLUME X November, 1926 NUMBER 7

Are There "Ether Waves" After All?

The idea that the ether is real is hard to kill. In July, 1922, when the late Dr. Charles P. Steinmetz published in POPULAR RADIO his famous article "There Are No Ether Waves," many distinguished scientists rushed to the defence of the threatened ether theory. Arguments raged for months; POPULAR RADIO published many of them. And at that very time—although the editors of this magazine did not then know it—there were going on quietly at the Case School of Applied Science in Cleveland, Ohio, the preliminaries of some experiments destined to produce four years later the nearest approach to a direct experimental proof of the existence of the ether that science has yet secured.

—EDITOR

By E. E. FREE, Ph.D.

BY a research continuing, with intervals, for a quarter of a century and marked, especially in the last three years, by a care and labor seldom expended even on scientific work, Professor Dayton C. Miller believes that he has detected a measurable motion of the ether relative to the earth—usually designated as the "ether drift."

If the ether can move, or if it can stand still while we move through it, it is obvious that the ether must be real.

Ether waves must exist after all.

It is admitted nowadays that our theories of radio waves, of light, of X-rays and of other forms of ether waves are in very unsatisfactory condition. We really know nothing whatsoever of what radio waves are; the "wave" idea is merely a convenient theory. It may be true; it may be untrue. No one can say which. Professor Gilbert N. Lewis, of the University of California, has even suggested that light is not really "emitted" by one body, like a flame, and "received" by another body, like our eye; both emission and reception may be, he thinks, parts of the same event. It is not that you see a light because a flame is lit. It is just as true to say that the flame burns because your eye has seen it.

The same ideas would apply to radio. Instead of a wave going out from a transmitting antenna because it was energized by moving electrons, Professor Lewis's theory would imagine that the wave went out because a receiver had received it. This sounds, it must be admitted, like utter nonsense, and I fear I am doing Professor Lewis's ideas some injustice by giving them merely this brief and inadequate description. They involve, for their proper comprehension, a complete revision of all our ordinary ideas of time and space. Past and future become interchangeable terms. A radio receiver does the transmitting just as much as the transmitter does. Which is cause and which effect becomes very difficult to discover, perhaps impossible.

It is unnecessary to pursue these ideas farther into the rarefied air of philosophical discussion. The point is that all our theories of radiation are now in difficulties. No one knows quite what to believe. It would be satisfying if we could return to the old and simple ether theory, which still persists in our language when we talk about "ether waves," but which, since Einstein and Steinmetz, many scientific men have come to doubt.

Professor Miller's experiments do not quite permit us to return to the old carefree days when the ether was thought of as a simple, weightless substance filling all space as a great motionless ocean and through which the earth and the sun moved along as fish move in the sea.

This theory of a quiescent ether is gone, perhaps forever.

But Einstein's theory of relativity

resulted, as Dr. Steinmetz pointed out in 1922, not merely in disposing of the idea of a motionless ether; it disposed of the ether altogether. We had to call our familiar waves something else; just what Dr. Einstein did not tell us. Space was merely space; traversed, once in a while, by a radio impulse or by a wave of light. What carried this light or radio remained—and still remains—quite unexplained.

Under these circumstances it is natural that Professor Miller's apparent detection of a real and tangible ether has attracted enormous attention in the scientific world. Since his preliminary announcements some months ago, as noted in POPULAR RADIO at the time, he has been traveling among the scientific centers of Europe, describing his results to the experts there and submitting both his data and conclusions to the severest criticism.

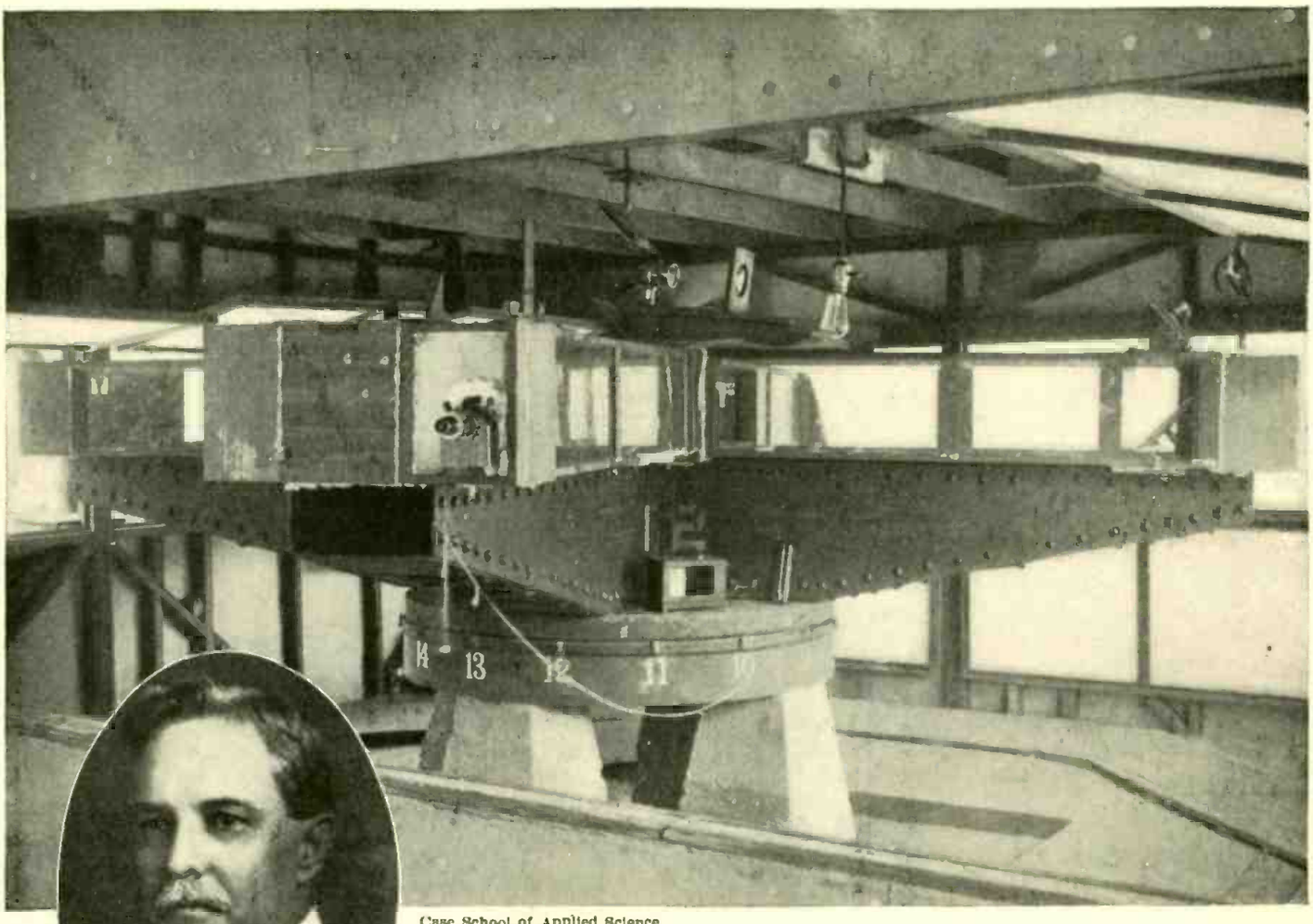
Such criticism has not been lacking. It is admitted by no less an authority than Dr. Einstein himself that if Professor Miller's results are correct the Theory of Relativity will need severe correction; if, indeed, it will not have to be abandoned entirely. So many scientists have accepted this theory, it has been the basis of so many subsidiary theories and of so much detailed experimentation, that science cannot be expected to give it up willingly or even to modify it without a struggle. Nevertheless, no one has been able to adduce a convincing case against Professor Miller's facts. On the face of his data, he seems to have got a grip on the ether. Other experts have said that they believe he must be wrong, but no one has been able to point out just how he is wrong.

His experiments are really refinements and continuations of the famous Michelson-Morley experiment, carried out at Cleveland in 1887 and which was one of the chief facts used by Einstein in elaborating his theory of relativity. This experiment was designed to detect the ether by measuring the speed of light in the direction in which the earth was moving as compared with the speed of light in the reverse direction.

It is obviously easier to swim with the current of a river than against this current. The down-stream swimmer will go faster.

A light ray may be thought of—if one believes in the ether—as swimming in the ether. The earth is in continual motion around the sun, as well as in continual rotation about its axis. Thus any particular place on the earth, such as the city of Cleveland, is moving through the ether in a spiral path composed of these two motions of the earth. Or, to put it conversely, the ether is streaming through Cleveland in a direction which varies from hour to hour, as the earth, with Cleveland on it, turns and flies. The ether is thought of, of course, as moving through the mass of the earth and the solid bodies of Cleveland and its inhabitants, just as though these were not there.

The Michelson-Morley experiment consisted in testing the speed of light in



Case School of Applied Science

Here 100,000 Ether Tests Were Made

This entire apparatus revolves slowly, being floated on liquid quicksilver. Dr. Miller, whose portrait is at the left, and his assistants, walked slowly around with the apparatus, like sailors around a capstan; meanwhile they observed, through the telescope, the changes of interference fringes visible therein. The final series of tests included more than 100,000 such measurements. The quicksilver is contained in the flat pan mounted on the concrete piers.

Case School of Applied Science

Where Dr. Miller's Ether-Test Apparatus Was Set Up

On the grassy, pine-dotted plateau on top of Mt. Wilson, far above the city of Pasadena, in California, Dr. Miller erected his revolving apparatus inside this small tent house. Here have been made the recent measurements indicating that the solar system is falling rapidly through space and that ether waves perhaps do exist after all. One of the great domes housing the telescopes of Mt. Wilson Observatory is visible at the right of the photograph.

a direction with the ether stream and in the opposite direction, against the stream. A difference should have been found; not a great difference, for the speed of light is vast as compared with the known speeds of the earth, but nevertheless a measurable difference. It was not found. Light proved to have the same speed in both directions, at least within the limit of error of the experiment and so far as the speed of the earth in its orbit was concerned. On this failure the Einstein theory was built.

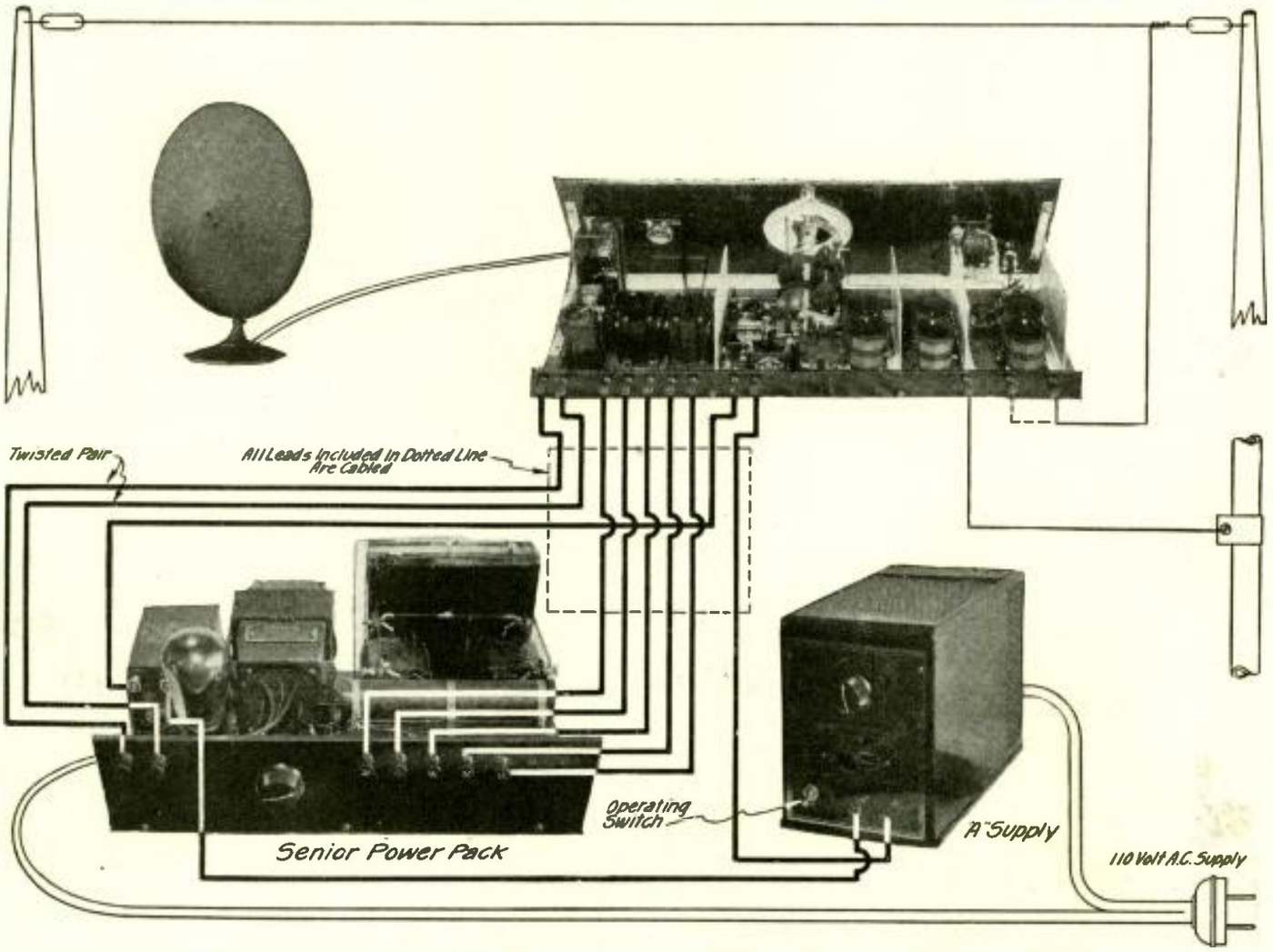
Shortly after this experiment was completed Professor Michelson removed to the University of Chicago. Professor Morley, staying on at Cleveland, brought Dr. Miller into the matter. They repeated the famous experiment, with variations and on a hill-top instead of in the basement laboratory formerly used. The result was the same. Nevertheless, the two scientists were not satisfied. They wished to repeat it again, with still greater refinements. Professor Morley died, but Dr. Miller kept up the work. In 1921 he carried apparatus to Mt. Wilson, in California, and made new tests there. These were still inconclusive. In 1922 and 1923 experiments were continued at Cleveland. Finally, in 1924, 1925 and 1926, other sets of tests were made at Mt. Wilson, the tests which now have set the scientific world so much agog.

These tests are perhaps the most laborious and fatiguing of all scientific experimentation. The apparatus consists of a series of mirrors, lenses and other optical parts mounted on a heavy, disk-like base which floats in liquid mercury. This entire apparatus is set to revolving in its mercury ocean, like a spinning top although much more slowly. An observing telescope protrudes from one side of the float. The observer must follow this telescope as it slowly moves away from him, with his eye continually glued to a quarter-inch eye-hole, but without touching the telescope or any part of the apparatus with so much as an eyelash.

One turn of the floating table requires about one minute. Within this minute the observer must make sixteen observations through his telescope, one each time that a nearby ticker gives the signal. The readings are called off vocally and are set down by an assistant. All that the observer has to do is to walk and look, like a horse on a tread-

(*Continued on page 706*)

¶ This is the first of the series of four articles to follow "How to Build the New LC-27 Receiver" which appeared in POPULAR RADIO last month—



HOW THE UNITS ARE INSTALLED

FIGURE 1: *This picture-diagram shows the LC-27 receiver connected up to the "A," "B" and "C" power and to the antenna, ground and loudspeaker. The input to the "A" supply and the Senior Power-pack are connected in shunt to the 110-volt alternating current supply lines so that no batteries are required.*

HOW TO BUILD THE

LC-SENIOR POWER-PACK

This new unit which supplies power for the whole set was especially designed for use with the LC-27 receiver; it may, however, be used with ANY TYPE OF RECEIVING SET, provided that a UX-210 tube is used in the last stage of amplification. Any set so equipped will be capable of delivering broadcast programs with the full volume of an orchestra and with a tone quality that is actually comparable with that of the orchestra itself.

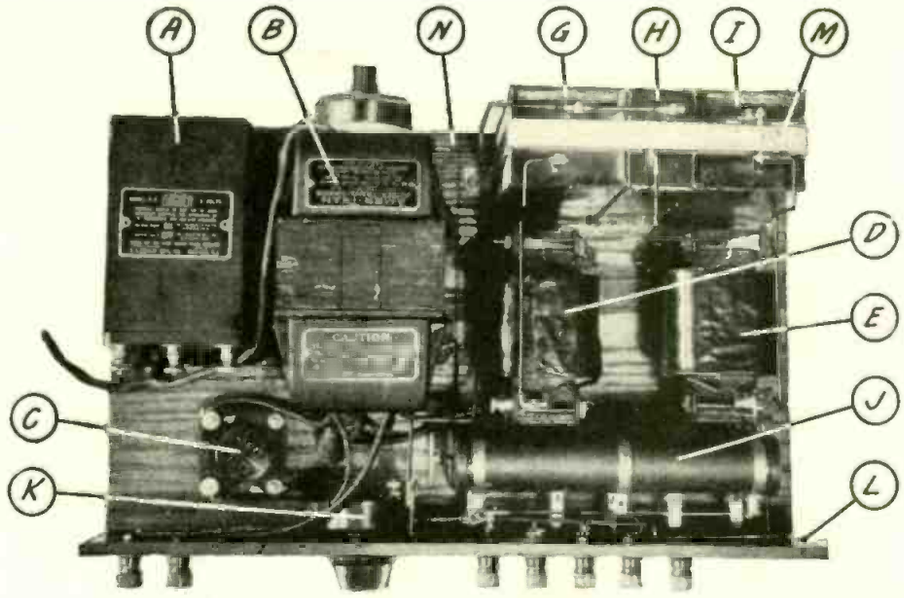
By LAURENCE M. COCKADAY

¶ *The list of parts given here includes the exact instruments used in the unit from which these specifications were made up. The experienced amateur, however, will be able to pick out other reliable makes of instruments which have been approved by* POPULAR RADIO *which may be used with good results. But we recommend that the novice follow the list, as the diagrams in this article will tell him exactly where to bore the holes and exactly where to place the connections. If instruments other than the ones listed are used, the only change that will be necessary will be the use of different spacings for the holes that are drilled in the sub-base for mounting the instruments. To any reader who has difficulty in obtaining any of the parts which are necessary in making up these model receivers and power units,* POPULAR RADIO SERVICE BUREAU, *627 West 43rd Street, New York City, will gladly assist in seeing that his requirements are promptly supplied.*

COST OF PARTS (not including cable connector): *Not more than $64.50*

HERE ARE THE PARTS THAT WERE USED IN THE LABORATORY MODEL OF THIS UNIT—

A—Brach Controlit;
B—AmerTran transformer, PF-52;
C—Any approved type UX-socket (Benjamin socket illustrated);
D and E—AmerChokes, No. 854;
F6, F7, F8, F9, F10, F11 and F12—Any approved binding posts (Eby binding posts illustrated);
G—Dubilier paper filter condenser, No. 903, 2 mfds., 600-volt AC operation, or Tobe condenser, Acracon or Precision condensers with same characteristics;
H—Dubilier paper filter condenser, No. 902, 2 mfds.; 400-volt AC operation, or Tobe, Acracon and Precision condensers with same characteristics;
I—Dubilier paper filter condenser, No. 902, 4 mfds., 400-volt AC operation, or Tobe, Acracon or Precision condensers with same characteristics;
J—AmerTran resistor, No. 400;
K—Any approved high-current variable resistance to dissipate 5 watts, 2000 ohms. (Centralab resistance illus.);
L—Bakelite binding-post strip, 3½ inches by 15 inches by ¼-inch;
M—Brass mounting strip;
N—Hardwood baseboard, 8¾ inches by 15 inches by ⅝-inch;
Belden power cable connector assembly;
One set of full-size blueprints for LC-Senior Power-pack.



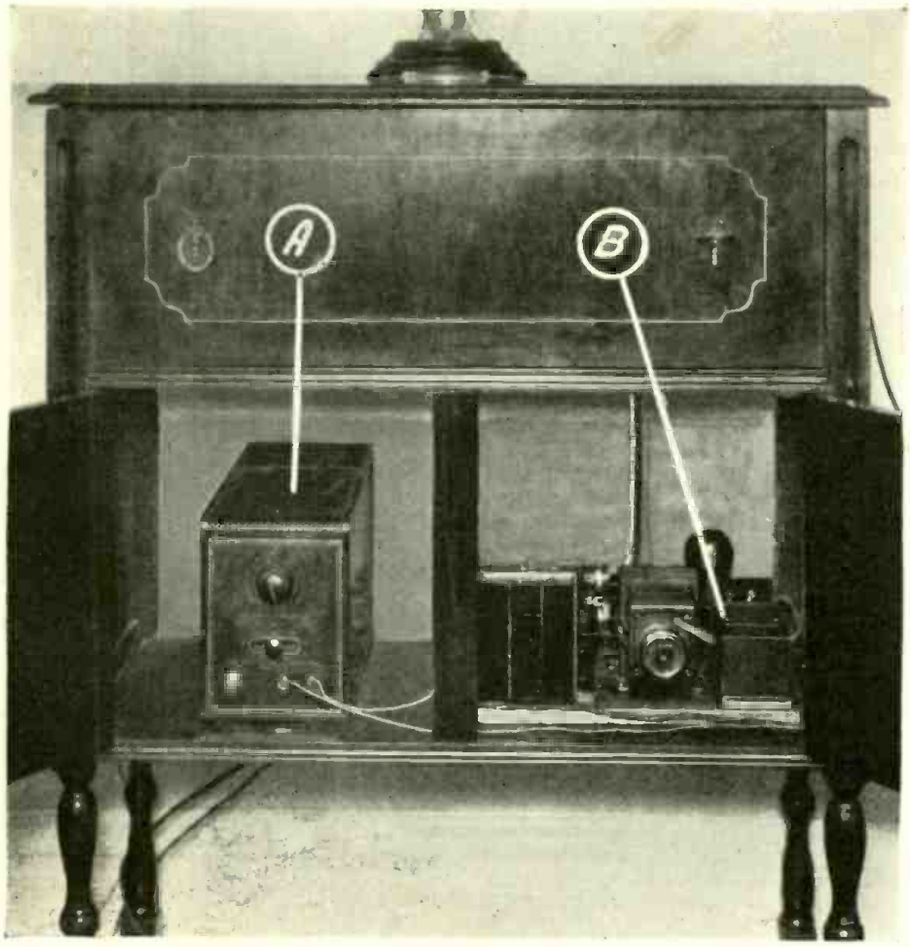
A VIEW OF THE POWER-PACK FROM ABOVE

FIGURE 2: *The relative position of all the parts that are mounted on the baseboard and the connection panel; the parts are designated with letters that correspond with the list of parts and with those given in the text.*

THIS power unit for the LC-27 Receiver has been designed, with the same care and foresight that were used in planning the receiver itself, to fill certain definite requirements—to supply adequate power to the set without the use of batteries of any sort and to furnish, in combination with the receiver, the best obtainable quality of reproduction with a volume great enough to fill a hall or auditorium when used with a suitable loudspeaker.

The volume, supplied by the unit, may be cut down to a mere whisper by means of the volume control in the set. But there is an abundance of reserve power ready to be delivered at any time in clear, undistorted tones. For this reason it should be especially useful to schools and other institutions as well as in homes where great amplification with fine tone quality is essential.

This power unit supplies the "A," "B" and "C" voltages for the 210 tube in the last stage of audio-frequency amplification. It furnishes, for the "B" supply, over 400 volts to this tube and 90 volts to the RF amplifier tubes and the first stage of audio as well as 45 volts to the detector plate circuit. The "C" supply is variable from 20 to 35 volts; besides this the unit supplies 7½ volts for the filament of the UX-210 power tube.



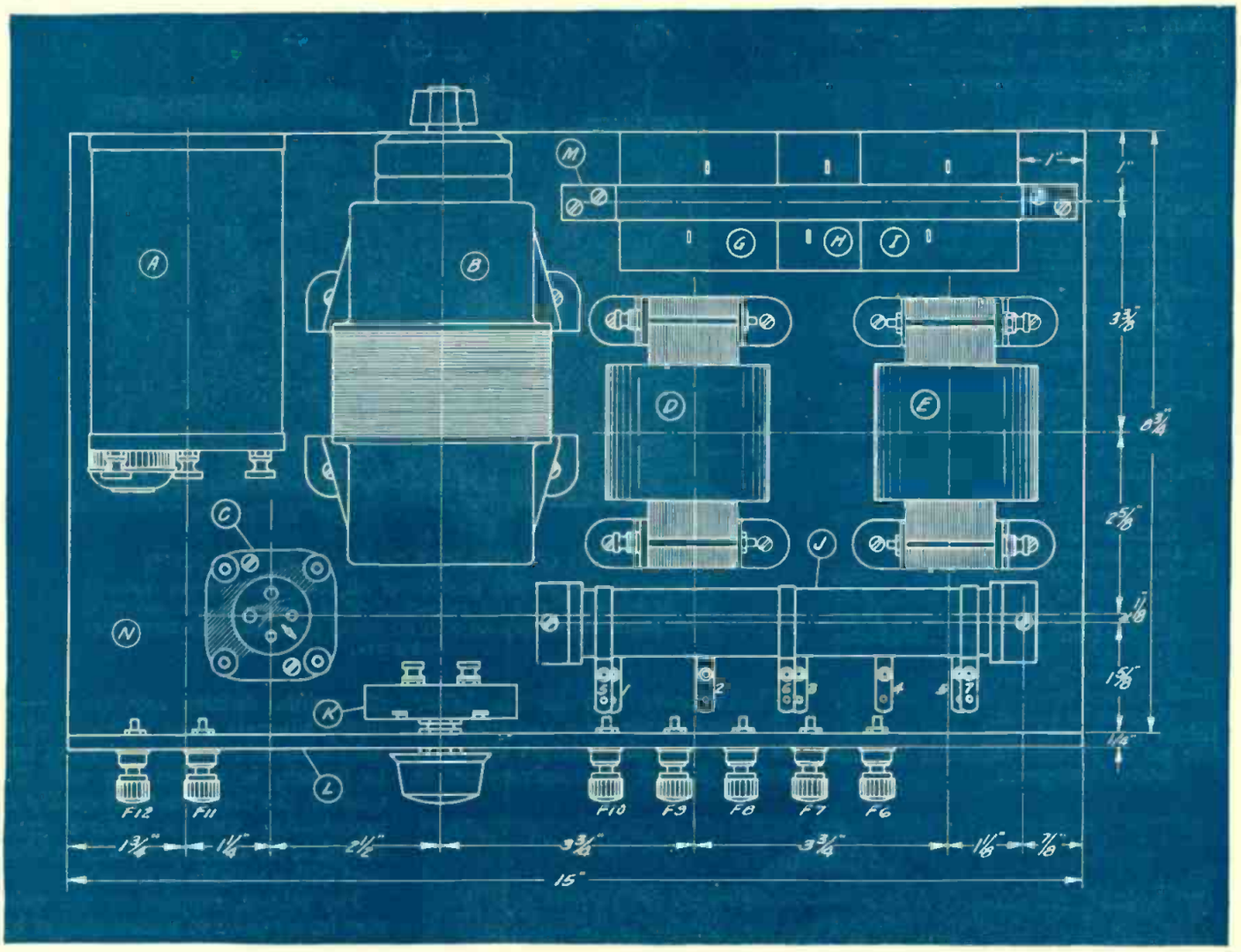
THE "A" AND "B" POWER-PACKS, INSTALLED IN THE CORBETT CONSOLE

FIGURE 3: *At the left, at A, is shown the "A" power-pack; the LC-Senior Power-pack is shown at B. The receiver itself is located in the top of the cabinet and is accessible when the desk lid is let down.*

How to Construct the Unit

After all the instruments and materials for building the power-pack have been procured, the baseboard, N, should be cut to the correct size, as shown in Figure 4. It should be smoothed with sandpaper and given a coat of stain and shellac.

Next, the small panel, L, upon which are to be mounted the binding posts and the "C" battery control, K, should be



THE WORKING DRAWING FOR CONSTRUCTION

FIGURE 4: *In this drawing all of the parts are shown in their exact positions; these are given from center to center for all of the instruments. If these dimensions are followed the home-constructed unit should be exactly like the original model built in the laboratory.*

prepared, as shown in Figure 7. When all the holes are drilled, the seven binding posts should be mounted and the variable resistance, K, should be fastened to the panel, as shown in Figures 2, 4 and 5. The panel, L, may then be fastened on one of the long sides of the baseboard, N, by means of three screws, as shown in Figure 1. These screws are inserted through the three holes in the panel into the edge of the baseboard, N. They should be strong wood screws.

Next, mount the control relay, A, by means of two screws. The metal cover of the relay will first have to be removed and then the screws put in place and screwed down on to the baseboard, N; after this the metal cover may be replaced. This should be mounted in the position indicated in Figure 4.

Mount the transformer, B, by means of four strong wood screws to the baseboard, N, and mount the two choke coils, D and E, in the same way. The positions for these instruments are also given in Figure 4.

Mount the tube socket, C, and the resistor, J, as shown in the same diagram.

Next, prepare the brass mounting strip according to the dimensions given in Figure 6 and fasten down the three filter condensers, G, H and I, as shown in Figure 4. Be sure that they are mounted in the exact positions shown in this drawing with the terminals turned in exactly the same position. Also be sure that the brass connection strip does not touch any of the terminals. A small strip of cardboard laid underneath the brass strip on top of the condensers will serve to hold them snug when the four screws are tightened down to the baseboard.

This completes the construction work and the pack is now ready to be wired.

How to Wire the Unit

The mechanical and electrical design of this device have been worked out with extreme care through months of experiment and test. The whole unit is self-shielding; and it is due to this as well as to the electrical design of the circuit that no hum is produced in the receiving set to which it is attached.

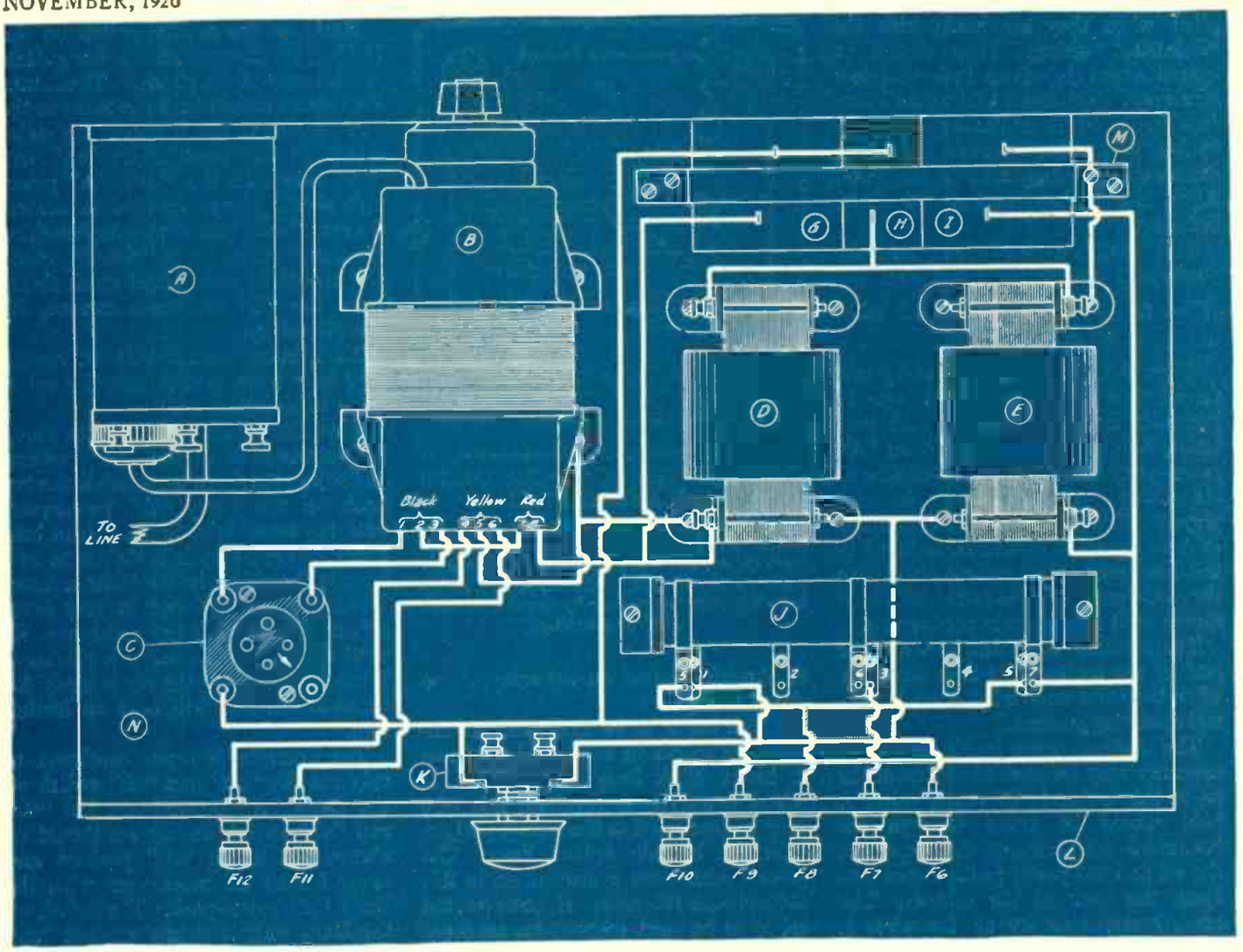
It is recommended that all wiring be done with an insulated, solid, round bus-wire.*

In wiring up refer constantly to the picture wiring diagram in Figure 5. Notice that the cases of the transformers and the chokes are connected together and grounded on the negative side of the direct-current voltage, which is obtained through the rectifier. This is an aid in shielding the output of the set from stray electrostatic fields.

Start the wiring by preparing the transformer leads in the correct lengths, as shown in Figure 5. The leads are of different colors, as indicated in this diagram. They may be readily recognized by referring to the small diagram given in Figure 7 which gives the proper numbers and the colors of the leads.

Then, wire up the leads to the socket and the resistance, the condenser bank, the chokes and the binding posts. Be sure that none of the leads touch each

*"The type of bus wire used in all the experimental models of this unit was "Celatsite."

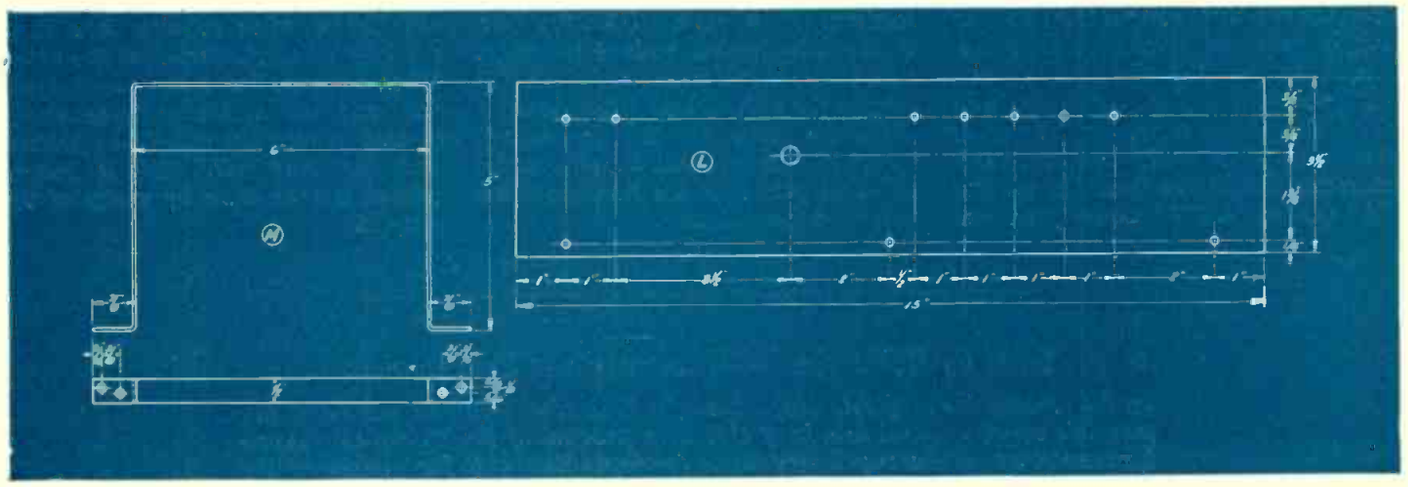


THE PICTURE WIRING DIAGRAM

FIGURE 5: *The instruments are drawn in their relative positions; the wiring is shown in heavy white lines. Notice that the input plug from the transformer, B, is inserted into the proper socket on the relay, A, and the 110-volts 60 cycles should be connected to the input wire to the relay which is marked "To Line."*

Blue Prints for the LC-27 Senior Power-pack

¶ *For the benefit of the experimental set builder who may prefer to assemble the LC-Senior Power-pack from larger diagrams than can be reproduced within the limited space of these magazine pages, a set of simplified blue prints in actual size have been prepared. This set includes (1) the working drawing for construction; (2) the picture wiring diagram, and the complete list of parts used in the laboratory model. If this set of blue prints cannot be obtained from your dealer, it will be furnished upon receipt of a remittance of $1.00 sent to the* POPULAR RADIO SERVICE BUREAU, *627 West 43rd Street, New York City.*



THE BRASS MOUNTING STRIP AND THE PANEL

FIGURE 6: *These drawings give the sizes for the strip with the drill holes located in proper position as well as the size and drilling specifications for the panel, upon which are mounted the binding posts and the grid bias resistance.*

other when they are made with the "Celatsite" wiring. They should be spaced about ¼ of an inch wherever necessary. The input lead to the transformer, B, which ordinarily would go to the alternating current should be shortened and plugged in on the relay, A, in the socket marked "B Batt. Substitute."

This completes the wiring and the power unit is ready to be installed.

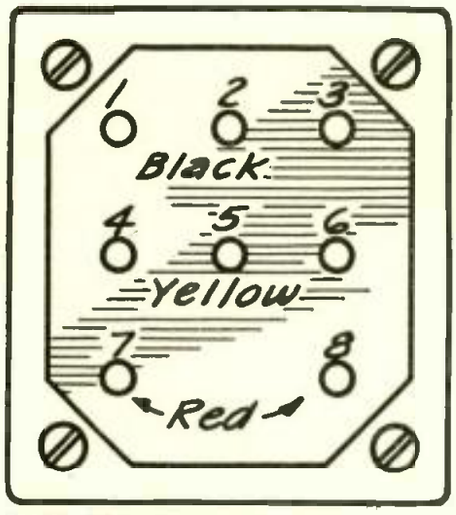
How to Install the Power-pack with the LC-27 Receiver

When the LC-27 Receiver, which was described in the October, 1926, issue of POPULAR RADIO is used without batteries, it is recommended that an "A" power-pack of similar characteristics to the Davy "A" power-pack be employed. This pack, which is designated as A in Figure 3, should be installed in the lower part of the console along with the LC-Senior Power-pack, which is shown at B in this same photograph.

The set itself is located in the upper part of the cabinet and it is accessible when the front door is let down in normal operating position.

The Belden power cable connector assembly may be used to run from the set to the "A" and "B" power units. A hole should be bored through the horizontal compartment that separates the set and the power packs somewhere along the back of the cabinet. The exact connections for all the wires is shown clearly in Figure 1. The cable itself contains wires of the correct lengths at one end to fasten directly to the binding posts on the back of the set and as they are all marked with tracers of different colors, it will be an easy matter to find the proper wire at the bottom end of the cable for connection to the "A" power-pack and the "B" power-pack.

The two wires marked "two line" in Figure 5 should be connected in parallel with the two wires coming from the "A" supply unit and they should be connected to the 24-foot length of wire equipped with a plug that comes with the Belden cable assembly. The other loose wire that comes with the cable assembly should run from the positive "A" post on the "A" power pack over



HOW THE TRANSFORMER LEADS ARE DESIGNATED

FIGURE 7: *This small drawing gives the correct information for wiring up the leads from the transformer, B, to the various other parts of the circuit. The leads are designated by color as well as by number in both of these drawings.*

to the middle post on the relay, A, as shown in Figure 1.

If the set is to be used with an antenna, it should be connected as shown in heavy black lines in Figure 1. If added selectivity is required, this wire may be connected to the second post, as indicated by the dotted lines. The ground connection is also shown in this same pictorial diagram. If, however, the set is to be used without an antenna, the ground should be connected to the end binding post that is ordinarily used for the antenna.

The loudspeaker should be inserted in the jack on the front of the panel of the set.

The set is now ready for operation.

How to Operate the Set With the Power Units

First of all, place two UX-201-a tubes in the first and second sockets in the receiver. Then, place a UX-200-a tube in the third socket with a UX-201-a tube in the fourth socket and a UX-210 tube in the fifth socket. Then, insert a UX-216-b tube in the power-pack socket, C. Be sure that the pins on the tubes are pointed in the direction of the arrows on the sockets.

Next, set the middle switch on the Davy "A" power-pack on the middle section marked "medium." Then, turn the battery switch on the receiver to the "on" position, which should be maintained at all times. The "on" and "off" switch on the Davy "A" power unit *should always be used* to control the set. Then, turn the power switch on the transformer, B, to "No. 1", which also should be maintained at all times. Place the "C" resistance control, K, in mid-position.

Then, insert the 110-volt AC supply plug in a lamp socket and the set is ready to be turned on.

Next, flip up the switch on the Davy "A" power-pack to the "on" position and adjust the rheostat, which is the top knob on the Davy "A" power-pack until the tubes light to the correct brilliancy. Then, tune in a station as outlined in the article in the October issue. When a signal is tuned in very loud, adjust the "C" battery resistance, K, until the best tone quality is obtained. When this is done, the set is ready for constant use and will need no further care.

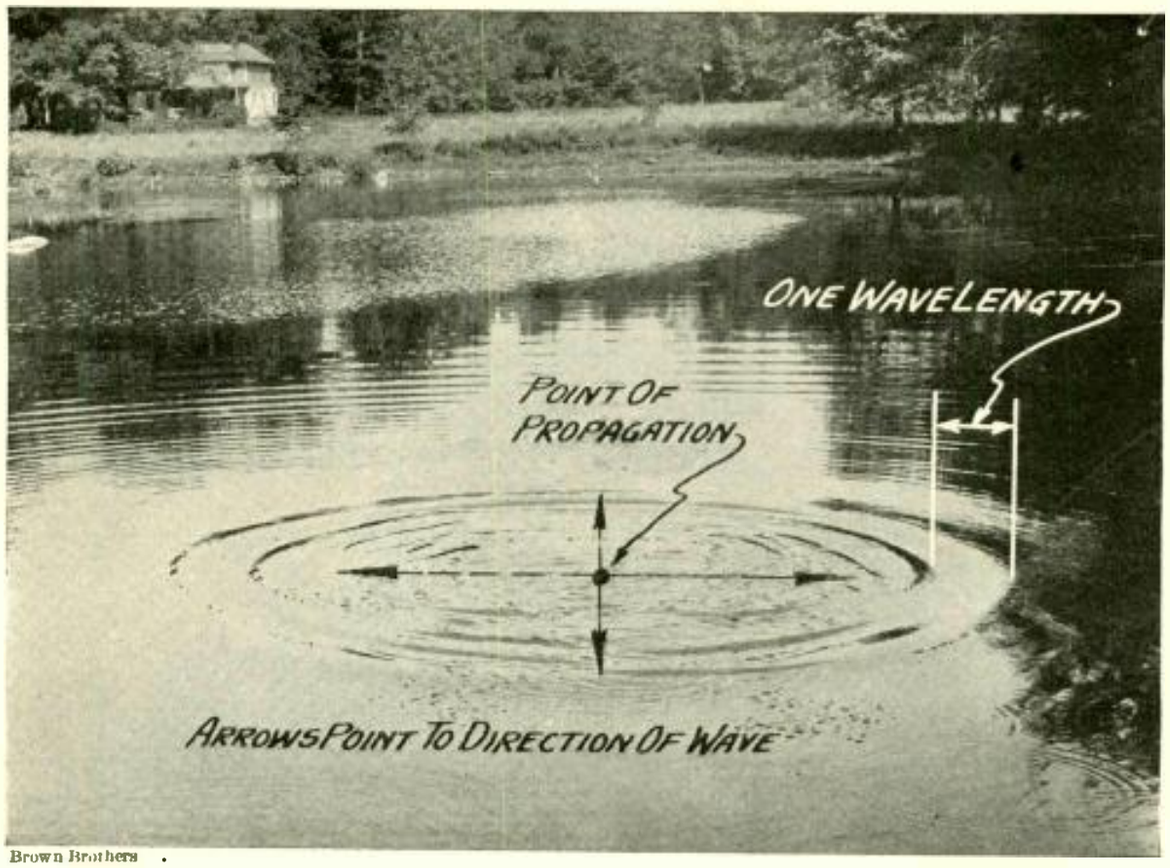
The operator is again cautioned to only use the "on" and "off" switch on the Davy "A" power-pack; the "on" and "off" switch on the set should be always left in an "on" position and never turned off when used with the Davy "A" power-pack. The switch on the Davy unit is clearly marked "on" and "off" and it will control the whole set including the "A", "B" and "C" batteries.

The volume from the receiver may be controlled to just the right amount by the volume control resistance, S, as told in the article in the October, 1926, issue.

If an "A" battery is to be used with the set, it may be connected exactly as shown in Figure 1 in place of the "A" power-pack except, of course, that there will be no wires running from it to the 110-volt alternating-current supply. When a storage "A" battery is used, the "on" and "off" switch on the set *should be used* to turn the complete combination "on" and "off." This is accomplished in both cases by means of the relay, A.

How to Build the LC-Intermediate Power-pack

In the coming issue of this magazine—for December—will be published the complete constructional details of this new product of the POPULAR RADIO LABORATORY, *including instructions for installing and for operating the LC-27 Receiver (described in the October issue) with the LC-Intermediate Power-pack, without the use of batteries.*



Brown Brothers

HOW A WAVE IS PROPAGATED

Just as in radio, a water wave is propagated from a central point and proceeds outward in widening circles—here, through the water, in radio, through the ether. The small water waves in this pool were propagated by throwing a stone into the water; notice how the circles increase in diameter as they proceed away from the point of propagation. One "wavelength" is the distance from the peak of one wave to the peak of the next adjacent wave; this applies to radio waves also.

WAVES *and* WAVELENGTHS

ARTICLE NO. 1

This is the first of a new and significant series of articles by this eminent British physicist. In this installment Sir Oliver begins with a simple description of waves and wavelengths; in the following articles he will treat of the conversion of radio waves into electrical impulses in tuning circuits, or electrical resonance and its analogy to mechanical or sound resonance, and finally he will describe the new method of tuning as embodied in the new "N" circuit, with which he has long been experimenting.

By SIR OLIVER LODGE, F.R.S., D.Sc., LL.D.

WAVES and the vibrations which give rise to them, and by which we are enabled to perceive them, contribute a great deal to our knowledge of the world and of the universe.

It is through waves of light that we gain a knowledge of the stars, even of their chemical composition and velocities, and of the existence of other worlds in space. Without the information thus acquired our universe would shrink to the small planet which we occupy.

It is through waves of sound also that we are able to communicate with each other, and to hear events which are occurring at a distance.

Without these two sources of information we should be limited to what we could touch and smell and taste. But touch, with all that appertains to it, is a mechanical sense located in our muscles, as well as in the skin. It is through this muscular and tactile sense that we become aware of matter and of motion; whereas taste and smell appear to be chemical senses and to be brought into activity by actual particles of matter given off by odoriferous bodies—the particles being received by the nose, or dissolved in juices of the mouth. The two main senses of man are dependent on waves or tremors, that is, on vibrations of some kind.

But now we have to consider in what sense the term "wave" can be applied to sound or to light.

The term "wave" was originally used, no doubt, to signify the traveling humps on the sea and the ripples on smaller

pieces of water. And it was by no means obvious—it had to be discovered—that there was any analogy between them and the apparently quite distinct phenomena of sound and light. As a matter of fact the waves *are* different; and it is chiefly because they can all be represented by the same mathematical equation that the same term is applicable to such very different phenomena.

Ask a mathematician what he understands by a wave, and he will probably reply

$$\frac{d^2y}{dt^2} = v^2 \frac{d^2y^2}{dx^2}$$

And if asked to put this into words he would say—something periodic both in space and time, traveling in the direction x with the velocity v.

Let us illustrate this.

By "periodic" is meant repetition at regular intervals. A row of railings is periodic in space, if the railings are all exactly alike. The swing of a pendulum is periodic in time. And if you had a row of pendulums swinging in regular succession, not all swinging together, but started one after the other, the arrangement would be periodic in both space and time. And if you watched the pendulumbobs you would see a wave form running along them, coming in apparently at one end and going out at the other. There is no real progressive motion of anything material; but there is a form which progresses.

One might take another analogy:

The turns of a corkscrew are periodic in space. If you make it revolve it is periodic in time too; and accordingly you see the waves advancing.

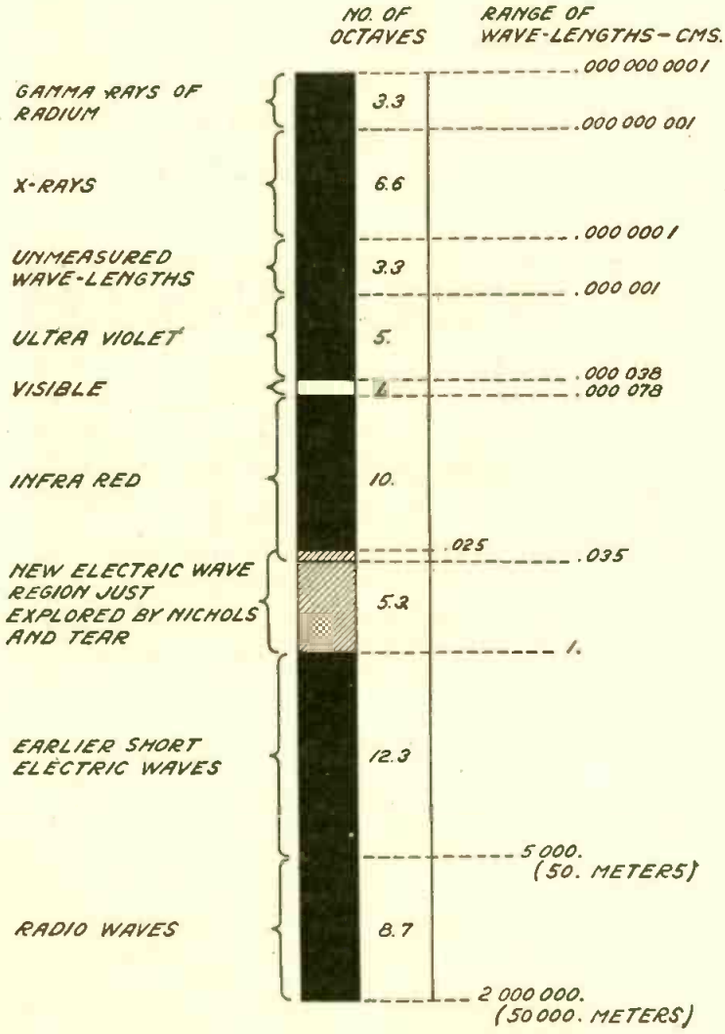
So it is on the open sea. The wave advances, but the particles do not. The particles heave up and down. But because they do it in regular and periodic order, the result is an apparent progression, which anyone can see by throwing a pebble into a pond. Near the shore the waves get more complicated. The bottom part is held back by the beach, the top part travels forward, and the wave topples over and breaks upon the shore. These also are popularly called waves, but they are more complicated than true waves. They are breaking waves, and represent absorption or destruction of the wave motion, and its conversion into the irregular vibration which appeals to our senses as heat; though indeed the heat thus generated hardly raises the temperature of the water appreciably unless the waves are exceedingly violent. Nevertheless that is the way we get heat from the sun. The energy does not come to us as heat. It comes to us as a form of wave motion, and only when absorbed or quenched by matter does it turn into what we speak of as radiant heat. It is those waves which keep the earth warm, and make vegetation, and life generally, possible.

