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April 21 1923

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52 Numbers

RADIO

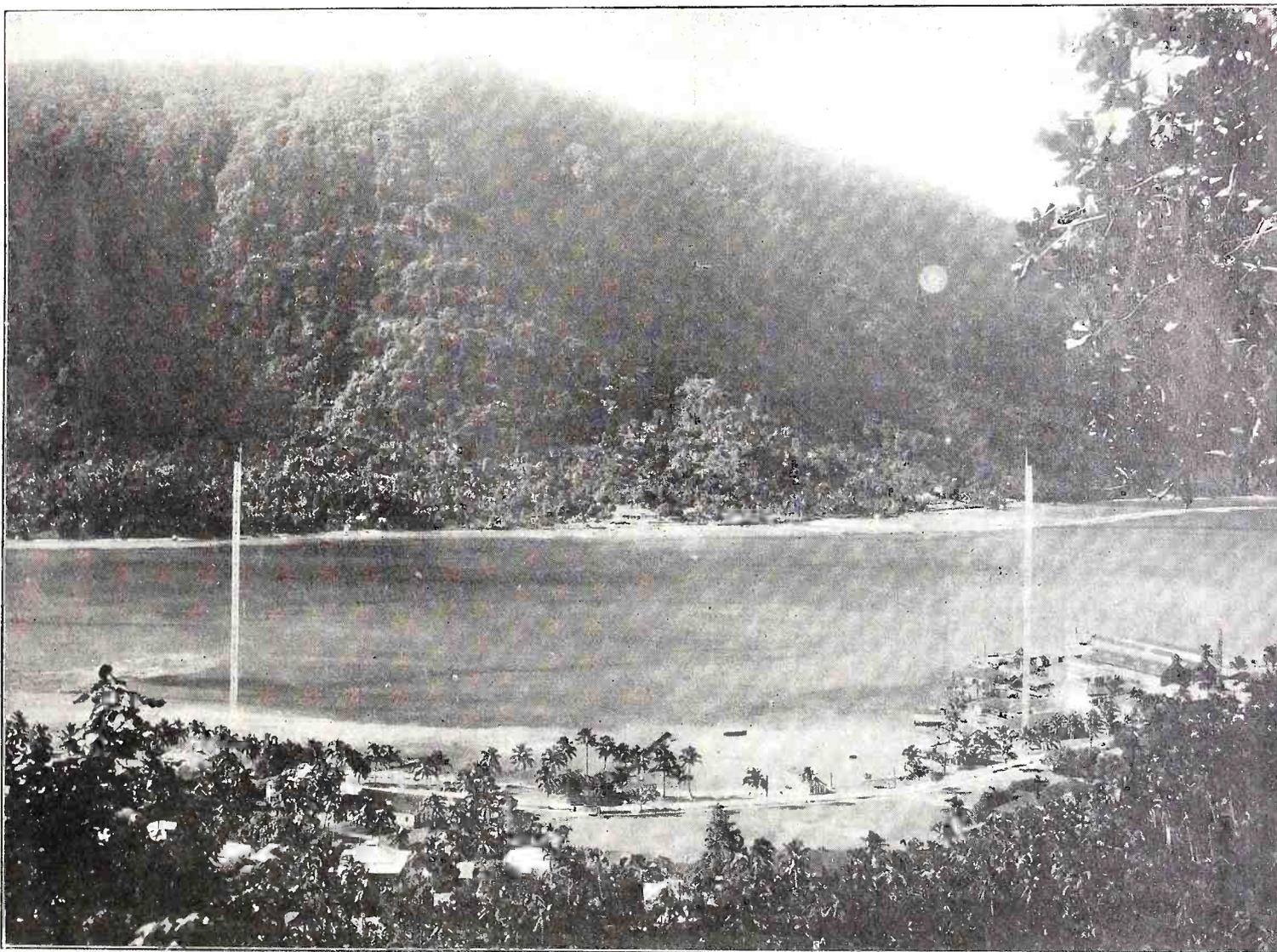
Title Reg. U. S. Pat. Off.

WORLD

ILLUSTRATED

WEEKLY

BEAUTIFUL LOCATION OF OUR SAMOAN RADIO STATION



(C. Underwood & Underwood)

An American radio station in the beautiful South Sea islands. This unusual picture shows the United States Government Wireless Station at Pago Pago, on the American-owned island of Tutuila in the Samoan group. It is an important link in the Navy chain of radio stations.

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\$6.50	1 1/2 V Tube for dry cells	\$5.25
\$5.00	Detector Tube, 6 V	2.95
\$6.50	Amplifier Tube, 6 V	3.50
	Welsh Peanut Tube, 4 to 6 volts, with socket	2.40
All above tubes fully guaranteed		
	Thorardson Amp. Transformers	3.95
\$1.50	22 1/2 V "B" Battery	.95
\$4.00	45 V "B" Battery	2.45
	Federal or Brandes 2200 ohm Headsets	6.50
	Dictograph 3000 ohm Headsets	6.98
	Murdock 2000 or Gilbert 2200 ohm Headsets	4.49
\$4.50	Acme Amp. Transformers	4.25
	Sockets and Rheostats	.69
	1.85; 7x10, \$1.10; 7x12, \$1.50; 7x14, \$1.85; 7x18	2.00
	23 Plate Condensers	1.59
	43 Plate Condensers	2.69

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This circuit is exceptionally quiet in operation. Works on small or indoor aerial. Very selective. Brings in long distance.

1 Reinartz Coil	\$2.00
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1 Grid Condenser	.15
8 Binding Posts	.32
1 Bakelite Panel	2.50
5 Lengths Bus Wire	.20
1 Audion Tube UV 200	3.95
1 2 1/2 V. B. Battery	.98
1 6 V. 60 Amp. Storage Battery	9.50
1 Cabinet, Mahogany Finish	3.75

Total **\$28.83**

Complete Parts for Flewelling,
Kaufman or Reflex Circuit

45 V. "B" Batteries (each)	\$2.25
U. V. 200 Tubes	3.95
22 1/2 Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	6.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95

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GRAND RADIO CO.
1789 Third Ave. 1714 Second Ave.
NEW YORK CITY

Radio Engineer for Bureau of Standards

DR. AUGUST HUND, of Berkeley, Cal., has been appointed electrical engineer in the Radio Section of the Bureau of Standards, Department of Commerce. Dr. Hund is a Doctor of Engineering, having been graduated from the Technische Hochschule, Karlsruhe, in 1913. He served two years under Dr. Steinmetz in the General Electric Company and is author of a technical book on frequency measurements. For the past several years he has been doing graduate work at the University of California.

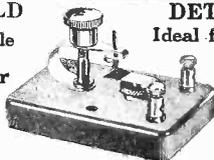
Adams County Radio Club

A RADIO club under the name of Adams County Radio Club has been organized in Gettysburg, Pa. The following officers were elected: President, Earl G. Ports, operator of Station 3BHY, Gettysburg College; vice-president, G. E. Slaybaugh; secretary-treasurer, H. W. Baker, operator of Station 3CBJ, Gettysburg, Pa. The club will hold weekly meetings in the physics lecture room of Gettysburg College. Papers by various members will be read, and code instruction given. Study and design of radio apparatus and other problems of importance in radio work will be among the activities of the organization. The two radio telephone stations operated by members of the club—3BHY, with 50 watts power, and 3CBJ, with 10 watts power—will be used to further club organization and interest. The club would be pleased to have reports from those hearing these stations.

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Catwhisker

\$1.50



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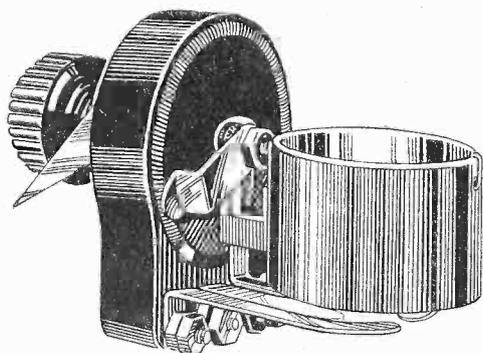
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A device for which amateurs and professionals have long been waiting.

A combination V. T. Socket and Rheostat for panel mounting which entirely eliminates separate leads between socket and rheostat and at the same time provides a panel-mounted socket without the use of additional brackets, thus materially simplifying the installation and hook-up.

Cat. No.	Type	Ohms	List Each
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2008	A-2	5 1/4" Shaft without Dial	2.00

Unless otherwise specified, Type A-1 will be supplied.

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REINARTZ CIRCUIT

EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 16 switch points and nuts, 4 switch stops and nuts, 2-3/4" dials, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, necessary bus bar wire, 1 high grade Radion panel and diagram and complete instructions.....**\$10.00**

FLEWELLING CIRCUIT

EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit.....**\$11.00**

CONDENSERS

3 Plate Variable; value, \$1.75	\$1.05
13 Plate Variable; value, \$2.50	1.20
23 Plate Variable; value, \$3.50	1.55
43 Plate Variable; value \$4.50	1.85

13 Plate VERNIER; value, \$5.50	\$3.75
23 Plate VERNIER; value, \$6.00	4.00
43 Plate VERNIER; value, \$6.50	4.25

Reinartz Coils; value, \$2.50..... 1.75

V. T. SOCKETS—Nickel plated sleeve, composition base; value, \$1.00; special at..... .50

Ball Bearing Inductance switch; value, 75c; special at..... .30

Honeycomb Coils, 50 turns, mounted... .95
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Double Coil Mountings 2.45
Triple Coil Mountings 3.35

Audio-Freq. Transformers 2.75

FILAMENT RHEOSTAT — Condensite base; value, \$1.10; special at..... .70
FILAMENT RHEOSTAT with 2 1/2" dial; value, \$1.50; special at..... 85c
Potentiometer with knob; value \$1.75; special at..... 1.00
Potentiometer with 2 1/2" dial; value, \$2.15; special at..... 1.15

BEST QUALITY JACKS, Single circuit; value, 65c; special at..... .30
Double circuit; value, 80c; special at..... .45

VARIOCOUPLER — Celeron condensate and Litz Wire wound secondary; value \$4.50; special..... 3.25

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EXTRA SPECIAL—Telephone 3000 Ohms Headsets; \$9.00 value; reduced to..... 5.50

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RADIO WORLD

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

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Hook-up of the Haus Transmitter

By John Kent

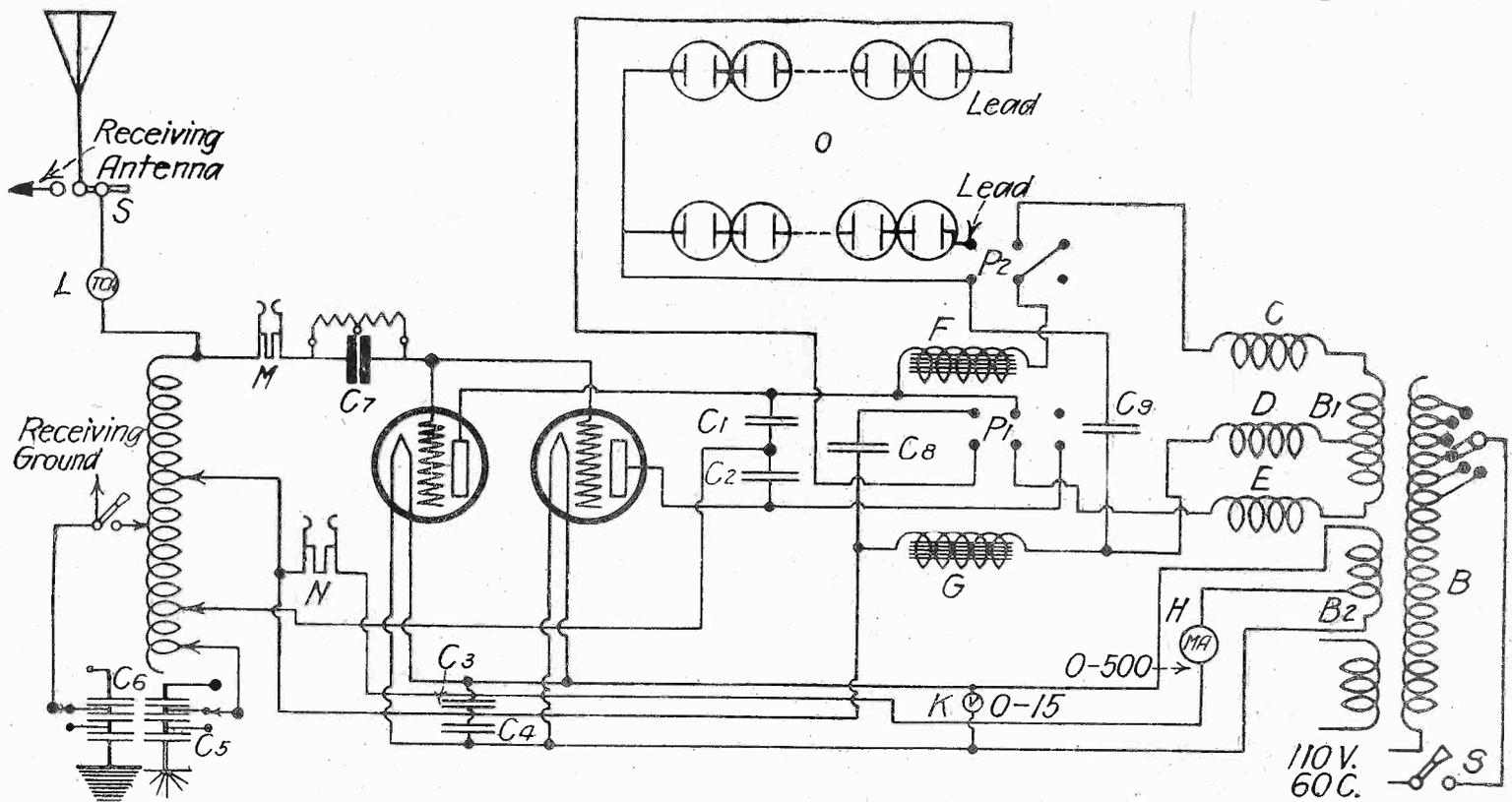
IN response to inquiries from many readers of RADIO WORLD, the hook-up of the transmitter devised by Paul Haus, radio amateur, whose call is 2VK, is published herewith.