Waves are often generated by the molecular agitation we call heat; and they excite the same kind of agitation when they are received and quenched. Holding the hand or face in front of the fire is a sufficient example of that process. So it is if you stand in the blazing sunshine. The sun is at a terrifically high temperature and consequently emits very intense waves with prodigious rapidity.

Waves of sound also turn into heat when they are absorbed. But if either of these two classes of waves falls upon appropriate receiving organs, they excite the nerves with which those organs are supplied, and thereby give us the sense of sound or of light. How they do this is partly understood and partly still mysterious. The translation of a tremor into a sensation has to be interpreted, as far as it can be interpreted at present, by the science of psychology.

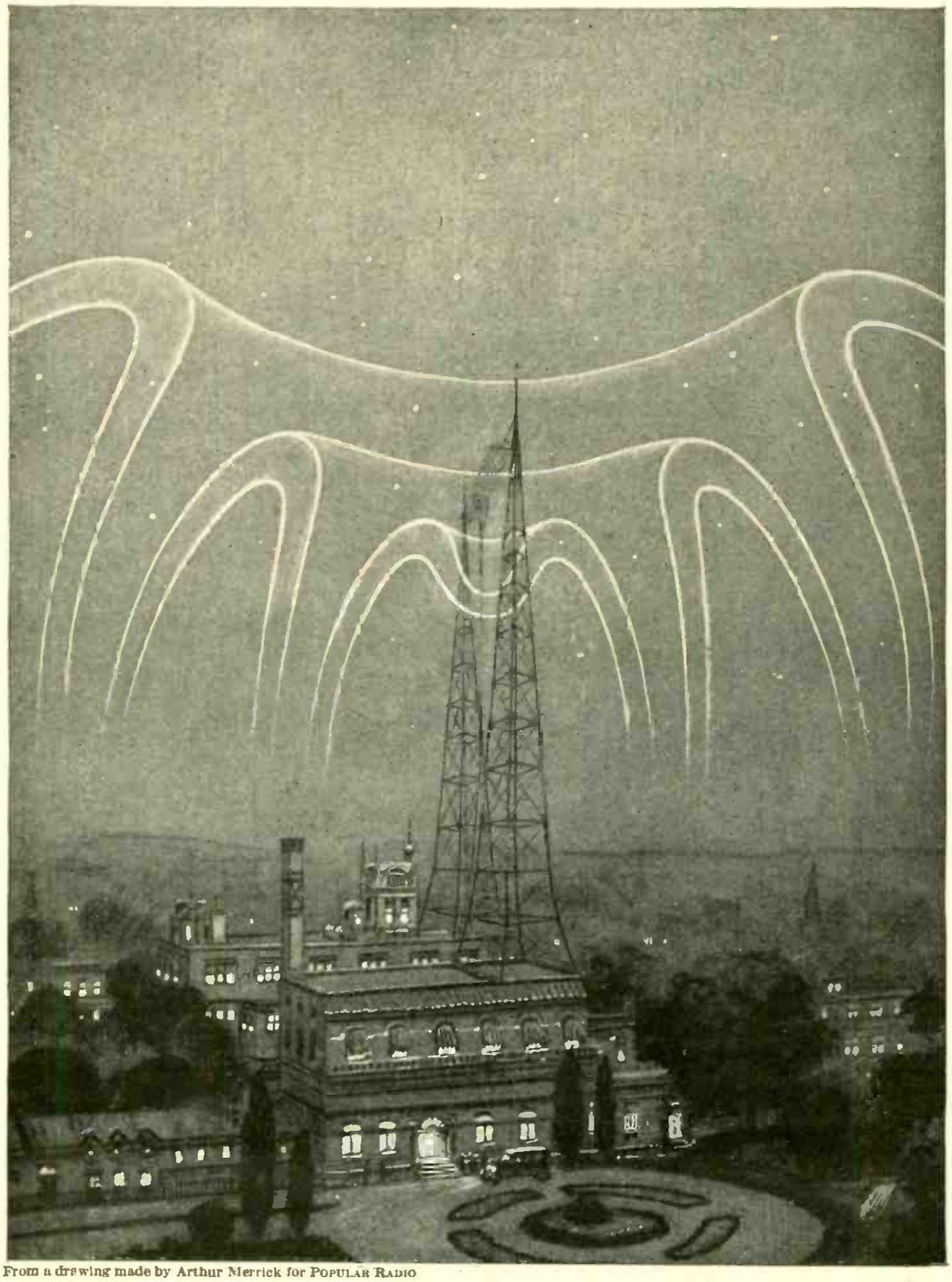
The eye and the ear only respond to a certain range of tremor. They will not respond to vibrations which are too slow, nor again to those which are too quick. The ear has the greater range of the two.

The range of the eye is extremely limited: the most rapid vibrations which the eye can perceive are only twice as quick as the slowest which it can perceive. The slowest excite the sensation that we call red, the most rapid excite the sensation that we call violet. But beyond the violet there is an immense range of ultra-violet, right away up to the X-rays and, even higher than those, the gamma-rays of radium, thousands of times more rapid than anything that can affect the eye. Fortunately, however, they are able to affect certain chemicals and therefore they may be photographed. Below the red again there is a great range, which is called infra-red; and much slower than that, the waves which are used in radio. These can neither be seen nor photographed; we require special instruments for their detection. They are big things and require a big collecting apparatus, well known as "the antenna;" and that



A FREQUENCY CHART THAT SHOWS MANY TYPES OF WAVES

This chart gives the frequencies of waves that lie between the extremely short gamma rays of radium and the relatively long waves that are used for radio communication.



From a drawing made by Arthur Merrick for POPULAR RADIO

IF WE COULD SEE RADIO WAVES

They would look something like the ghostly outlines shown in this picture. The waves start from the antenna and expand in ever enlarging circles. The white lines show a cross-section view of the wave motion of radio waves in the ether.

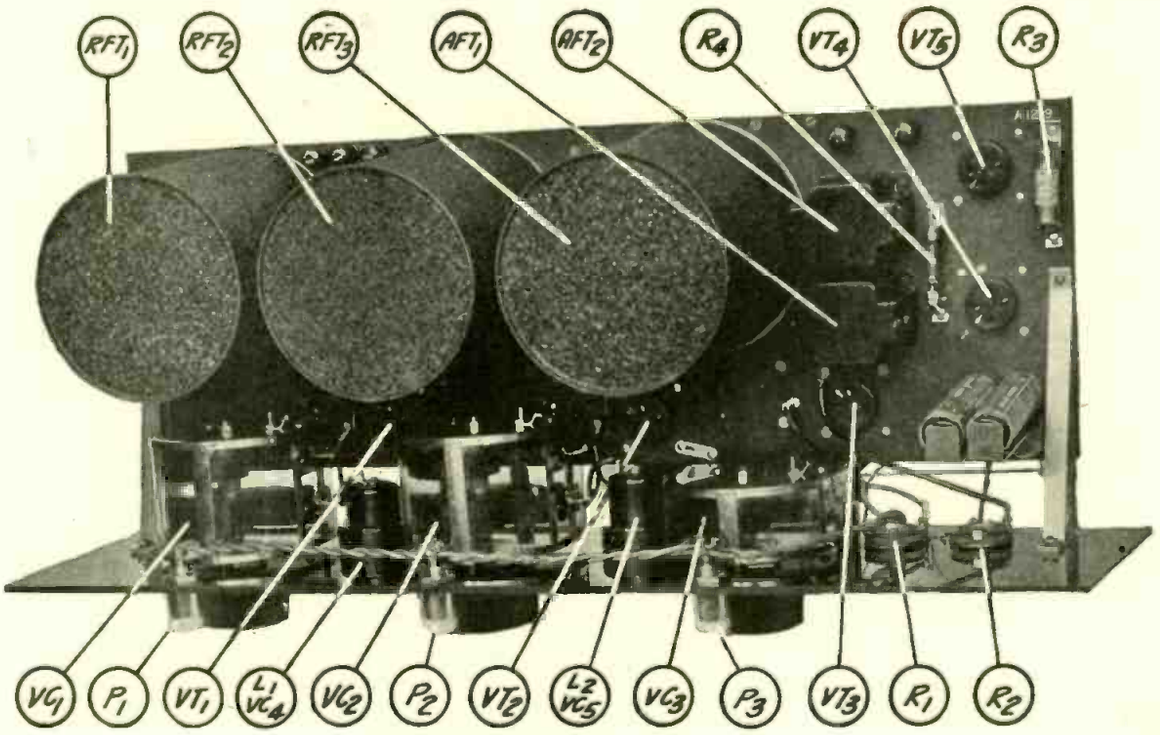
has to be associated with either a coherer, or a crystal detector or a vacuum tube, which has the property of rectifying them and enabling them to produce low-frequency electric or magnetic effects, so that they can deflect a galvanometer or be heard in a telephone.

So far we have dealt with the analogy between the different forms of wave. We must now say a word about their differences.

Waves of the sea and ripples occur only on the surface of a liquid. They are a special though a peculiarly familiar type of wave.

Waves of sound are not really appreciable as waves at all. They consist of compressions and rarefactions of the air, periodic variations of pressure, such as might cause vibrations in a drum-skin or any other flexible instrument susceptible to rapid changes of pressure. Such a drum-skin is provided in the ear, and, by what we must call ingenious mechanism, is transmuted into forcible though minute vibrations which can affect the endings of the auditory nerve immersed in nutritive fluid. Without air there would be no sound. The waves are conveyed by matter; and the ear is specially contrived to pick up these vibrations from a gaseous medium. Sound can be transmitted by solids and liquids also, but *always* by some form of matter. In that it differs entirely from light.

(*Continued on page 672*)



The Walbert "Isofarad" Receiver

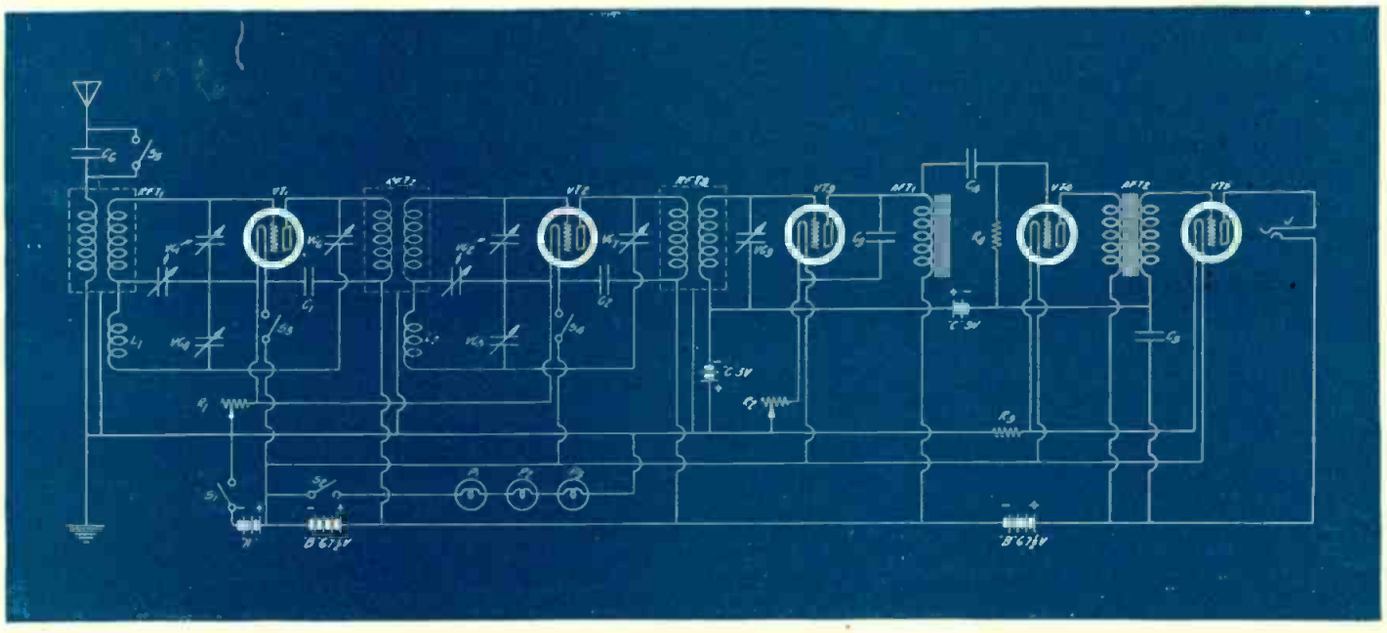
This receiver is extremely selective and the reproduction is clear and loud. A novel scheme is employed for neutralizing the radio-frequency vacuum-tube circuits so that they cannot oscillate which gives greater radio-frequency amplification and which is exceptionally stable.

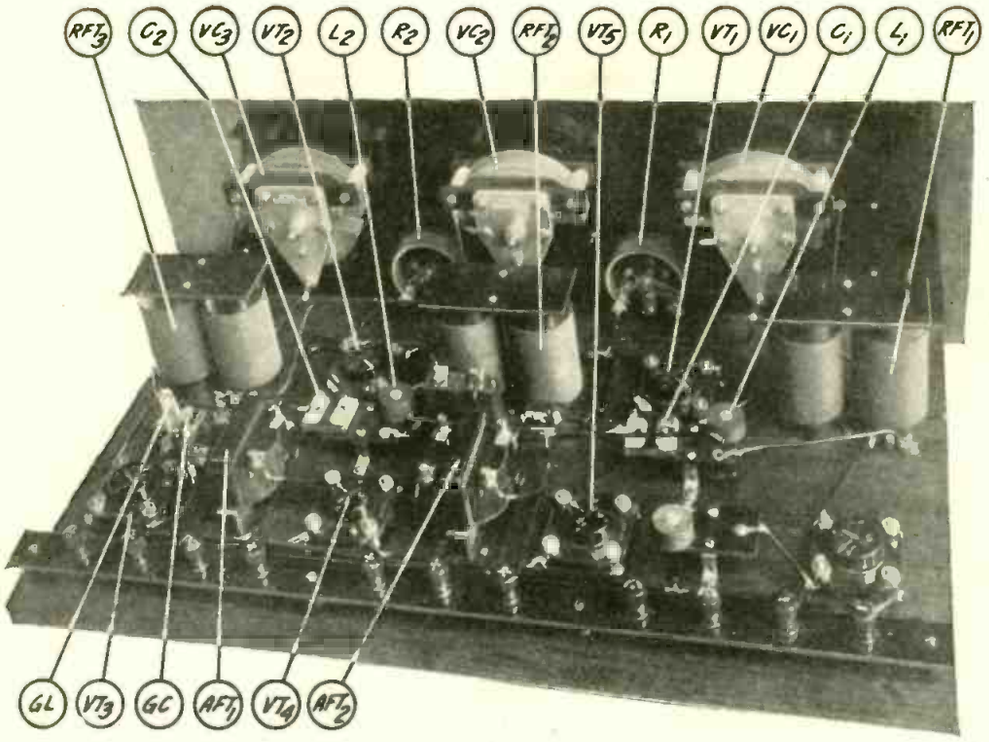
Popular Radio Circuits

INSTALLMENT NO. 4

THE PARTS THAT ARE RECOMMENDED FOR USE IN THIS RECEIVER ARE—

RFT1, RFT2 and RFT3—Walbert shielded RF coils;
L1 with VC4, L2 with VC5—Walbert RF choke Isodons;
AFT1—Thordarson impedance transformer;
AFT2—Thordarson audio-frequency transformer;
VC1 and VC2—Walbert Isofarad tuning condensers, type A;
VC3—Walbert Isofarad tuning condenser, type B;
VC6 and VC7—Walbert Isodons;
VT1, VT2, VT3, VT4 and VT5—Benjamin sockets;
S1, S2, S3 and S4—Walbert lock switches;
C1, C2 and C5—Dubilier bypass condensers, .5 mfd.;
C3—Dubilier mica condenser, .001 mfd.
C4—Dubilier mica condenser, .01 mfd.
R1—Carter rheostat, 10 ohms;
R2—Carter rheostat, 25 ohms;
R3—Brach filament ballast, ½ ampere;
R4—Electrad grid-leak, .1 megohm;
P1, P2 and P3—Walbert Panelites;
Composition panel, 7 inches by 26 inches by ⅛-inch, drilled and engraved;
Composition sub-base, 8 inches by 25 inches by ⅛-inch, drilled;
Sub-base brackets (2 required);
J and S5—binding posts used here;
Binding posts, 5 required (includes J and S5);
Walbert connecting terminal and battery cable;
Walbert "Univernier" condenser dials (3 required).





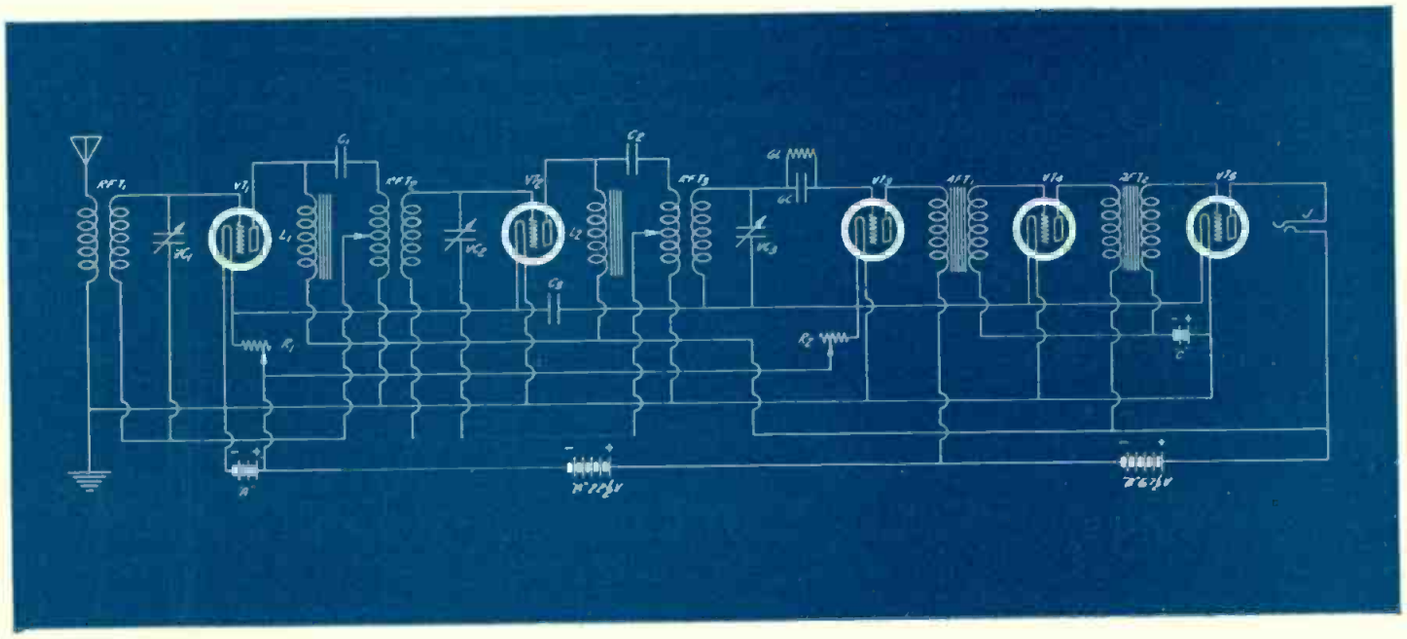
The "Dymac Somerlog" Receiver

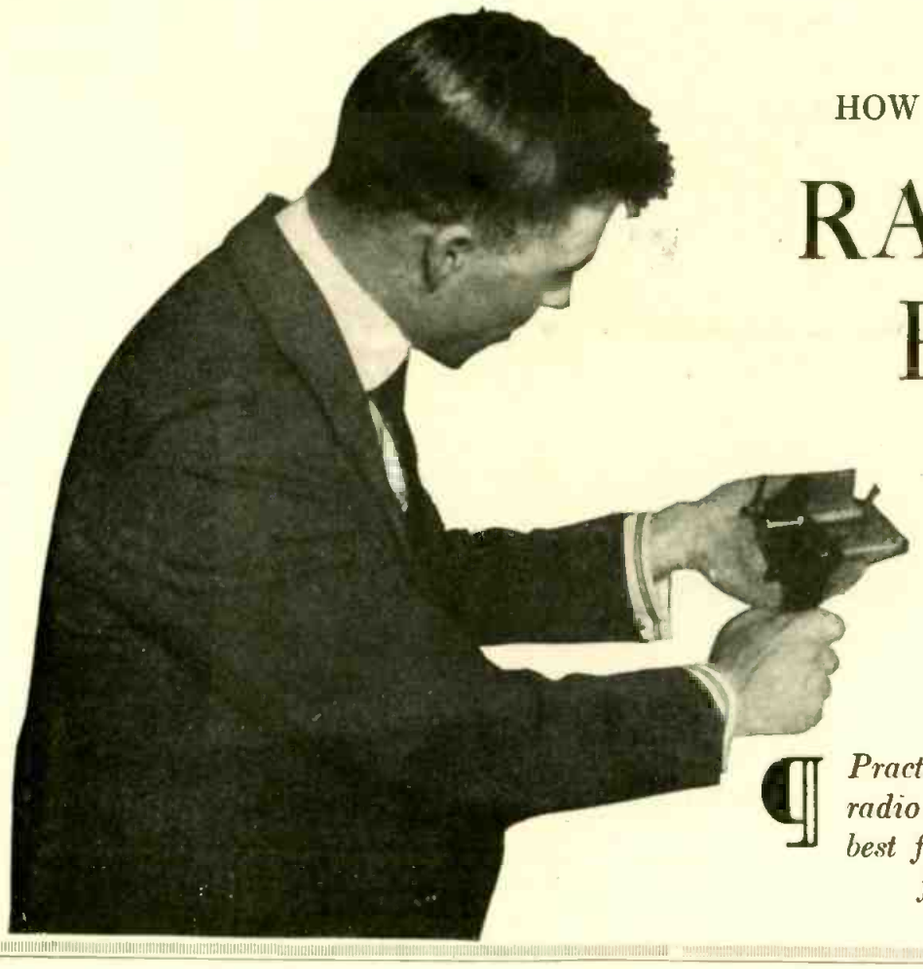
This receiver features a method of balancing the plate and grid circuits by means of a simple bridge. This provides exceptionally clear reception with a minimum of extraneous noises. An additional stage of neutralized radio-frequency amplification may be added, as shown above, but the selectivity that is obtained with two stages, as shown in the circuit diagram, is sufficient for ordinary use. The audio amplifier is transformer-coupled. Another good addition to this outfit is recommended by the designer and shown above—a .1 mfd. bypass condenser across the "B" battery and a .002 mfd. condenser across the primary terminals of the first audio transformer.

The Parts That Are Recommended for Use in This Receiver Are—

L1 and L2—Dymac chokes;*
RFT1, RFT2 and RFT3—Dymac radio-frequency coils;*
C1 and C2—Dymac mica balancing condensers;*
C3—Dubilier mica condenser, .006 mfd.;
VC1, VC2 and VC3—Dymac variable condensers, .00035 mfd.;
R1 and R2—Dymac rheostat, 10 ohms;
GC—Dubilier mica condenser with grid-leak clips, .00025 mfd.;
GL—Daven resistor, 2 meg.;
AFT1—Splitdorf audio-frequency transformer, ratio 5 to 1;
AFT2—Splitdorf audio-frequency transformer, ratio 3 to 1;
VT1, VT2, VT3, VT4 and VT5—Benjamin sockets;
J—consists of binding posts for speaker mounted on binding-post strip;
11 binding posts;
Composition binding-post strip, 1 inch by 21 inches by 1/8-inch;
Composition panel, 7 inches by 22 inches by 3/16-inch;
Baseboard, 11 inches by 21 inches by 5/8-inch;
Kurz-Kasch dials, zero-100 (3 required.)

*Contained in the Dymac Somerlog Kit.





HOW TO SELECT YOUR

RADIO PARTS

By K. B. HUMPHREY

¶ Practical pointers for the buyer of radio apparatus; how to pick out the best from the assortment placed before you for your choosing

THERE are times when a radio experimenter would like to build a radio receiver of a certain type, yet hesitates because the price of the parts is beyond his means.

While it is always better and safer to buy parts of standard make that are sold by reliable radio retailers, it is by no means possible always to stick to the letter of the diagram, as the question of price is often an important factor.

This article proposes to serve as a guide to the builder who wants to buy at the very minimum price, and who nevertheless wants to feel fairly certain that he will obtain satisfactory results from his purchases. Standard material which is specified in the hook-up may often be obtained at a price considerably below the list if the bargain sales are followed from week to week.

How to Choose a Coil

In all of the circuits a particular coil is usually specified and a condenser of particular size is designated to go with it.

It happens that in the choice of a coil there are a great many factors which enter in, such as spacing, form, number of turns, and the size. When a receiver is designed one of the most important parts and one that demands probably more attention than any other one detail is the coil. The spacing between coils of different shapes and sizes is particularly important when any radio-frequency amplification is used in the set. For this reason it is not desirable for the builder to deviate to a great extent in regard to the coil, unless he has had considerable experience in handling various types of coils. In other words, it is not possible to put any kind of a coil in just any sort of position without running into difficulties.

A solenoid has an entirely different shape of field than a spiderweb coil and different methods of spacing must be used. In many cases the turns, size, and other details, are specified in the drawings; in such cases the builder may wind his own coils. If he can do this, the price is considerably reduced.

How to Select the Variable Condenser

The size of condenser is always specified to go with a given coil and is usually .00035 or .0005 microfarads.

A given coil and condenser always go together in order to produce a resonant circuit which may be varied over the wavelength band in use for broadcasting. Therefore, when a .00035 condenser is specified, the buyer must insist on getting that particular size and none other.

It happens that there are dozens of condensers, a great many good ones, which will fill the bill so fas as size goes. In some cases the physical dimensions of the condenser are specified in a given receiver. In such a case the builder will have to find a condenser which is of the proper capacity and which will fit into the rest of the receiver. Practically any standard make of condenser will work as well as any other. Those of incorrect design are gradually getting fewer and fewer, and there is not a great deal of chance of getting one that is entirely inoperative.

Here are a few points which should be looked at when buying variable condenser:

First: See that the condenser is built strongly enough to resist any buckling or bending. It is not necessary to use a sledge hammer on it to test it, but it should be rugged enough so that it does not short with the slightest pressure.

Second: See that the condenser plates do not touch when the shaft is turned. The alignment of the plates is a very important factor and the spacing should be the same at all positions.

Third: See that the shaft turns freely but that there is no shake in it. The slightest movement of the shaft should cause it to be rejected because the

(*Continued on page 692*)

HOW A MOVING PICTURE OF A MOVING OBJECT IS TRANSMITTED

A large opaque disc that carries a series of small lenses mounted in a spiral revolves in front of the object, the image of which is to be sent through the ether. As this disc revolves, each one of the lenses cuts across a thin slice of the object and focuses the light variations on a sensitive cell that changes them into variations of electrical current. As each lens crosses the object a little lower than the previous one, the whole picture is finally strung out into a series of electrical vibrations, so that a whole picture may be transmitted with one revolution of the disc. The circle X shows the portion of the object taken in by each lens and the imaginary slot, Y, shows the path of the lens over the object. Of course, the illustration above greatly exaggerates the thickness of the slot, Y, that is taken in by one lens.

THE "TELEVISOR"

On August 9, 1926, the British Postmaster General issued the first transmitting and receiving licenses for radio television stations—thus officially recognizing the experiments of John L. Baird, who has been sending and receiving actual moving scenes between London and Harrow. The Baird apparatus used in these tests is described in this article.

By ORRIN E. DUNLAP, JR.

A message from the inventor to the readers of "POPULAR RADIO"

"We are transmitting from Motograph House on 200 meters, and it is possible that our television transmissions are being received by the U. S. A. amateurs; they are audible as a rhythmic hum something like the sound of an aeroplane. This note changes with every change of scene which is being transmitted, but what will be heard will probably be the sound sent out by the face of Captain Hutchinson, our business director, who is at present the usual performer before the transmitting Televisor. We will be very pleased to hear from anyone who has picked us up on your side of the Atlantic; our call sign is 2TV."

John L. Baird

AFTER fourteen years of experimenting, John L. Baird, a Scottish inventor and thirty-six year old son of a Presbyterian minister at Helensburgh, near Glasgow, has developed a method of transmitting pictures of moving objects by radio.

So confident is Baird in his "televisor" that he has recently secured from the British postoffice a license to build a television broadcasting station, with which he plans to let the public "look-in" as well as listen-in. Reports from London indicate that the televisor will not be offered for public use for at least

another year, owing to the fact that the British Broadcasting Company's concession from the postoffice expires on December 31 after which date it is believed that the postoffice will operate the broadcasting service throughout the British Isles.

The receiving apparatus with which Mr. Baird has given several demonstrations is a box about 3 feet by 2 feet by 1 foot in size, with a hood projecting from one side. Inside this hood is a lens through which the transmitted picture appears. It seems likely that when the television service is inaugurated it will operate in conjunction with the regular broadcasting of entertainment and a loudspeaker will be included inside the receiving hood. Then if King George actuates the microphone it will be possible, by watching the lens inside the hood, to hear and see him simultaneously.

In his laboratory in the West End of London, Mr. Baird has his guests watch the lens covered by a hood in a small theatre he has fitted up on the floor below. One observer who witnessed a demonstration said, "His voice and the picture of his face came through very clearly. The picture was in black and white, his lips could be seen enunciating each word, and the shadows changed with his changing expression."

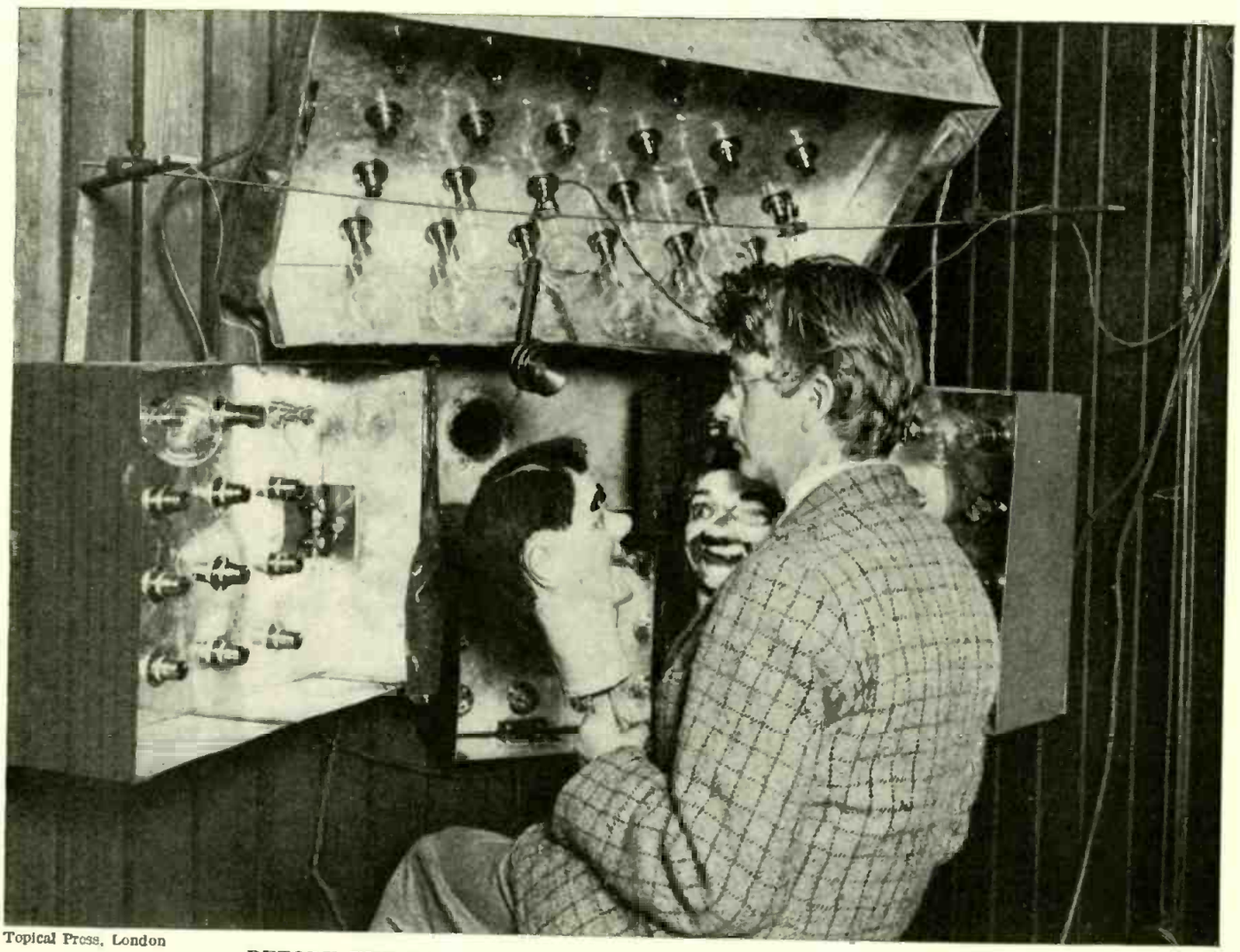
The televisor is designed to transmit to the human eye living and moving pictures at the instant of their occurrence. Baird explained to one group to whom he made a demonstration that his problem has not been only converting light into electric waves at the transmitting end and reconverting the Hertzian waves into light at the receiver, but he has had to find a way to synchronize the converting and reconverting processes and speeding them up so as to give the eye the impression that it is seeing an entire picture instead of a succession of parts.

"Once the synchronizing and speeding up problems have been solved," said Baird, "we can transmit motion pictures to any distance that wires or radio will carry. We can focus the lens of our transmitter just as a kodak is focused, so that we can send a close-up of a face or a distant view. It is all a matter of speed and synchronization."

The general theory of television is to project a picture onto a cell sensitive to variations in light. The picture is projected in a piecemeal fashion and each tiny area into which the picture is divided causes the photo-electric cell to send out an electric current proportional to the amount of light in its area. Thus the dim parts of the picture are represented by a weak current and the bright parts by a stronger current. At the receiver these currents control a source of light which is projected onto a screen in exact synchronism with the projection of the picture at the broadcasting station, and the process is performed so rapidly that, due to the eye's retention of images, the complete picture appears simultaneously.

The Baird system uses only one photoelectric cell at the transmitting end and he breaks up the picture into

(*Continued on page 668*)



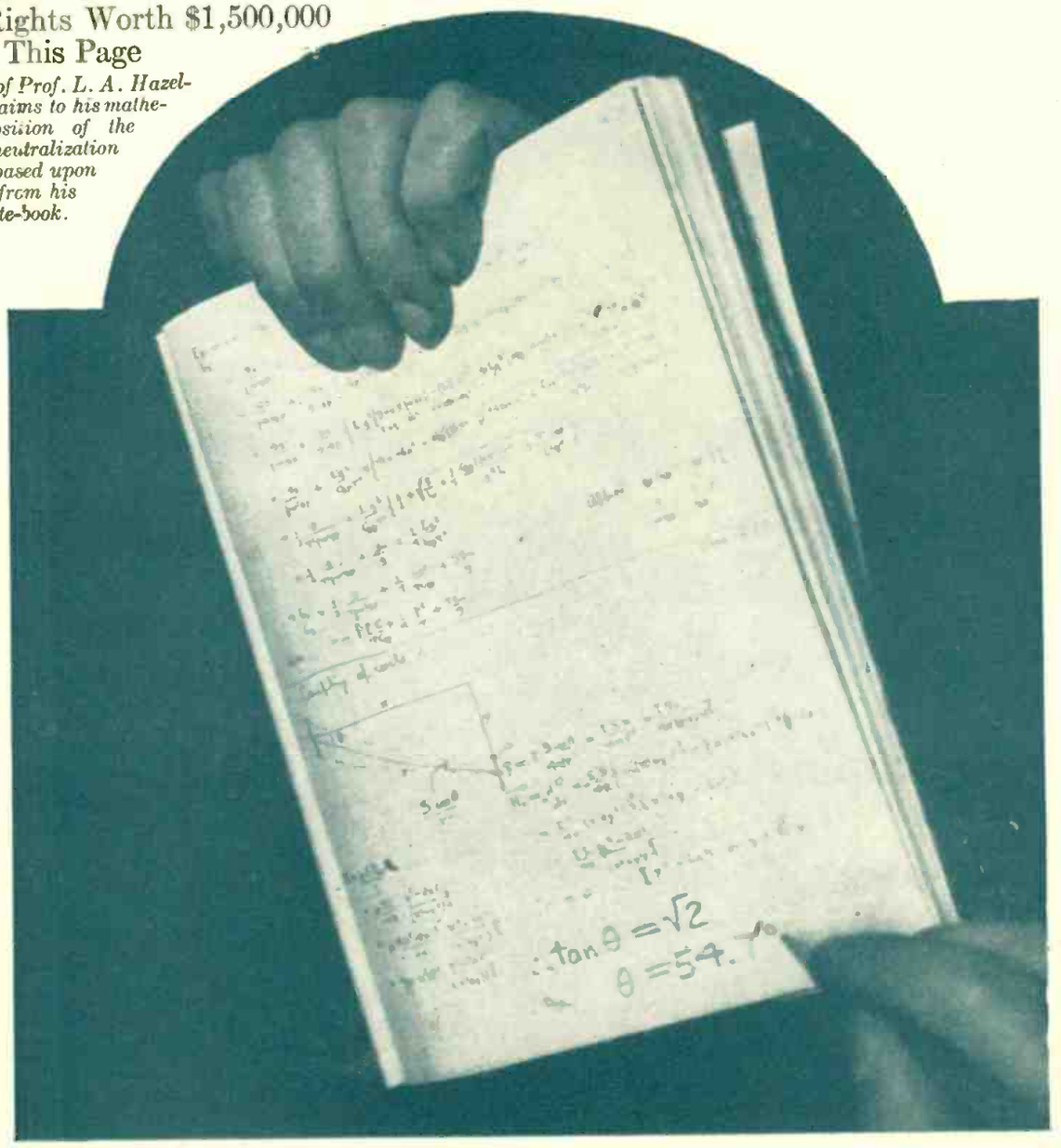
Topical Press, London

BEFORE THE FOOTLIGHTS OF THE TELEVISOR TRANSMITTER

The two ventriloquist's dolls, James and Bill—"the first television stars"—are held by Mr. Baird in front of the microphone and the mechanical eye that sees and hears everything that goes on in front of it.

Patent Rights Worth $1,500,000 Hung on This Page

The priority of Prof. L. A. Hazeltine's legal claims to his mathematical exposition of the principle of neutralization was largely based upon this notation from his laboratory note-book.



HOW TO

Patent Your Radio Invention

NOTE TO EXPERIMENTERS: *File this article for reference!*

The advice given on this and the following pages would have been worth millions of dollars to inventors—if they had received it before they made the mistakes that prevented them from profiting in full from their labors.

By EDGAR H. FELIX

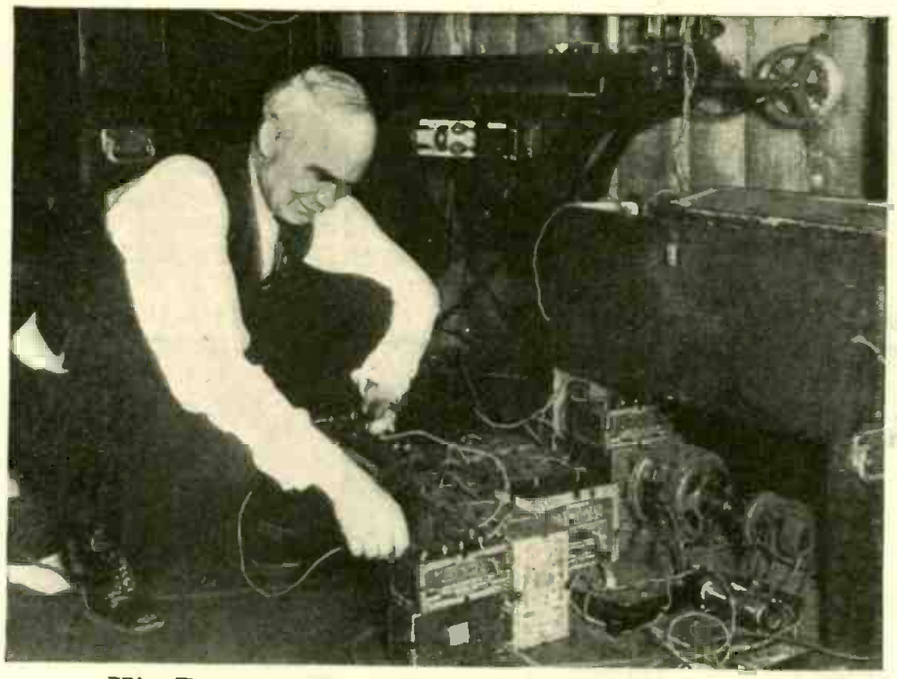
WHEN you experience for the first time the thrill of discovery—the realization that you have invented something, or found a new way of doing something which you believe has never been accomplished before—you are less than normal if you do not speculate how you will spend the fortune which is to be yours.

Your next step is to seek the services of a patent lawyer.

Probably the first lawyer you meet knows little or nothing about radio. He will listen to your plausible story, assure you that your invention shows considerable promise, and he will encourage you to seek a patent. There may be a number of conferences, a search, the preparation of claims, their amendment and final acceptance. Then, after a lapse of six anxious months, you may receive a prettily printed document, a letters patent certificate, which ultimately takes its place in your safety deposit vault with worthless oil stock, lapsed insurance policies and other misspent efforts.

At least, this is the experience of most inventors. Two out of three patent applications are rejected by the Patent Office because they fail to meet one or more of its requirements and, of the remaining third, only one out of a hundred, it is estimated, ultimately yields profit to its inventor.

Radio enthusiasts are particularly



His Patents Have Earned $500,000,000 for Others Than Himself

"I have roughly figured up the money which has been paid me as a result of my radio inventions; it totals between $800,000 and $1,000,000. This is not a very good showing, I will admit, considering that my patents have easily earned $500,000,000; however, it is much better than some inventors have secured from their work."

Lee de Forest

$3,000,000 Returns in Twenty Years

"It is rarely that the complicated patents are as remunerative as the simpler ones. Complicated patents, in order to be complete, involve a great deal of experimental work which is costly, and it is only occasionally that a chance experiment will result in a valuable improvement. . . . Regarding the approximation of the returns on my radio devices and patents during the last twenty years, I would say that about $3,000,000 would be a fair estimate, but at that I have spent probably $1,500,000 in development and patent expenses."

Edwin H. Armstrong

subject to the patent mania. There are so many ways of accomplishing a result in radio that an imaginative mind is more than likely to hit upon one now and then.

But a fortune is not yours unless your idea is entirely new, unless it is useful to a great number of people, unless it is patentable and unless it performs its service in a more convenient, economical and efficient manner than other existing devices for accomplishing the same object.

As the odds against the winning of the successful inventor's fortune are so much against you, it is worth while to consider carefully what your chances of making money are, before you seek a patent upon your idea. Answer honestly the following questions:

1. Does the device perform a service so useful that a sufficient number of people will pay enough for it to yield you a substantial profit?
2. Is the service performed by the device a new one, or is it accomplished by your device much more economically, efficiently and satisfactorily than by other existing devices?
3. Is it sufficiently simple of manufacture to permit it to be made in quantity at a profit?
4. Does it fill a need sufficiently obvious to its prospective users that it can be sold to them without excessive advertising and promotion cost?

An affirmative answer to each of these questions determines whether it is worth while to apply for a patent. A negative answer to one or more of these questions means that it is unlikely that you will ever be repaid for the expense to which you have to go to secure a patent. Each presents an essential link in the chain of success, which cannot be disregarded.

Let us suppose, for purposes of illustration, that you have discovered a device which automatically keeps all the stages of a radio-frequency amplifier in resonance, as you adjust a single controlling tuned circuit.

Applying the first question, the device is certainly useful because it would solve the difficult design problems in making a single-control receiver. It would be useful to a large number of people who desire and would pay for efficient, single-control receivers.

To the second question, you know that single-control receivers are already in existence. Even though your device may be a new one, if it does not do its job better than other present day, single-control receivers, it will never make you rich. It must, therefore, possess sufficient merit in these respects to replace existing means of accomplishing this particular purpose.

If the device is very complicated and difficult to make, the high cost of production will prevent it from being extensively applied. This point is brought up in the third question.

The desirability of single-control receivers is widely realized and you therefore may give an affirmative answer on the fourth question.

Assuming that you meet these four premises, you must next determine whether the device itself is patentable. Many conditions must be met to make a device patentable and, even if you are successful in meeting these conditions, you have still to go through the many steps of enlisting financial aid or selling your invention to those in a position to manufacture and market it.

The three principal conditions upon which the issuance of a patent depends are that the device under consideration is, first, an invention, a specific, tangible thing; second, it is a new device; and, third, it has utility.

These conditions are tersely stated in Section 24 of the Rules of Patent Office, which states:

"A patent may be obtained by any person who has invented or discovered any new or useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country or described in any printed publication in this or any foreign country before his invention or discovery thereof, or more than two years prior to his application, and not patented in a country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months before his application and not in public use or on sale in the United States for more than two years prior to his application, unless the same is proved to have been abandoned, upon payment of the fees required by law and other due proceedings had."

By "invention" is meant a new article, machine, manufacture or composition of matter, or any new and useful improvement of an existing device.

You cannot patent a superior skill or high grade artisanship in making a thing or a superior material applied to an existing thing or a method of enlarging or strengthening or merely changing or duplicating a part of an accepted article.

You cannot patent a general principle.

For instance, you might have been the first to conceive the idea that the heat of the sun's rays may be converted directly into steam, thus doing away with the use of coal. But you could not obtain a patent on this principle. If, you, on the other hand, were to invent a novel arrangement of mirrors and reflectors for the purpose, you might be able to secure a patent, even though there are scores of other experimental, sunheated boilers in existence.

He Received $300,000 from the Sale of His Sodion Patents Alone

"Up until December of last year I was retained by the Connecticut Telephone & Electric Company and up to that time for a period of approximately ten years all patents secured were assigned to that company. I have no exact information upon the returns which were secured other than a few isolated instances, such as the sale of the sodion patents for $300,000."

H. P. Doyle

Foto Topics, Inc.

So Far He Has Collected $1,500,000 on His Radio Inventions

Mr. Marius Latour, the French radio expert, despite the large sums that he has already received from his radio inventions, has figured extensively in litigation; the famous "Latour patent," which is still pending in the courts, has long been discussed in radio circles, as it purports to grant Mr. Latour patent rights which are said to control most of the multi-tube receivers now in the market.

You cannot patent a combination of old things in common use, so combined as to perform their old functions.

For instance, the man who attempted to patent the combination of an eraser and a pencil, failed to secure a patent, because this is a combination of old things producing an old result. If, on the other hand, this combination would produce an entirely novel result, such as serving as a barometer or as a new food for fishes or any useful service not performed by them separately, he might have obtained a patent.

The condition that an invention be new to be patentable is also a specification hedged in by many precedents. In a general way, your device must not be used or known prior to your invention of it.

If another has been making and selling the device upon which you desire a patent, without your knowledge, for two years prior to the date you apply for your patent, regardless of the date of invention, you are not entitled to a patent. Your patent may be upset, long after it is actually issued, if it can be shown that it has been manufactured or sold in quantity for more than two years prior to your application.

There is a limitation, however, to the rights of prior inventors. It often happens that somebody else has thought of an idea prior to the time another inventor conceives it. But, if he did not pursue its development with due diligence, by perfecting the idea and by taking steps to secure a patent, he loses his right to it by abandonment. One who would upset your patent must show that he did more than merely think of your idea before you did. He must have pursued its development with due diligence so far as his circumstances permitted. Patent law allows him two years to take active steps to secure a patent. If he has done nothing about it in that time, somebody else, who did actively pursue it to the patentable stage, is free to obtain patent protection.

Suppose you discover a new type of vacuum tube, built on entirely new principles. As far as your limited funds permit, you continue its development in your home laboratory. You may work on it for five years and, so long as you keep adequate records of your experiments and pursue them with due diligence, your right to secure a patent is firmly established when the idea is sufficiently clarified to draw patent specifications. You are in no sense guilty of abandonment, even though more than two years passed from the time of conception to patent application, because you worked diligently and continuously on the idea. If another inventor, six months before you apply for a patent, gets the idea, develops it and patents it, you are able to upset his patent because you can prove prior conception and because it cannot be shown that you abandoned the idea.

If a description of the device is printed in any publication in this or any foreign country before your discovery of it, you cannot secure a patent. The object of a patent search, which is made before the application is filed by your patent attorney, is to verify your precedence over other inventors. Patent searches are frequently made for a fee of ten dollars. Naturally, all existing periodicals in all countries of the world cannot be examined for this trifling fee. All you get for this sum is an examination of recent patents under that classification within which your device falls. This uncovers the most likely patents, but it does not protect you against applications already on file but not yet granted.

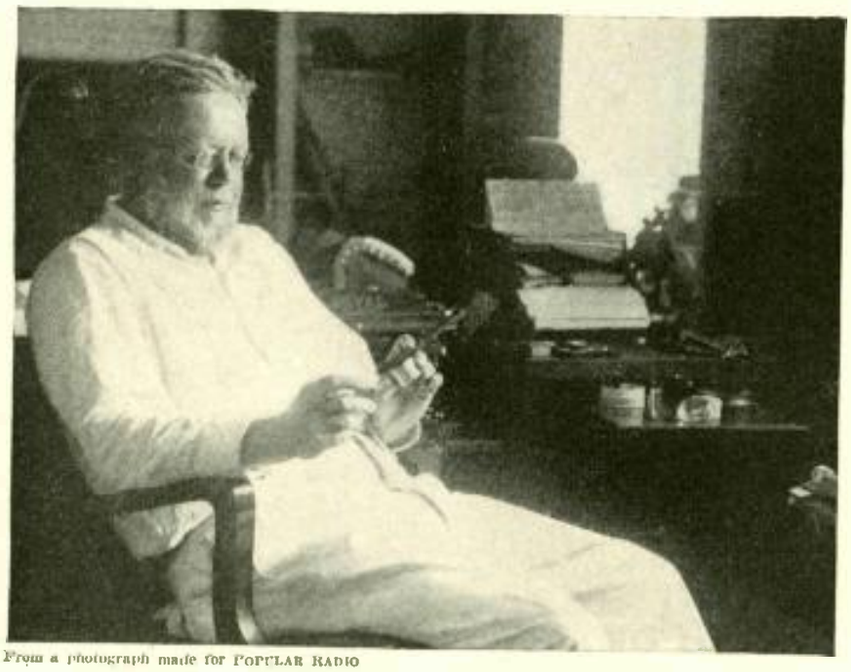
Another requirement is that the device shall not have been described in publication or book within two years prior to the time at which you make your application, even though this publication is made *after* you originally invented it. You may have conceived your idea in 1921; it may take you five years to perfect it before you can apply for patent, yet, if a description of it is published by another inventor in 1923, you cannot secure a patent in 1926, even though you antedated the other inventor.

The third requirement—that of utility—is a comparatively simple one and its purpose is obvious. For instance, a machine for making ruts in a highway might be very novel and efficient, but it hardly can be considered useful. A patent application for any device contrary and dangerous to the public interest would be thrown out on this ground.