As can be seen, the transmitter uses two tubes, getting the current for both the plate and filament through the agency of a combination transformer, which per-

jack N is for the key, when it is necessary to use straight CW.

This transmitter is powerful and at the same time is not difficult either to construct or operate, and should prove a welcome answer to many readers who have written to us to describe a similar transmitter.

For those contemplating the building of such a set,



- C1 and C2, High Voltage Condensers of .002 Mfd.
- C3 and C4, Bypass Condensers, .0005 Mfd.
- C5 and C6, Series Condensers, .0003-4-5 Mfd.
- C7, Grid Condenser, .0005 Mfd.
- C8 and C9, Filter Condensers, 1 Mfd.
- A, Tuner, 33 turns of No. 10 BSC wound on bakelite core, diameter 5 inches.
- B, Transformer (C.W.), 750 Watts.
- C-D-E, 200 D-L or Honeycomb Coils.
- B1, High Voltage winding, 1,500 Volts each side of center.
- B2, Filament Winding, 12 volts terminal.

- F, G, Iron core choke coils of 1½ henries each.
- H, Milliammeter.
- I, Grid Leak, 2,500 Ohms resistance.
- K, Voltmeter 0-15 volts A.C.
- L, Thermo-couple radiation ammeter, range up to 5 amperes.
- M, Jack for chopper or microphone transformer.
- N, Jack for key when CW is used.
- O, Chemical rectifier (Aluminum-Lead with borax solution), 48 jars in bank.
- P1 and P2, Double throw switch (4 pole).
- The tubes used in this set are U. V. 203, 50-watt.

The above references to the diagram make the Haus hook-up easy to understand.

mits Mr. Haus to supply 12 volts for the filament and 1,500 volts to the plate, if he wishes to use that much. By the jack and plug arrangement, described in RADIO WORLD for April 7, 1923, it is permitted to use either a chopper or straight key. The jacks are shown in the diagram at M and N. The jack M is for either the chopper or a microphone, whichever is employed, but which Mr. Haus uses only for ICW with the chopper. The

a look at the carefully worked out cabinet and set, as shown in RADIO WORLD for April 7th, will give the prospective builder some ideas that he can very easily incorporate in his set, such as the method of mounting the tubes, the meters, and the easy throw-over switch from receiving to transmitting.

The hook-up published herewith is sufficiently plain and the caption describes the different parts,

A Novel Double-Control, Back-Panel Switch

By Arthur G. Shirt

THERE are a number of interesting features about the novel switch described and illustrated in this article which commend themselves to the amateur looking for the last word in switch construction. The switch is a double-control device, by which not only the number of turns on the primary of the variocoupler may be varied, but also the position those turns occupy on the tube of the primary. The advantage of the duo-control is immeasurable. Many amateurs would not be without it. Although mounted on

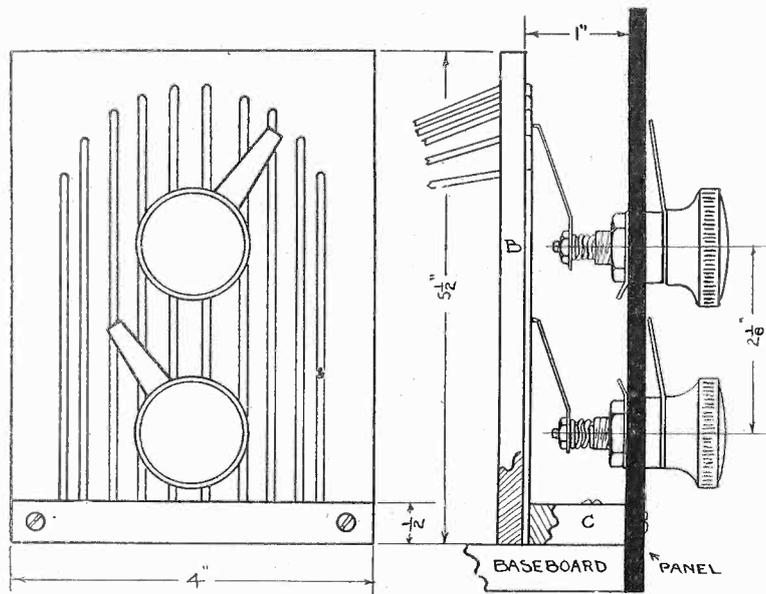


Fig. 1. At the right is shown how the wires are brought out from the coil to the sub-panel to serve in place of taps. At the left is shown how the switch arms are mounted, as well as how to mount the sub-panel.

the baseboard of the cabinet to the rear of the panel, this switch is operated from the face of the panel by two neat knobs, situated to the right or to the left of the dial which controls the rotor of the variocoupler. The switch is easily constructed, having been

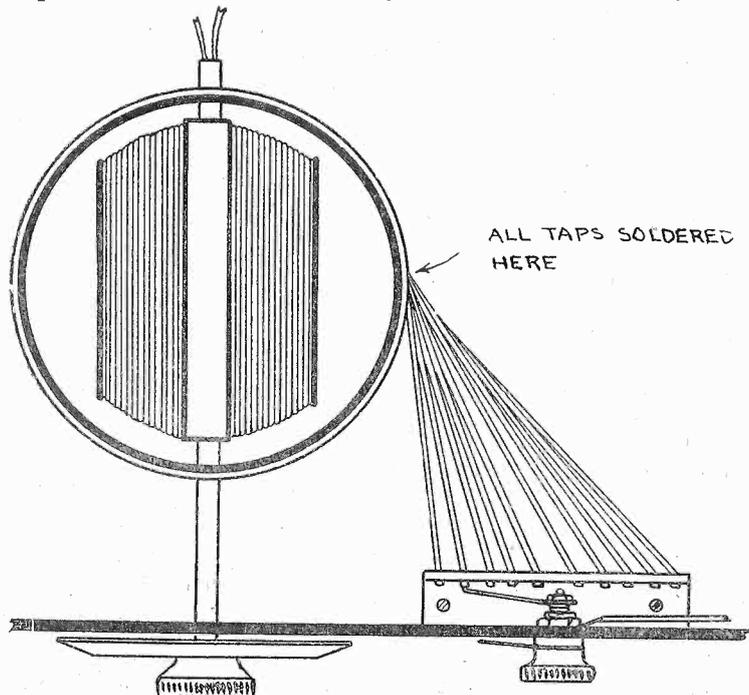


Fig. 2. Showing how the completed coil with taps will look from the top of the cabinet and giving a good idea of how to mount them on your panel.

designed so that its simplicity would appeal to those who cannot, or who haven't the chance to, do skilled work. There is no soldering in the building of the control itself, since the very leads which come from the taps of the primary coil are ingeniously made to serve

as the switchpoints. When completed, this double-control switch is an instrument by itself, which may be moved from place to place in the cabinet without leaving a semicircle of unsightly holes in the panel.

The material needed—that is, for the particular size switch-arms shown in the illustrations—is a piece of hard rubber, composition, fibre, (or hard wood if these first three are not available) four inches wide, 5 1/2 inches long and about 1/4 inch thick. The same material of which the panel is made should serve admirably. This rectangular piece of material is the upright base for the switch. It is marked with the letter B in Fig. 1. A second piece of somewhat thicker material (about 1/2-inch) is cut one inch wide by four inches long. This serves the triple purpose of a space block between the front of the switch base and the back of the panel, of a means by which the switch base is held upright, and of a "clinch" strip which holds the contract wires in place. It is marked C in Fig. 1.

Two switch knobs, such as may be purchased as separate units, will be needed. You will find that most of them are designed along the lines of the ones shown

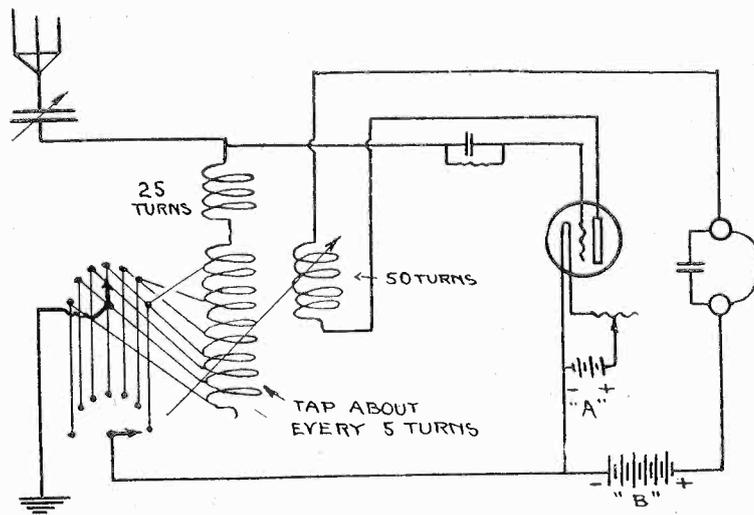


Fig. 3. A hook-up for the double control coupler. A WD-11 works admirably with this circuit, and by the use of the double control primary switch extremely sharp tuning is made possible.

with this article, so that the switch arm may be taken from its "front panel" position and shifted to a place in the rear. A pointer replaces the switch arm, and a semicircular scale is mounted suitably on the panel. With a switch arm about 1 1/2 inches long, the distance between the centers of the two knobs should be 2 1/2 inches or a trifle more. They are mounted in a vertical line, one above the other. This part of the construction is better done first than last, on account of the connection which goes to each switch arm.

The next step is to determine how many taps will come to the switch. The number decided upon should then be spaced off evenly on one edge of the bottom "clinch" strip, leaving a margin on each end of 1/2 inch. With a hacksaw, or a jackknife, groove each measurement on the edge of the strip so that there is a notch for each tap. Make the grooves no deeper than the thickness of the bare copper wire or the square bus bar material used as the switch leads. Drill two holes in the strip by which to bolt it to the upright base, and two others by which to screw it to the baseboard.

Now turn your attention to the rectangular switch base. Lay off a vertical center line up and down the piece. Measure down two inches from the top on this

(Continued on next page)

How to Use a Two Element Vacuum Tube

By Harold B. Turner

EVERYONE who builds his own radio outfit desires to receive over a maximum distance with a minimum expenditure. The writer recently constructed a receiver which is far more sensitive than a crystal outfit and is more satisfactory and reliable in its operation. In fact, the writer's results have been so pleasing that he thought he would let his brother fans know how to do the same thing.

Nowadays everyone wants a vacuum tube set and yet everyone cannot afford to invest in the necessary

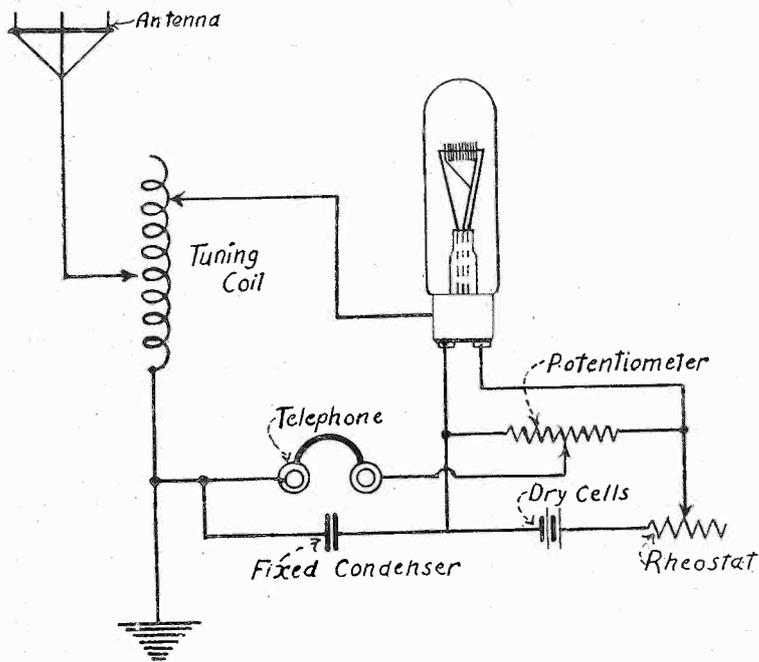


Fig. 1. Hook-up used by Mr. Turner with a Fleming type vacuum tube.

storage battery, "B" battery and the other accessories that go to make up receivers of this type. While shopping around recently, I came across a new Fleming type vacuum tube which I purchased complete with all accessories for \$2.50. This was a two-element tube operating from dry cells. The receiver circuit outlined in the diagram was set up and perfect reception was made possible. Previous to the purchase of this vacuum tube, I was using a crystal receiver. With the vacuum tube I was not only able to pick up stations that I had never heard before, but the quality of the reception was every bit as good as that obtainable with a good crystal set, and there was an entire absence of circuit noises and howling. In fact, one cannot make

a two-element tube howl no matter how hard one tries.

I have had such good results with this vacuum tube that one of my friends asked me to change his crystal set over into a vacuum tube set employing this same type of tube. I did not find it necessary to completely demolish his crystal set to make the necessary changes. In fact, I used all of the instruments of the old crystal set with the exception of the crystal.

The rheostat is carefully adjusted until the signals are loudest. When the rheostat was placed at the proper point, I did not find it necessary to adjust it further and tube retained its same degree of sensitivity for several hours. It is evident that it would not be advisable to operate these tubes without a rheostat as that would allow too much current to pass through the filament from the battery.



Fig. 2. Mr. Turner's two element vacuum tube set assembled.

The advantage of permanent adjustment of this arrangement will appeal strongly to those who have been troubled with crystal detectors. Crystal detectors are fine, but they do get out of adjustment and here is something that gives us just as good quality, greater distance and no trouble in adjustments.

In the way of experimenting I set up a second circuit, using a 200 ohm potentiometer. This allowed me to make the filament negative or positive. By the use of this arrangement the results were found to be a little bit better, but those who cannot afford the addition of the potentiometer can be assured that they will get good results well worth the trouble by using the other circuit.

(Continued from preceding page)

center line, and using the resulting point as a center, describe a circle on the switch base $1\frac{1}{2}$ inches in diameter. Lay off at the bottom of the rectangular piece the same number of points as on the edge of the clinch strip, spaced the same way. Draw lines up from these points, and where the lines cross the upper half of the three-inch circle, there drill the holes for the insertion of the contact wires or bus bars.

It will be seen at this point in the explanation that the number of taps must be spaced off on the edge of the clinch strip within the compass of the particular sized arm on your switch knob. In the case illustrated, the compass is three inches.

When the holes are drilled the base is ready for the insertion of the leads. Preferably the leads should be of that silvered bus bar material which is sold for inside wiring on radio receivers. They may be of No. 7 or No. 9 bare copper wire, in case these bus bars are

not obtainable. As many pieces are needed as there are taps on the coil. The proper length is from ten inches to one foot, according to how far away from the coil the switch is going to be located. For, as already mentioned, the same wire which serves as a switch contact goes directly to its particular turn on the variocoupler, where it is soldered at once to the tap. Fig. 2 illustrates this.

When you are selecting the drill for the holes, pick one that is slightly smaller than the wire or bar used. This difference in size will hold the wires in at the top of the switch base.

Now screw the completed instrument to the base-board just behind the two switch arms, and the double control is finished. Before connecting it up take a glance at Fig. 3, which is a typical application of the double control switch, so as to make sure you grasp the principles on which the control works.

Radio Medical Service for Seamen Proves a Boon

JUST a year ago the U. S. Public Health Service announced that it had completed arrangements to expand the medical aid service to American seamen, with which it had first been charged by Congress a century and a quarter ago, by prescribing by radio for any sailor who might be taken ill at sea and who might apply. Messages for aid were to be forwarded to the Service by the ship's radio via the Radio Corporation of America or the Independent Wireless Telegraph Company.

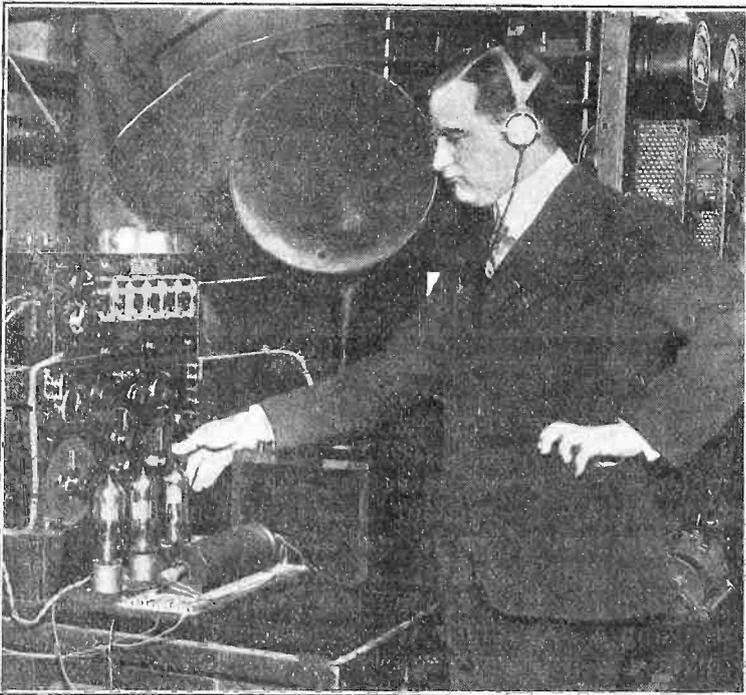
The range of diseases and mishaps for which aid has been invoked during the first year has been amazing. The list includes appendicitis, asthma, cramps, diarrhea, earache, eye injuries, heart disease, hernia, hiccoughs, influenza, infected teeth, malaria, opium poisoning, ptomaine poisoning and swallowing broken glass. Many

of the diagnoses were made on board ship because sailors are resourceful in meeting emergencies. Sometimes interchange of several messages was necessary to obtain clear information as to the cause of the trouble. Cramps among the crew and later more cramps and worse cramps elicited the information that all the sick ate at a single mess. This known, treatment of the sick and means of preventing further cases were definitely outlined.

When the patient grows better and the captain's apprehension is relieved, the case usually drops from observation. Weeks afterward, perhaps, the interested hospital receives direct information as to what occurred later.

The "Ship's Medicine Chest" is a manual issued by the Public Health Service and carried by most ships.

Experimenting with Interference Preventers



(C Underwood and Underwood)

Professor Alfred W. Goldsmith, noted radio expert, and closely associated with numerous improvements that have been made recently, is here shown experimenting with apparatus which when completed, he hopes will eliminate all interference between transmitting stations to a degree that will be ideal. Professor Goldsmith is shown manipulating a receiver that incorporates several of his ideas, but that is at present not for publication. The receiver is the naval type which is much used now.

Public Health Information By Radio

THE end of the first year's existence of the Pioneer Health Information by Radio Service of the World, by which title the radio service of the United States Public Health Service is popularly known, finds it serving, in addition to NAA, Arlington, the Naval Radio Station, at Radio, Virginia, twenty-three co-operating broadcasting stations so situated as to serve practically every portion of the United States. Stations in Arizona, California, Colorado, Kansas, Massachusetts, Nebraska, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, New Mexico, New York, Ohio, Oregon, Pennsylvania, Texas, Utah, Washington, Wyoming and Ontario, Canada, are now co-operating with the Public Health Service in releasing its broadcasts by radio. Plans to extend the service to Alaska and Hawaii are under way.

The co-operating stations are operated by newspapers, universities, electrical supply companies and other commercial organizations. These broadcasts after being released by radio are, furthermore, regularly translated into seventeen different tongues by the Foreign Language Information Service and supplied to the foreign language press both in the United States and in Europe. Correspondence in regard to these broadcasts from as far away as Czecho-Slovakia has reached the Public Health Service.

In the first six months of its existence, directly and indirectly it is estimated that this service reached 27,000,000 people in the United States alone

Radio Equipment of the Navy Dirigible "ZR-1"

THE great Navy dirigible "ZR-1," now being completed at Lakehurst, N. J., with which flights to the polar regions are planned, will be as efficiently and completely equipped with radio as is possible. The following preliminary description of this equipment is from official sources:

The main radio set is located in the control car in a sound proof booth. For transmitting a Navy Type SE-1390 transmitter, using six 50-watt tubes and giving CW and ICW signals is used. This set can also be used in connection with the Type SE-1370 transmitter to give a power amplifier transmitting set for telephone work or CW and ICW signals to give steady wave

lengths and signals despite any swinging of the antenna that may be caused by "bumpy" air. A reliable range of 400 miles is predicted for the transmitter.

A trailing antenna as at present employed by aircraft is to be used.

The power is supplied by a gas engine-driven generator and 24-volt battery, which drive a motor-generator.

Two receivers are provided, one the Type SE-1950 and 1805 detector and five-stage amplifier as used on F-5-L planes now. The second is a long wave receiver using a radio compass for the antenna. Due to the location of this compass and receiver away from the engines and propeller noises good results are predicted.

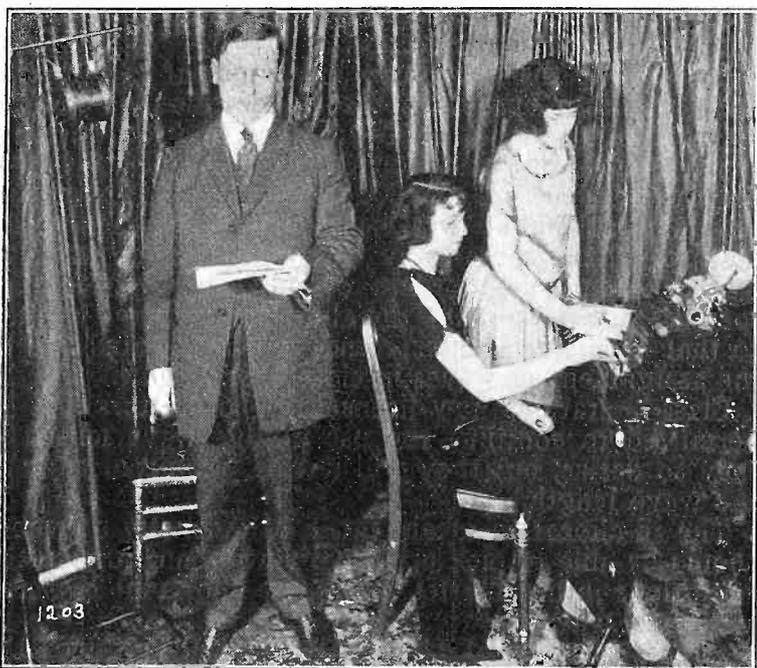
Install Radio in Every American College and School!

Radio World's Plan for Radio School and College Equipment Is Simple and Feasible

THE latent possibilities of radio as a practical, useful and well-nigh universal aid to education are but touched upon in a minor degree in the illustrations herewith depicting the first attempt at radio instruction in a New York City high school.

RADIO WORLD believes and prophesies that the

Radio In The Schools—Sending Instruction To a Distant Class



This picture shows H. W. Leyenberger, a teacher of the Haaren High School, New York City, giving via radio several problems for his class in mathematics to solve in their school room several miles away. Two girl students are checking the results of the problems. The broadcasting was done by Station WJZ at Newark, N. J.

day will come in the not distant future when every building in the great public school system of the United States will be equipped with a radio receiving set for the reception of instruction from central broadcasting stations.

In the larger cities, whose schools are, and will continue to be, crowded beyond capacity and where efficiency will demand every physical aid to instruction, it is not too much to expect that every class room will have its radio receiving set.