There is much practical advice which can be given to inventors. More important than anything else is the establishment in an unmistakable manner of the date of conception. Many an inventor has been unjustly denied the fruits of his inventive genius because he has not been able to prove that he antedated another. You may work for fifteen years in your laboratory to bring something to perfection but, if you cannot prove that you did so, another who hit upon your idea and applied for a patent a short time before you filed your own application may be able to upset your claim. The first documentary and verifiable evidence of invention which can be produced is called, in legal parlance, "reduction to practice." This is the first time a description of the device and the underlying idea is written out in a notebook or an affidavit, in a manner such that the date of the description may be established.

Professor Louis A. Hazeltine, inventor of the neutrodyne system of reception, when interviewed on the subject

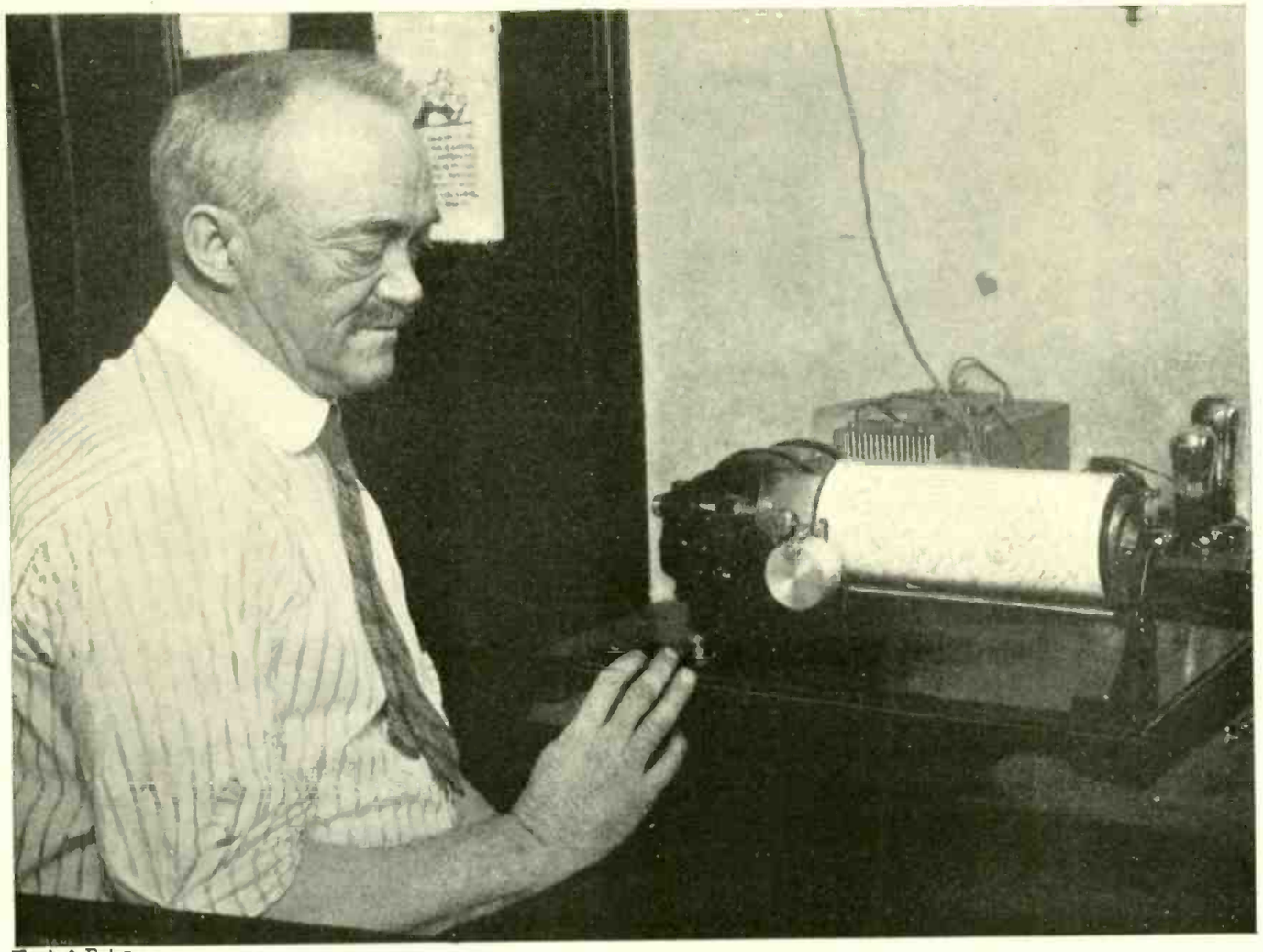
(*Continued on page 690*)



From a photograph made for POPULAR RADIO

Just One of His Patents Brought $1,000,000

That is the amount that Dr. Reginald Fessenden is reported to have obtained from the sale of his patent covering the basic principle of heterodyning. But in the ten years previous to this, Dr. Fessenden, working with a staff of thirty-five men which were supplied by the company which had been formed to exploit his patents, spent nearly $2,000,000 in developing new radio devices. He has probably patented more new radio inventions than any other man.



Harris & Ewing

THE INVENTOR SHOWS HOW A WEATHER MAP IS TRANSMITTED

The original map is shown fastened upon a rotating cylinder which slowly passes every portion of the map before a photo-electric cell, which is contained in the metal case at the left of the cylinder; this sensitive cell changes the variations in light into electrical pulsations which are used to make and break the key circuit of the transmitter.

Radio Transmits Weather Maps to Ships

By COMMANDER STANFORD C. HOOPER, U. S. N.

AT the present time three-quarters of an hour is required to broadcast the general weather forecast from the Arlington radio station every evening. As the message is repeated, the total actual time required for transmitting the forecast is an hour and a half.

All ships copy the Arlington broadcast weather forecasts for the information and use of navigators, who are thus enabled to change their course as may be advisable. Small vessels, particularly, must avoid storm centers, for the sake of safety.

After the message is received on board a ship it must be deciphered and the result must be plotted, in order that the navigator may visualize possible developments. Unless the navigator has plenty of time and is thorough, he will not take full advantage of the information furnished, as it is a tedious job to decipher and plot each day's weather map—not to mention the fact that portions of the message are often missed or garbled by the operators.

Now, however, the Navy Department, at the request of the weather Bureau, proposes to do the job in twenty minutes—and to put the results down in black and white—through the medium of actual weather maps transmitted by radio.

The recent tests made in Washington, D. C. employed the radio vision transmitter and receiver invented by Mr. C. F. Jenkins, of Washington, D. C., already described in POPULAR RADIO.*

The method of procedure is this:

The weather map is supplied by the forecaster in the same way that the forecast message is supplied, only the *map* is transmitted instead of the message.

*August, 1925.

The radio vision transmitter is shown in the illustration on this page; a typical weather map is shown elsewhere in this article.

The map with the temperature and barometer curves is wrapped around the glass cylinder of the apparatus, and in rotation passes before a light sensitive cell, to be changed into electrical pulsations which are used to make and break the key current of the 20 K.W. Arlington radio transmitter on 36 kilocycles.

At the receiving end the operation is equally simple. The Arlington signals are tuned in on the ordinary radio receiver by the receiving operator, and the signals from the receiver are automatically transferred to the radio vision receiving attachment. White paper is wrapped around the cylinder, which in

(*Continued on page 698*)

From a photograph made for POPULAR RADIO

A NEW MODEL WITH A SIMPLIFIED CONTROL

One of the advantages of this new Crosley "5-50" set lies not only in its small and compact size but also in the fact that it may be easily carried about.

INSIDE INFORMATION ON

New Radio Receivers

By S. GORDON TAYLOR

Third Installment

THE CROSLEY "5-50"; THE MURAD "SUPER-SIX"; THE FRESHMAN CONSOLE "6-F-11"

This feature of the magazine is conducted for the information of radio fans who want to know about the newest models of good broadcast receivers—exclusive data was gathered at first hand by the technical staff of this magazine not only from the engineers and inventors who developed the sets but also from tests made in the POPULAR RADIO LABORATORY itself. The receivers that were described in the first two installments of the series are: The Radiola No. 28; the Fada "8"; the Stromberg-Carlson "Treasure Chest"; the Bosch "Amborada"; the Grebe "Synchrophase"; and the Freed-Eisemann "800."

The New Model Crosley "5-50" Receiver

IF you are interested in a new five-tube receiver that combines great selectivity and good volume and tone quality with a reasonable price—consider the newest addition to the Crosley family—the "5-50" Receiver.

Small enough in size to fit nearly anywhere in the room (it is only twenty inches long by twelve inches deep with an overall height of ten inches) the receiver as a whole presents a pleasingly simple appearance.* It is made up with a panelled effect in light mahogany with darker borders of the same material.

There is a major tuning control and four sub-controls on the panel; three of these are surrounded by gold-plated metal frames. The main tuning control is placed at the upper right in a convenient position for the right hand; the other four controls are located along the lower edge of the panel.

The receiving unit itself consists of two stages of tuned-radio-frequency amplification, a regenerative detector and two stages of transformer-coupled, audio-frequency amplification.

Tuning is accomplished by means of a single control that operates three variable condensers the shafts of which are connected together through insulated couplings. With this arrangement the three tuned circuits are kept in resonance throughout the entire broadcasting waveband—enough to permit adequately close tuning of the circuits with the single control on all local and semi-distant stations.

To permit the exact tuning that is required to bring in distant stations, two additional controls, called "acuminators," are provided in the form of small levers on the front of the panel. By means of these two vernier controls, two of the circuits may be brought more exactly into resonance with the third. Once the correct setting of these two

(*Continued on page 678*)

*The same receiver unit that is described in this article may be obtained in the console type of cabinet (Model "5-75"); this will provide ample space for housing all the necessary batteries or power supply units.

The Mu-Rad Super-Six Receiver

THE Mu-Rad Super-Six receiver is a real single-control set; this has been amply shown in the POPULAR RADIO tests. There are no auxiliary wavelength tuning controls of any kind and there seems to be no necessity for them.

Aside from the usual requirements for tone quality, sensitivity, volume and selectivity, there has been a steadily growing demand during the past year for receivers of this type. But when a receiver employs two or more stages of radio-frequency amplification (as practically all receivers do these days), an effective single-control arrangement is a difficult objective for the manufacturer to attain. To accomplish this, the values of each of the three or more tuned circuits must be exactly alike to within a fraction of one percent. That is, as the single tuning control is turned it must vary the wavelength of the individual circuits in exactly the same degree. If one of the circuits is off, even slightly, the overall efficiency of the receiver is greatly decreased with a resultant decrease in volume, sensitivity and selectivity.

Many so-called "single control" receivers have auxiliary controls which are used to make up for slight variations in the values of the individual tuned circuits at different settings of the master control knob or dial; these sets, therefore, are not actually single control.

To check up on this point, the Mu-Rad receiver was set up next to a standard laboratory receiver in which all of the circuits are individually tuned. A distant station was then tuned in on the laboratory receiver and adjustment made for maximum volume. Then the same station was tuned in on the Mu-Rad receiver, which was also adjusted for maximum volume. The difference in the volume of the two receivers was then noted. Thereafter several distant stations were tuned in on the two receivers and it was found that the signal strength difference of the two receivers, as noted in the first test was maintained quite closely throughout the entire broadcasting waveband.

This true single-control tuning presents a decided advantage in the ease of operating the receiver. As the wavelength tuning knob is turned, station after station comes in with no fuss or juggling of a number of controls. The extreme selectivity of the Mu-Rad receiver adds to the pleasure of reception because it practically eliminates interference between stations. Powerful stations within fifteen miles may be cut out by a movement of one degree on the dial. With two high powered New York City stations operating on 305 and 315 meters and located 8 miles and 20 miles away from the receiver, no difficulty was encountered in tuning in WPG, Atlantic City, and KDKA, Pittsburgh, without any trace of the local stations. These four stations all came in within a range of three degrees on the tuning scale of the receiver. It takes a receiver with an exceptionally high degree of selectivity to accomplish this feat in this particular location.

From a photograph made for POPULAR RADIO

A NEW SIX-TUBE RECEIVER WITH A SINGLE WAVELENGTH CONTROL

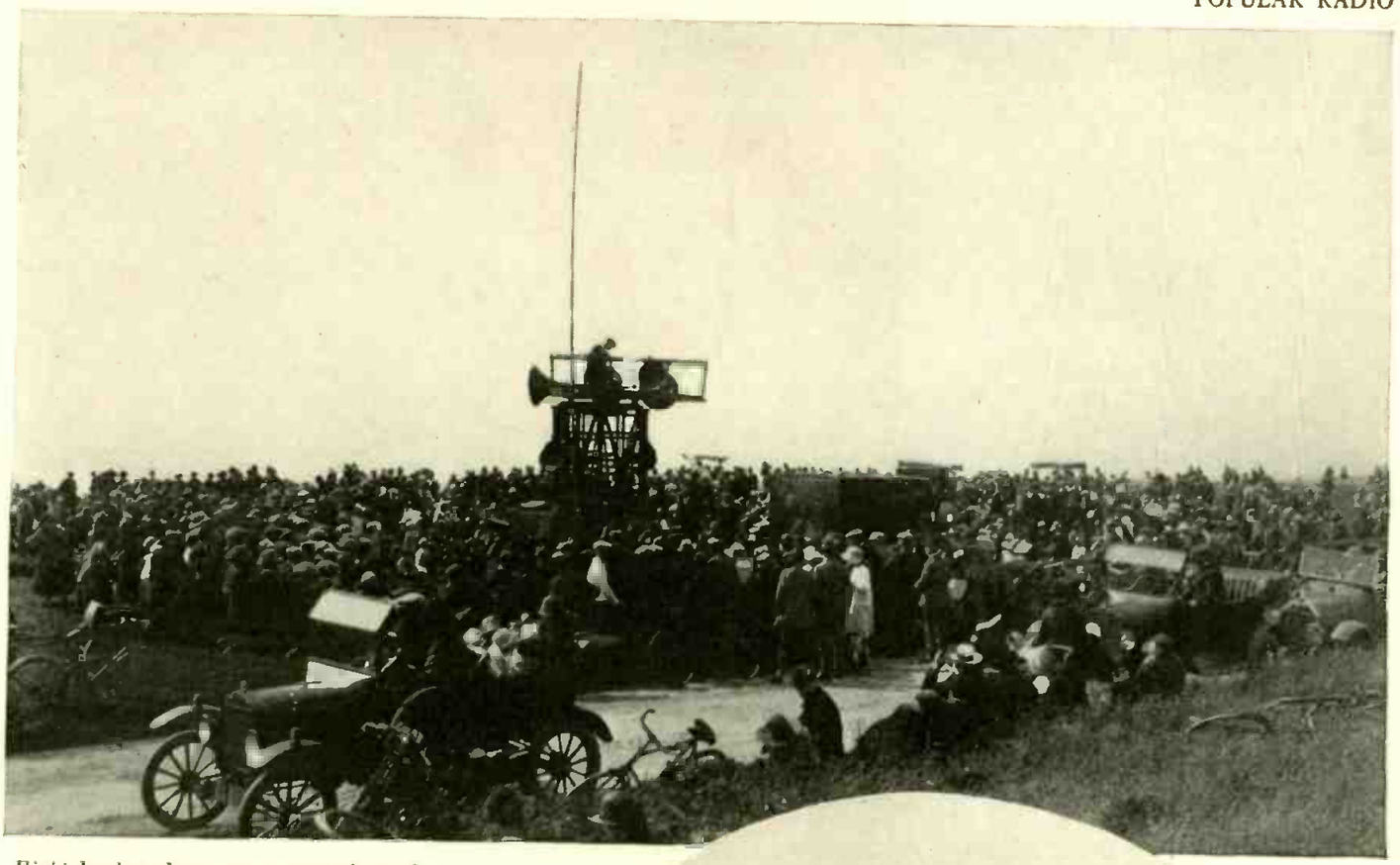
This new model Mu-Rad Super-Six receiver is extremely selective. All tuning is done by means of the small knob in the center that connects to the tuning condensers; the small controls on each side need be used only to vary the sensitivity of the receiver and the volume of the signals that are received.

As its name implies, the Mu-Rad Super-Six receiver uses six vacuum tubes and consists of two stages of radio-frequency amplification, detector, and three stages of transformer-coupled, audio-frequency amplification. The input circuits of the first three tubes are tuned by means of variable condensers. These three condensers are geared to a single shaft which is operated by the master tuning control knob. The gear ratio is approximately 5 to 1 and therefore permits fine adjustment without the inconvenience encountered where the gear ratio is too high.

In order to maintain constant the values of the tuned circuits, the torodial type coils are sealed in individual composition cases. The variable condensers are also protected by a metal shield to keep dust from lodging between the plates.

The design of the radio-frequency amplifier is such that advantage may be taken of the maximum degree of amplification, obtainable when the circuit is just below the point of oscillation. There

(*Continued on page 681*)



Eight loudspeakers were mounted on the platform of a motor truck.

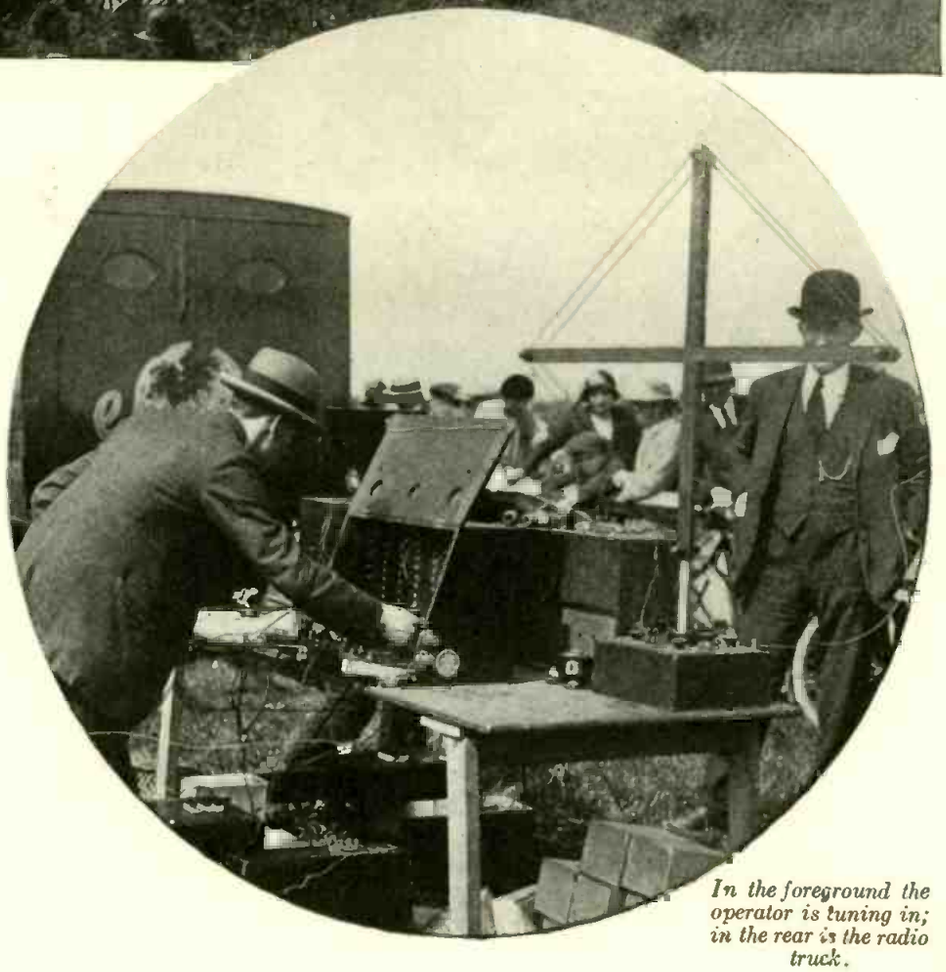
Recruiting an Army of Fans

By C. A. OLDROYD

TO convince country dwellers and people in small towns of England that radio was worth while, the firm of Marconi, England's pioneer radio organization, recently equipped some trucks with radio receivers and loudspeakers and sent them all over the country. Local newspapers gave their arrival advance notices and told their readers when and where the demonstrations would take place; the radio engineers in charge did the rest. They converted the English country dwellers to radio.

Better than words, the pictures on this page will show how the listeners enjoyed their first taste of broadcasting. By thousands the English country folk came—and they applauded and clamored for more as each program feature came to an end. The particular demonstration pictured here took place in the North of England, on the West Coast; just behind the crowd lies the open sea. It would be hard to find a more ideal spot for a broadcast demonstration, especially in fine weather.

To get a sufficient volume of sound, eight loudspeakers were linked up. The horns are shown mounted on the platform of a tramway inspection truck; the antenna mast is lashed to the side of the structure.



In the foreground the operator is tuning in; in the rear is the radio truck.

The circular picture shows the operator tuning in. The small loop in the foreground was used to determine the direction in which the antenna had to be erected to get maximum signal strength. Under the folding trestle table are the batteries; they are charged by a small generator attached to the motor of the truck. Behind the receiver is the radio truck.

These demonstrations were a great success. People came, listened and—joined the world-wide fraternity of radio fans!

HOW TO SOLDER

Details that Every Experimenter Should Know

How to care for your iron; how to tin it and keep it clean, and how to use it to make good and permanent connections.

By
ROBERT HERTZBERG

From a photograph made for POPULAR RADIO

IT IS EASY—WHEN YOU KNOW HOW

There is no excuse for the careless and slovenly soldering that mars the appearance of many home-made radio receivers. Far from being a difficult operation, soldering is both simple and enjoyable when the experimenter takes care and pride in his work.

OF all the processes that are employed by radio fans in the construction of receiving sets, there is not one more important—and not one less skillfully applied—than the process of soldering.

There are capable experimenters who can assemble any kind of standard set from a single-tube regenerative to an eleven-tube superheterodyne without the aid of wiring diagrams, but who can no more handle a soldering iron than a kindergarten student can handle a machine gun. Their outfits are well-proportioned affairs that show every indication of thoughtful design and placement—and every sign of careless and slovenly soldering. Their connections are either smothered under mounds of solder that may be pried loose with a fingernail or else covered with superficial specks that discolor the wire and do nothing else.

The mere mention of soldering often frightens people out of building their own experimental radio sets, yet the process is ridiculously simple after it is once explained properly. The erroneous impression that soldering is extremely difficult and its mastery requires years of arduous application has gained circulation only because its unsuccessful practitioners have loudly proclaimed its difficulty to excuse their own incompetence.

Every radio fan should know how to solder; he has at least the antenna, ground and battery wires to connect properly.

The first step is to obtain the necessary tools, which are few, simple and inexpensive. They include an electric iron of medium weight and with a small, sharp point; a two-ounce can of non-corrosive soldering paste, or a suitable non-corrosive flux; a roll of soft solder in wire form; and two or three sheets of medium emery cloth. A good iron made for radio work will cost from $3.00 to $5.00 in any radio or hardware store, while the rest of the material will not total more than fifty cents.

Don't make your first attempt at soldering at the expense of your set.

Delve into your junk box and select a piece of scrap brass or copper sheet, a few odd lengths of wire and a few soldering lugs such as most binding posts are supplied with. These will serve as the objects for your first experiment; if you ruin them you will lose nothing of value.

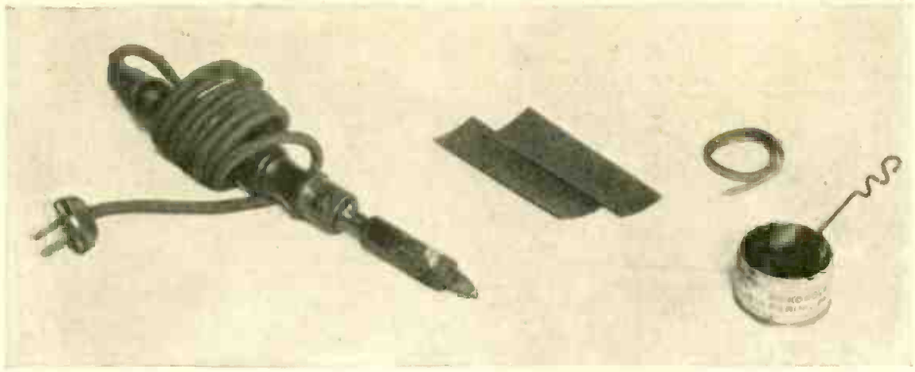
Connect the plug attached to the end of the iron wire to the nearest lamp socket. Support the middle of the iron on a small block of wood, and keep the tip clear so that it can not burn anything. Then turn the current on.

Now there is one watchword in soldering. *Cleanliness.* Everything you work with must be bright and shiny and, above all, free of grease. It is impossible to solder anything that is dirty. Practically every case of poor soldering may be laid to the fact that one of the elements used in the process, either iron, solder, paste or the material itself, was not properly cleaned beforehand.

Take the piece of brass and scrub it with the emery cloth until its surface is bright and clean. It is not necessary to wear off a sixteenth of an inch of the material; merely remove the surface dirt so as to expose the bright metal itself. Then, with the aid of a tooth pick or a match, cover the cleansed section with a very thin film of soldering paste.

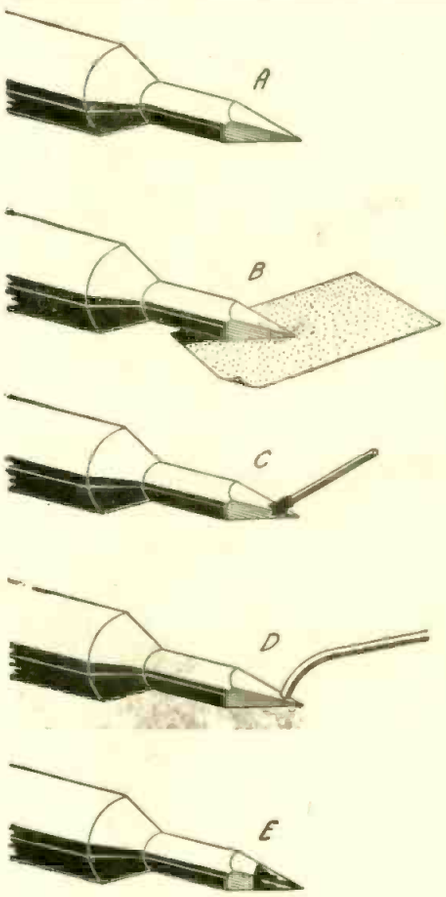
Another point to remember is: use just as little paste as is needed to cover the area to be soldered. This counsel is given in the interests of both economy and efficiency; the thinnest possible layer of paste works fully as well as the thickest slab and gives less consequent trouble from runovers.

Now, look to the iron. To test its



THESE ARE THE MATERIALS THAT YOU NEED FOR SOLDERING

FIGURE 1: *A good electrical soldering iron, some emery paper, a roll of solder and some soldering paste or fluid constitute all the material equipment for doing a proper job.*



HOW TO PREPARE THE IRON

FIGURE 2: *Clean the tip of the iron, A, up brightly by rubbing it on a piece of emery paper, B, while the iron is hot. Soldering flux, C, should then be applied to the hot point and the iron rubbed with a strip of solder, D, until the whole tip is covered with molten solder as shown at E.*

temperature simply touch the end of the roll of solder to the tip. If the solder must be held there for a few seconds before it starts to run, the tool is too cool; if it melts instantly, the iron is ready to be "tinned."

Tinning is a simple treatment which prepares the soldering iron for use. To apply it, determine that the iron is hot enough to melt the solder. Pick up the iron, and rub the faces of its tip on the emery cloth to clean them.

Then dab them quickly with some paste, and, before the latter has a chance to evaporate or burn completely, touch the solder to the tip and let a drop run onto each face. You will find the tip is now covered with a bright coat of solder. The plating looks like tin. This step requires about ten seconds for its completion.

If the solder does not adhere to the iron, but rolls off instead, you either did not clean the copper sufficiently, or you hesitated too long in applying the solder to the tip after you dabbed on the paste or fluid. Repeat the process, handling the materials a little more deftly, and you will be rewarded with a nice, shiny iron.

As your first task, you are going to make a layer of solder stick to the surface of the piece of brass you have already cleaned. To do this, place one face of the tip of the iron on the paste-covered surface, and at the same time touch the solder to the point. The solder will turn liquid immediately and will flow onto the brass. Keep the iron on the latter for about three seconds, moving the iron to cover the space you want soldered, and then raise it. You will find the brass covered with a coat of solder you cannot possibly pry loose.

As a second exercise, take a piece of bus bar, scrape it clean, and coat the end with paste. Touch the roll of solder to the iron so that a drop of solder hangs from the point. Press the bus bar to the piece of brass you have just tinned, and touch the iron to the juncture. The solder will flow onto the wire and the brass.

Then remove the iron, but do not release your hold on the wire until you see the bright molten solder shimmer a bit, whiten, and then finally harden. Remove the iron and you will find the wire held in place as firmly as if it were part of the brass sheet.

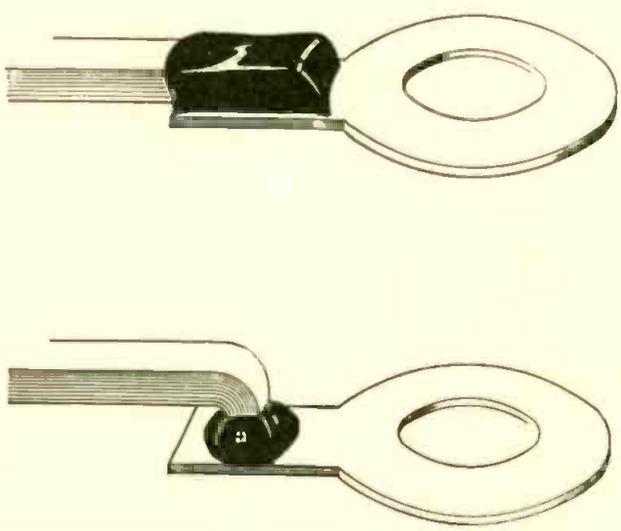
The ease with which you will do the whole thing the first time will astonish and delight you, and will make you wonder why you ever considered soldering such a toilsome undertaking. You will find yourself fascinated by the art, such as it is, and you will experience a rather unexpected thrill out of it. You may be so enthusiastic that you will carry around samples of your handiwork and exhibit them proudly to all your friends. "I made 'em; great, aren't they?" you will remark.

It all sounds foolish, but it has happened time and again. In the past you've undoubtedly associated soldering with rough looking plumbers and tinsmiths, but once you've tried it yourself, with your own hands, you will boost it as a highly diverting as well as useful pastime.

To develop dexterity with the soldering iron, pick up odd pieces of wire and metal and try soldering them together in various positions. If you remember to keep everything clean, bright and shiny, you will never have a loose joint.

Spare the paste and conserve the

(*Continued on page 673*)



TWO WAYS TO SOLDER BUS-BAR TO A TERMINAL LUG

FIGURE 3: *In the top drawing the bus bar is left flat on the flap of the soldering lug and soldered firmly in this position. At the bottom, the end of the bus-bar is bent at right angles and pushed through the small hole in the flap of the lug and then soldered fast.*

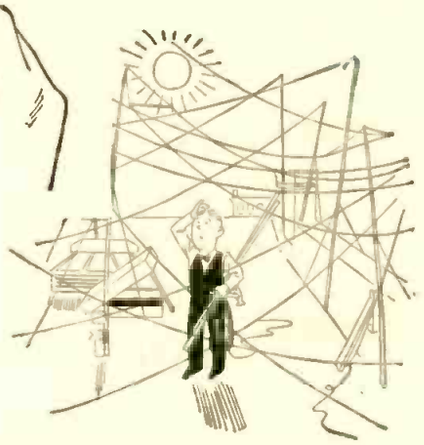
ELECTRAD

Listed by
Underwriters' Laboratories.
All genuine Bakelite.

Just Plug In—That's All

No Trouble With This Antenna

NO trouble putting up an aerial. Just plug in on any electric light socket. No inconvenience or interference from neighbors' sets and aerials. Also smothers static and helps get distance. Uses no current. Perfectly safe to use. Tested and certified electrically. The simplest, neatest and most efficient on the market.



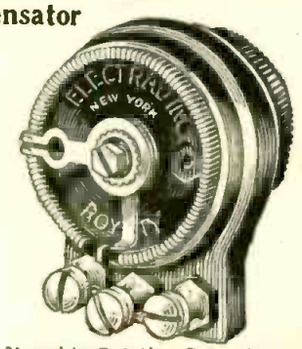
At all good radio stores, or they can easily get it for you. Price 75c., Canada $1.10.

For Perfect Tone and Volume Control, Use Electrad Royalty 500,000 ohm Compensator

The remarkable results secured by the use of this perfected device are due to the fact that it controls the output without any distortion or noise, so that pure music is received through the loud speaker. Note these six important features of design and construction:

1—Resistance element is not exposed to any mechanical operation.
2—Electrical contact is made positive by a metallic arm on the wire-wound strip.
3—The same resistance is always obtained at the same point.
4—The resistance value is under control in the process of manufacture and does not change in use.
5—The entire range of resistance is covered with less than a single turn of the knob.
6—There is no mechanical binding and the shaft is turned over the entire range with a perfectly smooth operation.

Made in various types for various purposes. Prices, $1.50 to $2.00; in Canada, $2.10 to $3.00. Write for circular.



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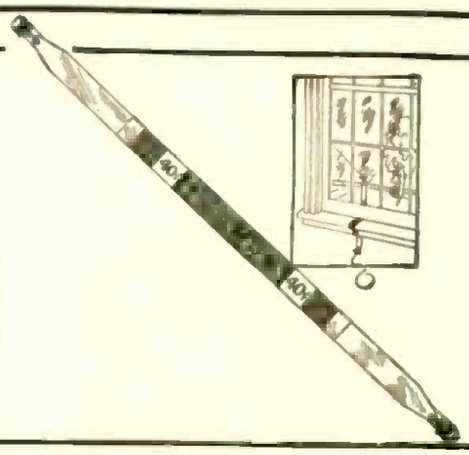
If You Have An Outdoor Aerial Demand the Genuine ELECTRAD Lead-In

Copied and imitated, but the quality never approached. Triple-ply insulation—full 10 inches long. Fahnestock clips, all connections *riveted* and *soldered*. Fits under locked windows and doors. Bend to any shape. Saves walls, windows and door trim. Price 40c, Canada 60c, at all good radio stores.



For perfect control of tone and volume use the Electrad 500,000 ohm compensator. For free hook-up write 428 B'way, N. Y. City.

ELECTRAD Inc.

The YES *and* NO MAN

HARRY L. H.—Does *Mrs. Wendell Hall* ever tire of hearing her husband sing to the "little girl back in Chicago?" * * * Well, it is reported that Mrs. Hall never listens to her husband.

CURIOUS.—So you want to know what happened to *Mr. Right* and *Mr. Wrong* the "funny" men who appeared at WJZ. They were being chased through Bryant Park when last seen; according to late reports they are hiding in Hoboken. * * * *Mr. Goldman*, director of the famous Goldman band, is an American and was born in Kentucky.

LAURENCE D.—From what university did *Mr. Brokenshire* graduate? Let's see, we think it was the Provident Life and Trust. * * * *Phillips Carlin* is the father of a daughter, now about ten months old.

GRACE.—If you want to perform at WMAK write to *I. R. Lounsberry*, Lockport, N. Y., care the Norton Laboratories. * * * Don't worry about "microphone fright," you'll survive it. * * * It is the New York Edison Company that is conducting the "World Tour of Music" from WRNY.

SOUL MATE.—Why are you so curious about KDKA'S musical director? His name by the way, is *Victor Saldaneous*. * * * Say, you're rather saucy, aren't you? Just remember we don't *have* to do this for a living; we *could* go back to paper hanging.

GINGER.—*Tommy Dowd* is not a musician; he assists *Major Bowes* at the Capitol. * * * So you're falling in love with *Quinn Ryan's* voice? Well here's his picture; see if you can fall in love with *that!*

F.M.F.—*Edward Goessling* (KMOX) drives an ambulance for a St. Louis hospital when he is not singing baritone at the studio. * * * Tenors, baritones and sopranos come from every walk of life, you know.

BUSTER.—We don't know why *Goldy* and *Dusty* were taken off the air. Perhaps the virus of doubt is beginning to bore into the minds of our national air advertisers.

ANXIOUS.—*Harold Sanford* has been directing the WEAF musical comedies. * * * *Joy Sweet* is the contralto. * * * Mr. Sanford, by the by, was an associate of the late *Victor Herbert*. * * * To whom would we give the title of the most popular performer on the air? Well, that's a problem; we would not care to risk an opinion although we know who *should* be the most popular performer on the air.

M.V.B.—*The Savoy Bearcats* (WEAF) are colored; perhaps that may help to explain their perfect harmony. * * * *Harry Reser* directs the *Cliquot Eskimos*. * * * *Phil Cook* (WOR) has been directing *Klein's Serenading Shoemakers*. * * * How do we know so much about the performers? Oh, we do a lot of browsing around the studios; we know a lot we won't tell, too!

B. W. MONTGOMERY.—*Cynthia Grey* (KOA) is a columnist on the staff of the "Denver Express." * * * You'd give $5.00 to hear us broadcast? We don't know of a better way to waste your money.

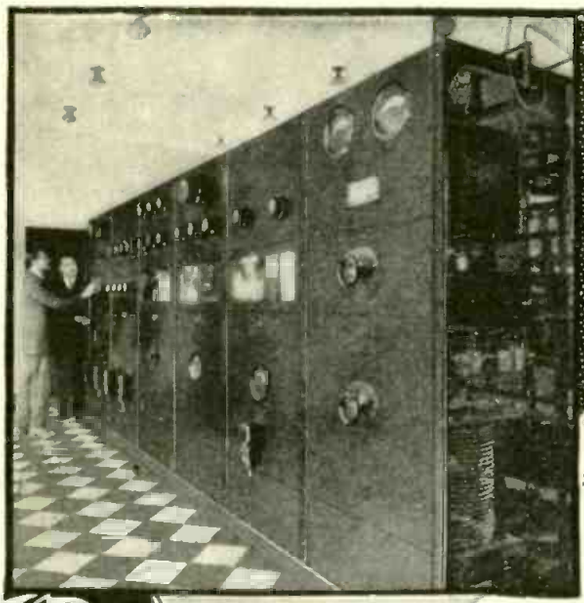
MR. VAN S.—If you were a millionaire you'd have your studio, eh? Well, if *we* were a millionaire we would try to get so far away from broadcasters that it would take $15.00 in postage to send a post card to the nearest one.

HARRY AND SAM.—Why don't they broadcast the noise of the New York Subway for out-of-towners who have never heard it? * * * Not a bad idea; we've heard worse things than that on the air.

JERRY.—We never went wild over the *"Solemn Old Judge"* as an announcer. * * * WLS evidently means "World's Largest Store." * * * We fear that your experience as a train caller would not be of great value to you in announcing; announcers must be articulate, polite, erudite, sanguine, resourceful, keen-witted, musical, virtuous, wise, calm, pleasant, chivalrous, dynamic, pragmatic and *frightfully* clever. * * * Aside from all of these things, an announcer may be an ordinary human being.

MERRYWEATHER.—The $500.00 radio contest was closed by WGY ages ago. * * * Your play "Slow Horses and Fast Women" should be a wow. * * * We don't know how you'd produce a noise like a man falling down stairs with eleven bottles of beer; if you'd make it a full case, we might be able to help you out.

CICERO.—You heard *Raymond Wright* playing from WOR at 2:50 P. M. on Saturday, August 21st; the gentleman was a pupil of Jean de Reszke. * * * It was *Ragini Devi* that you heard from WRNY on August 17th; Miss Devi was born in Sringar, Cashmere, which is a long, long way from Times Square. * * * *Joe Barnett* (WOR) is not, as you seem to think, an ex-policeman from Newark. * * *



$50 to $250 a week IN WORK THAT IS ALMOST ROMANCE

Be a Radio Expert

Get into the great new Big-Pay Industry —Radio. If you're earning a penny less than $50 a week, clip coupon now. Send for AMAZING FREE BOOK. Be a Radio Expert, and draw down big money for the easiest and most fascinating work in the world. Positions everywhere. Thoroughly trained men are in big demand. Need for Radio Experts in every community. Short hours. BIG PAY. Free book gives all the facts. Astonishing opportunities—thousands of them! Every day N. R. I. trained men are taking good places in the Radio field. Free book tells all about their success. Send for it now!

PROOF

Operates WMAQ

"Accepted a position with Chicago Daily News—Station WMAQ. My income practically doubled, thanks to your fine course."
Keith Kimball, Chicago.

Gets Big Job

"Just been made Sales Manager of this Radio concern—a big raise in pay. Regret I did not take course sooner."
R. E. Jones, Bay City.

Learn Quickly and Easily AT HOME

Master Radio Engineers will show you how to qualify quickly and easily at home, for Radio's fine jobs. We **guarantee** to train you successfully. Lack of experience no drawback—common schooling all you need. Our tested, clear methods make it easy for you. Send coupon now for free proof.

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Most amazing book on Radio ever written—full, interesting facts about this great field and how we prepare you and help you start. You can do what others have done. GET THIS BOOK.

Instruments Given with Course

All instruments shown here and many others given to students for practice work while learning. Receiving sets, from simplest kind to thousand mile receiver. An UNEQUALLED OFFER. Many other big features for limited time only.

Famous Training That "Pays for Itself"

Spare time earnings are easy in Radio. Increase your income almost from the start through practical knowledge we give you. This is the famous practical training that pays its own way.

Radio Needs Trained Men

Send Coupon

Send coupon today for special limited offer, including all instruments—you'll get full particulars by return mail.

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LARGEST RADIO SCHOOL IN THE WORLD

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Without obligating me in any way, send me your free book, "Rich Rewards in Radio," and all information about your practical, home-study Radio course.

Name.....

Address.....

Town.....State.....

OLIVE.—You are thinking of *Olle Yettru* the pianist of the WGY orchestra. * * * If you remember *Dilborn* and *Howard* you must be an old timer. * * * Thanks for the kind wishes; we may need them.

LARRY B.—If you want to broadcast from WJZ, make arrangements with *Keith McLeod* for an audition; you will find him to be a charming young fellow and his opinion of your work will be honest and sincere.

SPENSER PEN.—Write to the publicity Department of WEAF for that information. * * * How many Irish tenors are on the air? Oh, roughly 171,283; that's just a guess. * * * *Ben Bernie* is Jewish and not Spanish; you're thinking of *Lopez*.

HAL.—We don't know what station might want to have you talk about the "Psychology of High Pressure Salesmanship;" you'd never broadcast it from *our* station, we know that much, but you might try WGBS.

FRANK B.—Go ahead and write your play and submit it to either WLW or WGY.

BENJAMIN.—*Eunice Hoeffer* and *Eddie Hanson* play the organ at WBBM. * * * We are publishing *Ben Bernie's* picture herewith; we're pretty good natured after all, aren't we?

JOHN A. M.—*Josef Bonime* directs the *Edison Ensemble* (WRNY). * * * *MacNamee's* book is published and *Heywood Broun* has written a flattering preface for it.

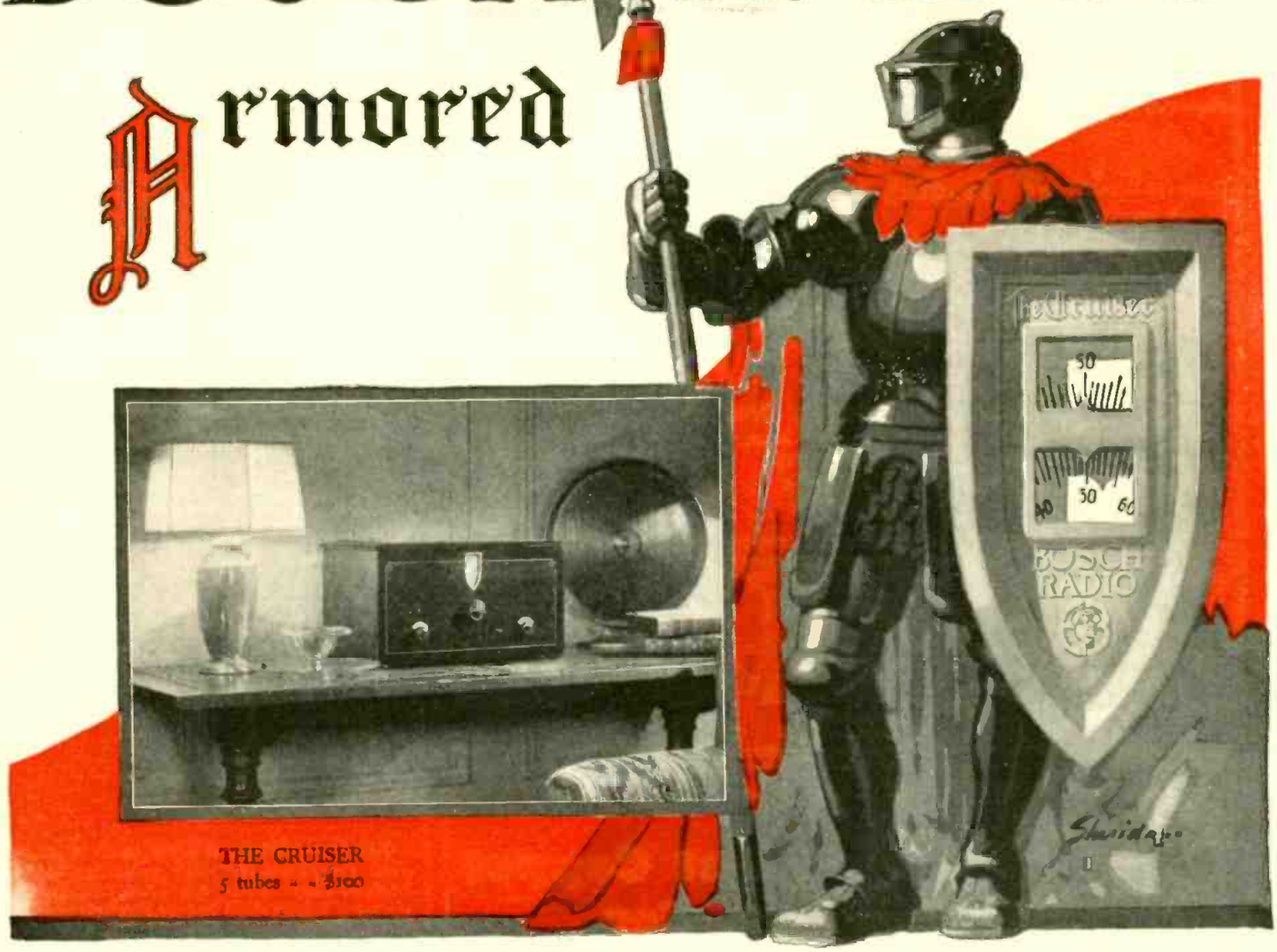
JOSEPH MCCANN.—*Art Gillham* is the whispering pianist, and records for Columbia; he was once on the staff of WDAP.

ALMA.—Yes, we believe that *Major Bowes* is sincere. He is idolized by the "family," and is an ingratiating employer. * * * We don't know what happened to *Mickey*, the keen-witted whistler of the old gang.

M.B.—The publicity man at KMOX, way out there in St. Louis, tells us that BAM is a *nom de plume* made up of the names *Byrne A. Marconnier*. * * * Mr. Marconnier is a member of the firm of Davis Realty and Mortgage Co. * * * We don't know his age, and besides, you're too inquisitive.

BOSCH RADIO

Armored



Perfect quality reception, tonal range, great power, penetration and simplicity of operation are the owner satisfaction features of the new Bosch Armored and Shielded Radio receivers.

The embodiment of perfect radio and quality in furniture is particularly emphasized in the Amborada, a seven tube receiver, completely Armored and Shielded in a manner developed by Bosch engineers. It is controllable with a unified station selector. This receiver is incased in the early American period cabinet illustrated in this announcement.

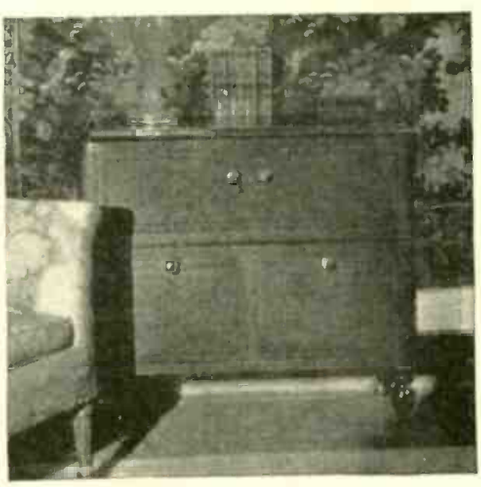
The Cruiser, is also a perfectly Armored and Shielded receiver, of five tubes. Complete with a control system of remarkable simplicity, one dial station selector for powerful stations and two dial advantages when "Cruising the Air."

To hear Bosch Radio is to realize that another great step toward perfect home entertainment has been accomplished. Look for the Bosch Radio Dealer or write us—we will send you his name.

AMERICAN BOSCH MAGNETO CORPORATION
SPRINGFIELD, MASS. Branches: New York Chicago Detroit San Francisco

Manufactured under patent applications of the American Bosch Magneto Corporation also licensed under applications of the Radio Frequency Laboratories, Inc.

There are five, six and seven tube receivers in the new Bosch Radio Line. Two cone type reproducers, the famous NoBattry "B" Power Unit and other improved radio necessities.



THE AMBORADA
7 tubes - - - - $310
All prices slightly higher, Colorado west and in Canada

Glad you miss *Hollywood McCosker's* funny stories; do you know his bed time story about the Elk who flirted with the little chicken on Broadway and about the dirty skunk telling his wife about it?

GERTIE.—Yes, *McNamee* was in the movies; these announcer boys certainly are popular. * * * Should you take a correspondence course in singing in preparation for broadcasting? Yes, but don't take it too seriously.

GUNBOAT.—You put yourself down as an old member of the Fraternity when you mention *Vaughn de Leath* "The Original Radio Girl;" she stopped at WOR only a few weeks back. Most of her time is spent in vaudeville. * * * The last we heard, the *Radio Franks* were singing at the Pelham Heath Inn at Pelham, N. Y.

DIMPLES.—No soft-soap, please! *Goldy* and *Dusty* have left the air, but the *Happiness Boys* go on forever. * * * Both *Winifred T. Barr* and *Kathleen Stewart* are married. * * * Why don't we tell who we are? Well, why don't we? * * * We don't know what happened to *Anne Pinto*; she certainly did not get rich from broadcasting. * * * Go ahead and send us an apple pie even if we're almost dying with the gout now.

J.H.M.—We cannot say whether or not *John Corigliano* will play again for the Atwater-Kent Hour; we have not had advance information concerning the winter program. * * * Here is Mr. Corigliano's picture for you.

STATIC.—The *Olympic Glee Club* usually broadcasts from KGO, San Francisco. * * * Yes, the "Last Rose of Summer" was included in Flotow's opera "Martha." Thomas Moore, an Irish poet, wrote the words. * * * Why don't we publish our picture? We'd rather be a subject for speculation than an article for condemnation.

TOMMY ROTT.—Please don't write such long letters—and thanks for wishing us a long, hard winter; if you get too fresh we'll have you pinched. * * * *Si Spencer* (WLS) hails from the state of Washington. * * * Imagine! Three pages to ask that question! If you wrote for money, you'd be a millionaire in no time.

SALLY B.—*Major Bowes* lives in an apartment on the sixth floor of the Capitol Theatre building. * * * Now that that's settled what are you going to do?

POLLY BANNA.—*Victor Cockaday*, who sang tenor from WJZ, is the brother of *Laurence M. Cockaday*, the Technical Editor of POPULAR RADIO. * * * So you want to meet us? Well, you can find us any night during the rush hour at the Times Square Station of the I. R. T.

A Supremely Fine Instrument

No. 78—$270

"The Mayfair"

Amazing Selectivity---Delightful Tone---Exceptional Volume!

TWO new home delights! First the joy of a supremely fine bit of furniture craftsmanship—a rarely beautiful console to enhance the beauty of your home.

Second the all surpassing joy of true radio entertainment —all the programs of the air brought in with surprising fidelity and beauty of tone. Amazing selectivity that makes radio enjoyable.

The Trinum Circuit makes Oriole Receivers genuinely satisfying in performance. Built with the precision of a fine watch they bring at last to radio that genuine dependability which you have been hoping for. Ask your dealer to show you.

"The Canterbury"

No. 75—$150

This pleasing consolette model will grace any home. The six-tube, two dial Oriole Receiver will bring new joy to Radio for you.

"The Warwick"

No. 71—$125

A table model of exceptional grace and truly unusual power. Everything that radio can give, at a price in reach of all.

Sales Department
THE ZINKE CO.
1323 S. Michigan Ave.
Chicago, Ill.

Manufactured by
W-K ELECTRIC CO.,
Kenosha, Wis.

ORIOLE RADIO RECEIVERS

with the Trinum Circuit

The "Televisor"

(Continued from page 650)

Topical Press, London

THE PICTURE THAT THE OBSERVER ACTUALLY SEES

This scene inside of the receiving studio shows how the radioed living picture appears; the operator is holding the two dolls on his lap in much the same manner as in the illustration on page 650. A loud-speaker located within the cabinet reproduces the voices at the same time.

"areas" by means of lenses set in a whirling disk. It is the function of the lenses in the disk to focus the "areas" of the picture, one by one, onto the photoelectric cell, and when the disk has been whirled once around every "area," the picture has been focused consecutively onto the cell.

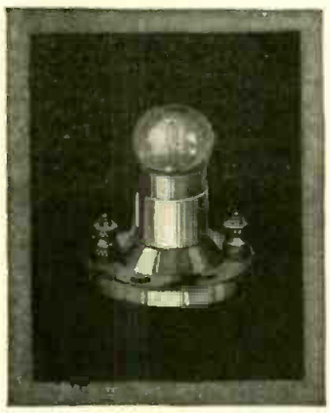
The photoelectric cell is connected through vacuum tubes and other electrical instruments to the transmitter and when the apparatus is actually broadcasting the ether wave is continually modulated to convey the strength of the light from successive areas of the picture. At the receiving end is a source of light the intensity of which is controlled by the transmitted wave. This light, is moved as a spot across a screen by means of a slot and rotating spiral and is moved so as to follow the beam which comes through the whirling disk onto the photoelectric cell at the sending station. This produces the picture traced out in light and shaded portions at the receiver with sufficient speed so that the whole picture is seen. To the human eye it seems as if the entire picture was transmitted simultaneously, but, in reality it is projected bit by bit.

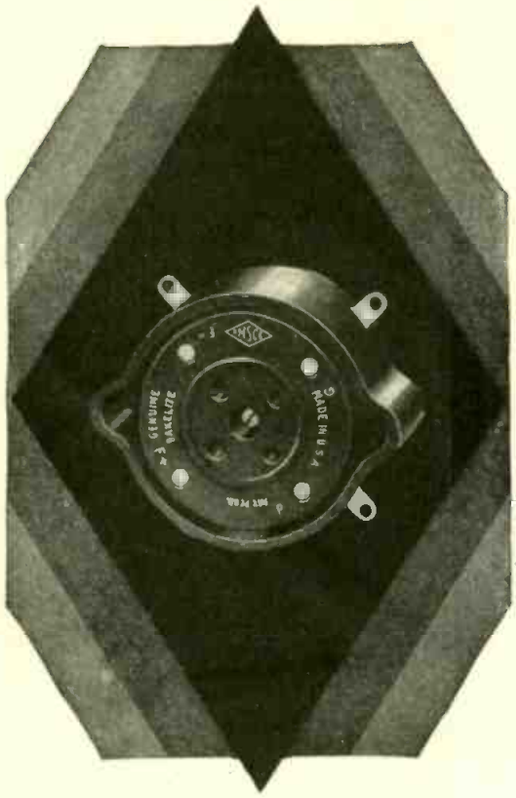
When a still picture is broadcast the transmittting disk whirls only once but when the picture of a moving object is to be radiated the disk is kept whirling and the successive pictures are traced out at the receiver. If the picture is to appear as a whole at the receiving end its last "area" must be flashed into space before its first "area" has had a chance to fade from the eye and this means that the complete picture must be broadcast in less than a tenth of a second.

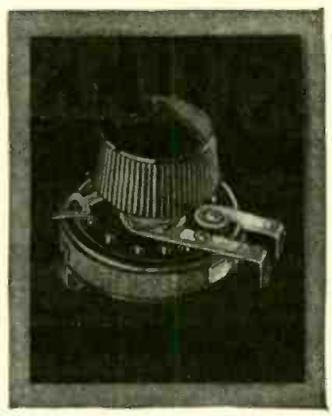
Baird explains that it is simple enough to transmit the "areas" but the "area" of an entire face must be flashed within a tenth of a second if the eyes at the receiver are to retain an image of the picture. For example, if it requires as much as half a second to send a picture of a face by the time the photoelectric cell is transmitting the light values of the chin the eyes watching the screen at the receiver will have lost the light values of the hair, and the result will be that, although the radio apparatus itself may be perfect, the eyes at the receiving end will retain no image.

Radio having given the eye of the receiver one complete picture in a tenth of a second, can give it another com-

AMSCO
FOR EXCELLENCE







FILATROL

AMSCO again leads the way toward elimination of controls. The AMSCO Filatrol is an automatic filament control that *really* takes the place of manually adjusted rheostats in the average circuit. Its unique design, a departure from conventional form, gives unfailing efficiency, and unmatched compactness.

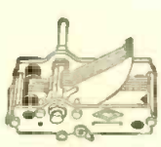
Guaranteed for the lifetime of any receiving set.

FLOATING SOCKET

Rugged and substantial, this socket is yet extraordinarily tiny — and "*it floats!*" All types of tubes fit with the click that accompanies positive wipe contact. The tubes almost literally float on air, practically isolated from the base or panel. Microphonic noises, mechanical feed back and audio vibration are effectively eliminated. An imperative choice for the sensitive set — or the set with built-in loud speaker.

TOM THUMB RHEOSTAT

A true midget for saving space front and back of the panel. No less effective because of its compactness—it has the normal amount of resistance, the normal electrical contacts. It is simply that needless bulk is eliminated by AMSCO design. Air cooled construction—Bakelite base and knob with indicator arrow. Sold under the usual AMSCO guarantee.



AMSCO ALLOCATING CONDENSERS "spread" the stations with engineering precision. Made single, siamese, three-gang and four-gang.

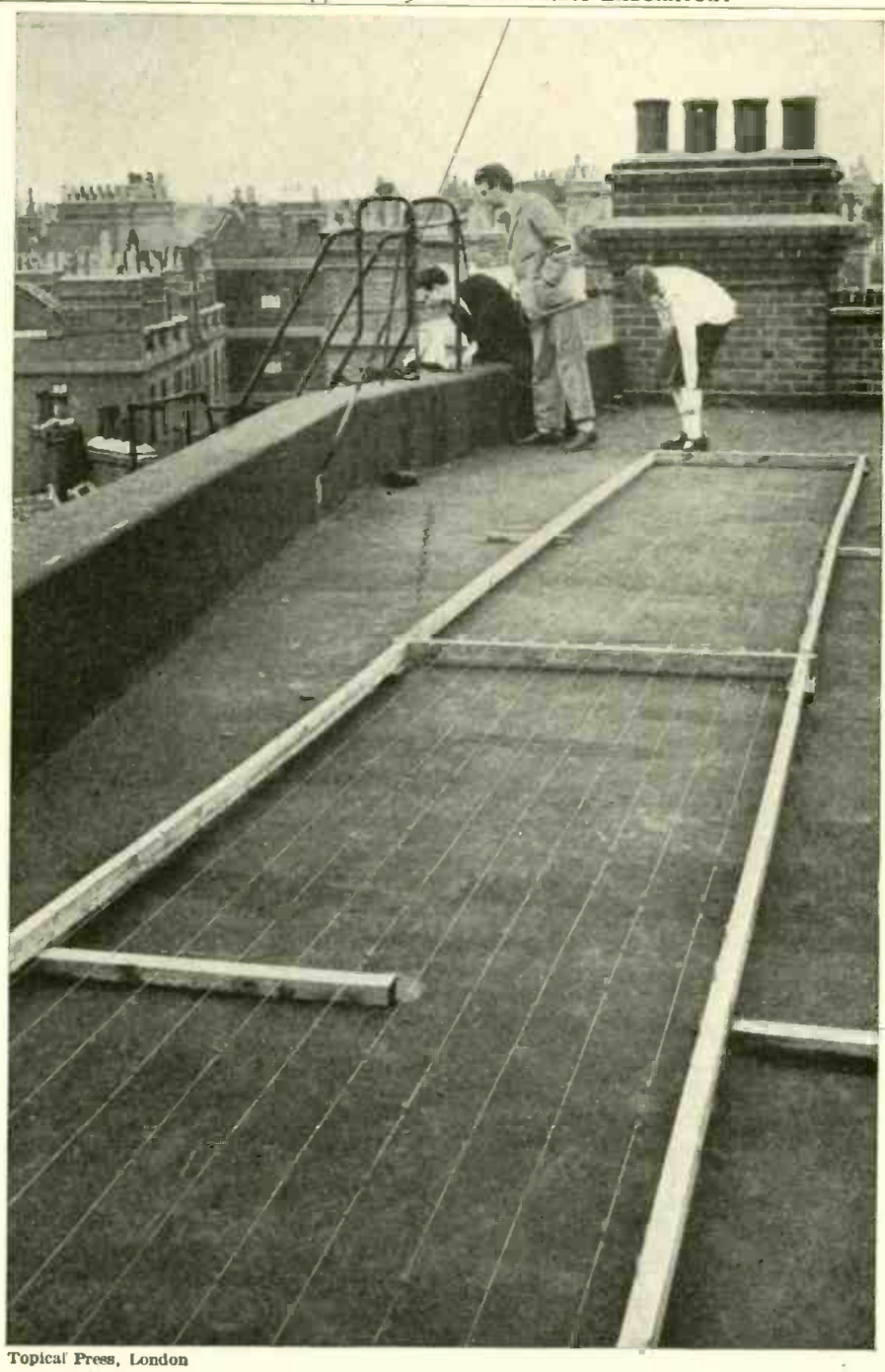
AMSCO PRODUCTS, Inc.
Broome & Lafayette Sts., N.Y.C.

All AMSCO Parts are manufactured in accordance with Standards of the Radio Mfrs. Association, Inc.

AMSCO METALOID GRID GATES AND RESISTORS are uniquely silent, due to a perfected colloidal Metaloid resistance element. Ask your dealer.

AMSCO

R.M.A.



Topical Press, London

ERECTING THE ANTENNA ON THE WORLD'S FIRST TELEVISION BROADCASTING STATION

The large counterpoise that lies flat on the roof is a part of the antenna circuit for Baird's pioneer station in London for transmitting moving pictures by radio.

plete picture in the next tenth second by merely keeping the disk whirling at the transmitter. This is the ordinary moving picture principle and, as everybody is aware, motion pictures consist of an extremely rapid succession of still pictures. To transmit a motion picture of an object two inches square it is necessary to flash at least ten complete pictures of it every second, and by the most conservative estimate this requires approximately 25,000 light dots a second. This is what the Scottish inventor's machine is designed to do.

WANTED—A Radio Humorist

Why does one kind of humor "get over" to the radio audience while another kind falls flat? What peculiar quality must a humorist have to prove successful before the microphone? For the answer, read Homer Croy's article in the next number of POPULAR RADIO*—for December.*

No tears in these tunes!

Unless, perchance, they're tears of joy. For there's only unalloyed pleasure in a set kept at its lively best with a Rectigon. Your batteries are charged with ease and convenience. But more than solid comfort—there's no costly grief. You'll shed no agonizing tears because of spoiled furnishings, ruined clothes. You can do your charging wherever you wish. There's nothing in a Rectigon to spill or burn. No acids, no chemicals —and no moving parts.

when you do your own charging with

The Westinghouse Rectigon Battery Charger

No noise as it charges—not a bit of fuss. Not even a murmur that would disturb the mildest slumber.

Saves its cost in short order—Count the dollars spent in a few trips to the service station and you'll hotfoot it for a Rectigon, for the good it does your pocketbook as well as your batteries.

Snaps on in an instant—Just plug into the light socket, snap on the terminals. Saves service station bother. Spares interruptions caused by absent batteries.

Charges both "A" and "B" batteries—Keeps both packed with power. Bulb is used for "B" battery charging and it is enclosed, like all other parts, in metal, safe from accident. (Rectigon charges automobile batteries, too.)

Perfect safety for your set—If you tune in while you're charging there'll be no harm either to set or batteries. Nor will batteries be discharged if anything happens to the current while your Rectigon's attached.

No Storage Battery Radio is Complete Without a Rectigon

THE RECTIGON'S a superb Westinghouse product. Things you *can't* see, like extra heavy insulation, things you *can* see, like the durably enameled case—all are of highest quality. Westinghouse also manufactures a complete line of radio instruments, and Micarta panels and tubes.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

Tune in on KDKA - KYW - WBZ - KFKX

Waves and Wavelengths

(*Continued from page 645*)

The air is no assistance to light: it can travel perfectly well in a vacuum. Air, and aqueous particles suspended in the air, are obstructive to light rather than helpful. We are screened from the full blaze of the sun by the atmosphere. We could not stand the undiluted glare. And if we ascend a high mountain, so that half the atmosphere is below us, we find the light very trying, not only to the eyes, but to the skin: we get first bronzed and then blistered. And even so, we are still screened by the upper half of the atmosphere.

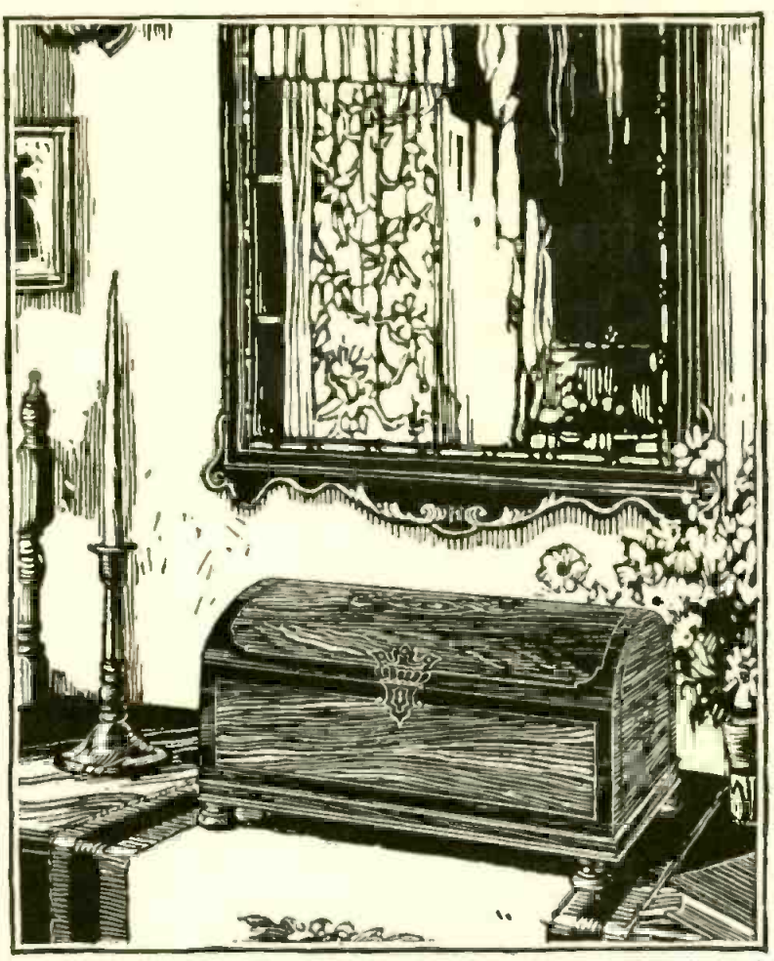
If light is not conveyed, then, but rather obstructed by matter—which is liable to absorb and quench it and turn it into heat—if it is able to travel quite freely and unobstructively through vacuum, what is there in that vacuum to convey it? There clearly must be something; we cannot imagine vibrations in empty space. We have every reason to know that space is not empty, but is filled with a subtle impalpable medium, which used to be called the luminiferous ether, that is to say, a substance which had the power of conveying light. This fact was known more than a century ago, but since then many other functions of the ether have been discovered, especially those associated with the terms electricity and magnetism.

But we have no sense organ for their appreciation; we can only investigate those things by instruments. And we have thus learned that what we call "light" is not a material but an electrical vibration, and that the ether is able to transmit every kind of vibration at the same rate, a rate which has been measured, and amounts to about 186,000 miles a second.

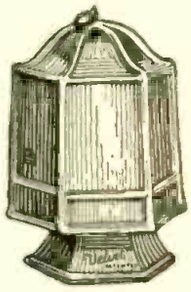
Sound waves travel at a comparatively slow pace, taking about five seconds to cover a mile; so that if we hear the thunder five seconds after the flash, we know that the flash is a mile away. If we hear the noise of the thunder ten seconds after, it is two miles away; and so on. But we see the flash practically instantaneously, though not quite. The light of the moon takes 1¼ seconds to reach the earth; the light of the sun takes eight minutes; the light of the nearest star about five years. How long the light has taken from the the furthest star, no one knows; nor whether there is a "furthest" star. But clusters of stars are known of which the light that we now see started on its long journey 30,000 years ago.

The rate at which light travels carries it a distance equal to seven times round the world in a second. A thread wrapped nine times round the world, and then stretched out straight, would reach to the moon, and 1¼ seconds is the time taken to cover that distance.

Velvet Radio Speakers



No. 21
"The Jewel Case"
$45



No. 9
"The Lantern"
$12.50

Such quaint charm to please the eye — and rare power to please the ear! Full and faithful tone recreations of beauty. Priced low.

No. 12--$16.00
No. 15--$23.50

Borkmanite Horn—Velvet Double Stylus Unit

No. 18 ---$27.50
"The Chinese Cone-Flex"

"Just as if you were there!"

The Ultimate in Radio Recreation

THE trappings of laboratory are gone. In its rich, quiet beauty, the Velvet "Jewel Case" Speaker is at peace in company with your richest furnishings---a rarely precious possession for any home.

For it is not merely beautiful. It is living Radio Recreation itself when it brings in the full round tones of the whole orchestration. Tonal beauty that matches its outward delightful dignity. You must hear it---see it---to fully appreciate the long step ahead which Velvet brings to Radio.

Dealer-Jobber Franchise sales plan unusual---write or wire for details. It will bring you new satisfaction in selling Radio.

Sales Department
THE ZINKE CO.
1323 S. Michigan Ave.
Chicago, Ill.

Manufactured by
THE BORKMAN RADIO CORP.
Salt Lake City, Utah
Kalamazoo, Mich.

With Rare Beauty, Volume, Power!

This is the rate at which radio waves travel; for they too travel through the ether, and consequently reach every part of the earth that they reach at all in a minute fraction of a second.

So that when it is said that a speaker whose utterance is being broadcast can be heard by the listeners-in before his voice and the other people at the back of the same hall as he himself is in, the statement is quite true, and would be true even if the listener-in were thousands of miles away.

In contrasting sound waves with water waves, we realize that the motions are different and that the rapidity of vibration is different too. The up-and-down motion on the sea may take several seconds to complete each period. The vibrations of an ordinary voice may be two or three hundred a second; or for a soprano might run up to almost a thousand or so. Indeed the highest squeak that is audible is estimated at between 20,000 to 40,000 a second. But radio oscillations are much more rapid than that, unless the sending-station is a gigantic one emitting waves several miles in length. The most usual waves employed in broadcasting are from 200 to 600 meters, let us say, about 400 meters, or about a quarter of a mile; and the antenna at such a station has to vibrate electrically 750,000 times a second. No form of matter is able to transmit waves at this rate. We are dependent wholly on the properties of the ether for *all optical and radio phenomena*. And were it not for the fact that the speed of transmission for every length of wave—whether they be twelve miles or the millionth of an inch in length—is accurately the same, there would be great confusion, and the transmission of radio telephonic speech would be impossible.

The question must now be asked, if waves on water and waves of sound, though both conveyed by matter, differ so entirely in their details—one being a heave up and down, while the other is a to-and-fro compression—what sort of motion is it which occurs in the ether, and what kind of waves are light waves?

The answer at present is that we do not precisely know. We know that they are not like water-waves, nor are they like sound-waves. They are purely electric or electromagnetic.

There is something in the structure of the ether which enables it to transmit these peculiar waves; but what the structure of the ether is has not yet been worked out. The remarkable thing is that these electric or ether waves, even if very intense—and they may easily be emitted with the strength of some horse-power—do not affect any of our senses, and do not appear to affect the human organism at all. We can live in the midst of them and know nothing about them. As a matter of fact we are living in the midst of them now, and we can only de-

"How To Build It" Book

Complete instructions for assembling, wiring and operating the Hammarlund-Roberts Hi-Q Receiver. Prepared under the direction of the Engineer-designers.

25c

$63.05

Complete Parts (less cabinet)

Hammarlund-Roberts Performance Means A New Measure For All Radio

Automatic Variable Coupling, same control operates tuning condenser and primary coil coupling simultaneously, gives maximum and equal amplification and selectivity over entire tuning range.

Stage Shielding—prevents coupling between stages, eliminating oscillation and increasing selectivity. Clarifies reception.

Hi-Q Foundation Unit

Includes drilled and engraved Micarta Panel, drilled Micarta sub-panel, two complete shields, extension shaft, two equallizers, fixed resistance, hardware, wire, nuts and screws.

$10.50

Associate Manufacturers

Carter Radio Co.
Martin-Copeland Co.
Radiall Company
Samson Electric Co.
Sangamo Electric Co.
Benjamin Electric Mfg. Co.
Eby Manufacturing Co.
Hammarlund Mfg. Co.
Durham Resistors
Westinghouse Micarta

THE Hammarlund-Roberts Hi-Q is an outstanding example of scientific radio engineering. No ordinary standards of tone, selectivity or volume, can be applied to this new receiver.

In designing this Hi-Q Receiver, the Hammarlund-Roberts Board of Engineers representing twelve nationally known manufacturers, had at their disposal the finest experimental laboratories—and no handicap in building to establish specifications or to a set price.

This concentration of the leaders in the perfection of one radio Receiver has developed entirely new features that produce results unknown to the average radio man. Automatic variable coupling gives maximum and equal amplification and selectivity over the entire tuning range. Stage shielding eliminates coupling between stages, prevents oscillation and increases selectivity. Two dial control simplifies tuning.

ANYONE CAN BUILD THE HAMMARLUND-ROBERTS Hi-Q

All the research, the selection of parts, the exact placing of units, has been worked out in advance for you. And you have a receiver that will equal an eight tube set—simplicity of design and operation hitherto unthought of—all at less than half the price you would pay for a factory made set of anywhere near equal efficiency.

Hammarlund ROBERTS Hi-Q*

* High ratio of reactance to resistance. High ratio—Great selectivity—Loud signals.

Hammarlund-Roberts · 1182-B Broadway : New York

tect their presence if we provide ourselves with a suitable "medium" for their detection, that is, a suitable receiving instrument.

Then we find that we are immersed in speech and music and Morse code, without the least knowledge on the part of ordinary humanity. Only the enlightened experimenter or listener has learned how to receive these ethereal pulsations, and interpret them in the way intended by the sender.

There may be many other things in the Universe of which we are equally unconscious, and until our eyes are opened, figuratively, or until we are provided with the necessary receiver, we may live and die in complete ignorance of many of the things that are going on round us all the time.

How to Solder

(*Continued from page 660*)

solder, but don't skimp on the heat. A lukewarm iron is worse than useless. On the other hand, don't allow the copper to become red hot, for it is impossible to solder with a red hot iron. If you don't believe this, try it some time. You will see the solder roll right off the tip, and all the paste in the world won't make it stick.

Now, when you start work on your set, you will find the soldering the least troublesome of the mechanical details. In fact, you will distinctly enjoy handling the iron, for as it cements each wire in place it puts you just so much nearer the completion of the outfit.

Perhaps you are curious about the function of the paste or flux in the soldering operation. As most soldering directions are strangely silent on this detail, it is explained briefly here.

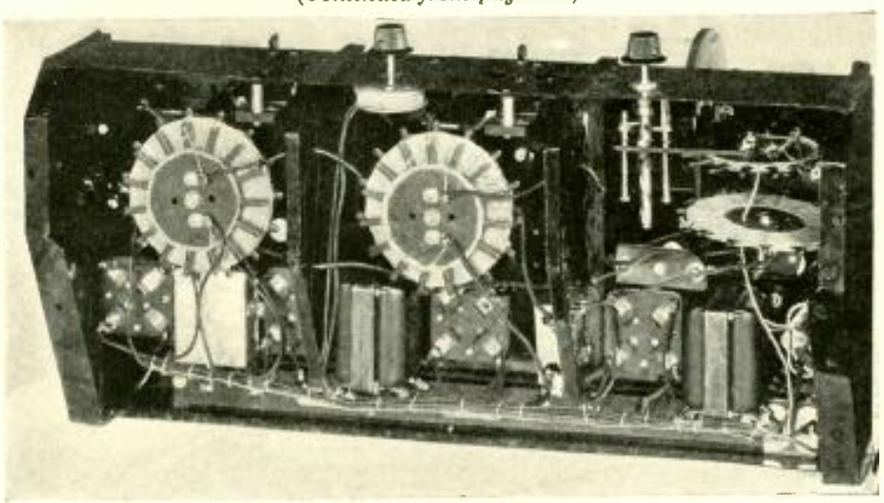
When a high heat is applied to an ordinary metal like copper or iron, the material reacts chemically with the oxygen that forms part of the air, and as a result its surface is covered with a thin film of a new substance, known as an "oxide" of that metal. Rusting of steel and iron constitutes a common form of this action. If it is desired to join two metals together through the agency of heat, this film must be destroyed, otherwise it would prevent the molten cohesive agent from attaching itself directly to the surfaces of the metals.

It is therefore necessary to introduce into the operation a substance which is capable of absorbing the film and rendering it harmless as quickly as it forms. In soldering, the paste, or more properly the "flux," is what accomplishes this devitalization.

The viscosity of the paste or fluid itself is no factor in the binding practice. The soldering flux serves only to remove the harmful film of oxide. As a matter of fact there are as many liquid fluxes as there are pastes.

The New Model Crosley "5-50" Receiver

(Continued from page 656)



BENEATH THE SUB-PANEL OF THE NEW CROSLEY

Notice how the metal framework supports all of the apparatus that is used in the receiver and at the same time acts as a shield between the various stages.

controls has been found, however, they may be left in that position and the three circuits will remain in resonance except, perhaps, when the receiver is tuned to the extremes of the broadcasting waveband.

There are two other controls on the front panel. At the left, near the bottom edge, is a small knob which operates the filament rheostat. This controls the amount of current fed to the filaments of the five tubes from the "A" battery. In operation this control may be set at the point which provides best volume and left there at all times (unless the "A" battery starts to run down, in which case this knob is advanced accordingly). Or this knob may be used as a volume control. (Another and better method of controlling the volume will be described later.)

The other operating control is the "crescendon," which is located toward the right, at the lower edge of the panel. This is a knob similar to the rheostat control knob. Its purpose is to regulate the sensitivity of the receiver by varying the amount of regenerative feed-back in the detector tube circuit. This use of regeneration adds greatly to the sensitivity of this receiver which is one of the few licensed under the Armstrong patents to use this method of amplification.

The tuning indicator is in the form of a calibrated drum which projects part way through the panel. The surface of this drum is covered with white paper on which is printed the calibration scale and ample space is provided to write the call letters of each station opposite the point on the scale at which the station is tuned in. On the side of this drum is a knurled disc which projects part way through the panel. This disc is the master tuning control which, as mentioned above, tunes the three circuits simultaneously. It is large enough to permit minute variations in its adjustment; the knurled edge provides a good grip for the fingers when tuning.

The internal assembly of the receiver presents many innovations. All of the instruments are mounted on a chassis of comparatively light metal made rigid by the use of bulkheads of the same material, welded to the main chassis. These bulkheads not only add to the strength of the chassis, but serve as shields to isolate the fields of the various circuits from one another.

Except for the three variable condensers, all instruments are mounted on the under side of the chassis. Thus they are doubly protected from dust and damage. The tube sockets are placed just below suitable openings in the top surface of the chassis so that the tubes may be inserted or removed readily. None of the instruments are mounted on the front panel of the receiver, but instead, are mounted on the chassis in such a position that their control shafts extend through holes provided in the panel.

It is evident that simplicity and economy have been considered important factors in the design of the receiver. An examination of the internal assembly discloses numerous ingenious devices which accomplish difficult ends in a simple but efficient manner. One of these innovations, for instance, is the use of a small weight inside of the calibrated wavelength drum to counterbalance the weight of the rotor plates of the variable condensers. Thus when the master tuning control is turned to a position which brings the heavier portion of the eccentrically shaped rotor plates uppermost, the weight in the drum is down. This holds the rotor plates in position, without the necessity for friction bearings on the condenser shafts. The net result of this scheme is to provide easy action of the master tuning control without shifting of the condensers when the hand is removed from the control.

Instantly – they have set a *new* standard of what a tuning control should be

BRAND NEW... yet it is already the distinguishing mark of a 1927 model receiver.

Such is the reception accorded the MAR-CO illuminated control by leading technical authorities and circuit designers everywhere

... a reception paralleled only by the widespread acclaim which, a year ago, swept 500,000 MAR-CO vernier dials into use.

Today MAR-CO tuning is standard or optional equipment in virtually *every* important set-design of the season:

Radio Broadcast's
"LAB" Receiver
MAR-CO *controls standard equipment*

Cockaday's L. C. 27
Entirely MAR-CO-tuned, using the illuminated control and 2 MAR-CO rheostat dials.

Radio News'
"Auto-transformer"
MAR-CO *controls standard equipment*

Popular Science's
5-tube receiver
MAR-CO *dials standard equipment; illuminated controls optional*

Citizens Radio Call Book's
TRF set
with shielded transformers
MAR-CO *controls standard equipment*
and the
St. James Super
MAR-CO *dials standard equipment*

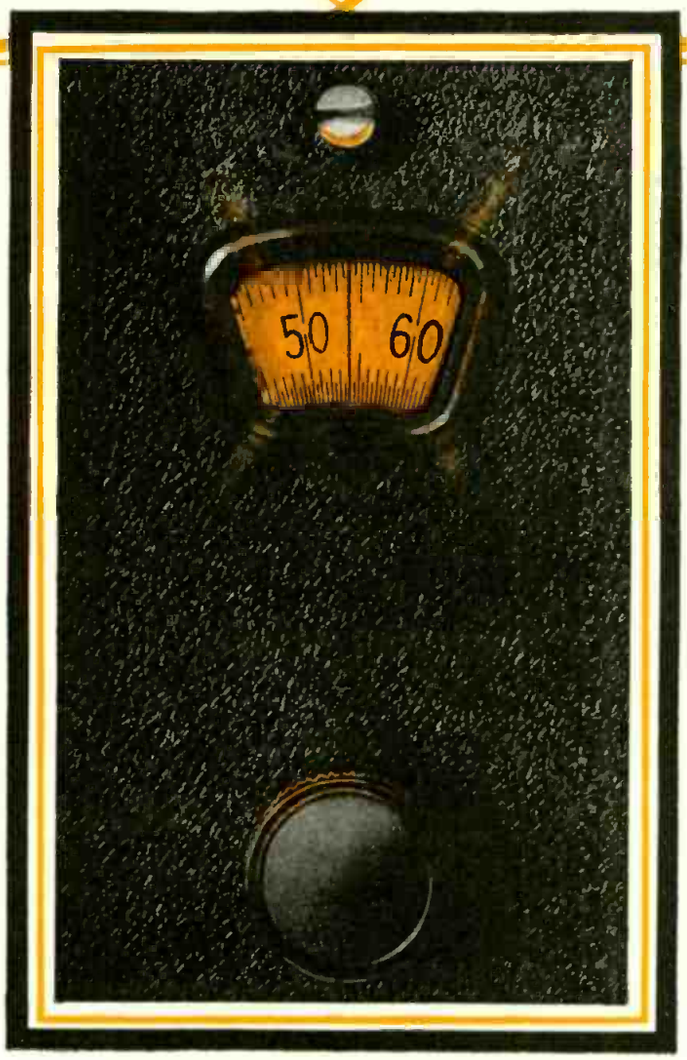
Radio World's
"Hi-Power" and Beacon Sets
MAR-CO *controls standard equipment*

Radio Age's "Super-9"
MAR-CO *360-degree dials standard equipment*

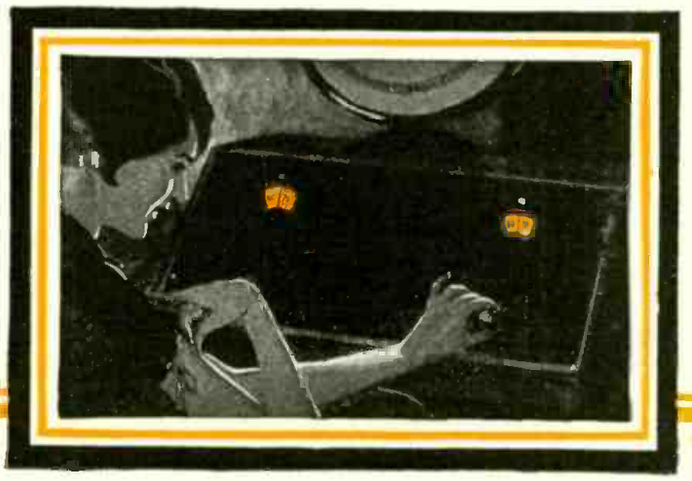
Radio Age "Four"
MAR-CO *controls standard equipment*

Daven "Bass Note" circuit
MAR-CO *dials standard equipment*

Hammarlund-Roberts, 1927
MAR-CO *dials standard equipment*



MAR·CO *Illuminated* CONTROLS



The Radio Home's
"VARION" A. C. set
MAR-CO *controls standard equipment*

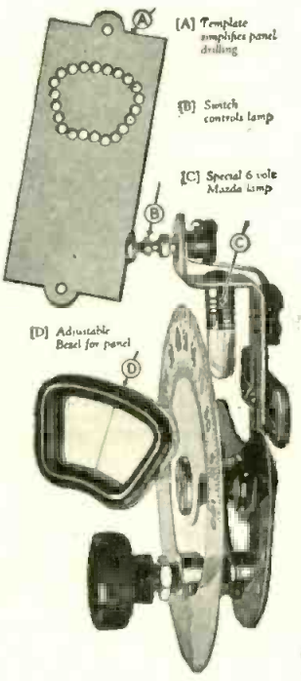
The "Infradyne"
sponsored by RADIO
MAR-CO *controls optional*

The Fenway
MAR-CO *controls standard equipment*

Ferguson Receivers
MAR-CO *controls built-in*

Let this impressive list be your guide when you select the tuning controls for the new set you build, or the old one you remodel. ANY set can have MAR-CO tuning. Write for booklet.

Martin-Copeland Company
Providence, R. I.



MAR-CO illuminated controls, (complete with template, bezel, and 6 Volt Mazda lamp) Scales 0 to 100, or 100 to 0, $3.50

MAR-CO vernier dials, 4 inch and 3 inch. Scales 0 to 100, or 100 to 0, and 360° vernier dials,
nickel plated $2.50
gold plated 2.75

MAR-CO 2 inch rheostat dial (matches vernier dials in appearance) ..... .75

The "5-50" receiver is exceptionally flexible in so far as its tube and battery requirements are concerned. The tube combination preferred by the author consists of UX-201-a tubes in the first, third and fourth sockets, a UX-200-a tube in the last socket for the detector, and a UX-112 power tube in the second socket, which is the second stage of audio-frequency amplification. If preferred, however, UX-201-a tubes may be used in all five sockets.

The above tube combinations apply only when a storage "A" battery is used. When the use of a storage battery is not desirable or practical, dry-cell tubes of either the 1½-volt or 3-volt type may be used throughout. Thus any standard type of tube may be used in this receiver without any change in the receiver itself.

The battery requirements depend largely upon the tubes used. If a power tube is used in the second stage of audio-frequency amplification, for instance, it is advisable to use a total of at least 135 volts of "B" battery, regardless of whether the power tube is a UX-112, a UX-171, or a UX-120. The "C" battery requirements will also vary with the type of tubes used. Complete information on the battery requirements of each type of tube are given in the instruction sheet which comes with the receiver.

In general, the tests of this receiver disclose the fact that its volume is so great that the use of a power tube in the last audio stage is necessary if distortion resulting from the overloading of the last tube is to be avoided. If a non-power tube is used it is necessary to keep the volume toned down in the case of reception from local stations, in order to avoid overloading. This regulation of volume is best obtained by turning the master tuning control slightly off the best setting for a given station. In other words, if a certain broadcasting station comes in best with the tuning indicator set at 50, the volume may be reduced by turning the tuning control slightly above or below this figure.

When a power tube is used the full volume of the receiver may be taken advantage of, without any loss of quality of reproduction. In such a case the volume is sufficient for all practical purposes, and too great for use in an ordinary room except on distant stations.

A good cone-type loudspeaker is recommended for use with this Crosley receiver—which is another way of saying that the tone quality of this receiver is of a high order that warrants the use of a high-class speaker if the good quality is to be maintained.

The set is considerably more sensitive than a five-tube receiver is ordinarily expected to be in these days of seven, eight and nine-tube receivers. A number of stations up to a thousand miles distant were tuned in during the eve-

ning of the test and all were clearly audible on the loud speaker. Inasmuch as the test was made on a rainy summer evening, conditions were far from ideal and thousand mile reception under these circumstances is a pretty good indication of distance-getting capacity under more favorable conditions.

This reserve of sensitivity makes it possible to use this receiver with an indoor antenna or a short outdoor antenna, and to obtain entirely satisfactory results, at least from local stations up to a hundred miles or so distant.

For the maximum result, an antenna around 100 feet in length will probably be found best. In locations close by the broadcasting stations, however, it is advisable to use an antenna somewhat smaller than this.

The Mu-Rad Super-Six Receiver

(*Continued from page 657*)

is a "sensitivity" control knob on the front panel which permits the operator to adjust the circuit to obtain this maximum amplification, but still to avoid distortion.

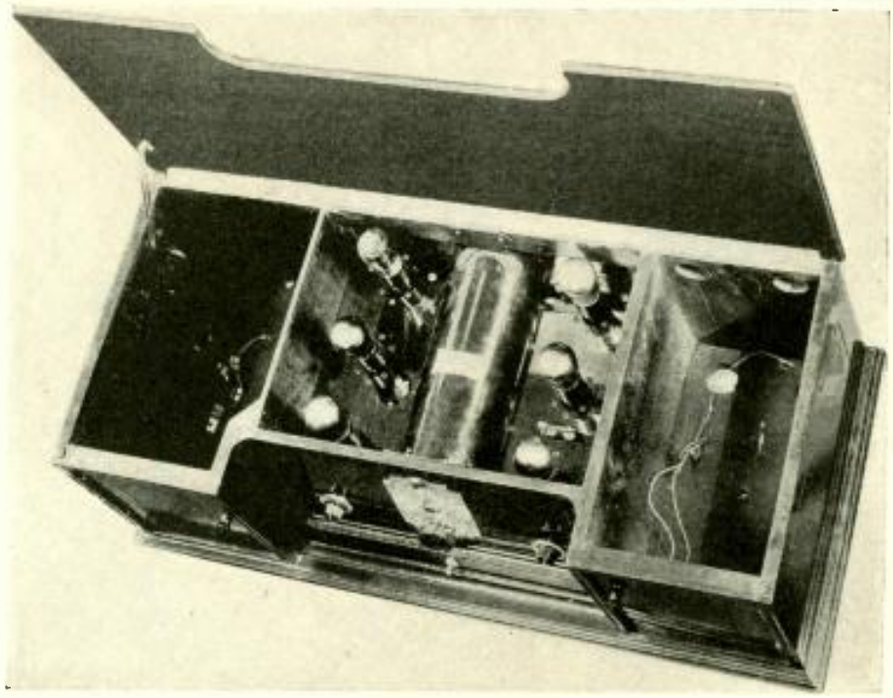
The audio-frequency amplifier uses three low-ratio transformers. The result is that the incoming signals are amplified to great volume and even in the case of reception from distant stations, there is ample volume to operate the loudspeaker. For local and semi-distant reception it is necessary to keep the volume control turned well down. The tone quality remains uniformly good, however, regardless of the amount of volume.

The external appearance of the receiver is altogether pleasing. The cabinet is of mahogany, finished in a warm two-tone brown; the large surfaces are broken by a panel effect, which lends considerably to the charm of the cabinet.

While the cabinet is a table mounting model, space is provided within it for all batteries. This space is provided in the form of compartments at either end, each of which has a front door which swings out to permit access to the batteries. Then, too, the entire top of the cabinet is hinged at the rear, so that it may be raised. This is an added convenience when replacing or moving the batteries or tubes, as the raised top not only exposes the receiver proper, but opens the top of the battery compartments.

The receiver is located between the two battery compartments and is equipped with a recessed, sloping panel which carries the operating controls. This panel is of a mahogany grained composition material, set in a frame of real mahogany. Both the panel and the frame match the coloring of the rest of the cabinet.

The single wavelength-tuning control



A TOP VIEW OF THE MU-RAD RECEIVER

The tuning condensers are enclosed in a metallic shield in the middle compartment that contains the receiver proper; the six tubes are mounted three on each side of the central tuning unit. The two rectangular compartments located on each side of the set compartment are for the "A" and "B" batteries.

is placed in the center of the panel. This control is set in a bronze escutcheon plate on which a calibrated scale is embossed. The tuning indicator hand, also of bronze, moves over this scale. Immediately above the scale is a small, colored crystal window behind which is a small electric pilot light to indicate when the receiver is in operation.

At either side of the master tuning control there is a knob similar to the master knob but smaller. These are the "sensitivity" and "tone" (volume) controls. These three knobs are all of such size and shape as to provide a comfortable fingergrip.

In the framework, just below the control panel, are two small rotary switches. One is the antenna switch, by means of which the antenna values are adapted to the requirements of this receiver. The other switch is to turn the receiver on and off.

Once a given broadcasting station has been tuned in on this new model, and a notation made of the setting of the indicator pointing for that station, it may be tuned in again at will by simply turning the control until the pointer is again at this same setting. Thus if a list is made up of the indicator settings of the operator's favorite stations, any of them may be tuned in whenever desired.

The antenna required for the operation of the "Super-Six" may be anything from a fifteen or twenty-foot indoor wire to a longer outdoor wire, up to 150 feet in length. When maximum results are required (considered from the standpoints of selectivity, volume, and distance reception), an outdoor antenna of from 80 to 100 feet in length is recommended. When reception from nearby stations is all that is required, an indoor antenna strung around the picture moulding of the room in which the receiver is located will give good results.

The receiver makes use of UX-201-a tubes throughout, except in the last audio stage, where a power tube such as the UX-112 or UX-171 is recommended.

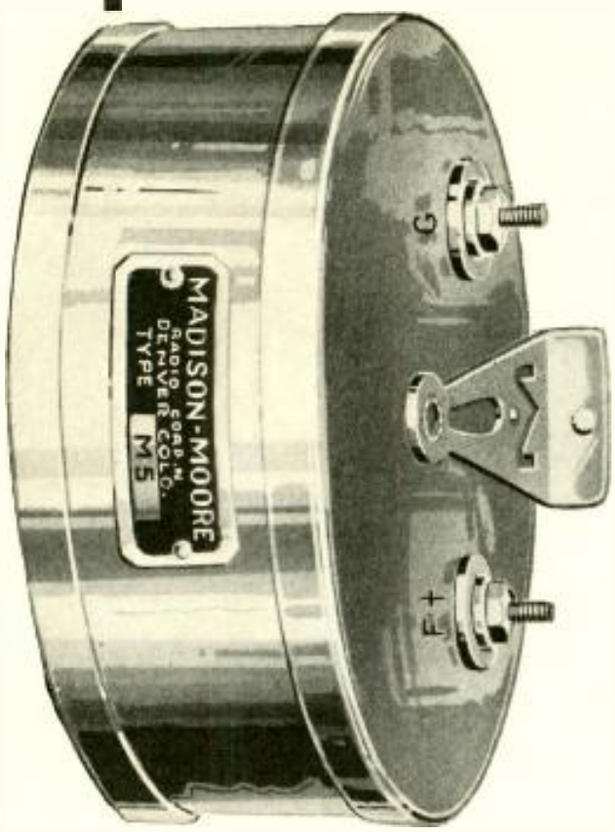
The batteries required are: a storage "A" battery and a suitable battery charger, preferably a trickle charger; three "B" battery blocks, with a total voltage of 135; and a "C" battery.

The type and voltage of the "C" battery will depend upon the type of power amplifier tube used in the last socket. With the UX-171 tube the "C" battery should be made up of one standard 4½-volt "C" battery unit and a midget size 22½-volt block. With the UX-112 tube in the last socket two of the 4½-volt "C" battery units are used.

In place of "B" batteries a power supply unit which takes the high voltage from the house lighting lines may be used. Such a unit should be capable of delivering between 135 and 180 volts, maximum, and should have additional terminals to provide 45 and 90 volts. The manufacturers of this receiver make such a supply unit, which is sufficiently compact to fit into the battery compartment in the receiver cabinet.

It will be seen from the illustration on page 657 that this receiver is adaptable to any sort of a table for mounting. As the batteries are all in the receiver cabinet there is no necessity for using a regular radio table. Instead a small serving table or any other form of table that happens to be at hand may be used.

THE "*finest* TRANSFORMER IN THE WORLD!"



RADIO Engineers and those who know, pronounce MADISON-MOORE TRANSFORMERS the most perfect. Their superiority has been unquestionably demonstrated under every possible test.

You are assured greatest satisfaction in the essentials of perfect Radio reception.

SELECTIVITY: Silent nights are no longer necessary. MADISON-MOORE Transformers can always be depended upon to make distant stations like locals on your dials.

QUALITY: From the tenor's falsetto notes, to the rumbling bass of a great pipe organ, they faithfully reproduce the beauty and shading of every tone.

DISTANCE: Repeated tests prove that stations out of reach of many of the finest receiving sets are easily brought in with MADISON-MOORE Transformers.

VOLUME: These Transformers, when used with only a two foot loop, produce loud speaker volume on stations that have never before been heard in that locality by the broadcast listener.

MADISON-MOORE Transformers are precision-made and subjected to most exacting laboratory tests until they are electrically and mechanically perfect.

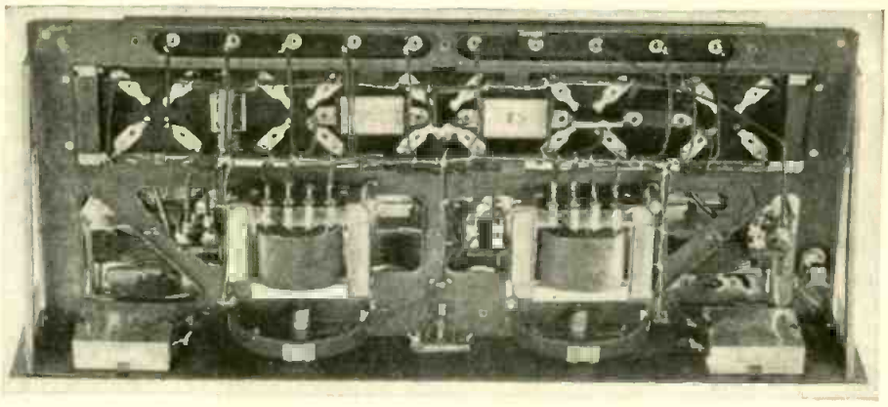
TO HAVE MADISON-MOORE TRANSFORMERS IS TO HAVE THE BEST IN RADIO

Write us for name of nearest dealer.

Madison-Moore Radio Corporation
2524 Federal Boulevard
Denver Colorado

READ THIS GUARANTEE IT IS ATTACHED TO EVERY INSTRUMENT

MADISON-MOORE



UNDER THE SUB-PANEL OF THE FRESHMAN RECEIVER

The transformers, condensers and tube sockets are mounted directly on the metal chassis and panel; notice that the wiring is all in the form of flexible cable leads.

The New Model Freshman Console Receiver

A HIGH-QUALITY radio receiver at the low price that mass production makes possible—that is the story behind the new Freshman receiver (Model 6-F-11).*

In appearance this new set resembles the newest of phonographs. The mahogany finish of the cabinet has shading and highlights that lend variety and avoid the somberness that large surfaces that are finished in an even color have.

When the set is in operation the entire front of the cabinet opens up. The hinged door at the top front, which conceals the panel, drops down to a position at right angles to the front of the cabinet to serve as a shelf on which to rest the arms in tuning the receiver.

The rest of the cabinet front is made up of two large doors which open to disclose a cone-type loudspeaker and, just below it, an inner door to a compartment which holds the batteries.

When the top of the cabinet, which is hinged at the back, is raised the entire "works" of the receiver may be seen. The entire assembly job has been done by a series of mechanical operations; hand labor was used only to wire the assembled receiver.

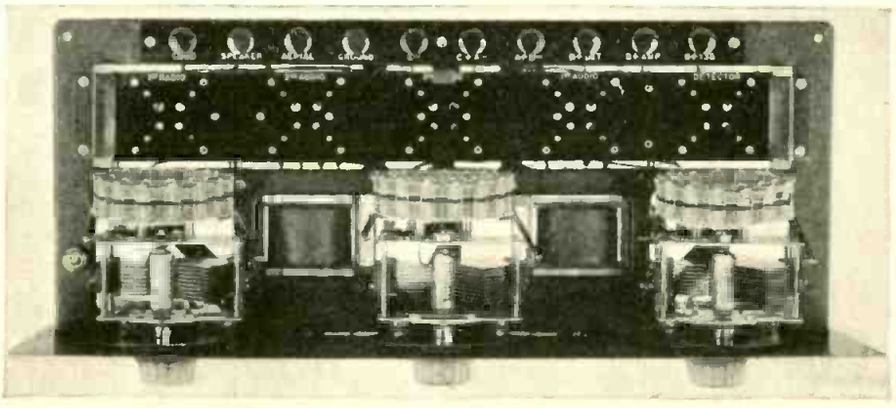
The receiver itself consists of two stages of tuned radio-frequency amplification, a detector and two stages of transformer-coupled, audio-frequency amplification.

The radio-frequency amplifier has been designed so that no neutralizing or stabilizing controls or adjustments are necessary. The receiver cannot oscillate, for the circuit design and physical construction of the radio-frequency amplifier are such that it keeps just below the point of oscillation no matter what wavelength the receiver may be tuned to. Thus good sensitivity is obtained, with stability, and with maximum simplicity.

The audio-frequency amplifier is really excellent; this is one of the reasons for the fine tone quality and great volume that is obtained. A UX-112 power tube is used in the last stage of audio-frequency amplification and this creditably handles the immense volume put into it and reproduces extremely loud signals without blasting or distortion.