The country schools in isolated communities will probably be the first to adopt radio instruction. This will come about because thousands of farmers, whose children must depend upon such schools for their primary education, already are familiar with radio through their ownership of sets by means of which they have been receiving weather and crop reports, market prices and general news. They will not object to a slight increase in the local school tax because the extra money needed for radio equipment will be spent for something with which they are familiar—price and quality, both.

The increase in city school taxes necessary to provide sufficient radio equipment will, of course, be proportionately large, but as far as the individual taxpayer is concerned the added burden may be figured in mills.

Nearly all American universities and colleges can afford to purchase radio equipment—in fact, many of them already are supplied with at least one receiving set. Others can be added as occasion demands.

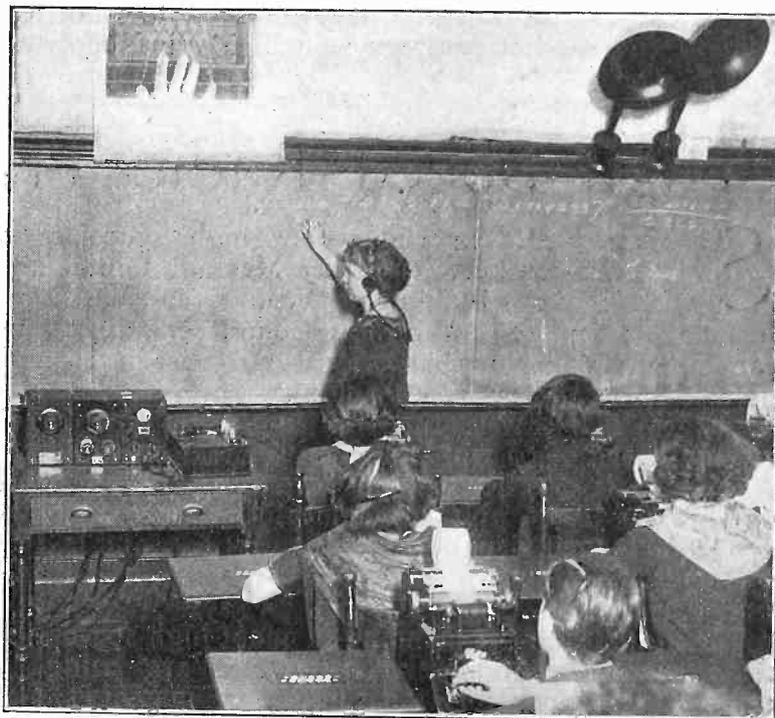
There is no doubt of the success of the idea. The experiment at Haaren High School, New York City, has proven the possibilities, even if that had been necessary.

RADIO WORLD is enthusiastic over the wonderful opportunity here presented to manufacturers and distributors of radio apparatus. An opening is offered such as comes to few young industries. Concerted effort and the consistent following of a well-formed educational plan by which Boards of Education throughout the country may be impelled to favorable action in this important matter are vitally necessary.

RADIO WORLD will assist the industry in every legitimate manner to accomplish the very desirable result of placing a radio set in every public school. If school principals, college presidents or technical instructors will write us their views, we will publish them. The illustrations herewith are almost self-explanatory. They show a class under instruction in adding machine operation, the instructor being located at a central point from which his words might as well be broadcast to a thousand receiving sets as to the one involved in the experiment.

From time to time RADIO WORLD will publish the views of eminent educators on this new phase of radio progress.

Radio In The Schools—Receiving Instruction In a Class Room



Miss Elinore Hastings, of the teaching staff of the Haaren High School, New York City, shown above instructing a class via radio. The questions are transmitted via radio from headquarters of the Board of Education, and the students of the class are then required to solve the problems. Station WJZ, Newark, N. J., is cooperating in these valuable experiments.

Hoover Approves New Wave Distribution—Much Interference Will be Eliminated by May 15

By Carl H. Butman

WASHINGTON, D. C.—Interference, the bugaboo of both radio operators and fans, will be greatly reduced, if not eliminated, by May 15th. On that date will go into effect the assignment of about 35 exclusive wave lengths to some 30 localities, where Class B, the high-powered broadcasting stations are situated. Wave lengths for Class A stations will also be assigned by districts by May 15, it is hoped.

Although Secretary Hoover is understood to have approved of the tentative allocation of the specific wave lengths to broadcasting stations, it is pointed out that each district radio inspector must now confer with the local operators and owners before the wave lengths are definitely assigned. For this reason the list is not yet made public.

All elements of the radio industry and public promised voluntary cooperation in an effort to eliminate interference especially in broadcasting, and officials of the Department of Commerce point out that it is now literally "up to them" to do so.

The tentative distribution of broadcasting waves is based on the recommendations of the Second National Radio Conference and is the first step in the application of the wave band allocations made recently. It will mean that anyone in the United States with a good receiving set will soon be able to pick up each and every high-powered radio broadcasting station and most of his local stations without experiencing the interference which has been prevalent for many months.

Practically every B station will have a national exclusive wave length, between 300 and 345 or 375 and 545, except where there are two or more in a locality, but the waves are assigned to localities rather than stations and will have to be shared in some cities. In four instances—New York, Philadelphia, Los Angeles and San Francisco—two or three additional wave lengths will also be assigned, but they will not be exclusive nationally. Those waves allocated on the Atlantic Coast will be repeated in the Pacific Coast cities. While not exclusive, these additional waves will aid in supplying

additional facilities and will scarcely cause interference as the stations will be about 3,000 miles apart. The difference in time of three hours will also tend to eliminate any interferences. As soon as the nine radio inspectors can arrange with the Class B station owners in their districts, authority to broadcast will be issued on the specified wave lengths and stations will be required to use them only. Where two or more stations exist, a time schedule will be arranged. Until the assignments are made definitely, B stations will continue to operate on 400 meters, and C stations on 360, but by the middle of May it is hoped that all readjustments will be completed and the transfers made. A few radio wave lengths in each district have been reserved because of anticipated interference with other lines of communication or held for new stations.

By May 15 the nine radio inspectors of the department will also undertake the re-allocation of specific waves to old Class A or new Class C stations in their districts now operating on 360 meters. These wave lengths, between 222 and 300 meters, will not be exclusive nationally but will be exclusive in each radio district, giving practically every station a selective wave. Along the borders of adjacent districts, inspectors plan to arrange the allocation of wave lengths so that no material interference will be created due to the assignment of waves in close proximity.

Class C stations now licensed on 360 meters will be permitted to continue the use of this wave length if they so desire, but they will not be permitted to vary the wave length.

The re-allocation means much to fans, any of whom should be able to pick up any B station and any of the A stations in his district due to the allotment of many additional waves.

A great amount of additional work will fall upon the shoulders of the radio inspectors and unless the receiving public, operators and other interests co-operate by staying on wave lengths assigned, the work will be delayed and interferences will not be overcome.

High Speed Radio Transmission in the Army

SUCCESSFUL experiments in high speed radio transmission between Army Message Center and the Munitions Building at Washington, D. C., have just been completed. With new commercial apparatus capable of sending mechanically from a perforated tape up to a speed of 100 words a minute and recording the messages in a saw-toothed ink line on a tape, a reception speed of 65 words a minute has been achieved. After a little practice, Signal Corps experts say, their operators will be able mechanically to copy the received messages visually as well as by ear, and in this way a great saving of time will be made in clearing traffic.

The Signal Corps is planning to adopt high speed systems such as commercial companies are using in transatlantic work for transcontinental messages, and may order new mechanical radio equipment capable of operation at the rate of 200 words a minute. The practical value lies in the fact that when only a few clear hours a day are available, a great number of prepared high speed messages can be sent through in a short

time. The transcribing on message blanks can be done after reception by several operators.

An addition to the Army radio net was made in March when the Fort Bragg, N. C., radio station WZG was put in operation. A new 5KW tube set has replaced the single tube set at Fort McPherson, Atlanta, which was not powerful enough to operate over the Appalachian Range. A new station with high powered tube transmitters will be completed at Fort Leavenworth, Kan., in August, and Fort Douglas, Utah, will also soon have new high-powered equipment.

High speed transmitting and receiving apparatus will also be installed between Washington, Fort Leavenworth, and Fort Douglas, and possibly at Fort Sam Houston, Tex. In good winter weather it is expected that Washington can clear traffic to Fort Douglas, Utah, but in the summer it will probably be necessary to relay through Fort Leavenworth, Kan.

The Signal Corps is now assigning waves lying within the bands recently allocated to the Government by Secretary Hoover's conference.

Coupling As It Affects a Transmitter

By *W. S. Thompson, E.E.*

IN a previous article the author pointed out very briefly the effect of coupling upon the selectivity of a receiving set and it is now his purpose to show by describing a few experiments how coupling will affect a transmitting set.

In order to give the reader a clearer idea of what the data obtained mean, the following description of the apparatus used is given:

As the object was to study the effects of coupling, a simple transmitting set, as shown in Fig. 1, was hooked up using a 100-volt 60-cycle alternator as a source of power. A quenched spark gap was used in order that damping of the primary circuit would be as

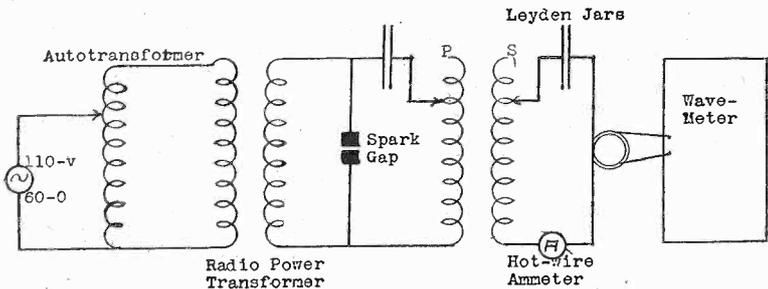


Fig. 1—Hook-up of apparatus used to obtain curves discussed in the accompanying article.

small as possible. The oscillation transformer was made so that the degree of coupling between the primary circuit and the equivalent antenna circuit was variable. The Leyden jars in the secondary circuit are the equivalent of an antenna, so that the circuit is identical with some in use today. In recording data for the curves reproduced, a hot-wire ammeter "A" and a wave-meter were used.

The wave length of the primary circuit was first obtained by using the wave-meter when the set was operated with the antenna circuit open, giving the true

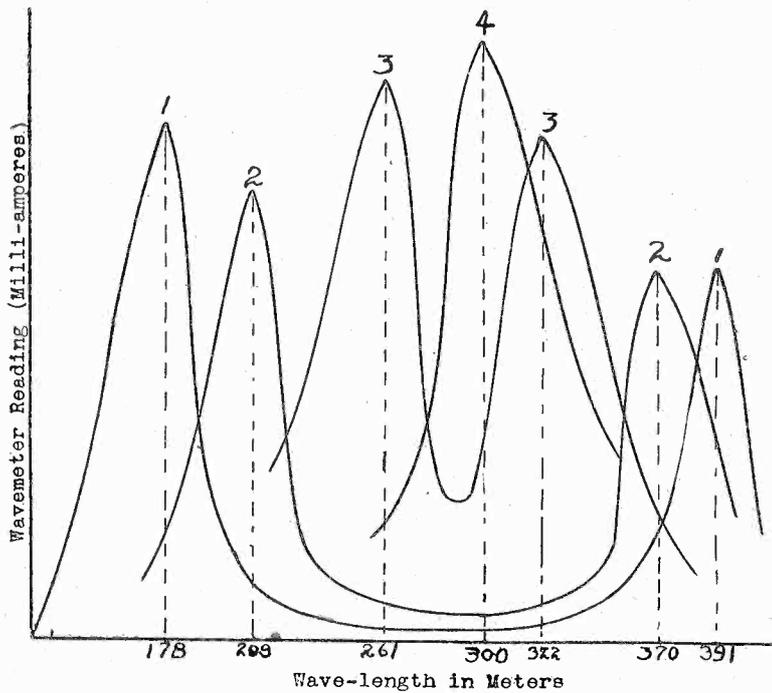


Fig. 2—Energy distribution curve of a transmitter for four degrees of coupling.

wave length of the transmitter. The antenna circuit was then tuned to the primary so that in taking all data, both circuits were tuned to the true wave length of the set.

The first part of this experiment was to obtain data

for the energy distribution curves for four different sets of coupling. The purpose of the energy distribution curves are to show how much energy is being radiated from the antenna at different wave lengths. To get the data necessary, the wave-meter coil was coupled to a few turns of wire made in the secondary circuit. With the primary oscillating the wave-meter condenser was turned, taking a series of readings of the current induced in the wave-meter, and the wave length as shown by the condenser. This was repeated for four different settings of the coupling between the primary and secondary circuits.