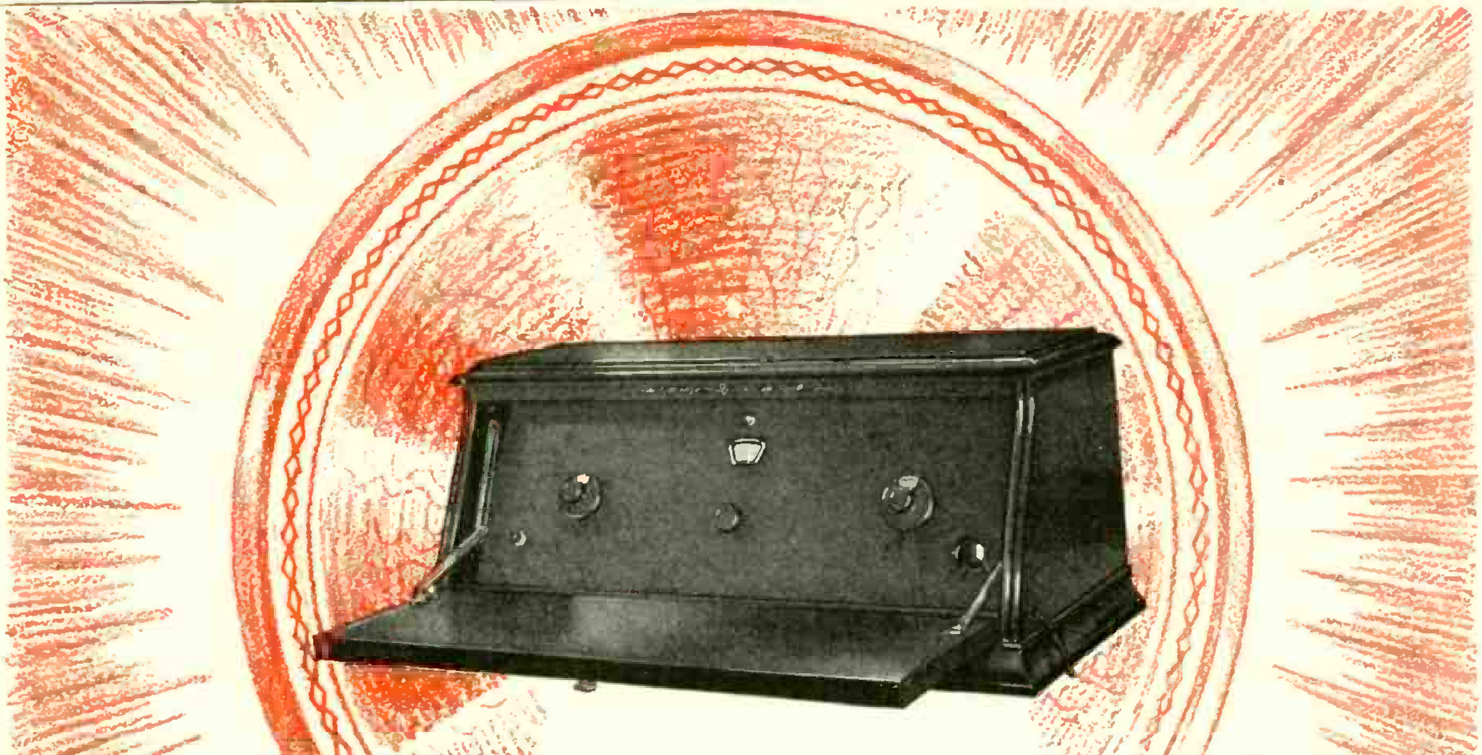
Tuning is accomplished by means of three knobs located on the front panel

*The data in this article also applies to Model 6-F-12 which is exactly the same as Model 6-F-11 except that the cabinet is of walnut instead of mahogany.



THE RECEIVER UNIT AS VIEWED FROM ABOVE

Note the neat appearance of this new model with the condensers and coils mounted as units and with the bakelite shelf for the tube sockets which is mounted on spring rubber to keep the set from howling by preventing tube vibration from loud signals.



UNIFORM POWER AMPLIFICATION

NOT just power amplification. *Uniform power amplification*—one of the three essentials embodied in the new LC-27 Receiver, designed by Laurence M. Cockaday, Technical Editor of POPULAR RADIO. It adds more pieces to the broadcast orchestras—the drums, the bass viol, the big horns, and it gives them the powerful, clear tone *you were able to get only on the middle and higher tones before*.

Now is the time to build the LC-27, the first receiver to have all three requirements for perfect tone in radio reception:

1. A clean, undistorted signal through the detector.
2. Uniform amplification of all voice and musical frequencies with full volume.
3. A filtered output by which nothing but pure voice current is permitted to actuate the loud speaker.

The LC-27 Receiver operates with batteries or power-supply units; with or without aerial.

Let us tell you more about Mr. Cockaday's newest contribution to radio. Fill out and mail the coupon today. It's worth your while.

COMPLETE [illegible]ST OF PARTS FOR THE [illegible]-27 RECEIVER

1—Hammarlund mid-line dual condenser, .000275 mfd.
1—Hammarlund mid-line single condenser, .000275 mfd.
[illegible] Octaform coil set, [illegible] and two interstage coup[illegible]
1—AmerTran [illegible] transformer.
1—AmerTran [illegible] second-stage transformer.
1—AmerChoke No. 854.
1—Dubilier No. 902 filter condenser, 4 mfd.
1—Dubilier No. 907 filter condenser, .1 mfd.
1—Mar-Co illuminated control, scale 0 to 100.
1—Mar-Co small controls, special for LC-27.
1—Carter Imp. battery switch.
1—Samson radio-frequency choke coil No. 85.
3—Aervox mica fixed condensers, .00025 mfd.
1—Durham resistor, 4 megohms.
1—Lynch grid leak mounting.
1—Carter short jack, No. 1.
1—Carter resistance, 0-10,000 ohms.
12—Eby engraved binding posts.
5—Benjamin UX sockets
1—Amperite, No. 1.

Complete official parts, including mechanical kit, without cabinet. $85.20

Mechanical Kits for the LC-27, $12.50

The complete mechanical kit, containing the special parts necessary to duplicate the Popular Radio LC-27 Receiver, can be purchased from your dealer. The kit contains one decorated and engrave Micarta panel, one binding post strip, one pair of genuine cast aluminum Tait angle brackets, one set of four special Aluminum Co. of America shields, and all the nuts, bolts, screws and brass angles necessary to build the complete receiver. Dealers may obtain these Mechanical Kits from the Committee of 21 Manufacturers.

COMMITTEE OF 21 MANUFACTURERS :: 118 E. 28th STREET :: NEW YORK, N. Y.

The LC-27 Receiver

Watch for this seal. It stands for parts of proven worth.

"—used in the LC-27"

MAIL THIS COUPON NOW!

Committee of 21 Manufacturers,
118 East 28th Street,
New York, N. Y.

Gentlemen:

I enclose 10c for which please send me full constructional data for building the LC-27 Receiver.

Name...

Address..

of the receiver proper. This panel is of brass, finished to resemble mahogany; thus it matches the color scheme of the cabinet. The three knobs control the variable condensers which tune the antenna and the two radio-frequency amplifier stages, respectively.

The manipulation of these tuning controls is simplified by the fact that the second and third tune exactly alike. That is, for a given station or wavelength, the settings of the second and third condensers, as indicated by the calibrated scales which revolve behind small windows just above the tuning controls, will always be the same. The setting of the first condenser may vary slightly from the setting of the other two, depending upon the size of the antenna used. At most, this variation does not appear to be more than a few degrees.

In addition to these three tuning controls there is a small lever, lower down towards the left of the panel, by means of which the volume may be regulated to any desired degree. A similar lever is placed to the right of the volume control for the purpose of regulating the filament current to the detector and audio-frequency amplifier tubes. This latter adjustment is made once and requires no further attention unless the storage "A" battery is allowed to run down below normal voltage, in which case compensation may be made by means of this filament control lever.

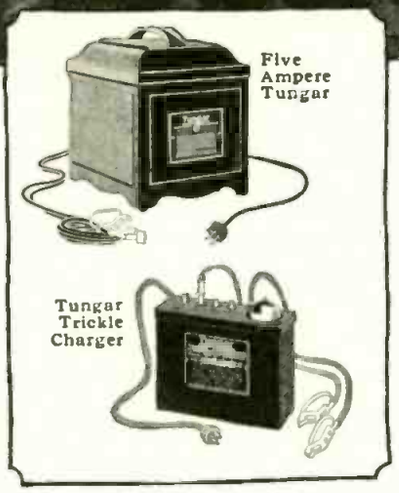
The physical make-up of the receiver is notably sturdy; it is evident that every precaution has been taken to keep anything from going wrong during shipment or after installation in the home of the owner.

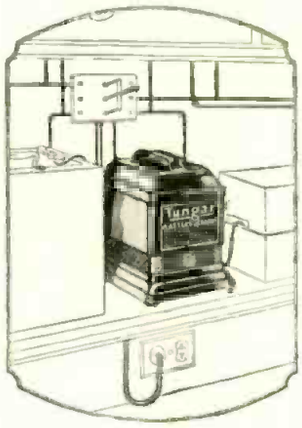
An instance of this quality is seen in the assembly of the complete receiver unit on a rigid, pressed-steel chassis which is copper plated and then enameled. Mounting throughout is accomplished by means of riveted eyelets instead of the usual bolts and nuts. Thus there are no nuts to work loose.

This damage-proof construction has even been carried to the extent of equipping the receiver with brass tuning knobs and brass control levers, all with a pleasing antique finish in old silver. Then, too, instead of wiring the receiver with stiff bus wire, a flexible, insulated cable is used. This makes the possibility of broken connections remote.

A high-grade, cone loudspeaker is incorporated in the cabinet as part of the receiver. This speaker is especially designed and adjusted for this particular receiver; for this reason it does not have the peculiar muffled sound that is ordinarily obtained from a cone loudspeaker when it is partially inclosed in a compartment of a cabinet. Other difficulties were encountered in the attempt to operate the speaker inside of the cabinet; for instance, the tendency of the receiver to howl, due to the vibration of the vacuum tubes. When a sig-

Two ampere Tungar installed in a radio cabinet.





Charging *now* simplified

When a Tungar charges your batteries just by the turn of a switch, how easy it is to keep batteries fully charged.

Nowadays, it is possible to have a Tungar *permanently* installed. Then you can place the batteries in a cabinet, a closet, or down in the cellar, and just have a convenient switch to throw when they need charging.

It's as simple as snapping on a light. And an overnight charge costs less than a dime

The 2 and 5 ampere sizes will charge 2, 4 and 6 volt "A" batteries, 24 and 96 volt "B" batteries, in series: and auto batteries, too. No extra attachments needed.

East of the Rockies

2 ampere Tungar—$18
5 ampere Tungar—$28
Trickle Charger—$12
(60 cycles—110 volts)

Tungar is the original bulb charger. It is a G-E product developed in the Research Laboratories of General Electric.

Tungar
Reg. U.S. Pat. Off.
BATTERY CHARGER

Tungar—a registered trademark—is found only on the genuine. Look for it on the name plate.

Merchandise Department
General Electric Company
Bridgeport, Connecticut

GENERAL ELECTRIC

nal was tuned in with great volume the loudspeaker, mounted inside of the cabinet, caused the entire cabinet to vibrate strongly enough so that the vibrations could be felt if the hand was placed anywhere on the outside of the cabinet. Naturally if the vacuum tubes were rigidly mounted they would vibrate with the cabinet. To overcome this the entire tube assembly was mounted on sponge rubber; this eliminates this trouble absolutely.

Some idea of the sensitivity of the receiver may be obtained from the fact that during the POPULAR RADIO tests of the receiver, the antenna was disconnected entirely and the ground connection made direct to the antenna terminal of the receiver. Under these conditions stations up to fifty miles distant came in so strongly that the volume had to be cut down for comfort. In a home where there is no interest in reception from great distances and where reception from stations up to say fifty miles is all that is desired, there is no real necessity for an antenna at all with this receiver.

If reception from distant stations is desired, an antenna is of course, necessary. Under ordinary conditions this should be an outdoor antenna about 75 feet long (measured from the receiver to the furthest end). If the receiver is located in close proximity to a number of broadcasting stations, as is the case in the larger cities, best all around results will be obtained with a shorter antenna of from 30 feet to 50 feet in length.

The tubes recommended by the manufacturer for use with this receiver are UX-201-a's for the two radio-frequency amplifier sockets and for the first audio-frequency amplifier socket. For the detector a UX-201-a or one of the new UX-200-a tubes may be used. The latter provides greater volume, especially on comparatively weak signals from distant stations. For the last audio-frequency amplifier tube the UX-112 tube is recommended although the UX-171 tube may be used.

The battery requirements call for a storage "A" battery for lighting the tube filaments; 135 volts of dry-cell or storage "B" batteries and two small dry-cell "C" batteries, providing a total of 9 volts. The voltages used by the receiver are: 22½ to 45 volts for the detector, 90 volts for the radio-frequency amplifier tubes and the first audio amplifier tube, and 135 volts for the power amplifier tube.

In place of batteries, it is entirely practical to operate this receiver from a power supply unit connected to the alternating current light lines.* For this purpose the manufacturer recommends its complete "ABC" power-pack. When connected to the alternating

*Any one of the various Raytheon Power-pack units described in POPULAR RADIO for November, 1925, May, 1926, June, 1926 and July, 1926, may be used to supply the "B" current for this receiver.

current supply lines this unit rectifies and filters the alternating current, changing it to the required direct current and supplying this at the proper voltages as required of "B" and "C" batteries. The power-pack also contains a trickle charger which keeps the small storage "A" battery fully charged at all times. The storage "A" battery used with this power-pack may be a small one because there is never any considerable drain on it with this continuous charging process.

The use of the "ABC" power-pack relieves the owner of the receiver from all battery worries. Its use is extremely simple, as there are no adjustments to be made on it. It includes a relay switch so that when the push-button on the receiver is pulled out, to put the receiver into operation, the "B" and "C" power is also automatically turned on. When the receiver is turned off, the "B" and "C" voltages are cut off, and the trickle charger is automatically turned on to charge the storage "A" battery while the receiver is idle.

Our Silly Contemporaries

The average man's life is now divided between worry over two tubes—radio and inner.

—*Exchange*

* *

"So your husband has taken your radio all apart?" said Mrs. Suburbs. "Is he an expert?"

"Not yet," replied Mrs. Saylor, "He hasn't got it back together."

—*Life*

* *

Excited voice on the phone; "John, come home at once, I've mixed the plugs, the radio is covered with ice and the ice box is singing, 'Way Down South in Dixie'!"

—*Life*

* *

R. M. sends us the story of a young bride who asked her husband to copy off a radio recipe she wanted. He did his best but got two stations at once, one of which was broadcasting the morning exercises and the other the recipe. This is what he took down:

"Hands on hips, place one cup of flour on the shoulders, raise knees and depress toes and mix thoroughly in one half cup of milk. Repeat six times. Inhale quickly one-half teaspoonful of baking powder, lower the legs and mash two hard-boiled eggs in a sieve. Exhale, breath naturally, and sift into a bowl.

"Attention! Lie flat on the floor and roll the white of an egg backward and forward until it comes to a boil. In ten minutes remove from the fire and rub smartly with a rough towel. Breathe naturally, dress in warm flannels, and serve with soup."

—*Fargo* (N. D.) *Forum*

How to Patent Your Radio Invention

(Continued from page 654)

of patents by the writer, gave some valuable advice to would-be inventors.

"The most practical way to establish beyond a doubt the date at which an inventor conceived an idea is to keep a notebook, summarizing all the work which he does from day to day. This should be a bound volume, not a loose leaf notebook. Whenever an idea is recorded which holds promise of being the basis for a future patent, it is important that the inventor discuss the idea with two or three friends who are capable of understanding it and in whom he has confidence. They should then sign the notes referring to that idea in the margin of the inventor's notebook, with some such statement as 'explained and understood by me,' together with a notation of the date they did so.

"Often an idea, which, at first, shows promise of but limited application, develops, and by means of a notebook, such as I have suggested, an inventor has an adequate legal record from the time he first conceived the basic idea. If an inventor waits until he fully appreciates the possibilities of an idea, especially in a subject upon which so many active minds are working, as radio, before he establishes by written record his date of conception, he may ultimately lose the patent as a result, even though he is, in truth, the first inventor."

It is interesting to note that Professor Hazeltine's mathematical exposition of the principle of neutralization was recorded in his laboratory notebook and that this original working out of the problem was very valuable in establishing the priority of his invention. This page from his notebook is reproduced with this article.

Another method of establishing your date of conception is to write yourself a letter, preserving a carbon copy, describing the device in full. Seal this in an envelope with sealing wax and mail it to yourself by registered mail. The record of its acceptance by the Post Office establishes the date without question. Upon its receipt, do not open the letter, but keep it sealed. File it in a safe place, attaching the carbon to the envelope. If it is ever required to establish your priority, see that the seal is broken in court under conditions prescribed by a lawyer. Of course, if the seal is broken without adequate legal witness, it can be contended that the description was not in the envelope at the time it was registered.

If you have conceived what seems to be a patentable idea, by all means establish in written legal form, through an affidavit or by the means herein described the date upon which you

conceived the idea. Then apply the four questions which determine whether the idea holds a promise of profit, given in the beginning of this article. When the idea is sufficiently definite that you can show a working model or practical drawing so that it can be made by another, consult a patent lawyer. Select one who has had experience in drawing patents on similar devices. Patent lawyers of repute are usually specialists in some one field, such as radio, traction and automotive, for example. Use the same care in finding a reputable lawyer as you would in seeking a physician to perform a difficult operation. Inventors are usually careless about selecting legal, financial and sales assistance. A skillful and experienced lawyer can often extend the scope of a patent, greatly increasing its ultimate value.

If the preliminary search, which costs from ten to twenty-five dollars, does not reveal any interfering patent, specifications are then drawn up which consist principally of a description of the device, drawings sufficiently clear to enable one skilled in the art to construct the device and a series of claims which set forth what the device proposes to accomplish. With the filing of this document at the Patent Office, a fee of fifteen dollars is required. It is now examined by the Patent Office examiners who bring to the attention of the patent lawyer any patents or applications which appear to conflict with it. These may require modifying amendments to your application or further affidavits to establish priority until all the objections of the Patent Office are met.

Notice of the allowance of the patent is then sent by the Patent Office and an additional fee of twenty dollars is due which must be met within six months or the application lapses. Astute inventors sometimes permit as much of this period to pass as possible because it, in effect, lengthens the useful life of the patent. Usually, within a month or two after the twenty dollar fee is paid, the patent is granted, effective for seventeen years after the date of issuance.

The granting of the patent is not, as is often supposed, a guarantee on the part of the government of the inventor's priority or possession of the patent monopoly. As a matter of fact, it gives you little more than the right to sue and to be sued in defense of the patent. The famous Selden patent, covering the use of an internal combustion with a wheeled vehicle, was contested almost to the day of its expiration.

Foreign patents must be filed before the U. S. patent is granted, but not more than one year before application is made in the United States. In many foreign countries, publication of a description of a device makes it impossible to secure a patent on it.

Patents may be assigned to another

person or a corporation and the inventor and assignee thereby become co-owners. Either of them may prosecute infringement. Licenses to manufacture your patents may be granted without assignment. Sometimes two inventors work out a patent and a patent may be granted to them jointly.

We have set forth in some detail many conditions which must be met before a patent can be obtained and before profit may be realized from it. Indeed they are a formidable array of conditions, sufficient to cool the ardor of the most enthusiastic would-be inventor. Recall that two out of three applications are rejected and that only one out of a hundred patents yield a profit. Obviously this high morta ity of inventive effort makes it worth while to consider exhaustively all of the many conditions which must be faced. Appreciation of these problems may prevent the expenditure of hardearned money uselessly in an effort to secure patents on impractical devices.

Fortunately, to those who successfully clear all these hurdles, the opportunity for profit and distinction offers adequate compensation for the thought, effort and expense that are involved.

How to Select Your Radio Parts

(*Continued from page 648*)

slightest play will certainly cause trouble in the future if not from the start.

Fourth: Be sure that the insulation between the rotor and stator is located away from the shaft. While this is not a factor which will cause a great deal of trouble, it is usually possible to get one which has this feature. Many good condensers have a bakelite end piece and are of very low loss design.

Fifth: See that the proper mounting screws are included with the condenser. This little factor will save a lot of trouble when the receiver is being assembled. The center hole mounting condensers are usually the best as there is no strain placed upon them if the hole should happen to be off a little, or the panel not quite true.

The question as to whether a straight-line-wavelength, or a straight-line-frequency, or a combination is to be used is up to the individual; there is no difference in the results obtained except that the straight-line-frequency, or combination, is usually slightly easier to tune. There will be no difference in the selectivity.

It is often possible to get the straight-line-wavelength, or the straight-line-capacity condenser at a very reasonable figure and if the design is correct, as indicated in the preceding lines, the builder need not have any hesitation in getting them.

FREE

This 84 Page Wonder Book of RADIO Bargains

Send for it TO-DAY

Save 1/3 to 1/2

Send for this guide to Radio prices and Radio quality. All of our vast resources and radio experience have been utilized to assemble for you in one gigantic institution, the best and newest things in radio. The Randolph catalog is indeed the radio market place of the world — a masterpiece of merchandising that befits our house—**the largest exclusive radio mail order house in the world.**

What Our Catalog Contains

Over 2,000 items—from the most beautiful, fully equipped console model radio set, down to the smallest part or tool for the set builder—kits, parts, and supplies of every conceivable type and style. All beautifully illustrated and interestingly described. And to give this book added value, we have included radio data that makes it an invaluable text book for every lover of today's most fascinating and most wonderful achievement—RADIO.

Radio Sets

In this great radio market place you will find table model sets and console types with built-in loud speakers; the newest ampliphonic console sets; new Spanish period consoles; **five, Six, seven, and eight tube sets. with three dial, two dial, and the newest and most popular single simplified control.** All sets are assembled in beautiful, genuine mahogany and walnut cabinets in a choice of latest types and designs.

5 Tube sets as low as $24.90
Latest 1927 Models

All Randolph sets are sold at amazingly low prices. No matter what kind of set you want—no matter how little you want to pay —you can select YOUR SET AT YOUR PRICE from the Randolph catalog.

Radio Kits

Includes all the popular circuits that have been designed and approved by the world's foremost radio engineers.

Radio Parts and Supplies

The Randolph catalog also contains a most complete line of **"B" Battery Eliminators**, including the famous **Raytheon Eliminators**; the latest type of Loud Speakers, Cone Speakers, a complete line of quality "A" power units — in fact, you will find listed in this wonder book every part that goes into the construction of a radio set, or any accessories you desire, at prices that mean a **substantial saving to you.**

Free Radio Service

Everyone has need for radio service. The average man has no time to keep up with the rapid developments of radio. We employ Radio Engineers who have made radio their life work. Their expert advice and helpful suggestions solve every radio problem of our customers.

Our Guarantee

Every article in our catalog is based on careful laboratory analyses and tests. We guarantee to back up every item in our catalog with our own as well as manufacturer's assurance of quality.

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Space limitations here prevent our telling you more about the Randolph Catalog. Simply fill out and mail the coupon—or you may send a postal or letter—and this truly remarkable Radio book will come to you **ABSOLUTELY FREE. MAIL THE COUPON NOW.**

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How to Select By-Pass Condensers

The question of a by-pass condenser is merely a matter of procuring the correct sizes; almost any mica or bakelite-impregnated condenser will give good service. There is only one point to watch out for; get one that is mechanically rugged, so that the capacity will not change while in use. Cases have been found where the construction was so poor that the capacity was changed materially by merely pressing on the condenser.

How to Choose Rheostats

Rheostats should be chosen from a standpoint of resistance, as this is the factor which controls the heating of the filaments by regulating the voltage.

Mechanical construction should again be the determining factor in the choice. See that the shaft does not fit too loosely and that there is good contact between the shaft and the binding post. A spring washer is usually preferable to a contact made only by the shaft in the bearing. Also see that the contact arm makes a sure connection and is not flimsy. The resistance wire should be wound on evenly and the contact should slide along without any perceptible hitches. The question of size sometimes enters into consideration, as rheostats are obtainable in sizes from slightly over an inch in diameter up to three inches.

How to Select Transformers

The question of an audio transformer is an important one, as it probably has more to do with the quality of the music obtained than any other one factor. It is better to skimp on some other part of the receiver such as the cabinet, for instance, than on the audio-frequency transformer.

The larger and more expensive the transformer, the better are its operating characteristics, due to certain elements of the design. It is safe to advise the experimenter to get a transformer of ample size. The ratio is not so important as it has been found that the lower ratios usually give better results than the extremely high ratios which were in vogue a few years ago.

The mechanical layout should also be considered to some extent. A shield is a good thing, but is not essential from an electrical standpoint; it does, however, prevent the windings from being damaged readily. (A note might be made here that transformers should not be substituted in any reflex circuit, as their constants vary to some extent and would no doubt make the circuit give results entirely different from the original model.)

How to Select Resistance Coupling

Here again the sizes of the resistors and the connecting condensers are im-

portant. There are many inferior resistance units on the market and probably the only way to choose them is by buying standard makes which have proven their worth in actual use. These resistors must carry a certain amount of current and many of them become defective after a short time in use, or the resistance changes or they become noisy. A poor resistor will cause a noise in the receiver very much like static that is extremely annoying and usually hard to locate.

How to Choose Sockets

In choosing a socket, care should be exercised to see that the springs make good contact with the prongs of the tube. This is very important.

The springs should be tested by bending for quite a distance more than they would normally be bent by the tube; if they come back to the original position, or at least very nearly so, they are all right.

The composition upon which the springs are mounted should be of bakelite or some other high insulating material. If the edge of the socket makes a mark on a piece of paper, the material is probably made of some lampblack compound and should be avoided.

A spring-mounted socket is sometimes desirable especially when the smaller dry-cell tubes are to be used. Only the best of this type should be used.

How to Select Jacks and Switches

Both jacks and switches should be looked at principally from a mechanical standpoint. A plug should be tried in the jack and there should not be too much play between them. Springs should be tested in much the same manner as with the socket. A poor contact in the jack will cause a lot of trouble after the receiver has been in operation a few months.

There are many good jacks on the market and their cost is in most cases reasonable in price. If the short type of jack is obtained, be especially watchful of the springs.

Switches are sometimes made in the form of a jack operated by a cam. The springs should be fairly heavy in order to insure good contact. It is hard to judge in the enclosed types whether there is a good contact or not and it is better to depend upon the name of the manufacturer in a case like that.

How to Choose Insulating Tubing

If the wiring of the receiver is such that insulating tubing is required, the only safe way is to buy the best. The expense of the tubing is not great in comparison with the rest of the apparatus used, and there is no excuse for getting a poor grade.

Leaky insulation causes a lot of

trouble and the outcome may be anything from a burnt-out tube to a serious fire.

How to Choose the Panel

The panel may be a conductor, such as brass or aluminum, and may act as a shield. If a metal panel is used, be sure and get at least No. 16 gauge, and heavier material is to be preferred. If metal is not used, a panel should be obtained of some good insulating material which will hold its shape and color through a long period of time. Here again it is better to go by standard trade marks as there are few indeed who can rightly judge panel materials without extensive tests.

Hard rubber of a good grade makes an excellent panel, while the cheaper grades gradually lose their luster and turn yellow or brown with use. There are many other panels of trade-marked names which will give excellent service.

It is well to remember that there is no halfway ground. The panel should be a good insulator or a good conductor.

How to Select the Cabinet

The cabinet is more or less a matter of taste on the part of the builder. It does not matter what kind of wood or what kind of finish is used, nor does the size matter, so long as it is enough to take care of the desired apparatus. It cannot be too strongly urged, however, to have a cabinet of some kind, as it does not take long for dust to settle on an open receiver and cause trouble through leakage paths for the high frequency currents. The cabinet should be well made and the cover should fit snugly so that the chance of dirt getting in on the apparatus is minimized.

There are many unscrupulous dealers in radio materials who will, no doubt, try and sell the buyer something "just as good" as the article called for. But with these short instructions the buyer ought to have a better understanding of what may be substituted in the various hook-ups without endangering the practical, serviceable features of the finished receiver.

BULL fights in Spain are now broadcast by radio.

* *

"My wife gave me a two-tube set for my birthday."

"Regenerative?"

"No. Shaving and tooth!"

—*American Legion Weekly*

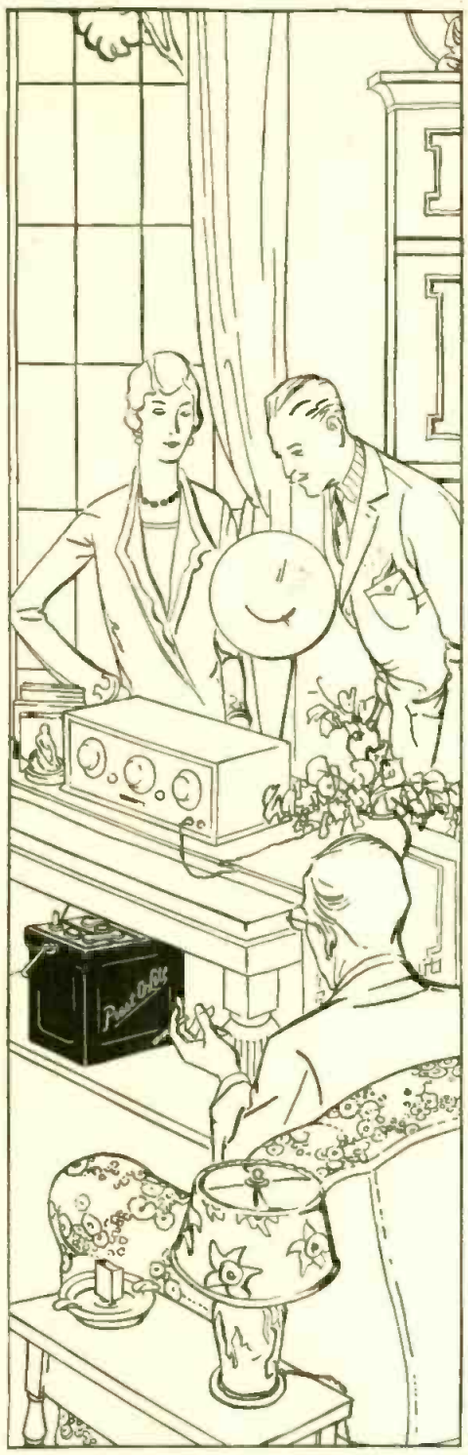
* *

When the President of the United States, the Vice President of the United States, a Member of the United States Senate (Representatives excepted), or a King or Queen of a Foreign Country enters a room *via* the loudspeaker the audience should stand, unless already standing, in which case it should sit down.

—*Collier's*

Statement of the ownership, management, circulation, etc., required by the act of Congress of August 24, 1912, of POPULAR RADIO, published monthly at New York, N. Y., for October 1, 1926, State of New York, County of New York.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Douglas H. Cooke, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the POPULAR RADIO and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher POPULAR RADIO, Inc., 627 West 43d Street, New York City, N. Y.; Editor, Kendall Banning, 627 West 43d Street, New York City, N. Y.; Managing Editor, None; Business Manager, Douglas H. Cooke, 627 West 43d Street, New York City, N. Y. 2. That the owner is: POPULAR RADIO, Inc., whose stockholders are: Laurence M. Cockaday, 627 West 43d Street, New York City; Kendall Banning, 627 West 43d Street, New York City; New Fiction Publishing Corporation, 627 West 43d Street, New York City, whose stockholders are: Douglas H. Cooke, 627 West 43d Street, New York City; Vernal W. Bates, 46 George Street, New Haven, Conn.; Wiley Blair, 4607 Ross Avenue, Dallas, Texas; Harold B. Emerson, 9 East 40th Street, New York City; Estate of William Green, 627 West 43d Street, New York City, *Harris Corporation, 34 Pine Street, New York City; Le Roy Sargent, St. Petersburg, Fla.; Abel J. Smith, 120 Broadway, New York City; Louis H. Strouse, Samuel Falk and Frank C. Fisher, Trustees in bankruptcy of Metropolitan Finance Corporation, 9 East 40th Street, New York City. *Harris Corporation with the following as Trustees in dissolution of Harvey Fisk & Son (1921) now dissolved: John Donovan, 30 Church Street, New York City; Harvey Fisk, 34 Pine Street, New York City; Joseph M. Shellabarger, 30 Church Street, New York City. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: NONE. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Douglas H. Cooke, Business Manager. Sworn to and subscribed before me this 17th day of Sept., 1926. Joseph T. Cooney, Notary Public, New York County. (My commission expires March 30, 1928.)



It doesn't take a battery expert to buy the best battery

ANYONE who walks into a radio store and asks for a Prest-O-Lite Storage Battery is making as wise a purchase as any battery expert could make.

The name "Prest-O-Lite" stands for storage batteries made by a company that for more than twenty years has rigidly maintained the highest standards of manufacturing skill and honest workmanship.

Prest-O-Lite Radio "A" and "B" Batteries have been perfected especially for radio use, in the world's largest electro-chemical research laboratories.

They are not only made to give you long years of service, but they can be depended upon to deliver their rated ampere-hour capacities. These two qualities constitute the real measure of battery value, and hours of radio pleasure result.

Prest-O-Lite Radio Batteries are attractively priced from $4.75 up. It is unwise to take a chance on batteries of unknown make. Ask for Prest-O-Lite.

Send for free booklet

"What every owner of a radio should know about storage batteries" is a little booklet which every radio fan will find interesting and helpful. It is crammed full of hints that will bring surprising radio results—and save you money. It's yours for the asking, without obligation.

THE PREST-O-LITE CO., INC.
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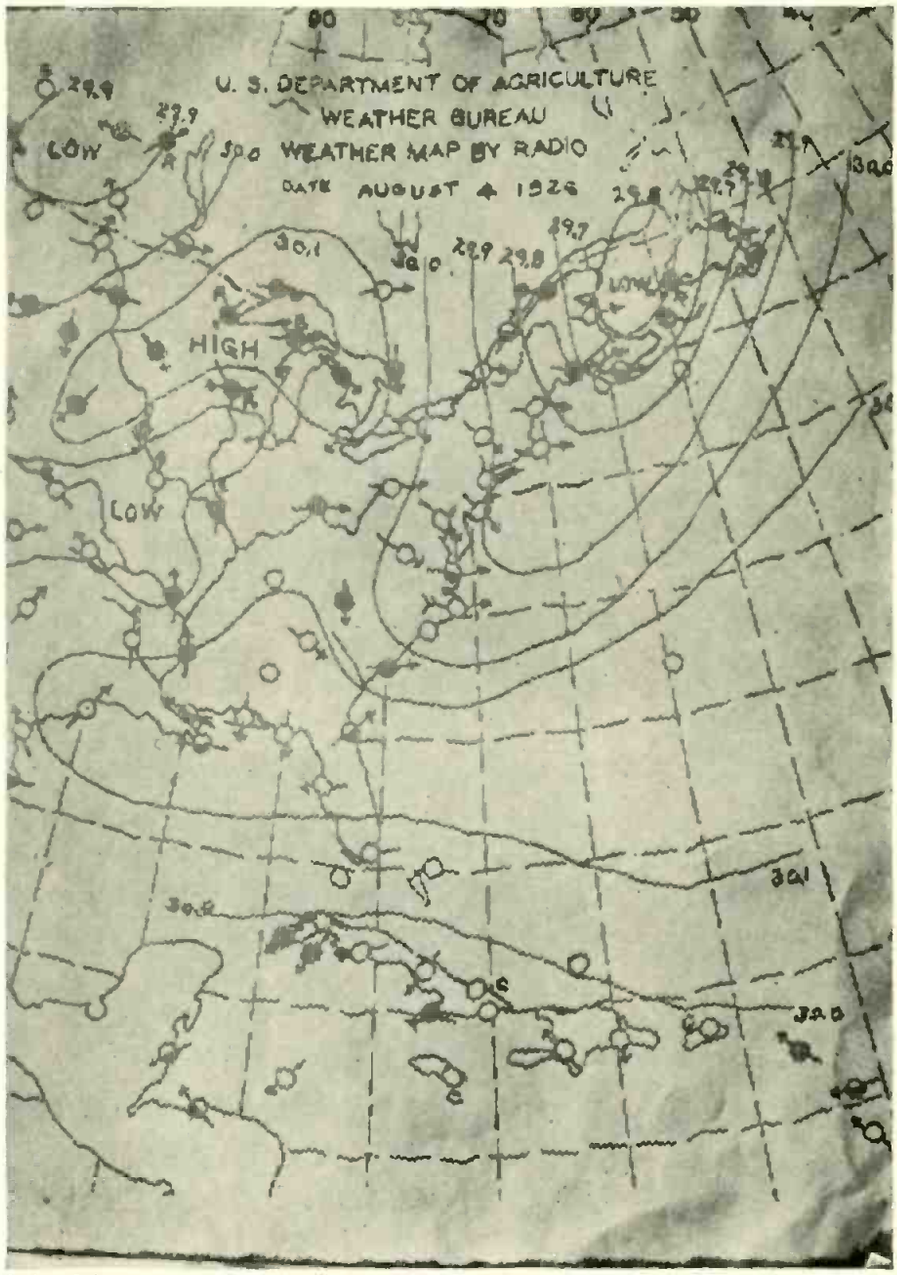
Designed especially for radio

Prest-O-Lite

STORAGE BATTERIES FOR MOTOR-CARS AND RADIO

Radio Transmits Weather Maps to Ships

(*Continued from page 655*)



Jenkins Laboratories

THE WEATHER MAP AS IT IS RECEIVED

This is made up of the short strokes of a pen actuated by the electrical impulses received by radio; the blotches on the map are caused by bursts of static.

rotation under the pen and ink device, has the incoming radio signals converted into ink dots to build up the picture which was sent out by Arlington. The only machinery additional to the ordinary continuous wave transmitter and receiver are two attachments shown in the illustration; these instruments are about the size of an ordinary typewriter, and have something of the appearance of the old time phonograph.

Experience will determine whether or not it will be necessary to repeat each map transmission. Static often causes incomplete reception of code weather forecasts; it does not, however, detract from the accuracy or completeness of the weather maps transmitted by radio vision, as the static merely appears on the received map as dots, or at the most, blotches which are not sufficiently large to render the map unreadable to any important extent.

Mr. Jenkins has loaned the Navy Department two radio vision receivers for the purpose of the tests. These receivers have been installed on the cruiser *Trenton* cruising in New England waters, and to the naval transport *Kittery*, which makes regular trips between Norfolk and the West Indian ports. These ships will intercept the weather maps transmitted by Arlington daily, and will make reports of their success with the device.

In addition a radio vision receiver has been installed in the forecasting division of the Weather Bureau, in order that accurate check of maps that have been broadcast may be made.

The BEGINNER IN RADIO

CONDUCTED BY ARMSTRONG PERRY

INTRODUCTORY NOTE

THIS department, which starts with this issue, purposes to give practical help and inspiration to the youngster—as well as to the oldster—who is just entering the fascinating and limitless field of radio experimentation. Readers are invited to send in reports of their experiments and bits of advice and information that are of interest to "the other fellow." The conductor of this new department, Mr. Perry, is known to boys throughout the country not only as a contributor to boys' magazines but as a radio expert as well; he was for some years in charge of radio activities in the Boy Scouts of America.

—EDITOR

The Rewards Offered by Radio

A FELLOW who shoots without aiming seldom hits anything—except possibly, an innocent bystander. When you use radio what do you aim at?

Here are some of the targets that radio users have aimed at and hit:

Kept up-to-date on dance music; took college courses; learned to enjoy and appreciate classical music; kept up with current events; caught market reports and made money by using the information; kept the home clocks and watches correct; learned about the new discoveries in science, art and industry; mastered the receiving set and made it deliver maximum distance, and quality; learned code and found out how government, commercial and amateur traffic were handled; learned to design and install radio apparatus; secured places in the Army and Navy radio nets; communicated direct by radio with amateurs in other lands; became a radio operator on a ship and saw the world without expense; became a broadcasting artist; became an operator at a broadcasting station; became a director of broadcasting; became a radio engineer.

Any of these objectives can be reached by a boy who will begin today to use the opportunity that radio gives him.

* *

Inspect Your Wire Connections

WHEN a radio receiver loses its pep, in spite of good tubes and batteries, the trouble may be in the connections. Wherever wires are joined, or held by clips or binding posts, energy may be lost. Inspect every connection, from the antenna down to the ground. Clean joints with emery paper. Dampen a string with alcohol and run it through the holes in binding posts to clean the inside surfaces. Scrape the ends of connecting wires. Scrape the pipe or rod used for a ground connection until it is bright and fasten the wire or ground clamp securely to the bright metal.

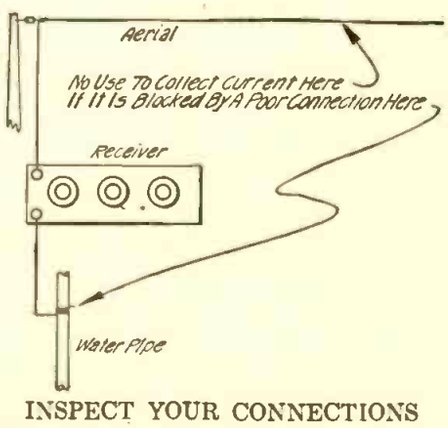
Solder the joint. These precautions not only save losses but also help to eliminate noises.

* *

What Three Boys Did With Radio

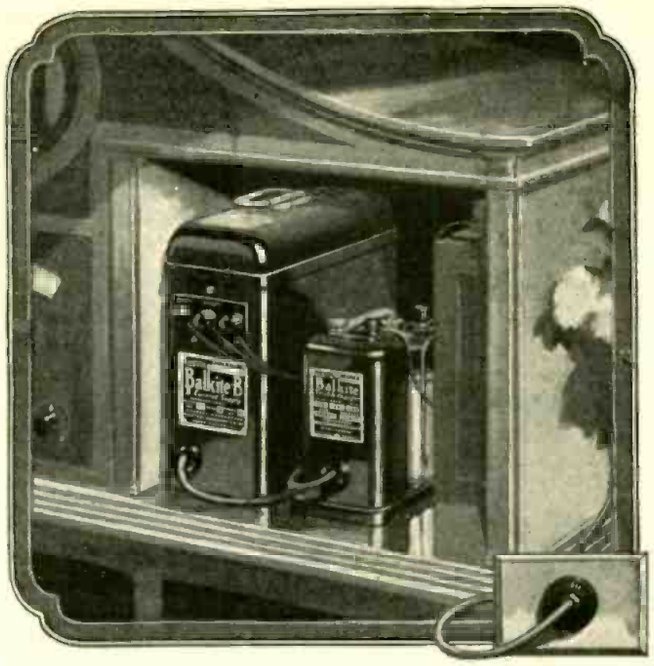
THERE is some encouragement in "ancient history." Here's some:

Harold Robinson, at sixteen, bought a radiophone guaranteed to transmit twenty-five miles; he worked at it until it was heard across the Atlantic ocean.



INSPECT YOUR CONNECTIONS

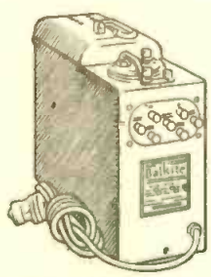
You can't expect to get good reception from the best antenna ever built if the connections to the ground or in your set are loosely and carelessly made.



The new Balkite "B" at $27.50 and the Balkite Trickle Charger *furnish all radio power from the light socket*

The New Balkite Charger

MODEL J. Has two charging rates. A low trickle charge rate and a high rate for rapid charging and heavy duty use. Can thus be used either as a trickle or as a high rate charger and combines their advantages. Noiseless. Large water capacity. Visible electrolyte level. Rates: with 6-volt battery, 2.5 and .5 amperes; with 4-volt battery, .8 and .2 amperes. Special model for 25-40 cycles. Price $19.50. West of Rockies $20. (In Canada $27.50.)



Balkite Combination

When connected to the "A" battery this new Balkite Combination Radio Unit supplies automatic power to both "A" and "B" circuits. Controlled by the filament switch on your set. Entirely automatic in operation. Can be put either near the set or in a remote location. Will serve any set now using either 4 or 6-volt "A" batteries and requiring not more than 30 milliamperes at 135 volts of "B" current—practically all sets of up to 8 tubes. Price $59.50. (In Canada $83.)

All Balkite Radio Power Units operate from 110-120 volts AC current with models for both 60 and 50 cycles. The new Balkite Charger is also made in a special model for 25-40 cycles.

The light socket is your most convenient source of radio power. Use it by adding the new Balkite "B" and the Balkite Trickle Charger to your radio set.

Balkite "B"—the unique "B" power supply—eliminates "B" batteries entirely and supplies "B" current from the light socket. The new Balkite "B"-W at $27.50* serves any set of 5 tubes or less requiring 67 to 90 volts. Balkite "B"-X at $42* serves sets of up to 135 volts and 8 tubes. Balkite "B"-Y at $69 serves any standard set.

The Balkite Trickle Charger at $10* is probably the most popular of all chargers. Over 200,000 were purchased during one season and are now in service. Instead of operating intermittently at a high rate, it operates continuously at a low rate, thus automatically keeping the battery at full charge. In effect it converts your "A" battery into a light socket "A" power supply. With 4-volt batteries it can be used as an intermittent charger, or as a trickle charger if a resistance is added.

Both Balkite "B" and the Balkite Trickle Charger are noiseless in operation. Both are permanent pieces of equipment, with nothing to renew or replace. Other than a slight consumption of household current, their first cost is the last. Both are built to conform with standards set by the Underwriters' Laboratories.

Over 650,000 radio sets are already Balkite equipped. Make yours a light socket receiver too by adding these Balkite Units. Enjoy the pleasure of owning a radio set always ready to operate at its best.

*Balkite Trickle Charger $10.50 west of Rockies. In Canada, Trickle Charger $15; "B"-W $39; "B"-X $59.50; "B"-Y $96. *Fansteel Products Co., Inc., North Chicago, Illinois.*

The Balkite
Radio Symphony Concerts
with WALTER DAMROSCH
and the New York Symphony

These concerts will be broadcast every other Saturday Evening, beginning with October 23d. On intervening Saturdays Mr. Damrosch will give a piano lecture recital alone. At 9 P. M. Eastern Standard Time, over a group of 12 stations: WEAF, WEEI, WGR, WFI, WCAE, WSAI, WTAM, WWJ, WGN, WCCO, KSD, WDAF.

FANSTEEL

Balkite *Radio Power Units*

Everett Sutton, age fifteen, built a 5-watt outfit and hooked it to his mother's clothes line; one night he picked up signals from the MacMillan Arctic Expedition, established two-way communication, and for the first time in two months the explorers in the frozen north were able to send out messages to the waiting world.

Arthur Collins, age fifteen, kept the MacMillan Expedition of the following year in touch with the world for three weeks while experts failed.

Men could not have done better. The number of birthdays you have had matters little. The question is: What can you do?

* *

Can You Read These Messages?

NAH NAH NAH DE KFYU KFYU KFYU QTF?
KFYU KFYU KFYU DE NAH NAH NAH QTF 67 W 42 N.

This is not a puzzle, but just an ordinary message and answer such as you might pick up any night if you were listening in on 600 meters and understood code. Can you read it?

Some "ham" who has a call book and a list of the abbreviations used in radio communication can help you. Millions of dollars worth of property and hundreds of human lives sometimes depend upon the prompt handling of messages such as these.

* *

What an Amateur's One-Tube Portable Set Did

IT WAS built and operated on the middle Atlantic seaboard. It used plug-in honey-comb coils and a .001 mfd. variable condenser with the rotor on the ground side.

The first night, the amateur heard two Chicago stations and one in Cincinnati clearly. All New York broadcasting stations except one came in while a 50-turn coil was used. For 200-meter amateur traffic he used a 35-turn coil. Ship-to-shore traffic on 600 meters was received on coils of 75, 100 and 150 turns. Navy stations in Washington, Arlington, and New Orleans were QSA. A station in Norway, LCD, was logged. All these stations came in over an inverted "L" type aerial 76 feet long, 6 feet above the roof of a three-story building, badly shielded, connected in parallel with a triangle 60 feet on a side and open at one end. The set was grounded on a water pipe.

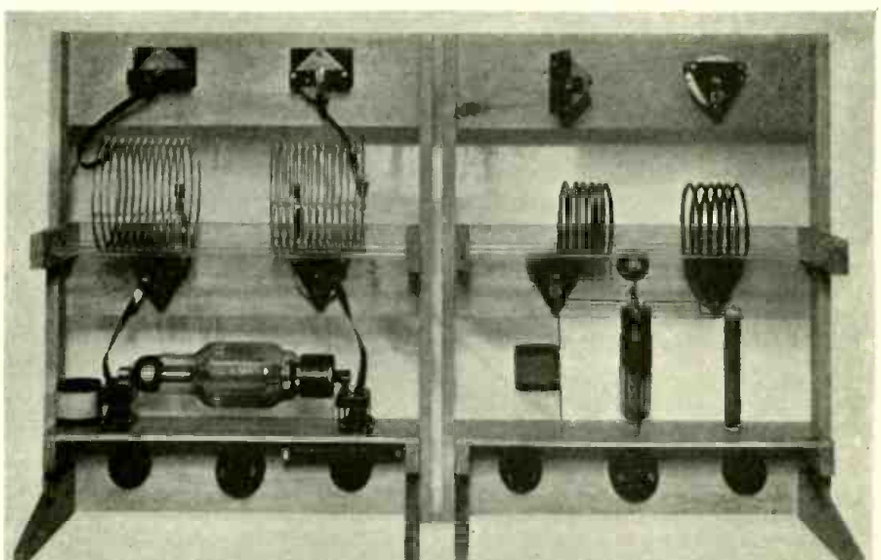
Experimenting with other antennas, this amateur brought in NAA, 200 miles away, with the bell wire circuit of the house. Local broadcasts came in without much volume on a 4-foot closed loop of four turns. Using an open loop and ground connection, NAA still came in well. With the bed spring as an antenna and the water pipe as a ground, local broadcasting stations could be heard clearly and NAA still could be copied.

* *

The Use of Short Wavelengths by Amateurs

Amateur stations, many of them manned by very young operators, are covering greater distances than some of the high-powered, long-wave government and commercial stations. The amateurs are using short waves, below 100 meters, and tubes rated at from five to five hundred watts.

American amateurs are reaching brother hams on all the continents and most of the islands where amateur radio has a foothold. Nearly every night they may communicate with other boys thousands of miles away.



AN HISTORIC TRANSMITTER MADE BY A BOY

These transmitters were built by Arthur A. Collins of Cedar Rapids, Iowa. With the larger one he handled all of the traffic of the MacMillan Arctic Expedition for 22 days while no other station was in touch with the explorers. His messages have been received in India, Australia and many nearer lands. He was fifteen years old when he made these remarkable radio records.

Winding a Low-Wave, Low-Loss Coil

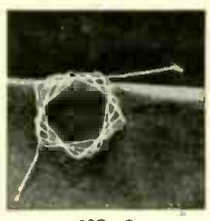
1. Start with a spool of No. 22 double silk-covered wire and a box about three inches square at the ends.

2. Wind the desired number of turns near the end of the box. If wound carefully, the turns will lie close together. Coils of from two to six turns are used in some low-wave receivers.

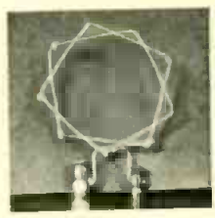
3. Remove the coil from the box. The wire will show a tendency to uncoil, instead of retaining its square shape.

NO. 1

NO. 2



NO. 3



NO. 4

4. Bring together the corners on alternate turns and tie them with thread, making a coil of regular design. Bent wires may be straightened with a small pair of pliers. Attach the ends to binding posts placed wherever the design of your receiver requires. The coil needs no other mounting.

* *

Keep Notes on Your Experiments

EVER think you would like to be an inventor and make a million dollars?

The article in this issue on "How to Patent Your Radio Invention" gives advice that you ought to read. School teachers are always insisting on notebooks which sometimes become a pest to pupils; this article shows that the habit of keeping notebooks saved Prof. Hazeltine, inventor of the neutrodyne receiver, patent rights worth $1,500,000. (It might be worth while to leave out of our diaries some of the stuff about girls and jot down a real idea or two.)

The article at first seems discouraging; it shows how many things may stand in the way of securing a patent. Also that a patent gives only the right to sue and be sued, and that the invention even though patented, may be worthless. On the other hand, the illustrations show men like De Forest, Dubilier, Donle, Latour and Fessenden who started with less chance than we have today and made millions from patented inventions. If youth stopped at obstacles there would be no football games this fall.

So, keep notes on your work.

Many will Start — But Few can Finish

IN the development of the radio industry, many have started but only those will finish who are building on a foundation of service which will stand.

IT is one thing to sell a radio instrument but quite a different matter to keep that instrument working perfectly in your home. Any new radio should deliver satisfaction but only trained service will keep it doing so—

In the rapid development of the radio industry the demand has been, in the past, generally more than the supply. It is only natural that little, if any, attention should have been paid to the one most vital requirement—trained service.

Four years ago Ozarka Inc. recognized the necessity of service—trained service, with the result, that now we have a trained service organization of 4364 men. One of these men is near you, ready and willing to deliver Ozarka service.

These men are not radio wonders who know all about all radio instruments. They make no claim to be able to service any radio instrument but they do know the Ozarka perfectly.

Radio is no different to any other mechanical device—sometimes little things will go wrong, serious to the owner, but very easily and quickly repaired by a trained service man who knows that instrument as he should.

In the mad rush of selling radio very little, if any, attention has been paid to service. A trained service organization requires time to develop and train—it has taken us four years to train 4364 men, who today constitute the Ozarka service organization.

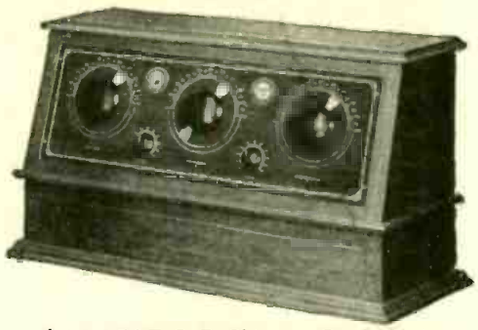
Ozarka instruments are only sold by these trained service men by demonstration in your home—the only place where you can decide what a radio should do.

The Ozarka representative will gladly set up an Ozarka in your home. He will not operate it but let you do all the tuning. Only in this manner can you decide if its tone, volume and ease of tuning is what you expect of a radio. Bring in station after station until you satisfy yourself of what it will do for distance, then discuss with him the most important matter of all—service—trained radio service.

OZARKA
INCORPORATED

120 Austin Avenue D CHICAGO, ILL.

OZARKA
TRADE MARK REGISTERED



$132.50 F. O. B. Chicago. Ozarka Senior 5 Tube Model complete with Loud Speaker and all accessories.
Also built in a 7 Tube Model

$100 F. O. B. Chicago. Ozarka Junior 5 Tube Model complete with built-in speaker and all accessories.

$215 F. O. B. Chicago. Ozarka Console 5 Tube Model, solid walnut cabinet, complete with all accessories.
Also built in a 7 Tube Model

We have a few Openings for the Right Men

WHILE there are today 4364 Ozarka representatives, some territory is still open. We want men who believe in the future of radio—men who are tired of working for some one else—men who would like to add to their present income by devoting their evenings to Ozarka.

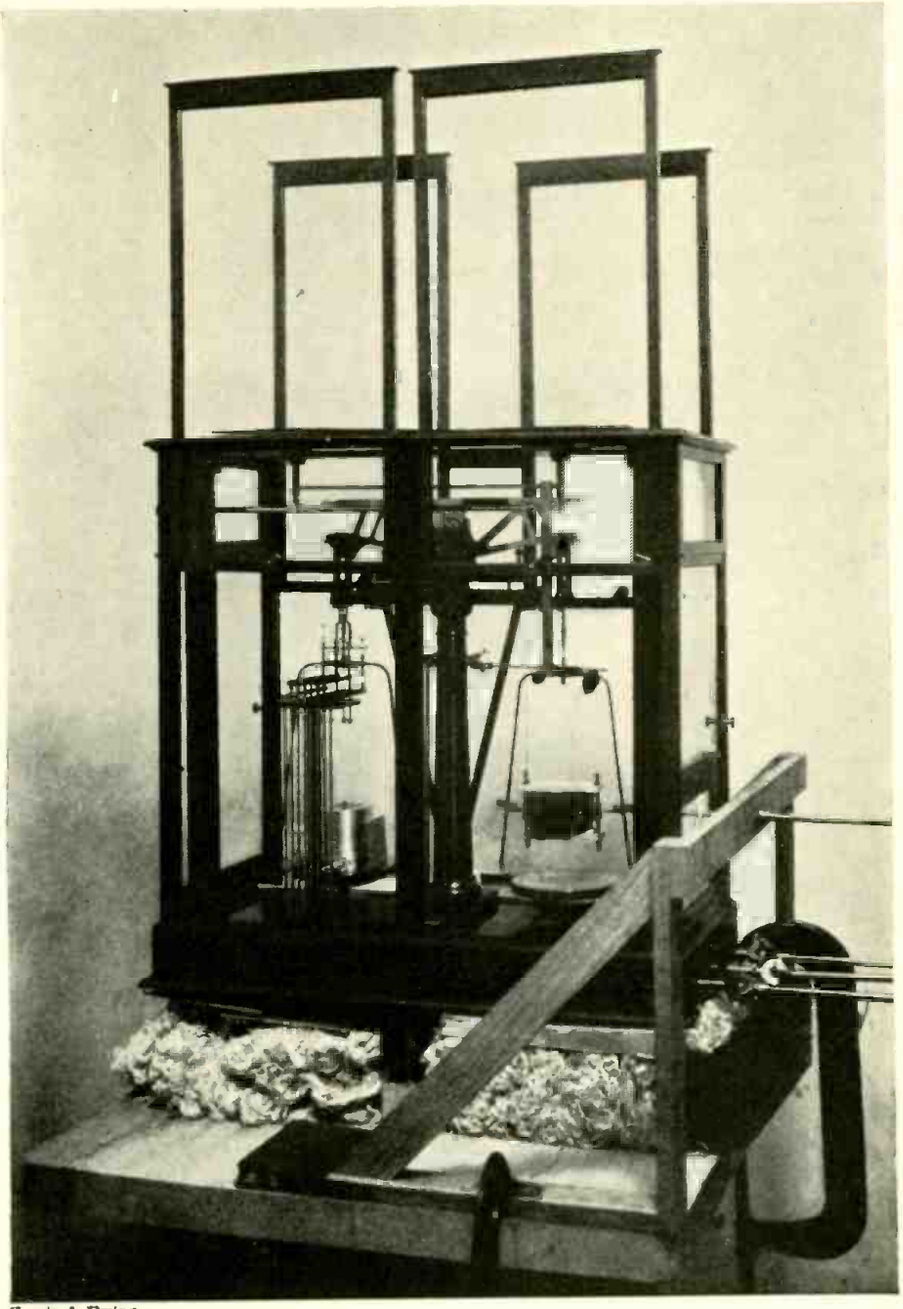
At the start you can keep your present position. Later on, after you have proven what you can do, then you will give us all your time because it will pay far more than your present position.

The man we want may not have much money but he is not broke. He has lived in his community for some time—he has a reputation that his word is good. He may not have made any startling success but he has never "put over something" just to make money. He may know nothing about radio or salesmanship but he will be successful if he is willing to study what we are willing to teach him, without cost.

The field in radio is wide open for the trained man. The success of the 4364 Ozarka representatives proves what men can do. If you are interested, ask for a copy of the Ozarka Plan, a 100 page book which tells a true story of how big money and a permanent business can be built in radio. It is a story of life; of why some men fail while others succeed. This book has shown many men how to start making extra money immediately and within a very short time establish a business of their own.

Are There "Ether Waves" After All?

(Continued from page 637)



Harris & Ewing

Another Way to Test Ether Theories

Dr. Paul R. Heyl, of the United States Bureau of Standards, has tried to obtain evidence of the ether drift with this apparatus. A large crystal of topaz was weighed, first in one direction, then in another, so that the internal structure of the crystal was differently placed with reference to the supposed ether drift. No drift was found, but it is conceivable that the experiment was not delicate enough.

mill with his eye glued to the deceitful bunch of hay in front of him. In 1925 Professor Miller and his assistants made over 100,000 separate readings and walked over a hundred miles round and round their scientific treadmill.

The purpose of all this is to measure, very accurately indeed, the velocity of light in different directions in space. What is actually measured is the difference in velocity between light moving in reverse directions inside the apparatus. If there is any motion of the ether relative to the earth this motion ought to affect these two speeds. As the table turns there will be some positions of the lightpath inside it which will be relatively fast positions for the light movement; other positions which will be relatively slow ones. The measurements are made by means of interference fringes, produced by the alternate reinforcement and cancellation of light waves which are a trifle out of phase with each other. It is well known that such interference phenomena constitute one of the best ways of measuring very tiny differences in the lengths of light paths or in the speed of light.

Without discussing all the multitudinous details of Professor Miller's precautions against error and of the thousands

NOW YOU CAN THROW AWAY COSTLY BATTERIES—GET CONTINUOUS RECEPTION —AND NO WEAK PERIODS

Plug into Electric Light Socket

with

$88.35 with all tubes

POWEROLA

In Combination With Power Tubes

The greatest fundamental advance in Electric Radio

At last the receiving set problem is satisfactorily solved. If perfect reception is possible, Powerola will secure it if anything will. There are no expensive batteries to buy or recharge. You use your electric current. The price of operation is low and above all, the price of Powerola is lower than others because it is not an experiment but is made by experienced engineers who have been in this business for fifteen years. There are none more perfect. There are none better. There are no good power sets that sell as low. Your dealer has a Powerola to show you. Or we will send one Powerola 6, Model 150, on a full and ironclad guarantee of $88.35, dealer's price; $20 with order, balance C. O. D.

Dealer's Price $88.35

Including All Tubes—A. C. Set Complete in 1 Cabinet

Powerola. Electric set specially wired for power operation. The first successful electric set. Now on market several years, growing stronger in good will every year. Tested, approved and endorsed by highest authorities. Thousands are now in use. Has satisfied customers, dealers and agents everywhere. Sold thru the New York Edison Co., and numerous other Public Utility Companies.

No Batteries. Eliminates A and B batteries, chargers, meters, separate eliminators, chemicals, fuses, fragile tubes and crystals.

Distance, Volume, Tone. 2000 miles radius under normal conditions. Tone is always sharp, clear and full, and can be regulated at will by volume control to beautiful whisper.

Selectivity, Tuning. 3 dials but is practically a one dial set, because of remarkable syncronization. No hum noises, squeals or whistles. A one-year guarantee against electrical and mechanical defects goes with each receiver.

Operating Cost, Tube Life. Consumes less than ¼c per hour. Tubes are good for at least 1000 hours, are sturdy, have longer life, less breakage.

Manufacturer. Terminal Electric Co., N. Y., absolutely the pioneer manufacturer of electric receivers and socket power units; 15 years specialists in battery-eliminating power devices.

Power Supply. A. C. —100-200 Volts, 50-60 Cycle. Powerola-6, Model 150, above, enclosed in rich, attractive mahogany cabinet; T. R. F. designed for combination with six power tubes. Eliminates A and B batteries. 200-600 meters.

Console Models: Powerola Chassis, Model No. 175, is the same set without cabinet. Will fit into practically all consoles. Dimensions, 7″ x 18″ x 11″. Power device in metal box, separate, for insertion in battery or other space. Easy to install. Other dimensions and D. C. chassis at special prices. Dealer's price including six power tubes. $79.80.

Direct Current Models: Powerola C-3, Model T. R. F. employing five 201A or other UV. ¼ Amp. tubes. Handsome two toned mahogany cabinet. Power supply, D. C. 100-120 volts. Dealer's price without tubes. $65.55.

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Executive Offices

44 Whitehall St., New York

CAN YOU BUILD ELECTRIC SETS? "Powerola Power Circuits," our book, contains 29 new diagrams and instructions, showing power parts used and how to build or rewire radio circuits, sets and parts, to operate, hum-free and successfully, from A.C. to D.C. power mains, without A, B, or C batteries, chemicals and chargers. Invaluable for the service man and trade-ins. Price $1.00.

A PROPOSITION FOR DEALERS

No doubt you have received a bulletin outlining our proposition. We are now adding to our exclusive agency list. Powerola is a fast selling proposition for three reasons—quality, efficiency, price. Your trade will become acquainted with Powerola thru advertising and will ask for it. Write us at once for detailed information.

of repetitions which he felt it necessary to give to every test, it may be said that the results did not detect the motion of the earth in its orbit, which was the effect originally looked for. We know that the earth does move around the sun but Professor Miller could not prove this by the ether. As his moving table turned it was alternately facing the earth's orbital path and against it. Regardless of this, the speed of light inside the apparatus remained the same.

This seemed at first a blow to the ether theory. The speed of the earth in its orbit is about nineteen miles a second, quite a sizable velocity. Nevertheless, the ether did not show any change. On careful computation, however, of the enormous number of individual observations which had been made, Professor Miller found that they did show one effect which was constant. There was a uniform alteration of the speed of light in a certain direction, not related to the earth at all but approximately parallel to the axis of the sun. The whole solar system seems to be falling through the ether, as though it were dropping like a flat cracker. The ether blows up through it, Professor Miller's results indicate, at a speed of about six miles a second.

It is not possible to assume that this is the actual speed of the solar system relative to the ether. If the Miller apparatus could detect an ether speed of six miles a second in the direction of the sun's axis, it would undoubtedly detect the known earth speed of nineteen miles a second in the direction of the earth's motion in its orbit. Professor Miller solves this difficulty by assuming the solar system to drag the ether along with it more or less, as a steamer moving in the ocean will drag some water in its wake. What the experiment measures, he thinks, is the amount of slip by which the ether drops behind the real speed of the solar system.

Computing, on reasonable assumptions, the amount of this slip as related to the real speed, Professor Miller calculates that the solar system is really dropping through ether-filled space at a rate of over 120 miles a second, instead of six miles a second. The direction in which we are pointed comes out as a spot in the constellation of the Dragon, not quite in line with the axis of the sun but nearly so.

Perhaps the chief support of these ideas from other sources is the fact that study of the motions of the stars with relation to the earth leads to an almost identical determination of the direction and speed with which our solar system is moving through space. Both Professor Miller's tests of the ether current on which we drift and the astronomers' observation of the stars that drift hither and thither with us, give us nearly the same reckoning for the course upon which we are set and the speed at which we travel.

That is the argument as it now stands. Professor Miller's critics have been able to point to no essential flaw in his conclusions; none, at least, that has proved convincing to independent students. There are, of course, some remaining difficulties. For example, there seems to be a continual tendency for the apparent wind of ether past the earth to deviate to the east of the direction from which it should be blowing. No one knows why this is so. Much has been made by the critics, also, of the necessity of assuming a slip between the ether and the earth, in order to account for the fact that the earth's own orbital velocity shows no effect. Whether these doubts will grow as time goes on or will disappear no one can say.

Are we to assume that an ether exists and that radio moves in it? Or are we to believe that there is no ether; which conclusion would require us to search further for an explanation of radio propagation.

Until the experts agree about Dr. Miller's conclusions, which they are now far from doing, we cannot answer these questions assuredly. But, at least, the reality of the ether is once more a tenable hypothesis. Those who clung to the ether idea when Dr. Einstein and Dr. Steinmetz attacked it are now provided, by Professor Miller, with some tangible ammunition of facts, facts which are proving very difficult to explain away.

And if an ether exists the old idea of absolute rest and absolute motion returns to a universe from which the mechanical theories of Einstein would have banished it. Indeed, it has recently been pointed out by Dr. Gustaf Strömberg, of Mount Wilson Observatory, that there are some astronomical facts which suggest the existence of a fundamental material, like the old-fashioned ether, which is at rest in space and with relation to which all motions of the stars and nebulas, the suns and planets, should be thought of as occurring.

These bodies may be "born," says Dr. Strömberg, "out of a fundamental medium, the metrical properties of which are the same everywhere. * * * The uniformity in Nature is then due to the uniformity of this medium." Instead of there being no ether in the universe, the universe is all ether. Instead of there being no ether waves, these waves turn out to be perhaps the most fundamental of all realities—far more real than matter.

Radio waves have been defined as "strains in the ether." Atoms have been thought of similarly; also as ether "knots" or ether "vortices" or as tiny vacua in the ether. Electrons have been called etherial condensations or rarifactions. The ether seems to be coming back into scientific theory. There may be ether waves after all.

WHAT READERS ASK

CONDUCTED BY DAVID LAY

IN justice to our regular subscribers a nominal fee of $1.00 per question is charged to non-subscribers to cover the cost of this service, and this sum must be inclosed with the letter of inquiry. Subscribers' inquiries should be limited to one question or one subject.

How to Get Your "C" Battery Voltage from a Raytheon Unit

QUESTION: I understand that it is possible to eliminate the dry-cell "C" battery where a Raytheon power-pack is used to supply the plate voltage for a receiver, by making some small change in the power-pack. Can you show a diagram of such an arrangement as I want to make the change in the Raytheon power-pack that I constructed from the description in the May, 1926, issue of POPULAR RADIO?

—CARL THOMAS

ANSWER: Your Raytheon power-pack can readily be changed to provide the "C" battery voltage required for your receiver. The power-pack circuit is shown in Figure 1. This is the same circuit that was given on page 22 of the May, 1926, issue except that the change has added in heavy lines.

The only extra parts that you will need are one more binding post for the "C" (—) minus terminal of the power unit and a variable resistance (R) with a maximum resistance of anywhere between 1000 and 2000 ohms. This resistance should be capable of carrying 50 milliamperes continuously without heating. The Federal No. 25 potentiometer or the Centralab "Radiohm" No. 2M are suitable for this purpose.

Terminal 1 of the power-pack is maintained at zero potential, so far as the receiver is concerned, inasmuch as it is connected to the filament circuit in the receiver itself. The new terminal will be at negative potential in relation to both the filament and terminal 1 by the amount of the voltage drop across the portion of the new resistance, R, which is in the circuit. This potential drop across R provides the negative biasing voltage that is ordinarily supplied to the receiver by the "C" battery. By varying the resistance, R, this negative voltage may be varied from zero to a voltage more than ample for the UX-171 tube which requires in the neighborhood of 40 volts when the plate voltage is 180.

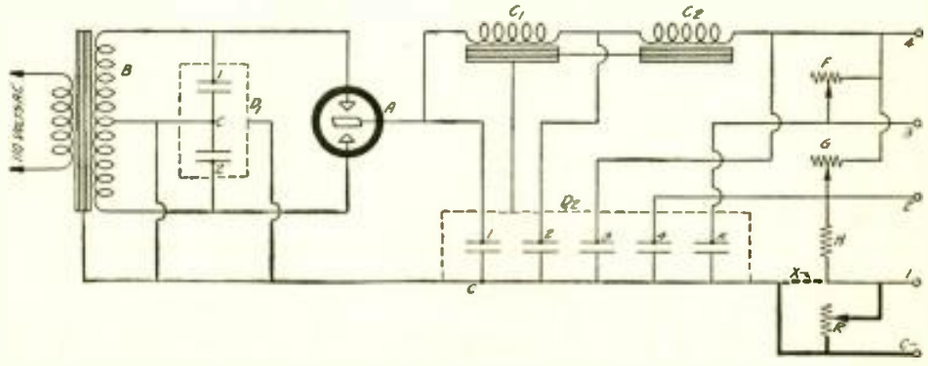
* * *

How to Substitute a Power Tube in the Last Audio-Frequency Stage

QUESTION: Can I use a ½-ampere power tube in my receiver in place of the UX-201-a tube which I have been using in the last audio-frequency stage, without the necessity of making a change in the rheostat? As the five tubes in the receiver are controlled by a single rheostat I don't see how a ½-ampere tube can be controlled by this same rheostat when all the other tubes are consuming ¼-ampere each.

—NICHOLAS J. HAIGHT

ANSWER: It is feasible to substitute a UX-171 or a UX-112 tube for the UX-201-a in the last audio-frequency stage; at least the rheostat presents no difficulty in this connection. All of these types of tubes are designed to operate from a five-volt source of supply. Storage batteries have a voltage of approximately six-volts and a rheostat is therefore needed to cut this down to the required five-volts.

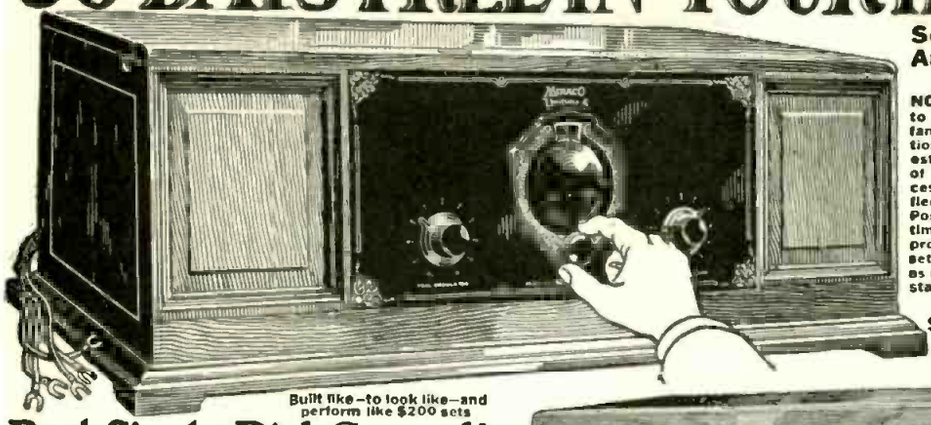


HOW TO GET "C" VOLTAGES FROM THE RAYTHEON

FIGURE 1: *This circuit diagram shows the change that has been made in the old Raytheon circuit to obtain a "C" voltage bias by adding a variable resistance.*

30 DAYS FREE IN YOUR HOME

Tested and approved by all of Radio's Highest Authorities



Built like—to look like—and perform like $200 sets

Send Coupon for Amazing Special Offer!

NOTE: This offer is made to prospective buyers by famous big Radio Corporation, one of America's oldest reliable manufacturers of fine sets—seventh successful year. Many satisfied users in every state. Postal or coupon brings testimony of nearby users and proof Miraco's outperform sets costing up to 4 times as much. Very easy to install and operate.

AMAZING SPECIAL OFFER to User-Agents who will allow friends to listen to their Miracos.

BEAUTIFUL-BIG-POWERFUL Ultra Selective MIRACO Ultra 5

Retail LIST Price now only **40.75**

GET SPECIAL OFFER

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Real Single Dial Control!

Magnificent Big Powerful Miraco "Unitune-5" Retail List price only $87.50—get special offer

The celebrated Miraco Ultra-5—U.S. Navy type circuit, has also been adapted to Single Dial Tuning—**without sacrifice of selectivity, volume, clearness, power, tone, or distance getting qualities!** In the magnificent big Miraco Unitune-5, above shown, you turn one vernier knob for stations everywhere. Beautiful hand-rubbed, piano hinged, solid walnut cabinet, 28 in. long, 15 in. deep, 10 in. high. Sloping Bakelite panel is walnut finished to match. **Also offered on 30 days free trial!**

Coast to Coast and Foreign Reception Certified by Miraco users

MIRACO RADIO GETS 'EM COAST to COAST

Send for Proof!

Notice! Enormous sales of the celebrated Miraco 5-tube Receivers (resulting from delighted users so highly endorsing them to friends) again enable us to add hosts of costly new features, latest refinements and up-to-the-minute improvements such as you might expect to find only on much higher priced sets. Miraco's this year are still better—more beautiful—more selective—more powerful for less money than ever before.

USER-AGENTS WANTED - - WRITE!

Reports from users everywhere leave little for us to add. These are only a few of the many in our files and which we receive daily. Send coupon for plenty of additional proof and testimony of nearby users.

CUTS OUT LOCAL, GETS PROGRAMS EVERYWHERE. Meridan, Miss. Everyone says my Miraco 5 is the best set they have heard. It gets stations all over the states, also Mexico, Cuba. Have a broadcasting station next door but it doesn't matter with the Miraco 5. I get them just the same. H. R. Hendricks.

COAST TO COAST THRU LOCALS

Omaha, Nebraska Miraco is a wonder for distance, volume, tone. We have 5 local broadcasting stations here and she goes right thru and brings them from coast to coast. No trouble at all. H. N. Eller.

BEATS OTHERS FOR SELECTIVITY. Cleveland, O. Have been up against some pretty good radio men with other sets and this receiver has them guessing. In selectivity, volume and range it has outdone several. We were able to cut out WTAM (powerful local station) in 3 points, to bring in other stations. W. C. Pike.

"UNITUNE" SEPARATES CHICAGO LOCALS. Chicago, Ill. With 4 local stations broadcasting less than a mile away, one after another I can tune and keep separated as high as 15 Chicago stations on your "Unitune-5". Even during the summer I frequently got stations clear and loud on speaker as far away as Colorado, New Jersey, New Orleans and many others. With the single dial I switch from one to another station in an instant. The selectivity is amazing, the set is a beauty and the tone is perfect. W. H. Schaeffer.

FLORIDA GETS CAL. FIRST NIGHT Daytona Beach, Fla. Tuned in 45 stations the first night ranking throughout Florida, Cuba and as far as California with Miraco 5. Monte Rankin.

OHIO HEARS THEM COAST TO COAST. Westerville, O. We have to our credit about 85 stations from CFCF Montreal, Canada to British Columbia, Canada, WIOD Miami Beach Fla. two stations in California; a station at Seattle, Wash. We are more than pleased with the Miraco 5. Dan Groce.

HONOLULU TO LONDON FROM IOWA. Anthon, Iowa. Here are some of the stations we picked up on the Miraco 5 Sunday Jan. 24 between 10 and 11 P. M.: 2LO London, KYO Honolulu, Hawaii; WKAQ San Juan, P. R. and one station in Ireland; could not get call letter. John Kuhn.

NEW YORK LOGS 163 STATIONS Buffalo, N. Y. I received 2LO London, 11:06 on Monday night but there was so much interference it was not very plain. I also have logged 163 stations in U. S. and Canada. A satisfied user of Miraco. Norman W. Ives.

NEBRASKA HEARS PORTO RICO ON SPEAKER. Spencer, Nebr. Using the Miraco 5 we have often heard Mexico City, Porto Rico, Miami, Florida, Ottawa, Canada and Vancouver, B. C., Canada and all along the Pacific Coast. All the above stations on the speaker. Have also heard Lima, Peru, South America. H. J. Schmidt.

TEXAS GETS 'EM N. Y. TO CAL. Waco, Texas. In less than a week after I installed the Miraco-5 I tuned in on the loudspeaker New York City; Oakland, Calif; Minneapolis, Minn. Mexico City, several stations in Florida and many others. E. E. Sitz.

TONE, VOLUME, DISTANCE. Elbing, Kans. We like our Miraco fine especially because of its volume, tone and its freedom from howling. Although I do not try much for distance we received programs from Oakland, Cal.; Los Angeles, New York, Miami and Havana. Mrs. E. A. Regier.

MIRACO EQUALS $240 SET Omaha, S. D. Miraco works fine. Selective and plenty of volume. Stations logged include Winnipeg, Canada; PWX, Havana, Cuba; and CYL, Mexico City, Mexico. Have heard quite a few sets, one costing as much as $240, but can't see where it is any better. Clarence Rusch.

NO HOWLS—SUPERIOR TO COSTLY SETS. Modoc, Ind. We certainly enjoy our Miraco-5. Results equal to any radio I ever heard and far superior to most radios costing a great deal more. All stations come in loud and clear on the loudspeaker. James Tullis.

OUTPERFORMS 6 AND 8 TUBE SETS. Duncansville, Pa. I don't think there is a better receiving set made than a Miraco-5. Stations received—all on the loudspeaker—include KFI, Los Angeles, Calif.—distance, 2,250 miles. I got this on loudspeaker plain, when others couldn't get it with 6 and 8 tube sets. Also have heard Can., Colo., Fla., Cuba, Neb. and Iman 7 other states. S. D. Fowkes.

OREGON HEARS 'EM FAR AND CLEAR. Chiloquin, Ore. A few stations I have heard very clear on Miraco include California, Denver, Colorado; Hasting, Lincoln, Nebraska, Chicago, Louisville, Kentucky; also Catalina Island. Cyril W. Benson.

CALIFORNIA HEARS PENNA. ON SPEAKER. San Rafael, Calif. I have purchased three of your sets and will give you an idea of what the Miraco-5 does out here. I have logged 86 stations, which I can get nearly any time I try. Mexico City on the South to CFCN, Calgary, Canada, on the North, with Honolulu to the West and E. Pitts., Pa., to the East. All on loud speaker, clear and plain. Roy I. Shafer.

CUTS THRU POWERFUL LOCAL. Pontiac, Mich. The Ultra-5 is sure a wonder. I live 1-4 of a mile from WJR a 5000 Watt Station and can cut through with ease and receive distant stations. During the International Test Week I received 2LO London, England; also CZE Mexico City, Mex. I have received stations from WMBF Miami Beach, Florida to KFI Los Angeles, Calif. In conclusion I'll say it's everything you claim it to be. Very truly yours, Edward J. Elkins.

Big Powerful New MIRACO Ultra 5

Solid Walnut Cabinet — Unitune 5 — 28 in. long

Solid Walnut Cabinet — 27 in. long

TRADE MARK REGISTERED

ULTRA-SELECTIVE LONG DISTANCE 5 TUBE SETS EASY ON BATTERIES

SAVE or make a lot of money on sets and accessories by writing immediately for our **Amazing Special Offer!** It will astonish you. Unless 30 days' trial proves a Miraco the most selective, clearest toned and most powerful distance-getter among beautiful big 5-tube sets, don't buy it.

Send for Testimony of Users Everywhere

First, reports of delighted users will assure you that the beautiful, big Miraco's actually are unsurpassed (even at much higher prices) for razor-edge selectivity combined with extreme long distance reception, clear natural tone and powerful loud speaker volume, plus economy in use of battery current.

Second, it is our honest conviction—based on seven years' successful experience in building fine sets—that these latest Miraco's are the most marvelous values offered in high-grade receivers.

Third, convince yourself by using a Miraco thirty days in your home before you decide to keep it.

You'll Be Proud of Your Miraco!

Each Miraco comes completely assembled, rigidly tested, splendidly packed and factory guaranteed for one year. Easy to install and operate—full instructions supplied. A big, handsome, expensive-looking radio—one you'll be proud to have friends see and hear. Stylish, sloping front cabinet of solid walnut, handsomely gold illustrated genuine Bakelite front panel and genuine Bakelite knobs—finished in walnut. In construction, too, like high-priced sets. Finest parts obtainable—and many exclusive features. Literature describes them fully—send for it, testimony of nearby users and Special Offer!

Deal Direct with a Big, Reliable Firm!

Thousands of satisfied customers can testify to the money they've made and saved by dealing direct with the great Midwest Radio Corporation. You are absolutely guaranteed and assured the same satisfaction. Clip coupon now and be convinced!

Our Factory Prices Save You Up to 1/2! Facts About Makers of Miraco's:

To our many thousands of satisfied users throughout the world, we require no introduction. But those who have never enjoyed the pleasure and satisfaction of operating a Miraco Set, will undoubtedly wish to be assured that the makers of the Miraco are thoroughly reliable. We therefore present these facts about the Midwest Radio Corporation of Cincinnati, Ohio:

1. One of America's oldest, largest and most experienced builders of fine sets—seventh successful year.
2. Builds all sets complete in its own big factory and thoroughly tests them under actual broadcasting conditions before shipping.
3. Sells all sets on a Guarantee of Unconditional Satisfaction, allowing liberal trial privilege.
4. Deals direct by mail with its users, agents and dealers, thereby effecting great savings which are reflected in amazingly low prices.
5. Keeps all promises to the letter. Highest references from users, bank officials and all concerns with whom we have dealings. We have been customers of a big $3,000,000 Cincinnati bank for many years. In our literature read what they say about our responsibility and reputation for square dealings.

AGENTS! DEALERS! Write for our latest Miraco proposition. Nation-wide popularity, superior performance of Miraco 5-tube sets, at amazingly lower prices, make them easy to sell. Send coupon today for proof

All the Proof you want is waiting for You!

Coupon or postal brings reports from hosts of users in your vicinity and elsewhere proving that Miraco sets **at rock-bottom money-saving factory prices**, outperform sets costing up to four times as much. **You can also buy speakers, tubes, batteries, etc. at big savings from us!** Get our proposition before spending money elsewhere.

Send coupon for Amazing Special Offer!

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Without obligation, send free literature, testimony of users, AMAZING SPECIAL OFFER and full particulars of your **big money-saving factory-price proposition** on Guaranteed Miraco sets and all radio supplies. ( ) Agent ( ) User ( ) Dealer

NAME

ADDRESS

The filament resistance of each tube is correct to permit the tube to draw only the required amount of current providing the "A" energy supply is maintained at five volts. In the case of the UX-201-a tube, for example, the filament resistance is 20 ohms. Applying Ohm's Law (voltage ÷ resistance = current) we find that 5 volts divided by 20 ohms results in a current of ¼-ampere. The filament resistance of the UX-171 tube and UX-112 tube is 10 ohms. Following the above formula, this resistance allows a current flow of ½-ampere.

Now, if several tube filaments are connected in parallel across the 5-volt line, as is the case in your receiver, each will draw current in proportion to its individual resistance. Each tube will therefore operate at the current rating for which it is designed, regardless of whether the five tubes are of the same type or not.

The only difference you will find in the operation of your receiver after installing a ½-ampere power tube will be that the rheostat will have to be turned a little higher to maintain the line voltage of five, due to the heavier total current drain that results from the use of the half ampere tube.

If you plan to use a UX-112 tube it will be necessary to provide higher "B" battery voltage for this tube if any substantial benefit is to be obtained from its use. This voltage (135 to 157½ volts) should be applied to the power tube only. A separate "C" battery connection for this tube will be required also. These considerations also apply to the use of the UX-171 tube, although in that case the higher "B" battery voltage is advisable, but not essential. If your receiver was designed for the use of 90 volts on all amplifier tubes, and a single "C" battery terminal for the two audio-frequency amplifier tubes there are special devices on the market, such as the Na-ald Connectorald, which will enable you to use the new tubes without making any changes in the wiring of your receiver.

* *

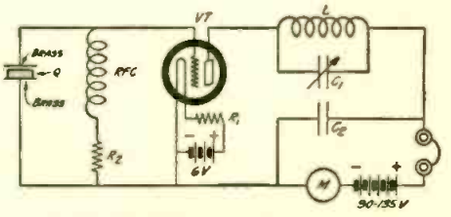
How to Build a Piezoelectric Oscillator

QUESTION: I want to make a piezo-electric oscillator, using a quartz plate, that I can use to check the calibration of my short-wave wavemeter. Can you give me a good circuit for an oscillator of this sort? Would you advise me to purchase a ready-cut quartz crystal for this purpose, or can I cut and grind a suitable quartz plate myself?

—HARRY FREEMAN

ANSWER: A good circuit for an oscillator of this type is shown in Figure 2. The parts used in this unit are:

L—45 turns of No. 24 DSC wire on a three-inch tube;
C1—variable condenser, .00035 mfd.;
C2—fixed condenser, .002 mfd.;
Direct-current milliammeter with a a range of zero to 100 milli-amperes;



THE CRYSTAL OSCILLATOR

FIGURE 2: *The hookup for the quartz crystal in a vacuum tube circuit for obtaining a standard of frequency.*

Q—quartz oscillator plate ground to oscillate at about 400 meters;
RFC—radio-frequency choke coil consisting of 200 turns of No. 36 wire (DSC) wound on a two-inch tube;
R1—Amperite or other fixed filament-control resistance, suitable for tube used;
R2—receiving grid-leak, 5 megohms resistance;
VT—201-a or 112 tube.

The quartz plate should be mounted between two brass plates about an inch square and with the large surfaces absolutely flat. Lay the quartz on the lower brass plate, and then lay the upper brass plate on the quartz. The pressure should be light, so the upper brass plate should be not more than 1/32 of an inch thick and should be connected in the circuit by means of a flexible connecting wire. Thus the only pressure on the top surface of the quartz plate will be that of the weight of the upper brass plate.

With the quartz plate in position and the tube filament lighted, there will be a flow of current in the plate circuit of the tube. The amount of current that flows will be indicated by the milliammeter.

As the plate circuit is tuned to the fundamental frequency of the quartz plate, the entire circuit will start to oscillate. This condition will usually be indicated by a drop in the plate current. The lowest reading on the milliammeter will then be obtained when the plate circuit is tuned to exact resonance with the quartz plate. The plate circuit may be tuned several degrees off resonance but the circuit will still oscillate at the frequency of the quartz plate.

For calibrating and checking a short-wave wavemeter it is best to use a crystal with a fundamental frequency corresponding to a wavelength considerably higher than the highest wavelength for which the wave meter is to be calibrated. The harmonics of a quartz plate with a frequency corresponding to 400 meters, for instance, will provide 17 calibration points between 100 meters and 20 meters; enough points to provide an excellent curve on a wavemeter that has this wavelength range.

It is not advisable for the experimenter to try to cut and grind a quartz plate at home. In the first place the plate must be cut out of the raw crystal at just the proper angle; otherwise it is useless. Then an examination of the plate must be made by polarized light to detect flaws, twinning and other defects that are not visible even under a powerful glass. Unless the final plate is free from these defects it will not oscillate. Aside from these considerations, try to imagine cutting a wafer-like slice out of a chunk of glass, without chipping or cracking the slice; and then grinding this slice of glass down to certain specified dimensions, with opposite sides smooth and absolutely parallel to each other, and remember that cutting and grinding a quartz plate is even more difficult than a glass one because quartz is the harder substance. Even with the use of all possible precautions probably not more than 25 per cent to 50 per cent of the perfect plates cut by skilled cutters will oscillate when they are finished.

* *

An Antenna for the Lynch Receiver

QUESTION: What is the shortest length of antenna that you would recommend for use with the improved Browning-Drake set?

—JEROME A. MCNALLY

ANSWER: Forty feet is the minimum length that should be used.

How to Make the Detector Voltage Adjustment on the Raytheon Power-pack

QUESTION: I constructed a Raytheon power-pack, some time ago, for use with my LC-26 receiver and have had splendid results from the combination. I find, however, that the adjustment of the variable resistance that controls the detector voltage for my UV-200 detector tube is quite critical. For this purpose I use a Bradleyohm No. 25; I have a 10,000-ohm fixed resistance across the detector voltage terminals. I find that the proper voltage is obtained when the knob of the Bradleyohm is turned to a point where the internal elements are barely making contact. Can you suggest any better method for making this adjustment?

—JAMES P. CONNOR

ANSWER: It is probable that you have a detector tube that operates best with an unusually low plate voltage, perhaps around 14 or 16 volts. If you replace the 10,000-ohm fixed resistance with one having a resistance of 7500 ohms you will find the adjustment of the variable resistance much less critical. For an additional improvement, you might substitute a Bradleyohm No. 50 for the No. 25 which you are now using.

* *

Resistance Coupling for Superheterodynes

QUESTION: Is it possible to use the resistance-coupled type of radio-frequency amplification for the intermediate stages of a superheterodyne receiver?

—C. A. BURKES

ANSWER: This is entirely feasible and, in fact, there is one such unit now on the market that is made by a well-known concern for just this use. You will need a tuned input circuit attached ahead of this unit to tune the intermediate-frequency amplifier to the desired wavelength that you choose for this purpose.

* *

What Tube Should be Used in High-voltage Power-packs

QUESTION: What type of tube could I use to get 400 volts of rectified energy for supplying "B" power to a 5-watt transmitter?

—LAURENCE REEDY

ANSWER: You can use a tube of the 216-B type for this purpose.

* *

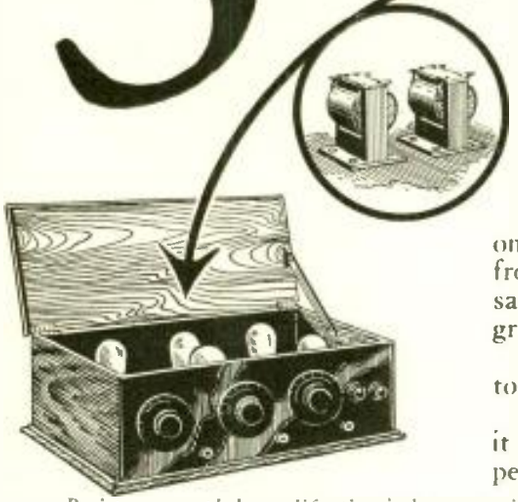
The Best Ground Connection

QUESTION: Which makes the better ground for a radio receiver—a cold water pipe or a radiator pipe?

—R. C. M.

ANSWER: In some cases the cold water pipe is considerably better than the radiator pipe for a ground. The best way to determine which is best is to try each out separately. If there is not much apparent difference the radiator pipe will be satisfactory. However, the connection should be made to a stationary part of the radiator or water pipe by means of a regular ground clamp.

Stop thief!



Ordinary amplification is the thief of Tone in radio music —

Your own radio set *as it now stands* is a perfect reproducing instrument—up to, and including, *the detector tube*. As everyone knows, if you listened with a pair of ear phones to the music from the *detector tube* you would have *perfect reproduction*. If that same quality could only be made to come out of your loudspeaker in great volume, then you would have perfect radio enjoyment.

But it cannot—with ordinary amplification. Too much is blurred, too much is weak, too much is lost altogether.

How can we get this pure detector tone with great volume? Can it it be had simply by changing the method of amplification? That depends.

Resistance coupled amplification is better, but many of the high notes are frayed and shattered, and the tone breaks down badly on strong volume.

Large size transformers are also better, but too many weak signals are absorbed. The actuality of the base, and the distinction between one musical insrrument and another are lacking.

Impedance Coupling is unstable. It shares most of the faults of resistance coupling, and, like transformers, it absorbs the weak signals.

Electric-light-socket power amplifiers are also better, to be sure. But they operate *after* one of the music-distorting transformers already in the set.

The Truphonic Power Amplifier

An entirely new and different method of amplification has been developed by the eminent radio inventor, Mr. H. P. Donle, and is made by the Alden Manufacturing Company, well known for its Na-Ald quality products. It is called the "Truphonic." Already manufacturers of the higher quality sets are endorsing it, and adapting it as the finest type of reproduction. The Truphonic Power Amplifier is different from any other method of amplification. But what is most important, the *results* are different. No more need be said than that the Truphonic passes faithfully *all* notes of broadcasted music.

The Truphonic is a small compact instrument (shown below) which when attached in a few minutes to any radio brings through the loudspeaker with great volume *the detector tube music* in all of its perfect tonal quality.

What has just been said of the Truphonic can be said of no other method of amplification—regardless of the price you pay.

What Does This Mean to You?

For the price of $20 and an extra tube (using two of the tubes now in your set and one additional tube, either power tube or regular) you attach the Truphonic in a few minutes to your present radio and at one stroke convert it into the finest reproducing set that money can buy. A strong statement. But you *want* strong statements when the product backs them up.

Today! Tonight! Attach the Truphonic Power Amplifier and get all that radio can give.

For the Set Builder

Truphonic amplification is provided in separate Truphonic couplers for the set builder. Three stages not only give the finest quality of reproduction obtainable but also give considerably more volume than two stages of ordinary transformer amplification. Price $5.00 per stage.

The Truphonic Output Unit protects the speaker against burning out and demagnetization when power tubes are used. (This output is used of course in the complete Truphonic Power Amplifier described above). Price $5.00.

The Truphonic Catacomb Assembly is also of great convenience to set builders. A lacquered steel catacomb houses three Truphonic couplers and a Truphonic output unit. A moulded Bakelite socket panel with 6 or 7 sockets of special construction which hold either UV-201A or all UX tubes, covers this catacomb. This unit may be arranged in a thousand different ways to meet all the requirements of every circuit and set design. Short direct leads to connected apparatus, with a minimum of soldered connections. No holes to drill, no apparatus to mount. A six-foot battery cable is included. Price 6 tube $20, 7 tube $22.

NA-ALD

ALDEN MANUFACTURING CO.
Dept. 316C. SPRINGFIELD, MASS.

TRUPHONIC
Power Amplifier
$20

C. W. Geiger

A UNIQUE RECEIVER IN A SHIP MODEL

Not only has Miss Ruth Sabichi of San Francisco produced a highly decorative and interesting style of cabinet for her set, but has ingeniously employed the copper wire used for the rigging, as an antenna.

BROADCAST LISTENER

Comments on radio programs, methods and technique —from the point of view of the average fan

By RAYMOND FRANCIS YATES

Commercializing Boobery by Radio

IT was not enough that that master crusader, Voliva, should use an instrument as beautifully scientific as radio to preach that the earth is flat and that Columbus was an unscrupulous Dr. Cook of his time.

Nor was it enough that Rev. Mr. Stratton, mad with the fundamentalist doctrines of orthodox theology, should use the radio in broadcasting a creed so thin as to be unpalatable to any open-minded schoolboy.

Now that prince of boob psychology, Mr. Edward Young Clark, formerly "Very Imperial Wizard of the Ku Klux Klan," has formed an anti-evolution society which he has endowed with the magnificent name of the "Supreme Kingdom."

The Supreme Kingdom is apparently a new and obvious attempt to commercialize the boobery of America.

That Mr. Clark should be adroit and clever enough to feed the starving minds of our prudery with the right kind of rot is really none of our business. But when this suave gentleman reaches to bring broadcasting into his scheme, as he is openly planning to do, it is high time to call a halt.

Mr. Clark assures his vapid followers that he is going to smear the country with anti-evolution propaganda from no less than six broadcasting stations and that he is going to wage a vicious attack on open-mindedness, tolerance and all of the really civilizing virtues that have been accumulating in the race since *pythycanthropus erectus* strode the primeval plains.

Is it not about time that a thing so representative of the breadth and growth of human intelligence as radio should be employed by cultists, propagandists and fadists for the spreading of creeds manufactured by cliques of mountebanks that prey on truth-fearing numbskulls?

* *

Why Not Standardize Radio Announcements?

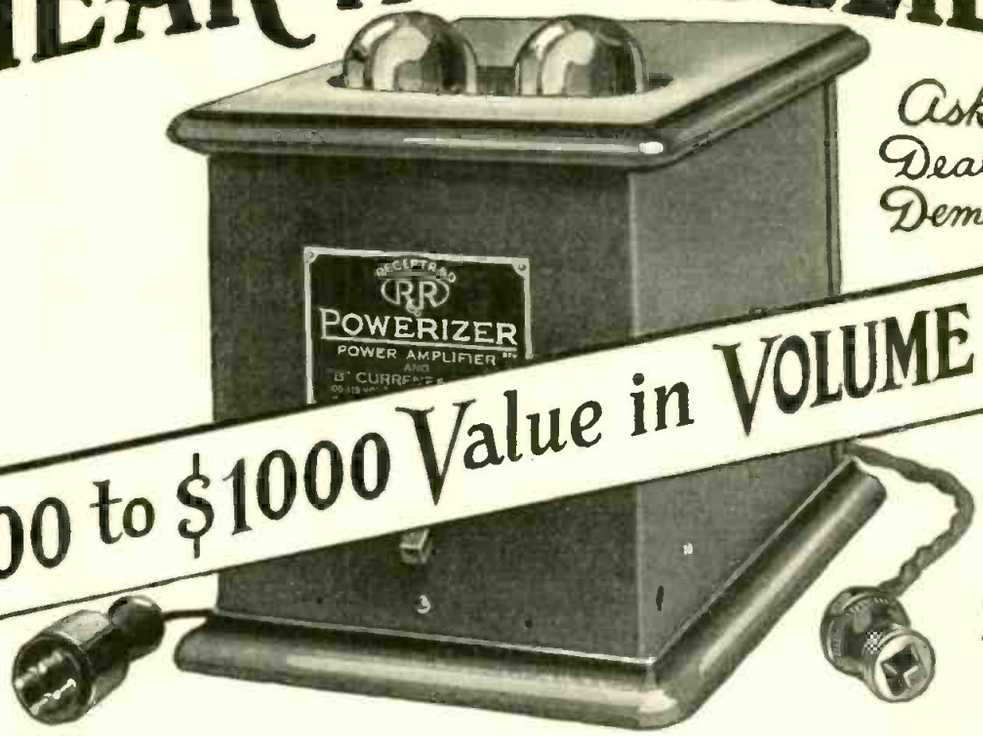
IF YOU are a regular reader of this department (and really there is not a reason in the world why you should not be), you will know that we have never been what you call entirely satisfied with announcing.

The trouble has been with the announcers. Most of them have lacked personality and the background necessary to make of announcing an art.

The average announcer of the present is more interested in his own popularity than he is in the success or perfection of his work, and we listen, not to the announcements concerning that which is about to be broadcast but to that which the announcers believe will make of him, in the minds of the audience, a member of the *intelligentsia*. Either that or he is of the type who bases his campaign for popularity on wit and humor; he wants to Joe Cooke his way into the heart of his audience.

HEAR IT—and BELIEVE!

Ask Your Dealer to Demonstrate It



$300 to $1000 Value in VOLUME and TONE for $49.50

POWERIZER

REG.

Combined "B" Eliminator and Power Amplifier

RADIO amplification and "B" Battery elimination are admitted to be the only two really big developments in Radio during the last five years. Powerizer now, in one revolutionary stroke, combines both in one unit, so that by merely attaching this unit, you can secure all the tone and volume advantages offered up to this time only in the newest power sets costing from $300 to $1,000.

With Powerizer attached to your set, former lifeless and colorless radio sounds are changed to vibrant brilliancies that literally transport you to the broadcast studio. Yet Powerizer costs you no more than a good "B" Battery eliminator ALONE.

Supplies up to 170 volts "B" power for set, 350 volts for power tube, proper bias eliminating "C" batteries, and "A" voltage for last tube. Operates directly from any electric light socket and pays for itself quickly in "B" Batteries saved.

To know the Powerizer fully and to appreciate it, you must HEAR it. If you want Radio's most perfect reproduction in your own home, on your own present set—go to the nearest Powerizer dealer today and ask for a demonstration.

Biggest Hit Ever Known in Radio

DEALERS! Are you missing this unusual opportunity? Become a Powerizer dealer now. Be able to demonstrate this unit and reap the big sales that Powerizer dealers are enjoying. Write or wire today.

Modernizes Your Set Instantly

RADIO RECEPTOR CO., 106 Seventh Ave., New York

After a terrible lot of night work we have decided to put our vote in for standardized announcing.

Rather than expose ourselves to the harangues of the average announcer, we would make of him an automaton, with a bit in his mouth.

He would never be permitted to compose his announcements. Instead he would simply say "Mr. Jones will now sing, 'Danny Boy' from WJZ, New York."

Of course, to make the scheme work out, Mr. Jones would have to start singing immediately, for periods of silence have done much to damage radio entertainment.

Incidentally, it has been the slowness of the performers in preparing for their next numbers that affords our announcers so many opportunities to gush over.

* *

The Intrusion of "Paid Advertising" on Broadcast Programs

WMCA, atop the big McAlpin Hotel in New York, is an erstwhile broadcaster that has on at least one other occasion been none too politely reprimanded by this Department. It is the most naïve broadcaster of advertising in the business and Sunday seems to be its big copy day.

If you want to hear broadcast advertising in its very worst form just tune in on this station any Sunday evening after 7:00 P. M.