Fig. 2 gives the energy distribution curves for the different settings of the coupling transformer as plotted from this data. In plotting these curves, distances along the horizontal axis represent different wave lengths to which the wave-meter was tuned and distances along the vertical axis represent readings of the wave-meter milli-ammeter.

Several very striking points are brought out by these curves. Both circuits of the transmitting set were

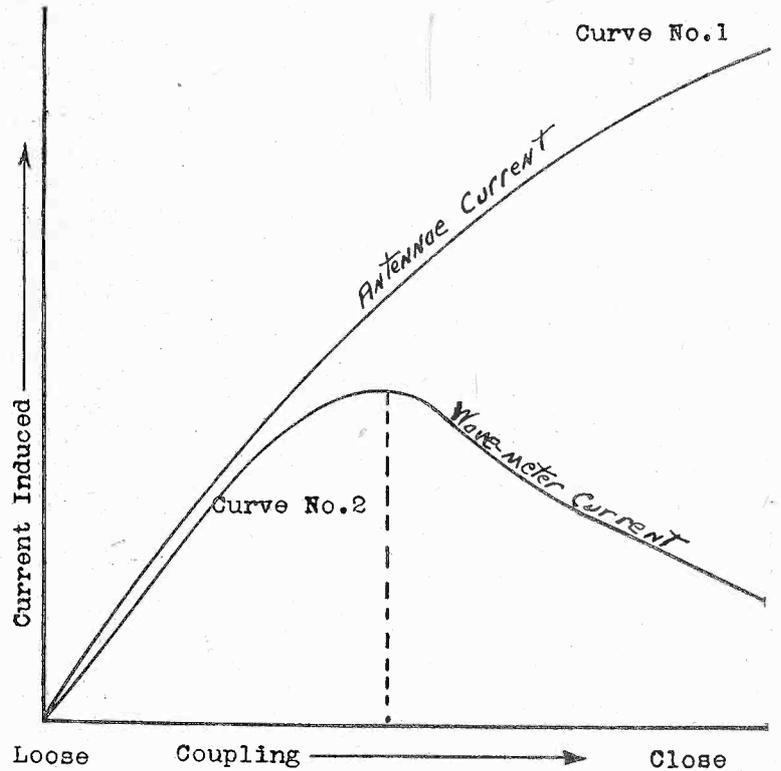


Fig. 3—Curves showing that maximum antenna current does not always mean maximum radiation on the true wave length.

tuned to 300 meters, as shown, but the set radiated maximum energy at 300 meters, only when the antenna circuit was very loosely coupled to the primary. Curves 1, 2 and 3, for which the coupling was close, all show that the antenna was radiating very little energy on 300 meters, but was radiating on two other wave lengths, one below and one above 300 meters. Also, the curves show that the energy radiated on the other wave lengths was less than that radiated on 300 meters when the coupling was loose.

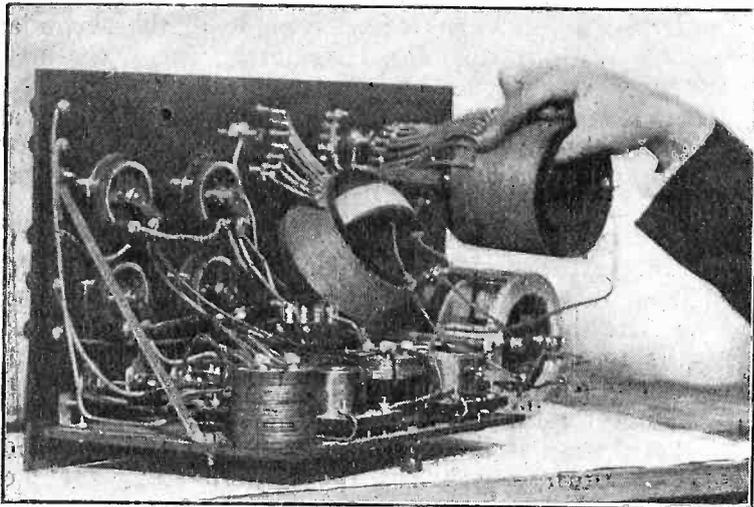
To the amateur who is transmitting these curves ought to show that if he wants the maximum distance from his transmitter and wants a sharp wave, he should have his primary circuit coupled very loosely to his antenna circuit. Whenever a transmitting set is sending with a closely coupled transformer, it is invariably sending on two distinct wave lengths—one so high or

(Continued on next page)

The War Department and the Farmer

THE Secretary of War delivered an address before the American Agricultural Editors' Association, at Washington, D. C., not long ago, of which the following is a partial report:

Rear View of the Kaufman Set



(C. Photonews, N. Y.)

Here is the original Kaufman circuit receiver. It marks somewhat of a departure from regular methods in more ways than one, but the most distinctive thing about it is the "active twenty" coil shown in the upper right of the picture.

In the present period of progress and transformation there is nothing more important for the people of the United States than to gain the frankest, most intimate contact with the departments of their own government. On the other hand, there is nothing which will more certainly

produce the necessary support for the departments than to have their activities fully understood by the public. Our public must always rest socially, economically and politically, upon the solid foundation of the farm.

There is no class more vitally concerned than the agricultural with the welfare of our country as a whole—and there is no matter of greater present importance to our country than that of effectively building up our system of national defense. Our present work has, in many fields, continued earlier contacts, and the Departments of Agriculture, Interior, and War now find themselves in routine conference relative to some of the most urgent problems of agricultural development, such as those relating to water power and irrigation.

Because of the isolation of the farm the development of communication facilities is highly important, not only in transmitting weather reports, but also in broadcasting data on markets and in dispensing music and recreational programs to the living-room of the farmer. The prominent part played by the Signal Corps of the Army in building up our system of wired communication is being carried on fully as effectively in the promotion of radio. The Signal Corps is responsible for the use of the vacuum tube in this country, and also largely for the development of the small radio set now used so generally by the amateur. General Squier's recent invention will serve to bring the radio even more generally into the home of the farmer, with the resulting enrichment of agricultural life. In certain sections, such as the early frontiers and present-day Alaska, the farmer has had no communication with the outside world other than that afforded by the Army signal system. The radio web of the Army is today a reserve system that would enable our country to continue its general contacts even in the face of a complete breakdown of the civil lines. The modern farmer will appreciate what this means. He has learned to look upon communication as a primary need instead of as a luxury.

(Concluded from preceding page)

low that it often interferes with the broadcasting wave lengths. This is an explanation of why code is often picked up around 360 or 400 meters.

In order to show any reader who is sending that he is not always radiating the most energy when his hot-wire ammeter reads maximum, Fig. 3 is given. To get Curves 1 and 2 the coupling was set so that no energy was picked up by the antenna circuit. Then, as the coupling was made closer, readings were taken of the hot-wire ammeter "A" and the milli-ammeter in the wave-meter which was coupled to the antenna circuit. Curve 1 shows the way current, as indicated by the hot-wire ammeter "A," mounted as the coupling was tightened until it was maximum when the circuits were very closely coupled. But the readings of the wave-meter which showed how much energy was being radiated on the true wave length was not maximum when the coupling was very close. The maximum energy was being radiated when the coupling was loose, showing that the maximum reading of the hot-wire ammeter in an antenna circuit does not mean maximum radiation. The explanation of this lies in Fig. 2, which shows that with tight coupling energy is radiated on two wave lengths, neither of which gives a response that can be obtained when all the energy is on one wave length.

The author hopes that this explanation will make some of the readers who are sending, look over their transmitters to see if they are putting all the power of their sets into one wave length. This can very easily

be done if a good wave meter can be procured. The following procedure will be found very satisfactory in obtaining maximum radiation on a given wave length. In order to make the explanation clearer, let it be assumed that a reader wishes to send on a 200-meter wave length. The first step will be to disconnect the ground and the antenna and couple the search coil of the wave-meter to the primary circuit. Then set the wave-meter condenser so that its wave length is 200 meters. Set the primary to oscillating and vary the number of turns on the primary inductance coil until the response in the wave-meter is maximum. This will be shown by a large reading of the milli-ammeter or by loudest response in the phones if the wave-meter has no current reading meter. Following this the antenna and ground should be connected and the secondary coupled very loosely to the primary and with the primary oscillating, vary the number of turns in the secondary until the hot-wire ammeter reads a maximum for that setting of the coupling.

The last and most important part of this adjustment is to make two or three turns in the antenna or ground wire as far away from the set as convenient and then to couple these few turns to the wave-meter still set at 200 meters. By changing the coupling between the antenna and the primary circuits, a point will be found where the response in the wave-meter will be maximum. This will be when the coupling is loose and the station owner may then be sure that the set, as it has been made, is giving maximum radiation on the given wave length.

Broadcasters, What Kind of Talent Do You Want?

Radio Fans, What Kind of Talent Do You Want?

Broadcasters, let us know the type of artist and the kind of material you prefer for your programs.

Radio fans, write and tell us the kind of program you like—whether instrumental, music, singing, comedy, recitations, service talks, etc., etc.

These replies will be published in an early issue of RADIO WORLD and the issue containing the wants and desires of broadcasters and radio fans will be specifically called to the attention of musical, vaudeville, dramatic and other talent in New York and throughout the country.

In this way the whole matter will be linked up so that everybody will know what everybody else requires in the important matter of broadcasting.

Broadcasters and fans, write us today and tell us what you want.

EDITOR, RADIO WORLD, 1493 Broadway, New York

See Next Week's Radio World

IS the radiophone industry about to be revolutionized?

Does the day approach when a radio receiver can be connected to an electric lighting fixture, as an electric fan is now attached?

RADIO WORLD will publish in its next issue a provocative article on a device which may be the entering wedge to radio possibilities now considered merely dreams.

Well Constructed Amateur Set Made by J. C. Gorman



(C. Photonews, N. Y.)

The radiophone station of J. C. Gorman, New York amateur, who has been heard a distance of 1,100 miles on phone and over 1,500 on CW. The transmitter is located on the left of the table, while the receiver is at the right. The receiver employs two steps of radio frequency and detector. Either one or two stages of audio-frequency can be used.

“Secret Radio” as an Aid to Naval Intelligence

DURING the recent cruise of the United States fleet for maneuvers off Panama, Secretary of the Navy Denby and members of the Congressional party with the fleet were intensely interested in an address by Captain Luke McNamee, chief of the Office of Naval Intelligence, on the subject of blunders in the World War due to misinformation supplied by intelligence agents.

Captain McNamee, who was stationed in London during the war on service in the War Planning Section, also dealt with some of the achievements of the British Navy as a result of accurate naval intelligence, and told of the early acquisition and dissemination of information which resulted in prompt measures by the British Navy in connection with the battle of Dogger Bank.

After a review of what had actually been done in the way of naval and military intelligence during the World War, Captain McNamee hinted at the possible use of “secret radio” in the next war—the sending of radio messages secretly in such manner that they might be picked up by the sender’s own fleet, but remain a secret to the enemy.

“I am not speaking of what is desirable theoretically,” said Captain McNamee, to the New York Times correspondent, “but of what was actually done in the World War, and we can be sure that all that is capable of vast improvement today. It may be that the one chief source of information, the radio, will in the next great war be entirely lost to us. Secret radio is well within the possibilities. The advantage of exclusive possession of such apparatus needs no comment.

“For combat information preceding and during a naval action the Commander-in-Chief will be largely at

the mercy of his intelligence service. He may know in a general way the enemy’s strength in the theatre of war and his possible intentions, but he will on the eve of action find the situation becoming hourly more confused by conflicting information—reports of enemy forces sighted by aircraft, by auxiliaries, by neutrals; false reports broadcast by the enemy, some of which will purport to come from his own ships.

“Amid all this confusion there must sit near the Admiral an intelligence staff that can winnow the wheat from the chaff. Expert radio men may know the wave lengths, the tune, the idiosyncracies and touch of the enemy’s operators. This sounds impossible, yet it is the very thing that British operators did in the war. It was useless for the Germans to change call letters or exchange them between ships as long as the operators remained the same. They were spotted at once. The Oldenberg could not palm herself off as the Derflinger. The enemy’s codes must be known, and, if not known, broken. Direction-finders will give the key to the probable source of dispatches.

“In the absence of aircraft a knowledge of the enemy’s radio may enable direction-finders in the fleet to get an intersection on important vessels of the enemy main body that will at least give a clue to his location and course.

“In the German fleet certain ships were detailed to handle the traffic in groups. This facilitated the business of the fleet, but made it easier for the British intelligence service, who by listening only to the traffic ship, could catch all the messages of the group. The grouping for traffic also indicated what ships were together.”