Some weeks back a good old-fashioned book salesman in the guise of a reviewer laid down a barrage of sales talk that would have made any insurance peddler appear like a rank novitiate. It was a direct piece of selling in bad taste. The price of the book, too, was mentioned although Mr. Hoover has asked that broadcasters refrain from this practice believing, as he must, that it tends to make a public billboard out of the air.

We're very sore about the whole thing.

* *

Why Do Broadcast Artists Assume Pseudonyms?

THERE are those in broadcasting who have the notion that if you conceal your identity and parade under some supposedly intriguing pseudonym like the "Silver-Masked Tenor" or WGN's "Phantom Violin" that you will in time rise to the dizziest heights of fame.

It is an old game and a highly successful one. It is at the same time a cheap press-agent trick unless the performer is sincere in his desire to withhold his identity.

If you travel long enough and far enough, you might find a modest genius fearful of the glare of the limelight. But who ever heard of a truly modest person seeking the stuff that American broadcasting stations have to offer?

Why the Saturday Night Debauch by Radio?

OUR broadcasters, it would seem, are victims of American Saturday night psychology—a frame of mind that, despite the blatant rantings of Billy-Sunday theologians, has brought moral ruin to many a lass and lad.

In the old days booze hoisters funnelled Anheuser and went maudlin before sloppy bars; young bucks courted the village belles with hired buggies; burlesque shows bulged with the sporting gentry of the times, and wasp-waisted, pompadoured young ladies were waltzed ragged by brown-derbied sheiks.

The good old Saturday night mothered debauchery in all of its forms. And it still does.

Unless you are a ravenous consumer of jazz, a Saturday evening at the radio will break over you like a flood tide. The reckless abandon of the hebdomadal spree is the motivating force of nine out of every ten broadcasters who operate on this night. Go to the radio at 10:00 P.M. and you will find nothing but a seething sea of syncopation. All of the new tricks of jazzery will be practiced on you and fresh announcers will give themselves up to a strain of buffoonery that would drive a Mennonite to brass buttons and ankle bracelets.

Of course, if you like your music raw and bloody this will please you. On the other hand, if you belong to that little band of silly old goofs who can still tolerate the work of founders of the musical art you will feel that Saturday-night radio is, after all, only a shade removed from the penny arcade and that a source of entertainment still subject to the devastations of week-end psychology has a misty future.

* *

The Renaissance of Jazz

IT begins to look now as if something might come of jazz after all. For a while there, during the very heavy floods, we thought that nothing could ever be done that would make of it a music fit for polite consumption. It was pretty bad, pretty bad.

Just as we were getting ready to sound the final warning, the Big and Little Jazz masters decided that syncopation was being muted and hammered to the bow-wows.

Mind you, this is not going to be a general indorsement of jazz. We still have plenty of adherents to the old school, who, despite the missionary work of this very popular department in a very popular magazine, (*adv.*) are going right on with the old stuff. But then there is Ben Bernie, Joe Kneeht, B. A. Rolfe, Whiteman and a few others who are leading the renaissance and who will eventually bring syncopation to the level of at least a sub-art.

What Vaudeville Programs Are Able to Teach the Broadcasters

THIS department has been doing some pretty deep thinking on the subject of the studio *vs.* the vaudeville theatre, and it only recently came to the astounding notion that our radio programs are, in the last analysis, very similar to the programs of the vaudeville theatres. Of course, the studio lacks the variety.

If we owned a broadcasting station we should present our programs with a single orchestra throughout the entire performance. This would not only give an effect of continuity, but it would give the performers a greater opportunity to win the approbation of their audiences.

There would be solos to be sure and they would be with and without orchestral accompaniment. In the case of piano and other instrumental solos the orchestra could pick up the melody on the last few bars and wind up each solo with a bang. The average soloist might be inspired to greater effort and the audience would be in a glowing frame of mind.

Our radio-vaudeville programs, by the way (and not very much by the way at that), would have *no announcements* except between the acts.

Announcing the names of numbers, has to us, always been a wholly unnecessary interruption. It is certainly never done in vaudeville and what vaudeville goer objects to that? The performer would be introduced and the nature of his act would be briefly described. Audiences want to be entertained, not educated, and entertainment must flow in an even stream.

Verbal interruptions such as we now have in radio programs are, to our way of thinking, breaches in what might be an orderly movement of the features that go to make up the evening's entertainment.

Now that this big thesis has been given to the world we shall wait for some alert broadcaster to make use of it. That shows what a little optimist we are!

Short Waves

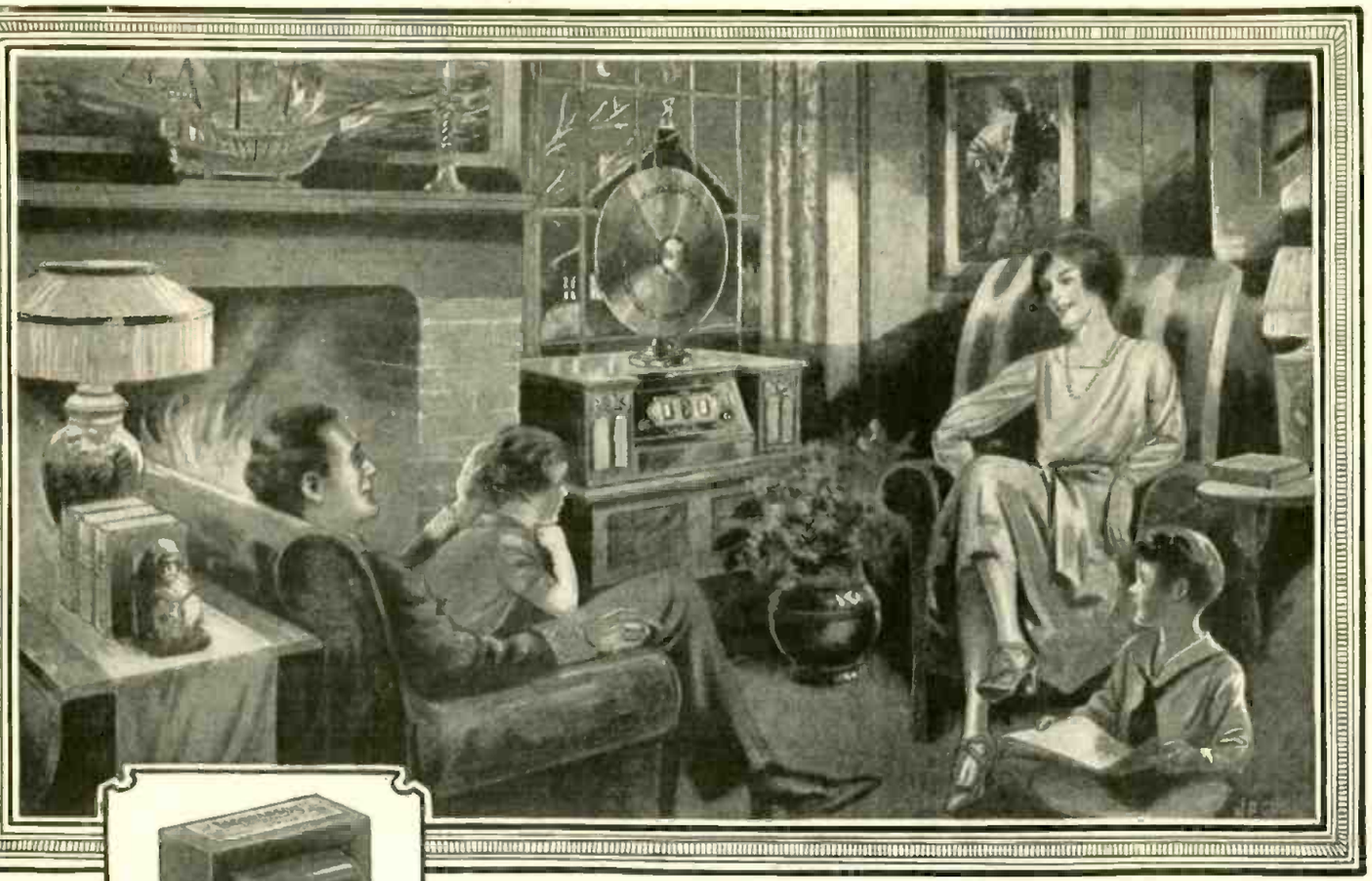
THE report of the War Department for the first six months of 1926 shows that the use of its radio net saved $74,313.74. The cost of radio communications during the period was $27,598.63; the same messages would have cost $101,912.37 had commercial wires been used. The War Department also handled the radio business for 31 other government departments.

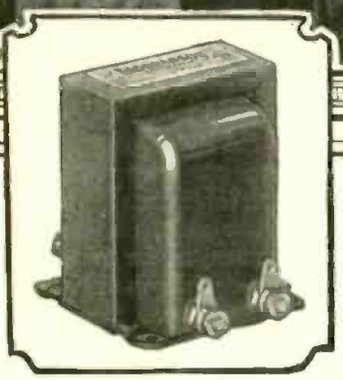
* *

Some mathematical soul has figured out that the man-made sources of interference now number 54.

* *

Radio programs are ninety percent music.





THORDARSON

R-200

AMPLIFYING TRANSFORMER

Supreme in MUSICAL PERFORMANCE!

THE secret of good reception lies not in attempted correction of the deficiencies of *poor* broadcasting, but in faithfully reproducing the programs of the *better* stations.

Thordarson transformers employ neither a "rising" or a "falling" characteristic for corrective purposes. They are designed to give, as nearly as possible, equal attention to all notes.

The majority of leading quality receivers are equipped with Thordarson transformers—a substantial evidence of the musical supremacy of Thordarson amplification.

THORDARSON ELECTRIC MANUFACTURING CO.

Transformer Specialists Since 1895

WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS

Huron and Kingsbury Streets — Chicago, Ill. U.S.A. 3445

IN THE WORLD'S LABORATORIES

CONDUCTED BY DR. E. E. FREE

Radio Features in the Vitaphone

NOTHING better illustrates the remarkable progress which has been made in the past few years with audio-frequency amplifiers than the new talking and singing motion picture perfected by the Bell Telephone Laboratories and presented for the first time in public by Warner Brothers, the motion picture producers, in New York City. The program offered to the public included a brief talk by Mr. Will Hays, so-called "Czar" of the motion picture industry; instrumental selections on piano, violin and banjo; an orchestral number; vocal selections and choral singing, and a complete musical score to accompany the motion picture "Don Juan."

The motion picture portion of the apparatus offers nothing of especial interest to the radio engineer. There is no attempt to photograph the record of the sounds on the motion picture film itself, as is done in Dr. De Forest's phonofilm; instead the sound record is made on a wax disk and a phonograph record is prepared from this disk in much the usual manner. The problem of synchronizing the operation of this phonograph record with the motion picture film, so that the sounds will be emitted at exactly the right instant to suit the action on the screen, has been solved by driving both the motion picture projector and the phonograph turn-table from the same electric motor.

The radio portion of the apparatus appears, so far as reproduction is concerned, only in the amplifiers and loudspeakers used to send out the sound.

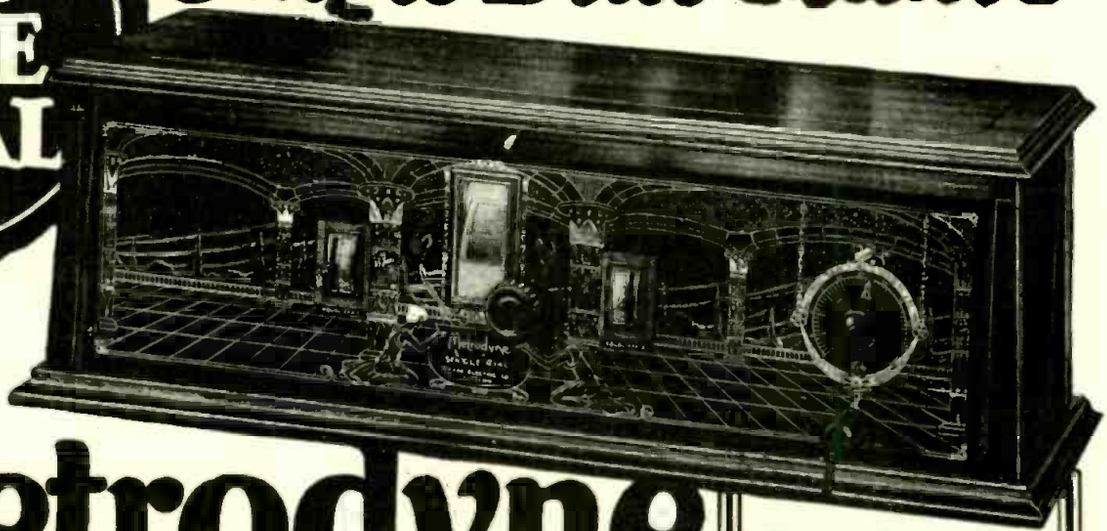
Bell Telephone Laboratories

THE VITAPHONE'S "ELECTRIC EAR"

On this wax disk is made the record of sounds which record is later played to accompany the motion picture. The synchronous motor which drives the disk at the same speed as the camera, is seen below and to the right. The microscope permits continuous observation of the tiny indentations in the record made by the recording needle.

30 DAYS FREE TRIAL

7 Tube Set
Single Dial Radio



The Metrodyne

ONLY ONE DIAL TO TUNE

Retail Price

$75

Completely Assembled

Big Discounts to Agents and Dealers

Wonderful offer direct from the factory!

A perfect working, single dial control, 7 tube receiver. And just to prove our claims, we will ship it to your home for **30 days' free trial.** Test it under all conditions. Test it for distance, volume and tonal quality — and if you are not convinced that it is the best single dial set you ever heard, return it to the factory. We don't want your money unless you are completely satisfied.

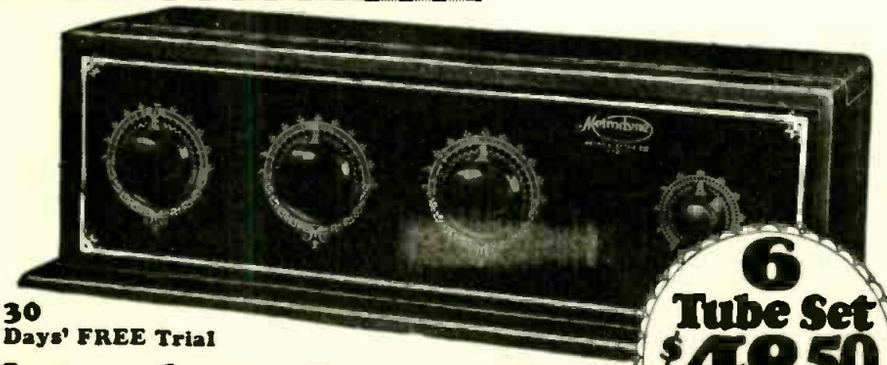
BIG PROFITS TO AGENTS AND DEALERS

Our Agents and Dealers make big money selling Metrodyne Sets. You can work all or part time. Demonstrate the superiority of Metrodynes right in your home. Metrodyne Radios have no competition. Lowest wholesale prices. Demonstrating set on 30 days' free trial. Greatest money-making opportunity. Send coupon below—or a letter—for our agent's proposition.

Metrodyne Super-Seven Radio

A single dial control, 7 tube, tuned radio frequency set. Approved by America's leading radio engineers. Designed and built by radio experts. Only the highest quality low loss parts are used. Magnificent, two-tone walnut cabinet. Artistically gilded genuine Bakelite panel, nickeled piano hinge and cover support. All exposed metal parts are beautifully finished in 24-k gold.

Easiest set to operate. Only one small knob tunes in all stations. The dial is electrically lighted so that you can log stations in the dark. The volume control regulates the reception from a faint whisper to thunderous volume, 1,000 to 3,000 miles on loud speaker! The Metrodyne Super-Seven is a beautiful and efficient receiver, and we are so sure that you will be delighted with it, that we make this liberal **30 days' free trial offer.** You to be the judge.



30 Days' FREE Trial

6 Tube Set $48.50 RETAIL PRICE *Completely Assembled*

Metrodyne Super-Six

Another triumph in radio. Here's the new 1927 model Metrodyne 6 tube long distance tuned radio frequency receiving set. Approved by leading radio engineers of America. Highest grade low loss parts, completely assembled in a beautiful walnut cabinet. Easy to operate. Dials easily logged. Tune in your favorite station instantly on same dial readings every time. No guessing.

Mr. Howard, of Chicago, said: "While five Chicago broadcasting stations were on the air I tuned in seventeen out-of-town stations, including New York and San Francisco, on my loud speaker horn, very loud and clear, as though they were all in Chicago."

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal **30 days' free trial offer,** which gives you the opportunity of trying before buying.

MAIL THIS COUPON

or send a postal or letter. Get our proposition before buying a radio. Deal direct with manufacturer— **Save Money.**

Mail COUPON Below!

Let us send you proof of Metrodyne quality

F. L. Warnock, Greentown, Ind., writes: "I received the Metrodyne in good shape and am more than pleased with it. Got stations 2,000 miles away."

C. J. Walker, Mariposa, Calif., writes: "Received my Metrodyne Single Dial set O. K. I believe that these one-dial sets are going to be excellent sellers. I had no trouble in tuning in stations enough to satisfy anyone, so you will please send me another set."

Roy Bloch, San Francisco, Calif., writes: "Very often we travel from New York to the Hawaiian Islands quickly — from station to station — by means of the little tuning-knob which operates the electrically-lighted dial. The Metrodyne Single Dial Set is much easier to operate than any radio set I've ever seen."

We will send you hundreds of similar letters from owners who acclaim the Metrodyne as the greatest radio set in the world. A postal, letter or the coupon brings complete information, testimonials, wholesale prices, and our liberal **30 days' free trial offer.**

METRO ELECTRIC COMPANY
2161-71 N. California Ave., Dept. 138
Chicago, Illinois

Gentlemen:

Send me full particulars about Metrodyne 6 tube and 7 tube sets and your **30 days' free trial offer**

*Name*_____

*Address*_____

If you are interested in AGENT'S proposition, place an "X" in the square ➡ ☐

METRO ELECTRIC COMPANY

2161-71 N. California Ave. • Dept. 138 • Chicago, Illinois

The sound record consists, as usual, of a series of tiny indentations in the groove of the phonograph record. The needle runs over these indentations, also as usual. But instead of the vibrations thus induced in the needle being communicated mechanically to a diaphragm and discharged through a horn, as in the phonograph, the needle vibrations are transmuted electromagnetically into electric oscillations; that is, into an audio-frequency current. This is amplified by high-quality vacuum-tube circuits, much as is done with the speech currents in the telephone industry. When the amplification is sufficient the current is fed into loudspeakers placed behind the motion picture screen.

It is apparent that this system involves no basic departure from devices already well known. It merely puts together into one smoothly running unit a phonograph, an electric reproducer, an amplifier and a loudspeaker similar to those used in the well-known public address systems of the telephone company. However, to obtain the smoothness and perfection of operation which the Vitaphone shows was a most difficult task and one for which both Mr. Joseph P. Maxfield, who headed the Bell Laboratories' research on the problem, and his assistants deserve the heartiest congratulation.

While it is probable that delicate recording instruments might detect slight differences between the actual voice or music and the reproduction with which the Vitaphone fills the theatre, the human ear finds it impossible to make any distinction in those productions in which the equipment reaches its best attainments. A few of the short productions shown in New York City were not quite so perfect as this, but if perfection can be attained once it must be possible to attain it again and some of the productions shown were perfect enough to suit anybody.

The taking of the picture and the production of a simultaneous sound record are accomplished by what amounts to a reversal of the method of reproduction. A distortionless microphone is suspended near the scene to be photographed, but where it cannot be seen by the eye of the camera. The output of this microphone is amplified and supplied to an electromagnetic device which cuts the necessary indentations in the wax record. By these the sound record is made. At the same time the motion picture is photographed, exact synchronism being attained by driving both the recording turntable and the motion picture camera with synchronous electric motors energized from the same source of alternating current.

While the first use of the Vitaphone will presumably be in the amusement field, probably to present musical scores for motion pictures without the expense of an orchestra, the device promises to have still more important uses in the preservation and distribution of material of educational value. Suppose, for example, that a great scientist like Niels Bohr or Albert Michelson gives an experimental lecture before the Vitaphone; both voice and experiment are permanently preserved. Any college or club that has the Vitaphone equipment can hear the lecture any time they wish.

A whole lecture course could be given in this way; experiments, demonstrations and everything. First-class teachers are rare men. The country never has enough of them. If the Vitaphone helps, as it seems quite possible that it can, to bring the faces and words and acts of such teachers to thousands of additional students, Mr. Maxfield and

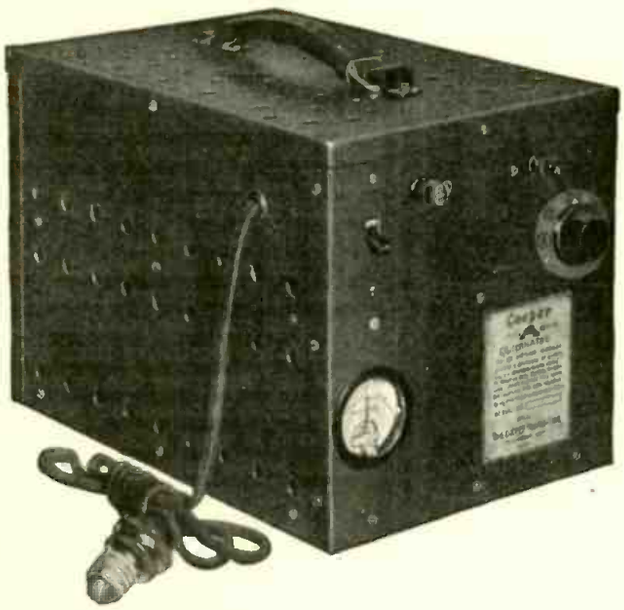
Bell Telephone Laboratories

THE INVISIBLE SECRETARY

Mr. Sergius P. Grace, President of the New York Electrica. Society, is using one of the new dictation systems which employ radio amplifiers to permit ordinary dictation by an executive to be repeated from a loudspeaker in a room elsewhere. The whole outfit is energized from the ordinary lighting circuit, no batteries being required.

HERE IT IS! THE NEW

Cooper "A" Eliminator



Actually *Eliminates* the "A" Battery!

Operates Directly from the Light Socket!

No Battery to Bother with!

No Acids or Liquids to Replace!

Needs No Attention of Any Kind!

Good radio dealers in most cities have the Cooper "A" Battery Eliminator on display now. Price $87.50 (tubes extra), slightly higher west of the Rockies.

RADIO has been awaiting this day. The storage "A" battery with all its messy watering and charging has at last been totally eliminated as a radio necessity.

The Cooper "A" Battery Eliminator is entirely new in principle. It is unlike anything that has ever been offered the radio public. It actually *eliminates* the "A" battery with all its objectionable features—it operates *directly* from the light socket. The Cooper "A" Eliminator requires no attention of any kind—no battery to water or bother with—no acids or liquids to replace—none to spill and ruin costly rugs. It is not a power unit—it employs no trickle charger—it operates only while you operate the receiver. A simple throw of a switch and your current is on—tumble back the switch and the current is off.

The Cooper "A" Eliminator operates on any make or type of receiver using 6-volt tubes—it creates no noise of any kind—it gives you everything that batteries ever gave—and DIRECT from the light socket.

DEALERS—JOBBERS

The Cooper "A" Eliminator is entirely different from the many "A" power devices on the market. It offers tremendous sales possibilities. Limited distribution and full protection to trade outlets insure legitimate dealer and jobber profit. Write for full particulars of our exclusive proposition in your territory.

SEND FOR THIS FREE BOOKLET

We have prepared a very complete illustrated folder describing the Cooper "A" Eliminator in detail. May we send it to you?

THE COOPER CORPORATION

Radio Division—Dept. P

CINCINNATI, OHIO

the Bell Telephone Laboratories will have justified the enormous effort and money spent on the enterprise even if—which is most unlikely—it should prove to be a financial failure as an amusement device.

Giving Dictation at Long Distance

THE application of alternating current from the ordinary power-lines to the energizing of radio receivers has been followed by the development of a business telephone system which operates from this same source of electric energy. Developed and now under test in the New York City offices of the Bell Telephone Laboratories, the system will probably be released soon for general public use. It will be manufactured by the Western Electric Co.

At the desk of an executive is what looks like an ordinary telephone except that it has no receiver hanging at its side and that there is a small push button on the base of the instrument.

Suppose that the executive wishes to dictate to his secretary in another room. He presses the little push button. This turns on the electricity from the power mains and energizes the system. Anything spoken within a foot or two of the telephone is then repeated by a loudspeaker at the secretary's desk, no matter how far away that may be. Orders may be communicated to assistants, even talks made to assemblies of men, in this same way.

The essential novelty about the apparatus is the amplifier. This is provided with rectifying tubes, transformers, filters and other apparatus to derive from the alternating line current the various plate voltages, filament currents and so on that are necessary. Two or more stages of audio-frequency amplification are used, as may be necessary. Control of volume, so that the loudspeaker does not shout loud enough to disturb other persons nearby, may be attained by taps which alter the ratio of the first audio-frequency transformer in the amplifier.

It is suggested that the apparatus will probably find many uses in addition to that by office executives. For example, waiters in restaurants can give orders thus to the cooks in the kitchen; even guests might give their own orders without leaving their tables, something that might produce a much-needed speeding-up of service in more than one establishment.

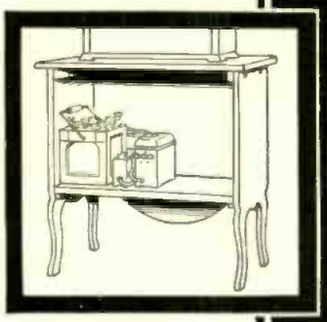
A Cheap Apparatus for Observing Atom Tracks

IT IS now possible for anyone to see an atom. Or, to speak more exactly, it is now possible to see the track which a flying atomic particle makes when it passes through the air, this being the only way in which individual atoms have ever been made visible. The atom itself

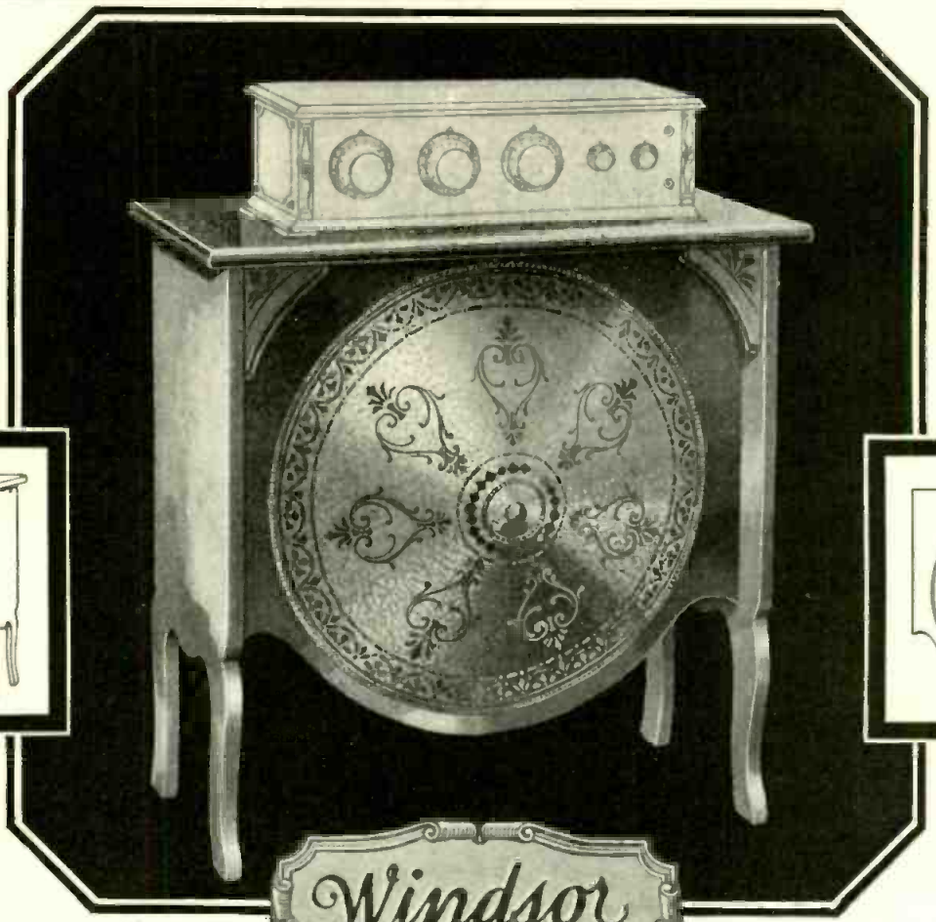
$29.00

Console with Cone Loudspeaker Ready for Your Set and Batteries

(West of the Rockies $35)



Rear view showing large compartment providing ample space for all batteries, battery charger or battery eliminator. These are entirely concealed from view. The back is open for ventilation of batteries.



MODEL 200
with 22-inch Cone

MODEL 200
with 22-inch Cone

The Cone Loudspeaker, with its Spruce sounding board, is quickly and easily removable, allowing instant access to all batteries, battery eliminator or other equipment and wiring.

A Revelation in *Radio Reproduction*

AT LAST—a cone loudspeaker that reproduces *all* the tones as they are broadcast. From the deep voiced tuba of an orchestra to the softest note of a vocal solo—*every* tone—*every* sound is reproduced in all its beauty, just as it entered the microphone.

* *

This 22-inch Windsor Cone Loudspeaker, with its *spruce* sounding board, will reproduce the softest crooning lullaby in a softly lighted room, or the full throated march music of a band in an auditorium—both with perfect fidelity of sound and tone.

* *

The Windsor Cone Loudspeaker Console is the greatest value in the world of radio. When compared with the average cost of cone-type loudspeakers of even smaller size, the cost of the complete Windsor—cone loudspeaker, spruce sounding board, and console—is amazingly low.

* *

As a piece of furniture, the Windsor Cone Loudspeaker Console is of such manifest high quality and attractive design as to be a welcome addition to any home. Finished in Mahogany or Walnut.

* *

The Windsor Cone and Horn Loudspeakers, combined with attractive pieces of furniture in many models, are being demonstrated by recognized dealers everywhere.

Model 600

With 16-inch Cone (*Pat. applied for*)

This 20 by 17-inch Cone Loudspeaker Table has suspended from the underside of the top a 16-inch Windsor Cone Loudspeaker. Placed in any part of a room, it fills the room with music just as an inverted electric lamp floods the room with light. Finished in Mahogany or Walnut. Price..... **$19**

(West of Rockies, $23.00)

Go to your dealer today and examine this astonishing new Cone Loudspeaker Console. If he happens not to have one, write to us and we will tell you the name of the nearest store at which you can see and hear one.

Note to Dealers Write or wire today for details of the highly profitable Windsor selling franchise

WINDSOR FURNITURE COMPANY
World's Largest Manufacturers and Originators of Loudspeaker Consoles
1414 Carroll Avenue Chicago, Illinois
Los Angeles Branch—917 Maple Avenue

WINDSOR FURNITURE COMPANY
Electrical Department
1414 Carroll Avenue, Chicago, Illinois

Send me FREE and without obligation circulars of the Windsor line of Cone and Horn Loudspeakers combined with pieces of furniture, and name of nearest dealer:

Name .....

Address .....

City ..... *State* .....

Dealer's Name .....

From a photograph made for POPULAR RADIO by courtesy of Professor Knipp

A CHEAP DEVICE FOR WATCHING ATOMS

Professor Charles T. Knipp, of the University of Illinois, has perfected a simple and inexpensive apparatus by means of which the tracks of flying atoms can be made visible and studied. This opens atomic science to everybody, not merely to wealthy laboratories. The device is just in front of Professor Knipp. The batteries at the left supply potential to attract the atomic particles.

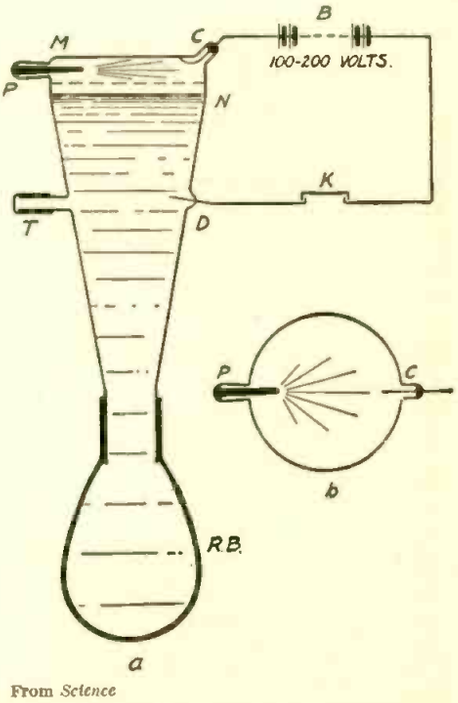
is far too tiny, of course, ever to be seen in any manner now known or foreseen.

It has been possible for a number of years to produce these visible atom tracks by means of expensive apparatus. The important investigations of Professor W. D. Harkins, of Chicago University, were made with such apparatus. Collisions between atoms and air molecules were studied and the paths of atoms, and even of electrons, were observed under many different conditions. In this way much additional knowledge of atoms and electrons was obtained. But only the larger universities could afford the complicated and costly apparatus with which this was done. To the ordinary experimenter in physics, a radio fan, for example, who wanted to study atomic relations a little, the atom-track apparatus was inaccessible.

Professor Charles T. Knipp, of the University of Illinois, has now done the extremely useful thing of making an atom-track apparatus which can be bought for a few dollars or which an amateur can build for himself.* Nothing could be better calculated to increase general interest in atomic experimentation in the smaller physical laboratories and among amateurs.

In the new apparatus, as in the earlier and more expensive ones, the principle is to make the track of the atom visible by producing dew along it. As the moving atom flies through the air it strikes against and ionizes many air atoms. These ionized atoms lose one or more electrons each. That gives them an electric charge. This charge attracts water, so that if a little dew is produced immediately in the surrounding air, the track of the atom will be marked by a line of tiny visible particles of water.

In Professor Knipp's apparatus the supply of atoms is furnished by a little radioactive material placed near the flat bottom of an inverted glass flask. This radioactive material does not, strictly speaking, produce atoms. It produces what are called alpha particles, which are helium atoms which have lost their outer electrons. These alpha particles are shot out at enormous speeds from the radioactive material. Atoms



From *Science*

THE ATOM-TRACK APPARATUS

R.B. is the rubber bulb, attached to the glass flask. M is the radium, sealed into a small glass tube. The flask contains water. The small diagram, b, is a top view of the bottom of the inverted flask, showing what the atom tracks look like.

*"Improvements in an Alpha-Ray Track Apparatus," by Charles T. Knipp. *Science* (Garrison, N. Y.), volume 64, pages 140-141 (August 6, 1926).

Recommended for the

LC SENIOR POWER PACK

THE NEW PRECISION HIGH VOLTAGE FILTER CONDENSERS

Made in the following capacities particularly for use where high voltage condensers are necessary:

No. 46—4 mfds. DC working voltage 600. Price $9.00.

*No. 26—2 mfds. DC working voltage 600. Price $5.50.

*No. 44—4 mfds. DC working voltage 400. Price $5.50.

*No. 24—2 mfds. DC working voltage 400. Price $3.00.

*Specified for the Senior Power Pack.

THE PRECISION R. F. CHOKE COIL

Can be used wherever this type of coil is necessary. Very compact, being one inch in diameter and one and one-half inches long. Can be mounted on a subpanel or a baseboard. Bracket for baseboard mounting provided with each coil. Has a very low distributed capacity, due to the slotted form of winding. List price $1.00.

180 VOLT B-SUPPLY

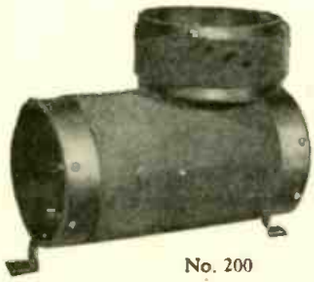
for use with 110 v. AC 50-60C.

A very powerful, strongly constructed UX216B tube eliminator. Gives 180 volts at 60 mils. Particularly designed to supply current for the new UX171 tube. List price $47.50.

No. 20

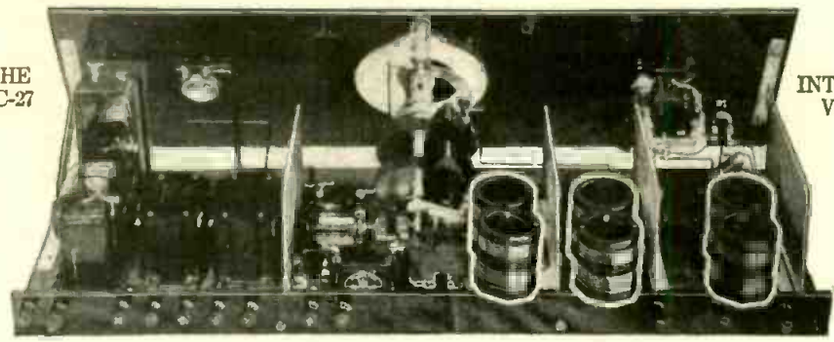
THE ORIGINAL COCKADAY COIL

The only coil ever specified by Laurence M. Cockaday, inventor of the famous Cockaday Four Circuit Tuner for use in his set. The best hard rubber tubing and double silk covered copper wire insures a coil of unusual quality, resulting in increased volume and greater selectivity. Dielectric and leakage losses are extremely low. Price, $5.50.



No. 200

THE LC-27



INTERIOR VIEW

PRECISION

DUO-OCTAFORM COILS

Used in the remarkable new LC-27 Receiver, designed by Laurence M. Cockaday, Technical Editor of POPULAR RADIO. Price each, $3.50.

THE COCKADAY LC-27 RECEIVER KIT

For the convenience of those consumers and dealers who wish to buy Cockaday's LC-27 in complete kit form: we offer the following parts exactly as used in Mr. Cockaday's laboratory model.

1—Hammarlund mid-line dual condenser, .000275 mfd.	$7.50
1—Hammarlund mid-line single condenser, .000275 mfd.	4.65
1—Precision Duo-Octaform coil set, one antenna coupler and two interstage couplers.	10.50
1—Amertran De Luxe first-stage transformer.	10.00
1—Amertran De Luxe second-stage transformer.	10.00
1—Amerchoke No. 854.	6.00
1—Dubilier No. 902 filter condenser, 4 mfd.	5.50
1—Dubilier No. 907 filter condenser, .1 mfd.	.60

"—used in the LC-27"

1—Mar-Co. illuminated control, scale 0 to 100	$3.50
2—Mar-Co small controls for LC-27	1.50
1—Carter battery switch	.65
1—Samson radio-frequency choke coil No. 85	1.50
3—Aerovox mica fixed condensers, .00025 mfd.	1.05
1—Durham resistor, 4 megohms	.50
1—Lynch grid leak mounting	.35
1—Carter Gem Jack	.25
1—Carter resistance, 0-10,000 ohms	2.00
12—Eby binding posts	1.80
5—Benjamin UX sockets	3.75
1—Amperite	1.10
Mechanical Kit consisting of aluminum shields, binding post strip, decorated panel and Tait Brackets	12.50
Complete	$85.20

Without Cabinet $85.20 **With Corbett Cabinet $103.20**

Built complete with cabinet $10.00 extra

THE LC SENIOR POWER PACK

Exactly as used in the laboratory model. Every part fully guaranteed.

COMPLETE PARTS FOR THE LC SENIOR POWER PACK

1—Brach Controlit	$ 6.00
1—AmerTran transformer, PF-52	18.00
1—Benjamin UX-Socket	.75
2—AmerChokes, No. 854	12.00
7—Eby binding posts	1.05
1—Precision paper filter condenser, No. 26, 2 mfds.	5.50
1—Precision paper filter condenser, No. 24, 2 mfds.	3.00
1—Precision paper filter condenser, No. 44, 4 mfds.	5.50
1—AmerTran resistor, No. 400	$7.50
1—Centralab resistance, 5 watts, 2,000 ohms	2.00
1—Bakelite binding post strip, 3½" x 15" x ¼"	1.50
1—Brass mounting strip, 17¾" x ½" x 1/16"	.80
1—Hardwood baseboard, 8¾" x 15" x ¾"	.60
1—Set POPULAR RADIO blueprints	1.00
	$65.20

INFORMATION EVERY DEALER SHOULD HAVE

Write for a set of Precision Coil catalog sheets. They describe in detail all of the Precision Coils used in POPULAR RADIO designed receivers for the past two years.

Be able to tell your customers all about the coils used in the New LC-27, the LC-26, the Cockaday Four-Circuit Tuner, and other famous circuits published in leading magazines and newspapers.

A complete list of the new Precision Line of Radio Power Units are also given in easily filed catalog form.

PRECISION COIL CO., Inc.

209 Centre St. New York, N. Y.

Underwood & Underwood

A CRYSTAL INSPECTOR FOR BROADCASTING

The possibility of maintaining an absolutely constant frequency for radio transmission by using one of the three fundamental frequencies of a quartz crystal has been put to use by several investigators. The apparatus shown in this photograph is used by the Westinghouse Company to maintain a constant 47-meter wave for radio telegraphy between Newark, New Jersey and East Pittsburgh, Pa.

shot out in any way would work in the same way but a radioactive source of alpha particles is the most convenient thing available to demonstrate what such atomic or electronic tracks in air are like.

The radioactive material is shooting out alpha particles all the time. To show some of the tracks moist air inside the glass flask is suddenly expanded by a rubber bulb attached to it. Water is kept in the flask to insure that the air is moist. The expansion of this wet air by the bulb cools it sufficiently that some fine drops of dew are instantly produced. These collect along the atom track. For tracks that are close to the flat bottom of the glass flask, these dew particles will persist for a moment on the inner glass surface, where they can be seen and their shapes observed. To assist the motion of the alpha particles across the space inside the flask an electric potential may be applied, just as it is to radio vacuum tubes but with a reversal of the positive and negative.

Many Frequencies from Quartz Crystals

THE use of quartz crystals, oscillating by what is called the piezo-electric effect, as controls for wavemeters and for radio transmitters has become well known. It is not so well known that many different frequencies, even well down into the audio range, may be obtained from the same quartz crystal. That this is possible was demonstrated by Dr. A. Hund, of the United States Bureau of Standards, before a meeting of the Institute of Radio Engineers on May 5, 1926.* The secret is that any quartz crystal, if properly cut, has three fundamental vibration frequencies and a large number of harmonics for each.

If the cut piece of quartz crystal used for piezo-electric oscillation is cut so that its sides are properly placed with reference to the crystal axes of the original crystal, the cut piece will have three fundamental frequencies, one corresponding to its thickness in each of the three directions parallel to a pair of sides. Its harmonics are like the harmonics of any oscillator, one set for each of the three fundamentals. Even low frequencies, within the audio range, may be obtained from a single small crystal, by selecting a crystal of such size that two of its fundamental radio-frequencies can be heterodyned to give an audio-frequency.

*The paper will appear in the *Proceedings* of the Institute during 1926.

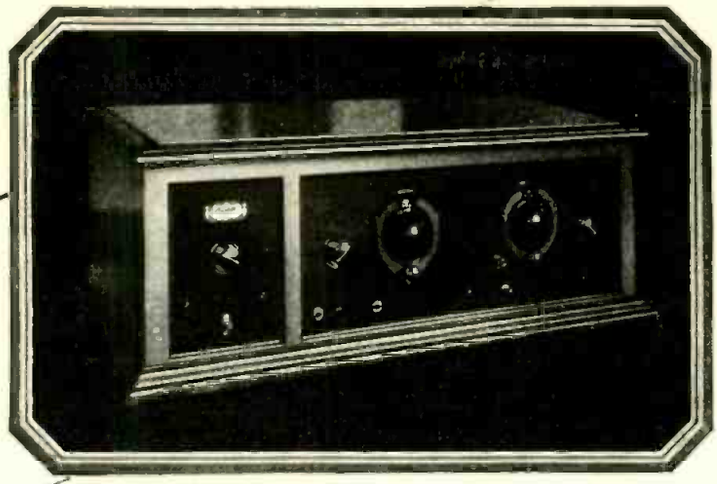
A New Vacuum with Five-Electrode Tube

As one of many recent attempts to place the units of two or more vacuum tubes inside a single exhausted bulb, Dr. Leithauser, of Berlin, recently described a five-electrode tube in which a common filament supplies electrons for two grid-plate systems.* The two grids and the two plates are connected to separate external terminals, so that each of the two systems can be used like a separate tube. The only common point is the filament.

The two parts of the tube can operate as detector and audio-frequency amplifier, as the parts of a push-pull amplifier system, or in many other ways. By connecting the two grids and the two plates together, the tube will operate at double emission, as though two separate tubes were connected in parallel. And, since the two sets of parallel elements are within the same vacuum and operating from the same filament circuit, the parallel operation is much easier to accomplish than with two separate, and somewhat different, tubes.

Under favorable conditions, collisions of an alpha particle with an air atom may be observed. This produces a branched track, one branch belonging to the air atom, the other to the alpha particle.

*"The Pentatron," by H. Kroncke. *The Wireless World* (London), vol. 18, page 854 (June 23, 1926).



$231

with 5 McCullough AC Tubes and Rectron 213

without Loud Speaker

Cleartone LEADS THE WAY

Here is the first successful low-priced set to eliminate "A" and "B" batteries

EVERYBODY was waiting for a set that would eliminate "A" and "B" Batteries without being high-priced. Here it is at last. The Cleartone Radio Electric Model 110, operating from the house current and using no fluids or acids. And the price including 5 McCullough AC Tubes and Rectron 213 (without loud speaker) is only $231.00. What other set has such advantages at this figure?

The Cleartone Electric Model 110 abolishes the battery problem by using McCullough AC Tubes. They are undoubtedly the greatest achievement in radio today. The set has won the approval of such eminent authorities as Professor Wilcox of the Armour Institute of Technology, of Chicago.

This set is the result of five years of exclusive radio receiving set manufacturing. You will marvel at its tone quality and volume. And the selectivity, which is attained by two vernier dial controls is exceptionally acute. The high quality of workmanship insures a set which will give years of satisfactory service fully guaranteed by a manufacturer of the highest standing in the radio industry.

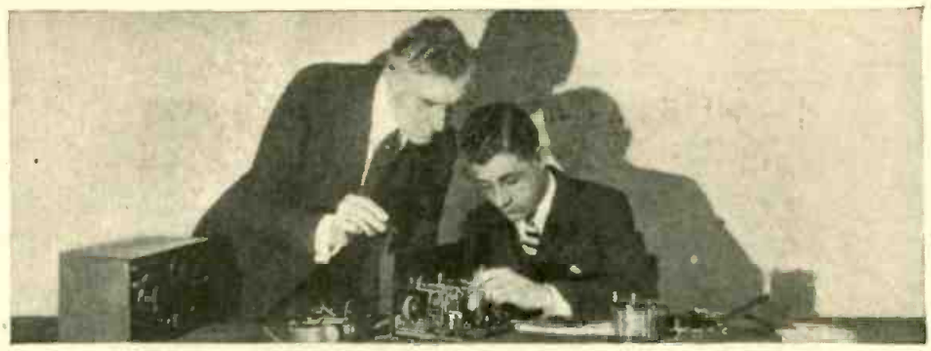
THE CLEARTONE RADIO COMPANY

2427 Gilbert Avenue :: :: :: :: Cincinnati, Ohio

DEALERS

Let us tell you how this set will help you do away with losses due to heavy service costs. We have some interesting facts and figures for YOU.

CLEARTONE *Complete* RADIO SETS



WITH THE EXPERIMENTERS

CONDUCTED BY LAURENCE M. COCKADAY

How to Eliminate Storage Batteries in Your S-C Receiver

MANY experimenters and radio fans do not care to use storage batteries with their sets; and, in the case of the S-C receiver that was described in the March, 1926, issue of POPULAR RADIO, it has been asked whether it is possible to get good loudspeaker operation on tubes that do not require a storage battery.

Dry-cell tubes may be used in this receiver with satisfactory results. However, if a dry-cell tube is used in the last stage, there is always the chance of overloading and consequent "blasting," if signals of great strength are tuned in.

In experimenting with this receiver, I have found a unique way to eliminate this trouble by operating this last tube from alternating current.

The diagram of the connections that are necessary in this novel scheme is shown in Figure 7. This diagram shows a circuit that uses, for the most part, the same fundamental principles that are embodied in the standard, storage battery operated, S-C receiver.

The filament and grid circuits, however, present a radical departure.

How the Filaments Are Connected

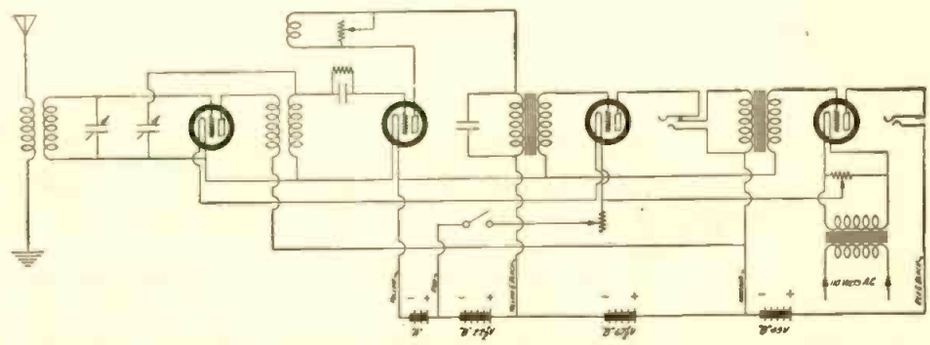
It will be noted that the filaments of the radio-frequency and first audio-frequency tubes are connected in series. The use of tubes of the 3-volt, UX-199 type, is recommended and for these an "A" battery of something over 9 volts potential is necessary. This is obtained by connecting seven standard No. 6 dry cells in series, delivering 10½ volts to the rheostat, which in this case should have a value of 30 ohms.

Attention should perhaps be drawn to the peculiar sequence in which these filaments are connected. Starting from the "A—" terminal of the battery, the first filament is that of the detector, the second that of the radio-frequency tube and the last, that of the first audio-frequency tube. The detector tube requires a positive grid return for maximum efficiency but the grid return of the radio-frequency tube should be negative.

As the tuning condensers have a common shaft and as this shaft is of a conducting material, it is necessary that the connection to the condenser rotors and to the two filament ends of the secondaries of the antenna and radio-frequency coils, should all return to points of the same potential. The filament sequence that is used accomplishes this condition.

The absence of "C" batteries will be noticed. The series filament connection is used to obtain a negative grid-bias without "C" batteries.

Observe that the grid return of the first audio-frequency tube has to traverse the filaments of the detector and radio-frequency tubes in order to reach the negative end of its own filament. This particular tube has for its grid-bias the voltage drop across the filaments of the other two tubes, in this case about 6 volts, which readily permits a plate potential of 90 volts to be used.



THE NEW WIRING DIAGRAM

FIGURE 8: *The wiring changes that are necessary in using dry-cell "A" batteries on the first three tubes, which are of the UX-199 type, and alternating current on the filament of the last tube are shown here.*

For All Popular Makes and Circuits *of radio receiving sets*

Type 405 Plate Supply

IMPROVED quality of reception, free from anxiety caused by steadily deteriorating "B" batteries is now possible thru the use of General Radio—Raytheon plate supply.

This unit operates on 110 volt (60 cycle) A.C. and provides voltages of 45, 90, 130 and 200.

Voltages are readily adaptable to all popular makes and circuits of radio receivers by means of fixed resistances which are tightly sealed from dust and moisture, thus eliminating bothersome and noisy tendencies of variable resistance voltage controls. The unit is contained in a metal case with attractive black crystalline finish, and has a conveniently located A.C. switch.