Westinghouse Cuts Out Broadcasting Copyrighted Music

RESPONDING to a demand of the American Society of Composers, Authors and Publishers relative to broadcasting copyrighted music, the Westinghouse Electric and Manufacturing Company announced last week that copyrighted music will no longer be sent out from its stations. The first step was taken when WJZ cut the opera, "Robin Hood," from its program.

In a statement the Westinghouse Company said that after a careful study of the subject it had decided to eliminate from its future programs all copyrighted music the copyright of which is owned or controlled by the American Society of Composers. Except for the elimination of certain copyrighted music, it will continue its broadcasting activities as heretofore.

How Broadcasters Can Beat the Music Publisher

THERE has been a lot of talk in recent weeks regarding the claims made by music publishers and various associations of authors and composers as to the very drastic attitude they intended to take regarding the broadcasting of their operatic, musical comedy or fugitive song numbers. They say they should be paid for the use of their material when broadcast just as they are paid by the phonograph companies.

Let us assume for a moment that we are running a broadcasting station. We receive nothing directly from this service. We do not want to be penalized for broadcasting songs and instrumental pieces which not so long ago the music publishers were dying to have everybody use, and in some cases paid handsome weekly or lump sums to vaudeville singers and other musicians for using. As broadcasters we know we are offering a great public service to radio and the public at large, and feel that the fees demanded should not be paid.

Supposing, however, that a fair argument does not bring the publishers to terms, what then can be done? The answer is simple. Every music publisher is obliged to boost his numbers so that singers will put

them in their repertoire, phonograph companies will record them, and eventually the public will buy them.

Broadcasters can adopt practically the same method. Good song writers—and some of the most popular and successful in the business—can be engaged on a salary or royalty basis and if their output is released through all the other broadcasting stations there would soon be such a demand for these numbers that the music dealers throughout the country would be placing their orders for hundreds of thousands, and, in some cases, millions of copies. These new numbers could also be released through singers, orchestras, etc., and practically the same method of boosting procedure adopted as is now used by the biggest music publishers.

Broadcasters should not worry at all when it comes to a matter of getting up-to-date material. They can make their own. They can popularize it in a more expeditious and thorough way than was ever known in the old days of "song-plugging." All they have to do is to adopt the methods of their friendly enemy and go right into the song and instrumental sheet music business themselves in the manner indicated.

Who will be the first to put over this very practical plan?

Radio Penetrates Bank Vault



(C. International Newsreel)

Officials of the Stratford, Conn., Trust Company demonstrating that steel vaults, concrete casings and electric protective wiring are insufficient to keep radio waves from entering a vault. Under an official test, station WJZ at Newark, N. J., was clearly heard by the bank officials in the vault.

Germans Pay for Broadcasting

IN Germany radio fans, most of whom are bankers and business men, have to pay 500,000 marks annually for their radio broadcast service.

A financial and commercial news service has been arranged for broadcasting by the Express Service Company of Berlin, according to information reaching Washington. This private company, financed by Germans, has just secured partial use of the Koenigswusterhausen radio station from the Government for broadcasting international news received via Nauhen from the United States, Switzerland, Sweden and other countries.

The news is rebroadcast over a radio phone circuit for about 800 subscribers, principally banks and industrial institutions, in about 200 cities. The company plans to handle New York quotations within ten minutes after their dispatch from this country and more rapidly, when possible.

Subscribers rent their receiving sets from the Express Company, paying an annual rental charge of 200,000 marks and an annual service charge of 300,000 marks. Two and a half hour schedules are maintained every morning and evening.

The Radio Primer

*For Thousands of Beginners Who
Are Coming Into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

A LICENSE is necessary to operate a transmitter. What method should be pursued by the layman in order to obtain one?

A knowledge of the code is necessary. In order to learn the code, the simplest method is often the best. To do this, equip yourself with a buzzer, key and battery and practice sending dots, which is accomplished by holding the key down for a very short space of time. Practice this until the wrist is perfectly limber. In sending, the arm should not rest on the table, but be held a short distance above, and the key manipulated by moving the hand and wrist in an up and down motion. When dots can be sent quickly and evenly practice sending dashes, which are three times as long as a dot. Then with the code in front of you, practice sending the letter "A," which is a dot and a dash. Practice until it can be sent easily and distinguishably. Then go to "B," which is a dash and three dots. Do this with the entire code until each letter of the alphabet can easily be sent. Then try to work individual letters, picked up at random. When your wrist is limbered up and will respond easily, go through the code and memorize it in the same way, by sending the entire code, each letter once or twice. If an error is made in a letter, stop and practice the particular letter until it is perfect. Don't try to speed up, but send easily and slowly, making each letter perfect. Speed will come later, with greater familiarity with the code itself.

* * *

What are the "Q" signals?

The Q signals are a list of abbreviations, adopted by the International Radio Convention, at Geneva, Switzerland, to enable transmitting stations to give information and ask questions with the least amount of time and energy. They are three-letter codes which, if a query is sent after them, mean the question; whereas, if they are sent without the query, the answer to the question is meant.

* * *

Is any extended technical knowledge required in order to obtain a license?

The technical requirements necessary are a thorough knowledge of the type of receiver you are using and a schematic diagram for it. A knowledge of the transmitter that is to be used, such as the power required, cut-out of transmitter, the name of the parts, their purpose in the set, the wave length of the antenna used, and a diagram of it are also necessary.

* * *

Into what classes are licenses divided?

Radio licenses are divided into two classes—amateur and commercial. The amateur class is again divided into first, second and third class. The operating license is then sub-divided into first, second and third grade, dependent upon the speed of reception and transmission of signals. The commercial operator's license is divided in the same manner.

* * *

Can a license be obtained when a person is not able to go to the custom house in person?

In case a person desires a license, yet is so situated that he cannot conveniently take a personal examination because of living at a distance from one of the naval stations or custom houses, he is at liberty to write to the nearest one, requesting the papers. By filling them out and swearing to them before a local notary, as to his operation of a transmitter, and the answers to the questions, he will be allowed the privilege of a license if the papers are satisfactorily filled out.

* * *

When a storage cell has been left standing for any length of time, what should be done before it is returned to use?

In case a storage cell has been left any appreciable length of time without charging the following action should be taken if the cell is to be saved: The electrolyte should be poured out, the cell filled with clean distilled water and placed on charge. Then the cell should be discharged for a short time and the distilled

Voice Amplifier Directs Passengers to Boston Elevated Cars



(C. Western Electric Co.)

Mayor James Curley, of Boston, using the microphone of the Western Electric public address system to amplify announcements on the Boston Elevated Railway at Park Street Station.

water removed. Clean new electrolyte should now be placed in the cell. Then the normal charge is put on and the cell slightly overcharged. Examine the bottom of the electrolyte by means of a glass tube in the following manner: Take a clean glass tube, open at both ends, and of sufficient diameter to insert in the end of the cell. Lower it carefully to the bottom of the cell and close the top by putting the finger over it. If when the tube is taken out the sample of the electrolyte withdrawn in the tube is muddy and filled with slime, the whole cell should be thoroughly cleaned.

Radio and the Woman

By Crystal D. Tector

FRIEND HUSBAND and I went over to the new radio apartments in Newark, N. J., the other evening just for a lark, to see if it was fun having anybody else tune in stations for you while you listen. I think it is a good idea, and if we ever decide to move to the city (F. H. decides that every time he has to mow the lawn) I shall insist that we move into an apartment that at least has antennae equipment installed for every apartment. As it is now, the operator in the Newark apartment has to be a diplomat, there are so many different programs going on. It really is hard to tune in the right one. Even if you do like jazz, you have to consider that the people downstairs may like to listen to the lecture on "Elephoyn Eucalyptus—Its Origin and Habitat," and he certainly must exercise care. I think that if I were an operator I would make a canvass of the families and find out how many liked opera and how many liked jazz, and then I could divide the program to suit every body, even the little flappers and their visiting flippers.

* * *

Convincing proof of the value of broadcast religious services was received by WGY, the Schenectady broadcasting station of the General Electric Company from a blind woman living in East Orleans, Mass., near Cape Cod. The paper was creased under each line of writing and it was evident that the creased line was used by the writer to guide her pencil as she wrote the following appreciation: "I am writing you a few lines this beautiful morning to tell you how much I enjoyed your good sermon Sunday afternoon, also the singing of 'Just as I Am,' and others. I heard every word of the sermon and singing, which was fine. I could hear just as plain as though you were in the room.

"What a wonderful invention! A friend and kind neighbor took me to his house to hear the radio. I am an old woman, almost 75 years old. Have been

stone blind over twelve years, have not seen one ray of light. I take care of a crippled husband who is over 80; cannot walk a step alone. I dress and undress him every day and wait on him. Sometimes the way seems dark, but my dear Heavenly Father gives me strength every day, and at night I say I am a day nearer home. I go to church or Sunday School and do enjoy it so much. I gave myself into God's hands over 50 years ago and He has never failed me yet. I always trust Him. He knows what is best for me. Pardon me for writing, but I did want to thank you for that service! May God bless you, is the prayer of your friend.

"P. S.—It is one of the most wonderful of all inventions to know that I can sit here in an easy chair way down on old Cape Cod and hear such lovely sermons and singing. God bless the man that invented it. I hope to hear you again some time."

* * *

'Member some time ago, I told everybody about my little friend up in the North Woods who appreciated radio so much? Well, I just received a letter, telling us that her father had "taken on" as a guide to a party of hunters who were spending the spring up there, and had brought along little receiving sets which could be carried by each man, and that they installed a small transmitter "right in our cabin" and that the man left in charge taught her the code. She says: "When the party broke up, you can imagine our surprise when the host of the party told them to leave the transmitter there and also one of the small receivers, so that I could keep in touch with daddy. Well, I am going to write for a license right away, so that I can use it." Now there is a novel idea for you Nimrods when you go camping this summer. Take along your receivers and make up small low power battery operated transmitters, and you'll never get lost.

Radiograms

Communication by means of radio telephony has been established between Sao Paulo and Rio de Janeiro, Brazil.

* * *

Plans are being discussed by city officials to institute wireless concerts on the municipal passenger boats of Paris, France.

* * *

Station WGR, of the Federal Telephone & Telegraph Company, will be moved to the new Hotel Statler, Buffalo, N. Y., now nearing completion.

* * *

Radio broadcasting from the Brazilian Centennial Exposition at Rio de Janeiro was heard last week by one of the United States Government stations at Honolulu, 8,000 miles away, establishing a new distance record.

* * *

An 11 per cent. wage raise for 150,000 employees of the United States Steel Corporation was ordered by radio last week by Judge Elbert H. Gary, chairman of the Board, who was at sea on his return from a Mediterranean trip.

* * *

Clarence M. Jones, composer of the popular "Trot Along," has just made a record of this number at the Rodeheaver Studio, Chicago. It is reported that several record companies are already bidding for the master record, so an early release of this number is expected.

* * *

A request to the Mayor of New York City for the installation of radio receiving apparatus on each of the Staten Island ferryboats to enable the passengers to enjoy the program broadcast on their half-hour trips to and from Staten Island has been made by a Staten Island schoolboy.

A musical concert at a radio broadcasting station in Boston was halted one evening last week while the announcer told of the death of a boy, run over by an automobile, in the hope that the news might reach his father aboard a fuel steamer in Chesapeake Bay.

* * *

Alan Edwards, who devotes his time to electricity and wireless when he is not playing the role of the rich young man in "The Gingham Girl," at the Earl Carroll Theatre, New York City, has just been granted a patent for a new portable radio outfit for which he has already received many orders.

* * *

WHAZ, Rensselaer Polytechnic Institute, Troy, N. Y., is claimed to be the most efficient and far-reaching station in any educational institution in this country, and its range extends from coast to coast, from Alaska to Panama, the Pacific islands and West Indies, according to reports direct from receivers.

* * *

Charles L. Eidlitz, head of Charles L. Eidlitz & Co., electrical manufacturers and contractors, New York City, has been appointed High Commissioner over two associations of electrical contractors comprising 300 members in Manhattan, Brooklyn and Queens, doing an annual business of between \$40,000,000 and \$60,000,000. Mr. Eidlitz, who entered upon his new activities last week, will have authority to reorganize local contracting methods. He will have nothing to do with labor.

* * *

When you step into one of the gorgeously appointed limousine-body airplanes being prepared by the Laird Airplane Company for passenger service between Kansas City and Wichita, Kansas, you will see a complete radio receiving set which has been installed for your pleasure and entertainment. This radio receiver is the Crosley Model VI, which, under favorable weather conditions, will permit you to listen to the music being broadcast by the large radio stations throughout the United States.

Answers to Readers of Radio World

I CONSTRUCTED the Flewelling described in RADIO WORLD for February 24, and, while it worked fine on local stations, it does not bring in the DX stations as clear and loud as I would like. I am using the following apparatus: Freshman grid leaks and condensers, Bradleystat and honeycomb coils. The set whistles very loud when I try to bring them in. A WD-11 is used, with $67\frac{1}{2}$ volts on the plate. Would a WD-11 function with a single-circuit receiver using the same apparatus?—Harry E. Haldeman, care of Keystone Fruit Co., Cincinnati, Ohio.

We would advise the following: If possible use a 201 U. V. with this set, as it has been found that it will function better than the WD-11 because of the increased plate surface and greater spacing between the elements. In order to decrease the whistle (it cannot be entirely eliminated without seriously impairing the circuit's work) you will have to vary your grid leak, both in the grid circuit and also in the filament condenser bank. This whistle can be brought to such a high pitch that it is almost indistinguishable to the human ear, and at that point it is very weak. Incidentally, this is the point at which the circuit works best, and the distant stations will pound in. The apparatus you are using can be employed for a single-circuit set, using the 50 as the tickler and the 75 as the primary coil.

* * *

I constructed the improved WD-11 receiver illustrated by C. White, using the apparatus mentioned, and get local work very fine, but with a lot of whistling and hissing. I have the rotor of the condenser C1 connected to aerial and stator to the grid. The condenser C2 has the rotor connected to grid and stator to the plate lead. Is this correct? Will it be practical to use one or two steps of A. F. amplification with this or any standard hook-up?—C. J. Wehmayer, 394 Penrose Street, St. Louis, Mo.

The condenser C1 should be connected between the antenna and the beginning of the first or primary coil of the tuner. The second condenser should be connected across the near ends of both coils. It should not make much difference in a single circuit which side of the condenser is connected. Would advise the use of a potentiometer in the filament-plate battery lead. Try connecting the grid leak between the grid side of the condenser to the minus side of the filament circuit. Try increasing the capacity of the grid condenser by placing another fixed (small size—.00025 mfd.) condenser in parallel with the grid condenser you are now using. If you desire to increase the strength of the received signals it is perfectly advisable to incorporate one or two steps of audio-frequency amplification. Audio-frequency, as you probably understand, will only allow you to amplify signals that you can receive on detector alone.

* * *

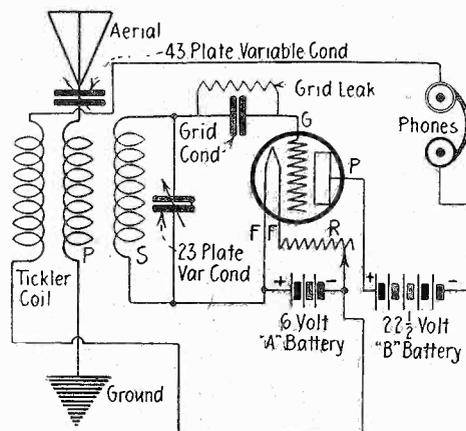
Kindly give me instructions for the construction of the transformers used in the Hazeltine neutrodyne receivers. What is the capacity of the neutralizing condensers used? Where can blueprints for the construction of such a set be obtained? Can ordinary radio-frequency transformers be used in this circuit? What is the range of such a receiver, and what plate voltage

should be used?—Emil R. Entress, 83 Main Street, Hackensack, N. J.; F. E. Roberts, Fountain and Dean Streets, Providence, R. I.; J. Scouten, Fall River, Mass.; C. R. Mason, P. O., General Delivery, Liberty, N. Y.; F. S. Meyer, St. Louis, Mo.; R. L. Alexander, Pawtucket, R. I.; J. K. Hines, San Antonio, Texas.

To these, and many other anxious readers, RADIO WORLD wishes to state that all the information that can be obtained was printed in our article on the Hazeltine neutrodyne circuit receiver in RADIO WORLD for March 31. This is a patented circuit, and such details as the construction of the radio-frequency transformers and the neutralizing capacities cannot be published at the present time.

* * *

Kindly publish a hook-up using the following apparatus: Three honeycomb coils, detector, bulb, phones, batteries and



Hook-up published in response to question of M. L. Ronecto. The different parts are all properly marked.

necessary condensers.—M. L. Ronecto, 113 Vine Street, Pittsburgh, Pa.

The hook-up you desire is published herewith.

* * *

Where can pictures and blueprints of the Lighthouse receiver be obtained?—J. Thurlant, 20 Broadway, Cohoes, N. Y.

Write to C. W. Tupper, Bureau of Lighthouses, Washington, D. C., and you will be advised of their cost. They will be sent to you on receipt of the price.

* * *

Have constructed the Sorenson hook-up as described in RADIO WORLD for January 20, but I cannot get any oscillation or regeneration. I have checked the hook-up over thoroughly, but cannot find what is wrong.—C. C. Huntington, Mauch Chunk, Pa.

Reverse the connections on your 75-turn tickler coil. Use a small fixed condenser across the B and phone leads. Connect the B lead to the opposite side of the filament circuit from that shown in the circuit.

* * *

In RADIO WORLD for November 25, 1922, you published a circuit by J. Schuck. What is the size of wire and number of turns used on each side of the rotor? What is the size of wire and number of turns on each side of the stator? What is the inside diameter of the stator and clearance of stator and rotor?—C. C. Powers, 403 West 33d Street, Richmond, Va.

In regard to this hook-up it may be said that any manufactured variometer will work

satisfactorily and does not have to be made. However, for your own information 20 turns of No. 18 or 20 wire on each side of the rotor will do. About 16 to 18 turns of the same size wire on the stator is O. K. Variometers are generally made with a $2\frac{1}{2}$ or 3 inch rotor; therefore the stator diameter will be about $3\frac{1}{2}$ or $3\frac{3}{4}$ inches to work satisfactorily, although this will be a little close.

* * *

Can I use a U. V. detector tube in the Flewelling circuit? Can spider-web coils be used with this set instead of the honeycomb coils?—Oliver Carmer, 1517 Franklin Avenue, Fort Wayne, Ind.

The tube you mention is perfectly O. K., and you can also incorporate spider-web coils in this circuit.

* * *

Should grid leaks be used in the hook-ups published in RADIO WORLD for March 10 on page 20, and what is the capacity of the condenser used?—R. W. Kirkpatrick, Anderson, S. C.

These hook-ups will work without grid leaks but it will improve the selectivity if a grid leak is used on the last one. The variable condenser should be .001.

* * *

Where can I obtain a hook-up embodying the following: One step of radio-frequency, detector and one of audio, with the regular three-circuit regenerative receiver?—J. K. Eisenberg, Janney & Co., 133 So. Fourth Street, Philadelphia, Pa.

We refer you to the diagram published on page 19 of RADIO WORLD for February 24, where you will find what you desire.

* * *

Kindly publish wiring diagram of two step amplifier for the long wave receiver published in RADIO WORLD for June 24, 1922, utilizing the new 201 A amplifier tubes.—Henry Zube, 1311 16th Street, Lorain, Ohio.

If you will refer to page 26 of RADIO WORLD for March 31, 1923, you will find the hook-up you desire. The grid leak can be omitted for the receiver you mention.

* * *

What is the U. V. 201A tube? What plate voltage is used on it? What is the price, and where can it be obtained?—A. J. Howe, R. F. D. 7, Mason, Mich.

We refer you to RADIO WORLD for March 24, 1923, where you will find a complete description of this new tube in an article by J. L. Bernard on page 8. This tube is obtainable in any up-to-date radio supply house. The list price is \$6.50.

* * *

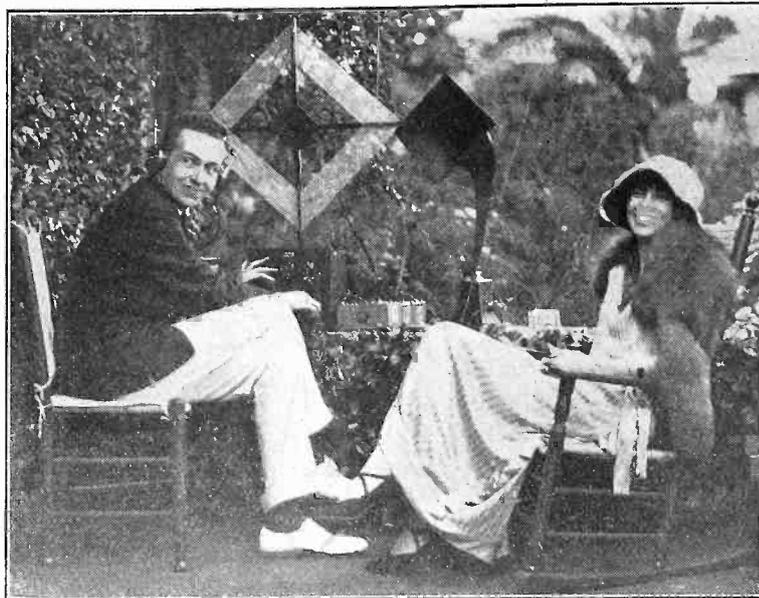
Am enclosing a sketch of my receiver, and wish some advice on same. When I tune in a station I have much trouble, because my circuit oscillates so violently that the voice is all muffled. I am using the best apparatus obtainable, and only use 22 volts on the plate. Would the set work without the variometer in the plate circuit?—L. L. Hamilton, Topsham, Me.

Put a potentiometer in the filament circuit of the first tube. Allow more space between the two variometers and the variocoupler. You have them too crowded. Try bridging the grid leak between the grid side of the condenser and the negative side of the filament circuit. This might help. The set would work without this variometer, but it would make it harder to obtain regeneration without it.

REALM OF RADIO REPROD



(C. Fotograms, N. Y.) Rather than spend time "below decks" in the submarine, these members of the crew of the S-50 bring their speaker up on deck and let the operator "stay below" to tune them in on a good program from some distant station.



(C. Keystone View Co.) Mr. and Mrs. Cornelius Vanderbilt, Jr., enjoying a second honeymoon amidst the sunshine and flowers of California, spend pleasant hours listening to the interesting programs emanating from KFI.



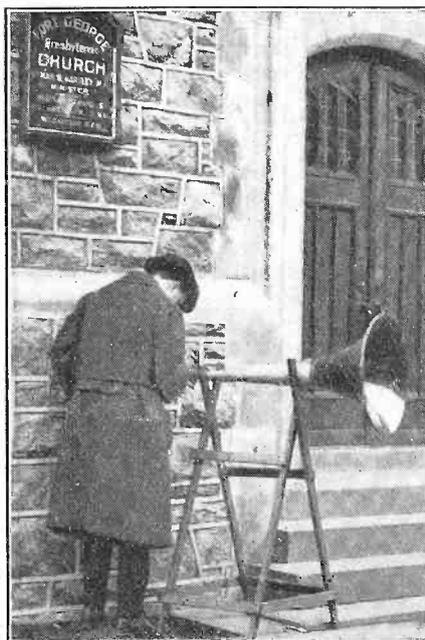
(C. International Newsreel Photo) Brother Nate intends to at least be able to listen in to the broadcast of the baseball games this summer, after the usual number of grandmothers die off. He therefore made his last summer's "kelly" into a receiver. The antenna is an umbrella, wound with insulated wire inside its shady roof, and the whole set didn't cost but fifty cents for the switchpoints and knobs. The wire for the tuner is wound under the band of the hat.



(C. International Newsreel) Assistant Secretary of the Navy Roosevelt broadcasting through Station WJZ on the needs of the thousands of war veterans. By this means he was able to reach thousands of people with a more personal touch than can be had by talking through the daily papers.



(C. Metro Pictures) Bull Montana recently got acquainted with a radio receiver, and after the instinct of the bug once it starts working, he wanted to know "what made the wheels go round" with the result pictured. It's easy to break, but—



(C. Kadel and Herbert) Fort George Presbyterian Church, New York City, not having either organ or chimes, recourse was had to receiving the music and chimes broadcast from the local stations in New York and Newark, N. J.



(C. Photonews, N. Y.) Old-time spark gap with muffer—shore stations in the early days—a "gatherer" with the neat an

RELEASES REALISTIC CONDITIONS



(C. Underwood and Underwood)
George Robey, of Covent Garden Theatre, London, England, recently made a receiving set so small that an ordinary matchbox is a gigantic thing when compared with it.