Price, with BH Raytheon Tube.....$46.00

Type 400 Power Amplifier and Plate Supply

THE type 400 is similar to the above described unit except that it has the additional feature of a power amplifier and uses the UX-213 Rectron tube as a rectifier instead of the Raytheon.

A power amplifier in conjunction with the plate supply permits the convenient use of a high power tube in the last audio stage, regardless of whether the receiver may be operated by dry cell or storage battery tubes—the filament current of the power tube being supplied by A.C. from the secondary of the rectifier transformer. The power stage overcomes the tendency toward tube overloading and removes the most common cause of distortion in loudspeaker operation.

The plate supply provides voltages of 45, 90 and 130 for the receiver and 180 direct to the power tube.

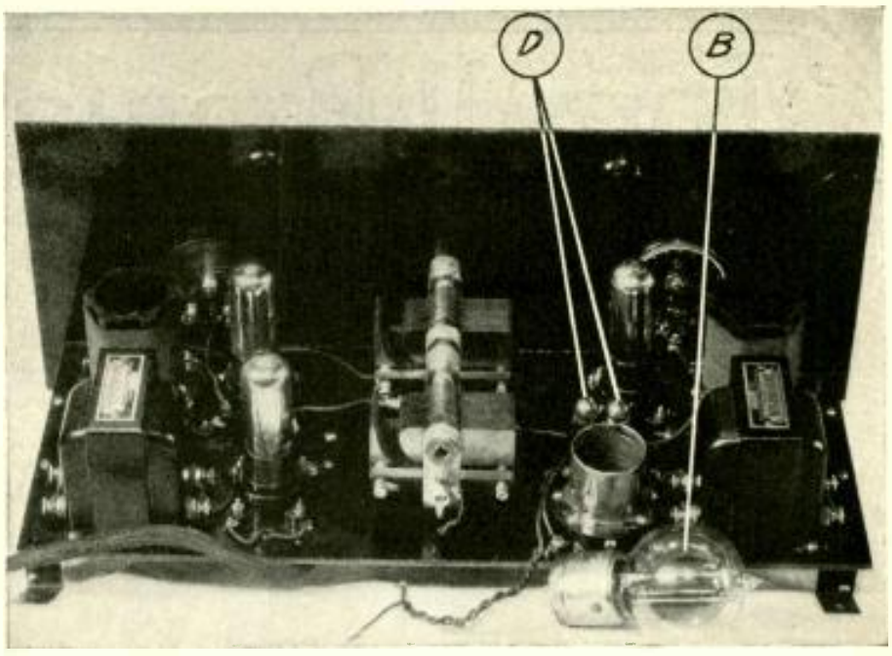
Price, without tubes.....$68.00

Ask your dealer to show and demonstrate these units to you or write for our booklet containing complete information.

GENERAL RADIO COMPANY, Cambridge, Mass.

GENERAL RADIO INSTRUMENTS

Behind the Panels of Better Built Sets



A REAR VIEW OF THE CONVERTED RECEIVER

FIGURE 7: *The two resistances, D, are connected like a potentiometer across the filament of the last power tube with the center point connection to one side of the filament to each of the other tubes. The power tube, B, fits into the large socket.*

The Life of the "A" Batteries

Just a word about "A" battery life. The three tubes consume a total filament current of 60 milliamperes, that is, the same amount of current that is required to light the filament of one '99 tube, though of course at a higher voltage. The use of an "A" battery of 10½ volts is necessary in order that the voltage of the dry cells as it drops slightly with use, may be compensated for by reducing the resistance of the rheostat.

The chance of tube damage, through the application of excessive filament voltage, is reduced about two-thirds by having the three filaments in series.

It is interesting to note that the plate current consumption of the three small tubes, with 90 volts on the plates of the amplifiers and 22½ volts on the detector plate, is only in the neighborhood of 4 milliamperes; that is, a small amount of plate current is used where a small amount will do the work.

The battery hook-up is shown in Figure 9.

The Output Tube

So far nothing has been said regarding the last, or output tube—by far the most important tube of the entire set, as its characteristics determine for the most part, the quality and volume of the music and speech you expect to hear.

This tube should fulfill two requirements: it should be capable of passing a relatively large "space-current" without overloading and its filament should be as quiet as possible in operation.

Tubes such as this are available only in types that draw a large amount of filament current and that, therefore, require a storage battery for operation.

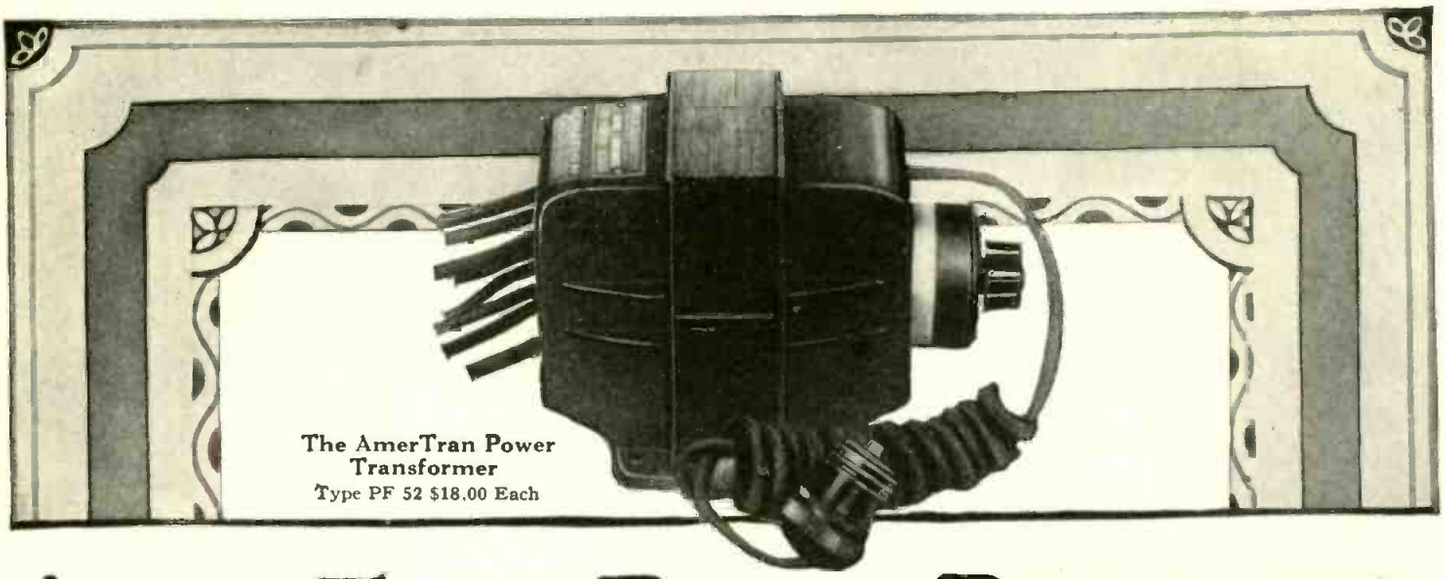
The tube that is recommended is of the Western electric No. 216-a type. The old VT-2 or the UX-171 will also answer the purpose well. Their filaments are of the oxide-coated type, are very quiet in operation and are of sufficient size so that they do not cool off materially between reversals of the alternating current; consequently the alternating current hum is minimized. Plate voltages of the higher order may be used with perfect safety.

How the Last Tube Is Adapted to Use AC Current on the Filament

To adapt these tubes to alternating current filament supply, two simple means are used. A step-down transformer of the bell-ringing type is inserted in the AC lighting line to reduce the voltage from 110 to 6 volts. An ordinary bell-ringing transformer is quite suitable and may be purchased for about a dollar. The grid return of the output tube is brought to the center of a center tapped resistance, the ends of which are connected to the filament lugs of the tube socket. A 400-ohm potentiometer may be used satisfactorily for this purpose.

It will be noticed that the grid return circuit again makes use of the "A" battery for negative bias. It passes through the three filaments of the three small tubes giving a negative bias of 9 volts and permitting a plate potential of 135 volts to be used on this tube.

This circuit therefore offers the fan who has 110 volts AC lighting-supply in his home, a receiver that gives an output of excellent quality and volume, and justifies the use of the most sensitive cone speaker. It permits the use of 3-volt tubes that have economical filament consumption and that operate on



The AmerTran Power Transformer
Type PF 52 $18.00 Each

AMERTRAN RADIO PRODUCTS

A REAL POWER TRANSFORMER

Perfected on the firm foundation of twenty-five years successful experience in transformer building, AmerTran Radio Products enjoy a reputation second to none in their respective fields. Their continued selection by leading engineers and experimenters gives ample proof of their high efficiency and dependable performance.

Of particular interest is the AmerTran Power Transformer Type P. F. 52—*the* transformer for real "honest-to-goodness" power supply. This transformer is intended for use on the standard 110 volt, 60 cycle house-lighting circuit and can be depended on to give and maintain satisfaction.

It has three separate windings—one for 525 volts and two 8-volt windings for the filament of the Rectifier and power tubes. The windings are enclosed in a strong metal case, provided with mounting feet. There are three primary taps for 110, 118 and 125 volts, connected to a three point snap switch, and a six-foot lamp cord and plug attached to the primary is standard equipment. The shipping weight is approximately 9 pounds and the price is $18.00 each.

The AmerChoke type 854

This is a scientifically designed impedance or choke coil of general utility, designed primarily for use in filter circuits. As an output impedance for by-passing direct current from the loudspeaker it is both efficient and economical.
Price—$6.00 each

The AmerTran De Luxe Audio Transformer

This new transformer sets an entirely new standard of Audio Amplification. It makes possible a transformer coupled amplifier that excels all other forms of amplifiers. Made in two types for first and second stages.
Price—$10.00 each

AMERICAN TRANSFORMER COMPANY

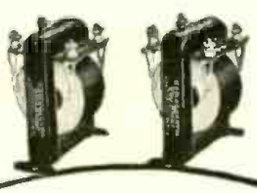
178 Emmet Street, Newark, N. J.

"Transformer builders for over twenty-five years"

AmerTran Products are Sold only at Authorized AmerTran Dealers

Other AmerTran Products:

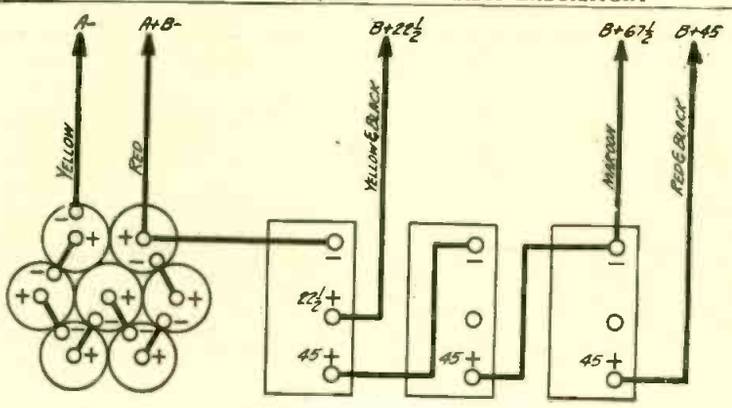
AmerTran Resistor Type 400 — $7.50.
AmerTran Heater Transformer Type H-28 (for A. C. Tubes)—$10.00.



We shall be very glad to send you upon request a copy of our booklet "Improving the Audio Amplifier" together with other interesting and constructional data.

AmerTran Types AF-7 and AF-6

AmerTran Audio Transformers, types AF-7 and AF-6, have been considered for years among the leaders in audio amplification. These popular and efficient models are made in two types—AF-7 (ratio 3½:1)—AF-6 (ratio 5:1) $5.00 each.



THE BATTERY HOOKUP

FIGURE 9: *The connections for the dry-cell batteries that furnish power to the converted receiver.*

dry cells. It offers sufficient grid-bias to prevent distortion without the use of a "C" battery. It permits the use of a high-grade, output tube with its filament operating from the lighting circuit. The inconvenience and first cost of a storage battery and charger are thus avoided.

Changes in the Parts Used

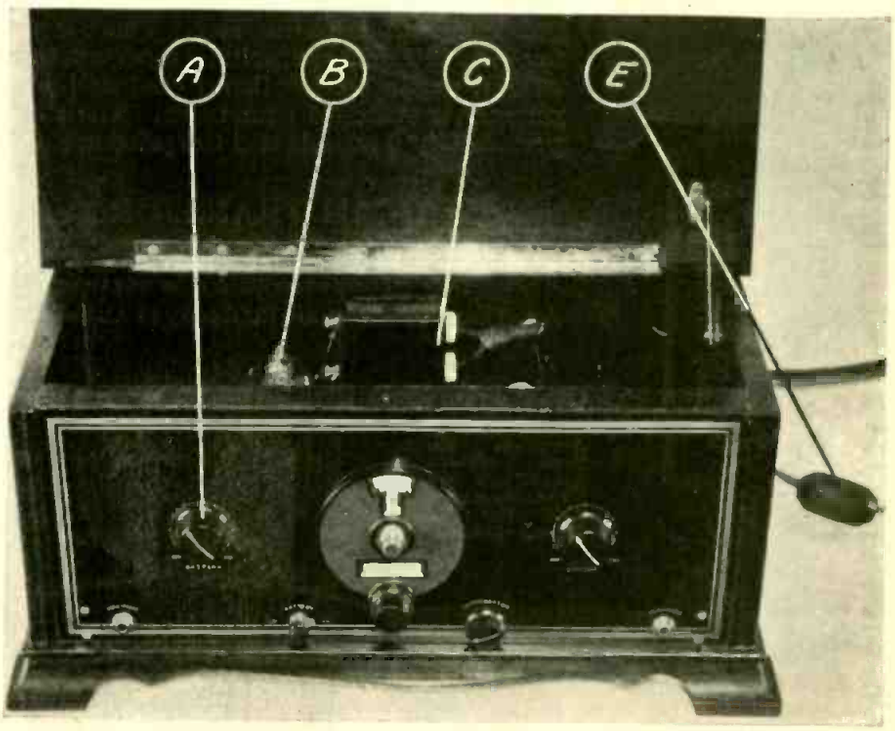
The following parts must be substituted for the parts usually used with the S-C receiver:

For the 6-ohm Yaxley rheostat, substitute a 30-ohm rheostat of the same make. For the last tube socket of the UX type, substitute a socket of the "bayonet" type, commonly used with UV tubes. For the storage battery, substitute seven No. 6 dry cells and a Thordarson "Winner" bell-ringing transformer, together with a Yaxley 400-ohm potentiometer. For the Belden wiring harness substitute 25 ft. of Belden rubber covered hook-up wire and a Belden battery cable. For the four UX-201-a tubes substitute three UX-199 tubes and one WE 216-a tube or any other suitable power tube.

The mounting of the parts of the set is exactly the same as described in the March, 1926, issue of POPULAR RADIO, with the addition that the potentiometer and the bell-ringing transformer may be screwed to the rear wall of the cabinet with wood screws. The wiring of the set is of course not quite as simple as no wiring harness is available for these connections. The diagram may be readily followed and wiring with the flexible, rubber-covered wire is not difficult or arduous. After the wires have been run beneath the sub-panel they may be laced into a neat cable by binding them with white flax package string.

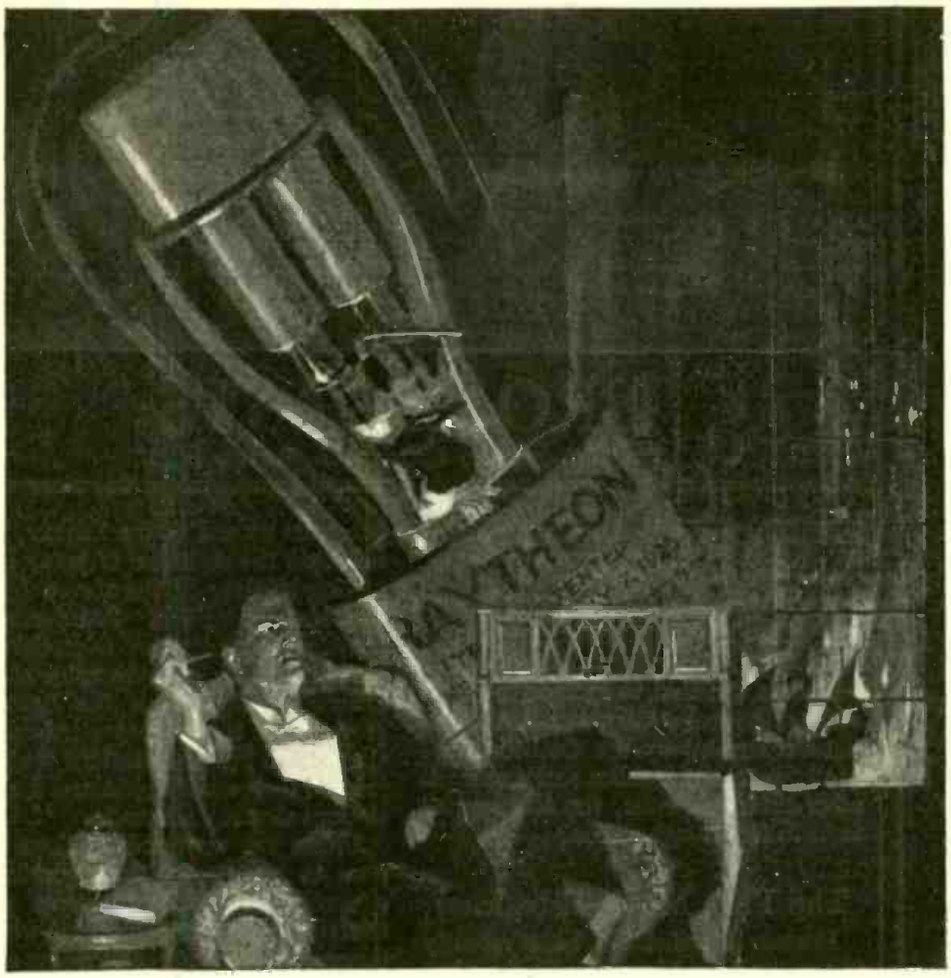
The operation of the set is exactly the same as the original model except that the last tube is lighted by plugging the flexible lamp cord, which is attached to the primary of the bell-ringing transformer, into a lighting socket.

—HERBERT S. SNEAD



A VIEW OF THE SET FROM THE FRONT

FIGURE 10: *The rheostat, A, should be replaced by a 30-ohm rheostat and the power tube, B, should be placed in the last socket. C is a bell-ringing transformer and E is the AC switch.*



Approved by Raytheon

ACME APPARATUS CO.
ALL-AMERICAN RADIO CORPORATION
AMERICAN BOSCH MAGNETO CORPORATION
AMERICAN ELECTRIC CO.
APCO MANUFACTURING CO.
BREMER-TULLY MFG. CO.
ELECTRICAL RESEARCH LABS., INC.
GRIGSBY-GRUNOW-HINDS CO.
KING ELECTRIC MANUFACTURING CO.
KOKOMO ELECTRIC CO.
MAYOLIAN RADIO CORPORATION
THE MODERN ELECTRIC MANUFACTURING CO.
SPARKS-WITHINGTON CO.
THE STERLING MANUFACTURING CO.
J. S. TIMMONS, INC.
VALLEY ELECTRIC CO.
THE WEBSTER CO.
ZENITH RADIO CORPORATION
CORNELL ELECTRIC MANUFACTURING CO.
DONGAN ELECTRIC MANUFACTURING CO
GENERAL RADIO CO.
JEFFERSON ELECTRIC MANUFACTURING CO.
THORDARSON ELECTRIC MANUFACTURING CO.

Then Forget It

A QUEER thing about the selection of a B-Power unit is that once you have it, you want to forget it. What you are after is complete freedom from worry over the source of your Radio B-Power.

Then why go half way? There are two major considerations in the selection of a B-Power unit:—the rectifier tube which is the heart of the unit, and the performance of the complete assembled product.

By selecting a B-Power unit using a Raytheon tube, you have taken care of both considerations. You may then forget it. The Raytheon Rectifier tube is the heart of reliable radio power. It has no filament nor chemicals requiring replacement and adjusting. Its gaseous principle assures even and permanent performance, and it gives full wave rectification with ample voltage for any set.

To assure more than satisfactory performance to the purchaser of any unit that is Raytheon equipped, Raytheon tubes are sold to a manufacturer only when his unit conforms by actual test to the standards set by the Raytheon Laboratory.

On this page is a list of makers of B-Power units whose product has been so approved. If you want unfailing, even power in your set, select one of these units, connect it, *and forget it!*

RAYTHEON MANUFACTURING CO.

Cambridge, Mass.

RAYTHEON

BROADCASTS

CONDUCTED BY CHARLES L. REESE, JR.

Ku Klux Klan to Run Their Own Station

ANOTHER propaganda station threatens to intrude upon the ether; the Ku Klux Klan now plan to erect a powerful station in the East to spread their doctrines. Between the propaganda stations controlled by the Catholics, the Methodists, the Zionites and numerous other sects and cults, the fan appears to be in for a tough season.

* *

The First Movie-Broadcast

BRITISH broadcasters have recently transmitted what is said to be the "first film play ever sent over the radio," from the station at Manchester, England. It was entirely a listeners program, however, for dialogue and sound effects took the place of scenes and the sub-titles were supplanted by descriptions given by the announcer. A background of orchestral music was used to supply the proper movie atmosphere and to give the desired emotional background.

* *

$2,000 for Essays on Radio

Two prizes of $1,000 each, await the successful lawyer-radio-fans who write the best essays on "The Law of Radio Communication" and on "Scientific Property"; that is, the granting of a *quasi-patent* right to the maker of a scientific discovery. The prizes have been offered by the Faculty of Law of Northwestern University and are known as the Linthicum Foundation Prizes. To be eligible for either prize the author must be a member of the bar or a registered law student.

* *

The Need of Radio Laws

THE chaos in radio that Secretary of Commerce Hoover predicted would follow the lifting of all restrictions on the broadcasters, is pretty well on its way as the fall season opens. More than 65 new stations have already been licensed, and listeners-in in the larger cities are finding it more and more difficult to pick up only one station at a time.

More serious, however, than the discomfiture caused to the listener, is the fact that the existence of many broadcasting stations is threatened by this new state of affairs. Broadcasters in America depend upon advertising for their livelihood, and the value of radio advertising lessens as the "good-will program" is turned into a nuisance by the conflict between stations that have jumped their wavelengths and the other stations that are affected.

Unless the wayward stations agree soon to return to the "gentleman's agreement" or unless Congress passes restraining laws, the stations will find themselves without visible means of support and America will be deprived of a goodly proportion of its radio entertainment.

* *

League of Nations Meets While Europe Listens In

ALL Europe listened in this fall to the speeches of their delegates when the speeches made at the opening of the General Assembly of the League of Nations at Geneva were broadcast from the high-power stations at London and Daventry, England. Arrangements were made for relaying the speeches to stations in other countries where listeners were eager to hear the words of their political idols.

* *

A Radio Station that Threatens a Government

MEXICAN police have been baffled for some time past by a secret transmitting station that is broadcasting attacks upon the Government in general and upon President Calles in particular. The police have so far been unable to locate the transmitter of this station, although it is thought to be operated by enemies of the President somewhere near Mexico City.

* *

Farmer Programs

APPROXIMATELY 100 broadcasting stations, covering every section of the country, will broadcast daily, beginning October 4, programs prepared by the United States Department of Agriculture for the benefit of the farmer.

PROBLEMS SOLVED

POPULAR RADIO maintains for the benefit of its readers a Technical Service Bureau and Laboratory, under the personal supervision of Laurence M. Cockaday which will, without charge, answer by personal letter any question, problem or request for information submitted by a subscriber. This service is, however, also available to readers, other than subscribers, at the very nominal rate of $1.00 the inquiry.

In writing please confine your questions to one general subject, writing on one side of the paper only, and enclose a self-addressed and stamped envelope.

It is possible that your individual problem has been covered in an issue of POPULAR RADIO, and so as an aid to you we endeavor to keep a supply of back numbers in stock. The condensed index below gives a few of the subjects that have appeared recently, look this list over and if the information you want is covered, we will be pleased to supply back numbers at 35c. a copy.

August, 1926
—A New Method of Using Harmonics for Determining Frequencies.
—Popular Radio Circuits.
—How to Build the Improved Browning-Drake Receiver.
—How to Pick Out a Loudspeaker.
—How to Get the Most Out of Your "Town and Country" Receiver.
—Three Vacuum Tubes in One.

September, 1926
—How to Build an Impedance-coupled Amplifier.
—A Radiant Crystal Pilot.
—Popular Radio Circuits.
—How to Simplify Your Set with Automatic Filament Controls.
—Inside Information on New Radio Receivers.
—How to Wire Your House for Radio.

October, 1926
—How to Build the New LC-27 Receiver
—The Radio Road Hog
—Popular Radio Circuits
—Sets That Earn Incomes.
—Inside Information on New Radio Receivers.
—Why Signals Fade.

POPULAR RADIO
Department 118
627 W. 43d St., New York

Trans-oceanic Calls Heard

POPULAR RADIO *has just completed arrangements for forwarding to transmitting amateurs in England, France, Germany, Austria, Ireland and Italy all calls heard (QSL) cards that may be addressed to them by American amateurs care of this magazine. These cards will be delivered through local agents in those countries, who have or can obtain knowledge of the present addresses of the foreign amateurs. Plans have also been completed by this magazine for forwarding to transmitting amateurs in this country in turn all QSL cards that may be addressed to them by amateurs from those countries. American amateurs are invited to send their cards to foreign amateurs through this office, which will not only assure safe delivery through the special agencies which are thus provided, but which will publish a monthly list in a "Trans-oceanic Calls Heard" department.*

Address your cards to the foreign amateurs by call numbers and enclose them in envelopes to—

The Calls Heard Editor,
POPULAR RADIO
627 West 43d Street, New York

THE following stations were received and logged at the experimental station of Thomas H. Coggins, 52 Castle St., Armagh, North Ireland, on a Reinartz-0-v-2 receiver. A single wire inverted L antenna 45-feet long with no ground was used.

U-1AAO—*August 24, 1926; signal strength, R6; lot of static.*

U-1CMX—*August 27, 1926; signal strength, R6-7; good note.*

U-1AXA—*August 28, 1926; signal strength, R7; sounded like crystal controlled, very loud.*

U-1CMF—*August 28, 1926; signal strength, R5-6; some QRN.*

U-1CJC—*August 28, 1926; signal strength, R6; easy note to read.*

U-1AYL—*August 28, 1926; signal strength, R6, note very steady.*

The following station was received and logged at the amateur station of J. N. G. Davidson, St. Fintans, Baily, County Dublin, Ireland on a Reinartz receiver with two stages of audio-frequency amplification.

C-8GS—*August 18, 1926; signal strength, R6; slight hum with signals.*

* *

Amateurs Vie for DX Prize

HAMS in the United States, Canada and Hawaii must be at their keys early and late to win the prize for short-wave DX work which has been offered by the *Rand Daily Mail* of Johannesburg, South Africa. The winner of the tests, which are being held under the auspices of the A.R.R.L. and the South African Radio Relay League, will be the amateur who makes the greatest number of two-way contacts on short waves with South African amateurs during the months of September and October. The making of schedules is prohibited. The prize will be a replica of an African springbok, a variety of small antelope.

Changes in the List of Broadcasting Stations in the U.S.

These corrections and additions to the list which was published in the March, 1926, issue of POPULAR RADIO *(together with the changes which have been published in succeeding months) make the list correct as of October 1, 1926. Further changes will be published each month in this magazine.*

STATIONS ADDED

KGBY	Shelby, Nebraska	202.6
KGBZ	York, Nebraska	333.1
KGCA	Decorah, Iowa	280.2
KGCB	Oklahoma, Oklahoma	331.0
KGCG	Newark, Arkansas	234.2
KGCH	Wayne, Nebraska	450.0
KGCI	San Antonio, Texas	239.9
KGCL	Seattle, Washington	230.6
KGCM	San Antonio, Texas	263.0
KGCN	Concordia, Kansas	210.0
KGCR	Brookings, South Dakota	252.0
KPJM	Prescott, Arizona	215.0
KSBA	Kennonwood, Louisiana	312.6
KTUE	Houston, Texas	265.0
WBBC	Brooklyn, New York	249.9
WBRS	Brooklyn, New York	394.0
WCAH	Columbus, Ohio	265.3
WCAZ	Carthage, Illinois	245.8
WCBS	Providence, Rhode Island	242.0
WFCI	Pawtucket, Rhode Island	229.0
WGM	Jeanette, Pennsylvania	372.0
WHFC	Chicago, Illinois	258.5
WKBD	Jersey City, New Jersey	235.0
WKBF	Indianapolis, Indianapolis	244.0
WKBH	La Crosse, Wisconsin	249.9
WKBI	Chicago, Illinois	220.4
WKBJ	St. Petersburg, Florida	280.0
WKBM	Newburgh, New York	215.7
WKBN	Youngstown, Ohio	360.0
WKBL	Monroe, Michigan	252.0
WKBO	Jersey City, New Jersey	309.1
WKBP	Battle Creek, Michigan	265.0
WKDR	Kenosha, Wisconsin	428.3
WRAH	Providenee, Rhode Island	235.0
WWRL	Woodside, New York	258.5

STATIONS DELETED

KFWA	Ogden, Utah	261
WRW	Tarrytown, New York	273
WTAP	Cambridge, Illinois	242

CHANGES IN CALL LETTERS

KFLZ	Anita, Iowa	*change to*	KICK
KTCL	Seattle, Wash.	*change to*	KOMO
WHBJ	Fort Wayne, Ind.	*change to*	WCWK
WKBD	Jersey City, N. J.	*change to*	WAAT

CHANGES IN WAVELENGTHS

KFBC	San Diego, Cal., 215.7	*change to*	380.0
KFBK	Sacramento, Cal., 247.8	*change to*	535.0
KFBU	Laramie, Wyo., 270	*change to*	374.8
KFDY	Brookings, S. D., 273	*change to*	305.9
KFIO	Spokane, Wash., 265.3	*change to*	272.6
KFYF	Oxnard, Cal., 205.4	*change to*	214.2
KGBS	Seattle, Wash., 209.7	*change to*	227.0
KOIL	Council Bluffs, Ia., 277.6	*change to*	305.9
KOWW	WallaWalla, Wash., 266.3,	*change to*	285.0
KQW	San Jose, Cal., 231	*change to*	333.1
WAAW	Omaha, Neb., 277.6	*change to*	384.4
WAPI	Auburn, Ala., 247.8	*change to*	461.3
WBZA	Boston, Mass., 241.8	*change to*	333.1
WCRW	Chicago, Ill., 239.9	*change to*	416.4
WEAN	Providence, R. I., 270.1	*change to*	367.0
WIBX	Utica, N. Y., 205.4	*change to*	234.2
WIL	St. Louis, Mo., 272.6	*change to*	258.0
WJAZ	Mt. Prospect, Ill., 322.4	*change to*	329.5
WKBA	Chicago, Ill., 288.3	*change to*	209.7
WKBB	Joliet, Ill., 214.2	*change to*	282.8
WKBE	Webster, Mass., 231	*change to*	270.1
WODA	Paterson, N. J., 223.7	*change to*	390.9
WQAM	Miami, Fla., 263	*change to*	285.5
WSBC	Chicago, Ill., 209.7	*change to*	288.3
WSBT	South Bend, Ind., 275.1	*change to*	315.0
WWAE	Electric Park, Ill., 241.8	*change to*	384.4

CHANGES IN LOCATIONS

KFWH	Chico, Cal.	*change to*	Eureka, Cal.
KFXJ	Denver, Col.	*change to*	Edgewater, Col.
KOIN	Portland, Ore.	*change to*	Sylvan, Ore.
WPAP	Palisades, N. J.	*change to*	Cliffside, N. J.

* *

1,000 Fans Listen In Through One Set

RADIO reception is very much of a community affair in an army fort out West, where one set is used to serve the needs of one thousand listeners. Each of the 254 homes at the fort is wired to a central receiver, where an operator is kept on service from 6 P.M. until 1 A.M. to tune in the best features that are on the air. In the homes it is necessary only to turn on the speaker.

Outstanding Program Features of the Month

OCTOBER 17th to NOVEMBER 19th

DURING the coming month, October 17th to November 19th, the following regular and special program features are scheduled. This list, which will be augmented monthly as advance information is received, will be published in each issue of this magazine; all broadcast stations are invited to report coming program features of outstanding interest or importance. Reports should reach the Editor of POPULAR RADIO on or before the 23rd of the month preceding.

OCTOBER

(Eastern Standard Time)

16th; *Princeton vs. Navy Football Game*, WJZ, WGY, WRC and WBZ.
17th; *Atwater Kent Hour*, WEAF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WGN, WCCO and KSD).
18th; *Opera "Il Travatore,"* WEAF, 10:00 P. M. (Also broadcast from WCSH, WCCO, WOO, WCAE, WDAS, WSAR, WTIC, WCAP, KSD and WSAI).
18th; *Rolfe's Palais D'Or Orchestra*, WEAF; 11:00 P.M.
19th; *George Olsen's Orchestra*, WJZ; 10:45 P.M.
19th; *Keystoners, WJZ*; 9:00 P.M. (Also broadcast from WRC and WGY).
19th; *Eveready Hour*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO, WTAM, WGN, WSAI and WTAG).
19th; *Auction Bridge Instruction*, WEAF; 10:00 P.M. to 10:30 P.M. (Also broadcast from WEEI, WCSH, WTAG, WSAR, WGR, WCAE, WTAM, WFI, WWS, WSAI, WGN, WOC, WCCO and KSD).
20th; *Eastman Theatre Orchestra*, WHAM; 6:30 P.M. (Also broadcast from WGY).
20th; *Radio Nature League*, WBZ; 8:30 P.M.
20th; *Smith Brothers*, WEAF; 10:00 P.M. to 10:30 P.M.
20th; *Eastman Theatre Orchestra*, WHAM; 6:30 P.M. (Also broadcast from WGY).
21st; *Judge, Jr.*, WJZ; 7:40 P.M.
21st; *Eskimos*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WJAR, WTAG, WFI, WCAE, WSAI, WTAM, WGR, WWJ, WOC, WCCO, KSD and WGN).
21st; *Silvertown Orchestra*, WEAF; 10:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WWJ, WGR, WOC, WCCO, WTAG, KSD, WSAI, WJAR, WGN, WADC and WCSH).
21st; *Royal Typewriter Hour*, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).
22nd; *Happiness Boys*, WEAF; 8:00 P.M.
23rd; *Yale vs. Brown Football Game*, WJZ, WGY, WRC and WBZ.
23rd; *Walter Damrosch*, WEAF; 9.00 P.M. to 10:00 P.M. Piano lectures and New York Philharmonic Orchestra. (Also broadcast from WEEI, WGR, WFI, WCAE, WWJ, WSAI, WTAM, WGN, KFB, WCCO and WDAF).
24th; *Atwater Kent Hour*, WEAF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WGN, WCCO and KSD).
25th; *Rolfe's Palais D'Or Orchestra*, WEAF; 11:00 P.M.
26th; *Auction Bridge Instruction*, WEAF; 10:00 P.M. to 10:30 P.M. (Also broadcast from WEEI, WCSH, WTAG, WSAR, WGR, WCAE, WTAM, WFI, WWS, WASI, WGN, WOC, WCCO and WSK).
26th; *Keystoners*, KSD; 9:00 P.M. (Also broadcast from WRC and WGY).
26th; *George Olsen's Orchestra*, WJZ; 10:45 P.M.
26th; *Eveready Hour*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO, WTAM, WGN, WSAI, and WTAG).
27th; *Smith Brothers*, WEAF; 10:00 to 10:30 P.M.
27th; *Eastman Theatre Orchestra*, WHAM; 6:30 P.M. (Also broadcast from WGY).
27th; *Radio Nature League*, WBZ; 8:30 P.M.
28th; *Eskimos*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WJAR, WTAG, WFI, WCAE, WSAI, WTAM, WGR, WWJ, WOC, WCCO, KSD and WGN).
28th; *Silvertown Orchestra*, WEAF; 10:00 P.M. (Also broadcast from WWJ, WFI, WCAE, WWJ, WGR, WOC, WCCO, WTAG, KSD, WSAI, WJAR, WGN, WCAD and WCSH).
28th; *Judge, Jr.*, WJZ; 7:40 P.M.
28th; *Royal Typewriter Hour*, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).
30th; *Walter Damrosch*, WEAF; 9:00 to 10:00 P.M. Piano lectures and Philharmonic Orchestra. (Also broadcast from WEEI, WGR, WFI, WCAE, WWJ, WSAI, WTAM, WGN, KFB, WCCO and WDAF).
30th; *Navy vs. Michigan Football Game*, WJZ, WGY, WRC and WBZ.

NOVEMBER

1st; *Opera "Aida"*, WEAF; 10:00 P.M. (Also broadcast from WCSH, WCCO, WOO, WCAE, WDAS, WSAR, WTIC, WCAP, KSD and WSAI.)
2nd; *Auction Bridge Instruction*, WEAF; 10:00 P.M. to 10:30 P.M. (Also broadcast from WEEI, WCSH, WTAG, WSAR, WGR, WCAE, WTAM, WFI, WWS, WSAI, WGN, WOC, WCCO and KSD).

3rd; *Smith Brothers*, WEAF; 10:00 P.M. to 10:30 P.M.
5th; *Happiness Boys*, WEAF; 8:00 P.M.
6th; *Walter Damrosch*, WEAF; 9:00 P.M. to 10:00 P.M. Piano lectures and Philharmonic Orchestra. (Also broadcast from WEEI, WGR, WFI, WCAE, WWJ, WSAI, WTAM, WGN, KFB, WCCO and WDAF).
6th; *Harvard vs. Princeton Football Game*, WJZ, WGY, WRC and WBZ.
7th; *Atwater Kent Hour*, WEAF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WGN, WCCO and KSD).
8th; *Rolfe's Palais D'Or Orchestra*, WEAF; 11:00 P.M.
9th; *Auction Bridge Instruction*, WEAF; 10:00 P.M. to 10:30 P.M. (Also from WEEI, WCSH, WTAG, WSAR, WGR, WCAE, WTAM, WFI, WWS, WSAI, WGN, WOC, WCCO and KSD).
9th; *Keystoners*, WJZ; 9:00 P.M. (Also broadcast from WRC and WGY).
9th; *George Olsen's Orchestra*, WJZ; 10:45 P.M.
9th; *Eveready Hour*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO, WTAM, WGN, WSAI and WTAG).
10th; *Smith Brothers*, WEAF; 10:00 P.M. to 10:30 P.M.
10th; *Eastman Theatre Orchestra*, WHAM; 6:30 P.M. (Also broadcast from WGY).
10th; *Radio Nature League*, WBZ; 8:30 P.M.
11th; *Eskimos*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WJAR, WTAG, WFI, WCAE, WSAI, WTAM, WGR, WWJ, WOC, WCCO, KSD, and WGN).
11th; *Silvertown Orchestra*, WEAF; 10:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WWJ, WGR, WOC, WCCO, WTAG, KSD, WSAI, WJAR, WGN, WDAC and WCSH).
11th; *Judge, Jr.*, WJZ; 7:40 P.M.
11th; *Royal Typewriter Hour*, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).
12th; *Happiness Boys*, WEAF; 9:00 P.M.
13th; *Yale vs. Princeton Football Game*, WJZ, WGY, WRC and WBZ.
13th; *Walter Damrosch*, WEAF; 9:00 P.M. to 10:00 P.M. Piano Lectures and Philharmonic Orchestra. (Also broadcast from WEEI, WGR, WFI, WCAE, WWJ, WSAI, WTAM, WGN, KFB, WCCO and WDAF).
14th; *Atwater Kent Hour*, WEAF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WGN, WCCO and KSD).
15th; *Rolfe's Palais D'Or Orchestra*, WEAF; 11:00 P.M.
16th; *Auction Bridge Instruction*, WEAF; 10:00 P.M. to 10:30 P.M. (Also broadcast from WEEI, WCSH, WTAG, WSAR, WGR, WCAE, WTAM, WFI, WWS, WSAI, WGN, WOC, WCCO and KSD).
16th; *Keystoners*, WJZ; 9:00 P.M. (Also broadcast from WRC and WGY).
16th; *George Olsen's Orchestra*, WJZ; 10:45 P.M.
16th; *Eveready Hour*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO, WTAM, WGN, WSAI and WTAG).
17th; *Eastman Theatre Orchestra*, WHAM; 6:30 P.M. (Also broadcast from WGY).
17th; *Radio Nature League*, WBZ; 8:30 P.M.
18th, *Judge, Jr.*, WJZ; 7:40 P.M.
18th; *Royal Typewriter Hour*, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).
18th; *Silvertown Orchestra*, WEAF; 10:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WWJ, WGR, WOC, WCCO, WTAG, KSD, WSAI, WJAR, WGN, WADC and WCSH).
18th; *Eskimos*, WEAF; 9:00 P.M. (Also broadcast from WEEI, WJAR, WTAG, WFI, WTAE, WSAI, WTAM, WGR, WWJ, WOC, WCCO, KSD and WGN).
19th; *Happiness Boys*, WEAF; 8:00 P.M.
20th; *Harvard vs. Yale Football Game*, WJZ, WGY, WRC and WBZ.
25th; *Pennsylvania vs. Cornell Football Game*, WJZ, WGY, WRC and WBZ.

* *

Plans for Curbing Radio "Pirates"

JAIL sentences from eight days to six months for persons who pick up and publish private radio messages were recommended by a conference of news agencies that met recently at Geneva under the auspices of the League of Nations. One of the problems of radio has been to insure the privacy of radio messages. To remedy this situation the news agencies ask that receiving stations be given the right to receive messages only from public broadcasting stations and from experimental stations, and that they be forbidden to pick up messages intended only for the subscribers to the news service.

CROSLEY RADIO
All prices slightly higher west of Rocky Mts.

This little double-circuit 1-tube set has made long distance records.

4-Tubes. Amazing efficiency. Crescendon equipped!

The 4-29 in portable form.

5-tubes, tuned radio frequency. Two stages non-oscillating radio frequency amplification. Crescendon, two stages audio frequency amplification.

5-tube, 1 dial control acuminators, Crescendon, power tube adaptability.

5-tubes. True-cascade amplification: non-oscillating and non-radiating.

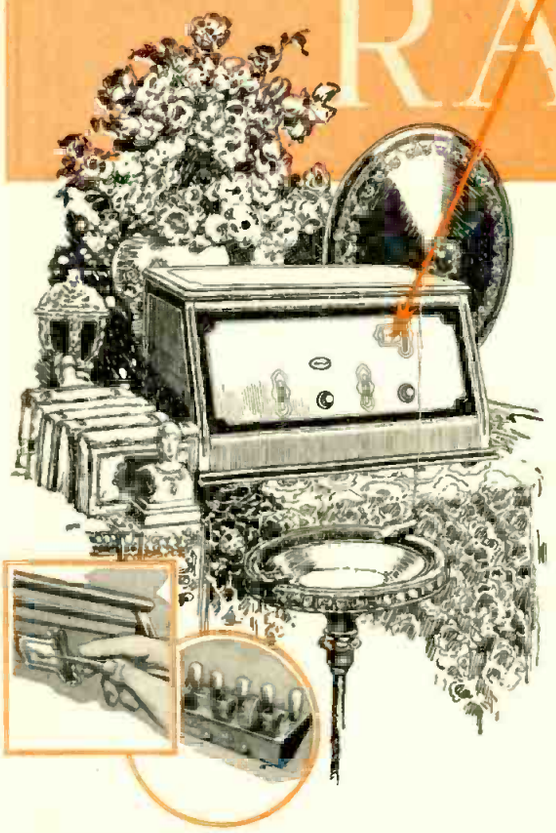
5-tube $50 instrument, Crosley Musicone speaker, ample compartment for batteries—solid mahogany console.

Double drum station selector! Musicone and room for batteries and accessories.

12-inch size, $12.50. Super Musicone, $14.75. Musicone Deluxe, $23.50.

Also beautiful console with room for batteries and accessories as below.

CROSLEY
BETTER—COSTS LESS
RADIO



One-dial control. You find your station, then write its letters on the graphic dial, locating it once and for all, to turn to whenever your fancy dictates.

The new Crosley all-metal shielded chassis not only aids in producing astounding selectivity, but standardizes manufacture and helps make possible the price of $50.

$50

Slightly higher west of the Rockies. Never before, at anywhere near this price, has a radio set possessed all these advantages: 1. Single-dial control with graphic station selector. 2. Metal-shielded chassis, contributing to amazing selectivity and reducing cost. 3. Crescendon control, producing exquisite volume from distant stations. 4. Crosley Acuminators, which sharpen tuning and increase selectivity. 5. Power tube adaptability. 6. Beautiful, solid mahogany cabinet of distinguished design and exquisite two-tone finish.

One-Dial Control!

. . . in this amazing 5-tube set at $50

Already the new 5-tube Crosley set, at $50, has met such a tremendous demand as to confirm the prediction that it will replace thousands upon thousands of sets now in use.

Confronted by high prices, many people who desired to replace their old sets have hitherto hesitated to do so. Now . . . in the new Crosley "5-50" . . . they find the features and qualities they desire, formerly exclusive to very high-priced sets . . . available at small investment.

The incomparable joys of Single-Dial Control! Uncanny selectivity, resulting from its metal-shielded chassis and the surpassing efficiency of the Crosley circuit's advanced design! Exquisite volume, thanks to the matchless Crescendon! Crosley Acuminators, power tube adaptability . . . all the attributes of radio at its best . . . for $50!

In all the Crosley line no instrument represents a greater triumph than this wonderful 5-tube set. Examine the line in full, as illustrated in the marginal column at the left . . . each item a victory for *mass production* in reducing radio prices. Then see the Crosley line at Crosley dealers . . . including the new "5-50" . . . now on display!

See it . . . hear it. View the refreshing beauty of its solid mahogany cabinet. Operate it yourself. Watch the stations, written in on the graphic dial, parade before you and usher in their programs with unerring accuracy. Sharpen the selection with the Crosley Acuminators. Release inspiring volume by means of the Crescendon.

Know what heights . . . in tone, volume, selectivity and sensitivity . . . radio of moderate price has reached!

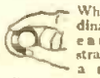
THE CROSLEY RADIO CORPORATION, CINCINNATI—POWEL CROSLEY, Jr., President

Crosley manufactures radio receiving sets, which are licensed under Armstrong U. S. Patent No. 1,113,149 or under patent applications of Radio Frequency Laboratories, Inc., and other patents issued and pending. Owning and operating station W L W, first remote control super-power station in America. All prices without accessories.

For Catalogue write Dept. 16

CROSLEY FEATURES

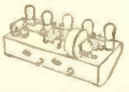
THE "CRESCENDON"



When, on ordinary radios, ears must strain to catch a station miles away, a turn of the Crescendon on Crosley radios instantly swells reception to room-filling volume.

An exclusive Crosley feature.

ALL-METAL SHIELDED CHASSIS



This truly great radio achievement, found in several Crosley sets, furnishes a substantial frame for mounting elements, produces excellent alignment of condensers, shields the units from each other, prevents interstage, improves the stability of the circuit, increases selectivity and saves costs by standardizing this phase of manufacture.

THE SINGLE-DIAL STATION SELECTOR

Nothing in radio equals the joy or the convenience of single dial control. Crosley single drum control enables you to find the stations sought without log book or "tuning."

THE "ACUMINATORS"

Crosley Acuminators provide sharp tuning where reception spreads broadly over dial, easily tune out local and bring in far stations. Ordinarily, once adjusted and they need not be touched again.

USE OF POWER TUBE

Power tube adaptability marks the Crosley "5-50," "5-75" and "RFL" sets. This feature typifies Crosley provision for best radio reception at moderate cost.

QUALITY AND BEAUTY IN CABINETS AND CONSOLES

PRESS OF WILLIAM GREEN, NEW YORK

From "Consort" to Symphony —from Radio to Thorola Art

The first known representation of an Orchestra dates from about the year 1000 A. D.

The first crude orchestras were described as mere "consorts of flutes and viols". Compare this with the limitless tone effects of the modern symphony orchestra. A great advancement of course. Yet we truly believe you are bound to discover just such advancement in Thorola radio.

Thorola clearly marks the end of those days when the scientific wonder of radio could excuse artistic compromise. The flawless reception of pure, unblemished music and distinct, natural speech is the greater wonder of Thorola instruments.

Relentlessly all the old radio "disturbances" have been downed. As the pioneer American builders of long-distance acoustic apparatus we were ideally equipped for the task. We were able to originate Thorola Low-Loss Doughnut Coils making selectivity *positive*—concentrating full power on the wanted station only—and eliminating internal interference and circuit confusion, so that the remaining difficulties revealed themselves and could be methodically conquered.

We also created Thorola Golden Tone transformers, balanced and sensitive to a degree never before considered commercially feasible. It was one more example of the attainments to be expected from an establishment which was one huge acoustics laboratory long before radio began!

And we already had the loud speakers whose brilliant clarity and fidelity, at any volume, admittedly improved all receiver performance.

Yet all of our highest technical achievements—so far ahead scientifically—should not mean as much as your ear in selecting radio! Unless you go and hear 1927 Thorola models you run the risk of owning radio that is already outdated. Whatever style you desire—console, cabinet, cone speaker, or horn speaker—the Thorola representative has it. He welcomes the most critical consideration. He will show you the first radio receivers with provable upkeep economy!

MODEL 9, CONE SPEAKER $20

With its Dual Range diaphragm, the Thorola Cone Speaker is the first of its type to cover the entire range of reproduction without compromise at either the high or the low end. Never has a speaker of this *style* had tone of this *character*. Luxuriously finished in Walnut and Old Gold, with Carved Ornamentation, this speaker delights the eye as well as the ear.

MODEL 4, HORN SPEAKER $25

The Controlled Mica Diaphragm of this speaker, with its exclusive Separix, brought out the artistic possibilities of radio, by reproducing even the musical overtones. Always known as perhaps the steadiest seller in radio history, Thorola 4 deservedly retains its rank—*in appearance, too!* The beauteous Bakelite Bell, smart Golden Throat Band, and Classic Base adorn any room.

THOROLA, JR. SPEAKER $15

Matchless Thorola tone quality, and graceful appearance are obtainable in a horn speaker of more moderate size, the Thorola Junior. It improves the operation of any receiver in a way which is out of all proportion to the price.

REICHMANN COMPANY, Chicago, Member R.M.A.

Thorola

(Western and Canadian prices slightly higher)

MODEL 57 CABINET . . . $60

Thorola radio at such a price seems unbelievable. Antique, Highlight Walnut finish and charming proportions distinguish this cabinet. It gives you the genuine Thorola 5-tube circuit, whose many special features insure performance which cannot be measured by any previous standards of power or hook-up.

MODEL 59 DE LUXE CONSOLE (*Illustrated*) $185

A receiver with two speakers—the Thorola Cone and the Thorola Horn type! Perfect reproduction facilities for every radio impulse. Of course the 5-tube Thorola Circuit brings them all in clearly, with its exclusive Doughnut Coils, Golden Tone Transformers, Duo-Dial Control, Power Tube, and other great advancements. Their advantages make it literally impossible to judge Thorola receivers by the old formula of power-ratings. In fact, Thorola developments mean more power, and more operating economy as well!

The cabinet, in Antique, Highlighted Walnut, is a furniture masterpiece: comparing only with the rich artistry of Thorola reception.

MODEL 58 $125

Full Thorola performance and economy characteristics are offered at a moderate price in Model 58. The Console is of Antique Highlighted Walnut, as in the most luxurious Thorola models. All the Thorola circuit and speaker features assure unsurpassed radio.