Captions by
ROBERT L. DOUGHERTY

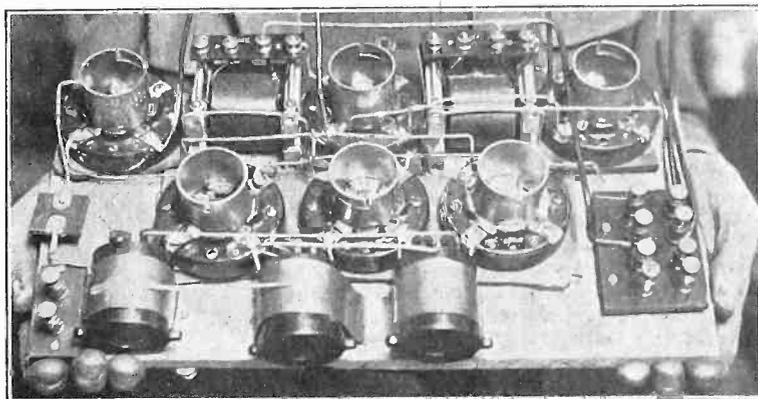
(C. Wide World Photos)
Born deaf, Leo Koehn, of Detroit, Mich., was made to hear through the agency of a radio receiving set with a power amplifier. A doctor made this experiment, after hearing of the success of a similar one on the continent.



(C. P. and A. Photos)
Mr. John Osborn, well known Philadelphian, created quite a furore when he appeared on the bridlepeth in Fairmount Park with a complete portable radio set on his back. It works on a loop and gives him lots of pleasure while out for a brisk ride in the mornings.



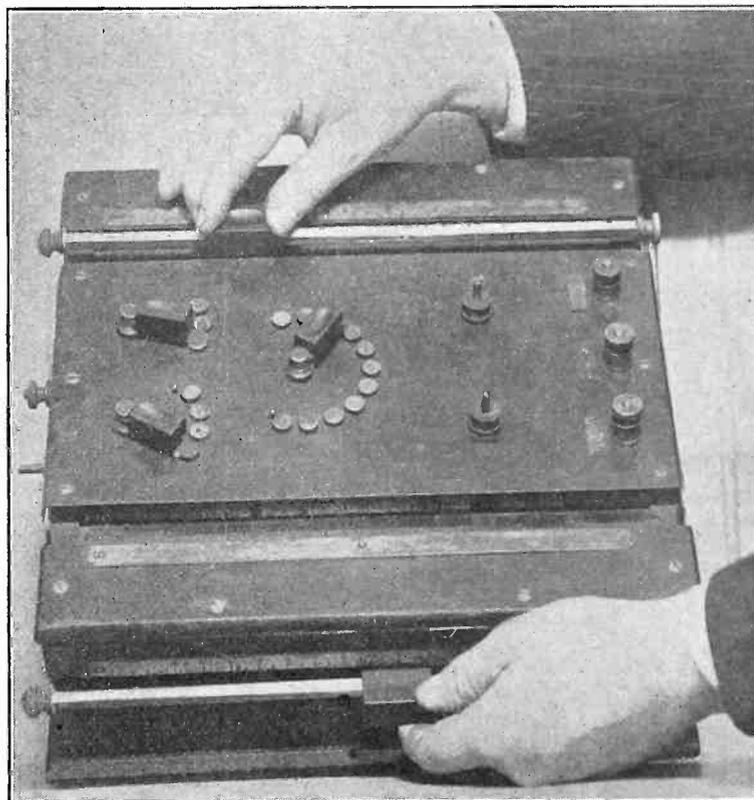
(C. Kadel and Herbert)
Tolling the knell of the hand organ. This radio hurdy-gurdy recently appeared in London and created quite a stir in hurdy-gurdy circles. A complete four-tube set is mounted inside the wagon, working on the small antenna, with a loud speaker on the far side. "'Ow's a feller goin' ter make a bob with that blighty thing a-tootin,' I arska you?" Is what the old timers are saying.



(C. Kadel and Herbert)
Here's the type of set they use in England when they want to hear WJZ or WOR. It is three stages of radio-frequency, detector and two stages of audio-frequency. American sockets and transformers are used.



lix as used aboard ship and in 1904. Contrast this bulky "dust" apparatus of today.



(C. Photonevs)
Numbered among the antiquities is this old United Wireless three-slide tuner used in the Navy in the year 1906.

Latest Radio Patents

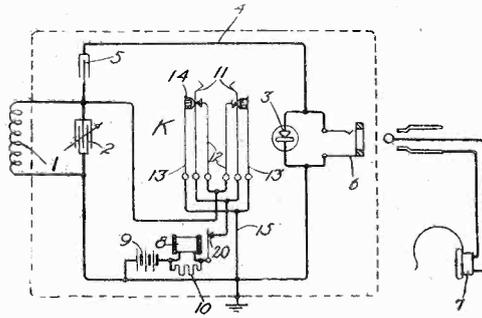
Wave Meter and Similar Electrical Devices

No. 1,448,575; Patented March 13, 1923. Patentee: George H. Stevenson, Rye, N. Y.

THE invention relates to wave meters and similar electrical apparatus, and more particularly, to means whereby the frequency calibration of such apparatus will not be rendered incorrect by the opening or closing of a key connected to the circuits of the apparatus.

It is customary in the arts dealing with high-frequency currents when wave lengths are to be measured or compared, to make use of a wave meter which for some purposes consists of a simple tuned receiver and detector for high-frequency waves and for other purposes consists of a low power generator. The usual manner of changing the apparatus to form a local generator is to include in circuit a buzzer or self-interrupting electromagnet which causes the tuned circuit of the wave meter to be excited at its resonant frequency. It has been found that the key which serves to connect the buzzer into the circuit has a capacity between its contact blades of sufficient magnitude to cause the wave length calibration which is correct with the key opened to be incorrect when the key is closed or vice versa. This happens because the effective capacity of the key blades is in shunt with

the tuning condenser of the tuned circuit when the key is opened. This capacity, in a particular instance, is of the order of 10×10^{-12} farads. A capacity of this magnitude produces appreciable effects at radio frequencies. By placing additional insulated blades on the key and connect-



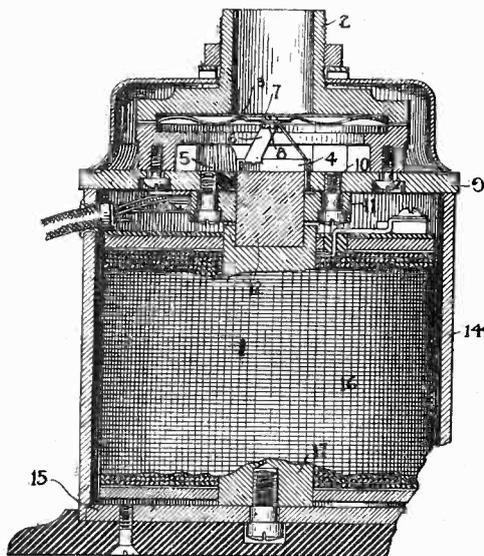
Tuned capacity wave meter, making more accurate readings possible.

ing these additional blades in circuit so that when the key is closed their capacity will be substituted for the effective capacity introduced by the contact blades when the key is opened, the calibration may be made correct for either operative condition of the apparatus.

Electrodynamic Receiver

No. 1,448,279; Patented March 13, 1923. Patentees: Edwin S. Pridham and Peter L. Jensen, Oakland, Cal.

THIS invention relates to telephones, and more specifically to improvements in the moving coil type of telephone receivers. The receiving instrument, which is the subject of this specification, comprises an annular coil rigidly connected to the



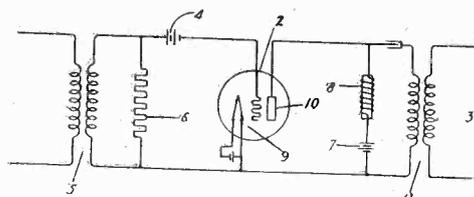
New method of dealing with diaphragm and electromagnets in telephones and loud speakers.

diaphragm. This coil is disposed, so as to be freely movable, in a strong concentric magnetic field, produced either by a permanent or an electromagnet. The magnetic field is so arranged that the lines of force cut the annular coil at all points in the same direction. This is accomplished by having one of the poles of the magnet within the coil and the other completely surrounding it.

Thermionic Amplifier Circuits

No. 1,448,550; Patented March 13, 1923. Patentee: Harold D. Arnold, Maplewood, N. J.

THE invention relates to repeater circuits wherein an electron-discharge device is employed for receiving comparatively weak incoming impulses and for transmitting them in the same form or in a modified form, but with amplified energy. Such an amplifier, which has a cathode, an anode and a control member, usually in the form of a grid electrode, has a very high impedance between control member and cathode, which are the usual input electrodes. This impedance is of the order of 25,000 ohms or more, being in the nature of a space discharge path between electrodes in a vacuum. Preferably, the vacuum is as perfect as practicable, substantially no positive ionization taking place during the operation of



Method of modifying high input impedance in amplifying circuits.

the device. In case a source of potential is employed for making the potential of the grid always negative, the input circuit impedance is of the order of infinity, for no electrons can flow from the filament to an electrode which is negative, so that no current flow takes place between cathode and grid, even though the latter does respond to the incoming potential variations.

An object of the present invention is to modify the effect of this high input impedance so that it may have any desired finite value.

Signaling System

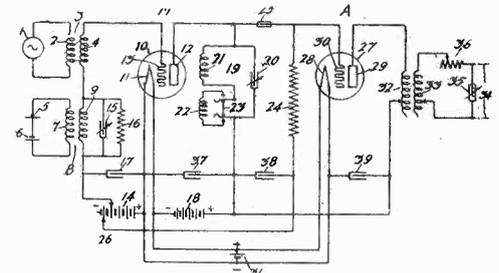
No. 1,448,216; Patented March 13, 1923. Patentee: Raymond A. Heising, Millburn, N. J.

THIS invention relates to signaling systems, and more particularly to signaling systems of the type in which high-frequency oscillations are modulated in accordance with signals.

An object of the invention is to provide a modulating and amplifying arrangement of the vacuum tube type in which the number of necessary current sources may be small.

Another object of the invention is to provide means to enable vacuum tubes arranged in cascade to be supplied from common sources of electrical energy.

A further object of the invention is to provide a circuit connection for a vacuum tube modulator and vacuum tube amplifier which will permit the use of common sources of energy for filament heating, space current and impedance controlling purposes.



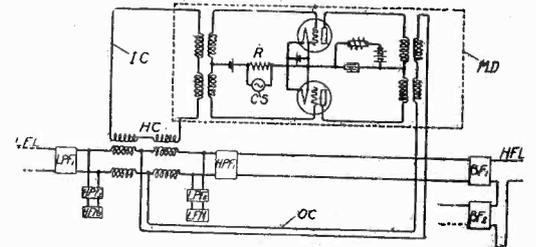
Transmitting circuit enabling a number of tubes to be arranged in cascade.

Still other features of the invention relate to certain combinations and arrangements of circuits hereinafter described and particularly pointed out in the claims, the advantages of which will be apparent to those skilled in the art.

Duplex Carrier Wave System

No. 1,448,408; Patented March 13, 1923. Patentee: Jacob S. Jammer, New York City

THIS invention relates in general to duplex transmission or signaling systems, and more particularly to carrier current telephone systems. The principles of the invention are more particularly adapted for application in systems employing conductive circuits throughout, but may be applied in systems in which the high frequency transmission is carried on through the natural media.



Arrangement enabling duplex carrier wave transmission.

An object of the invention is to provide systems of the type wherein a single apparatus is used to modulate waves passing in one direction and to detect waves passing in the other direction with improved line balancing impedance means. Individual means are provided for balancing the high frequency line separately for each carrier frequency. Since, with carrier currents of the frequencies ordinarily used, a high frequency line often varies considerably and irregularly in impedance for the various frequencies it is of considerable advantage to balance the line separately.

A further object is to provide means in connection with the modulator-detector for compensating for the attenuation produced in the circuit by the various apparatus.

The WD-11 Vacuum Tube

By G. Y. Allen

Radio Engineer, Westinghouse Electric & Mfg. Co.

CONSIDERABLE misinformation has been circulated from time to time on radio apparatus, its construction, use and application. This is particularly true in the case of the WD-11 vacuum tube, the most popular tube on the market today, possessing characteristics attractive to the average user, as it permits the use of a radio set in places remote from storage battery charging facilities such as the isolated farm, the seashore, the summer camp, the small yacht and other places too numerous to mention.

Let it be said in all fairness that the WD-11 vacuum tube was not the first vacuum tube designed for dry battery operation. It remained for the Westinghouse company to improve the mechanical features of the dry battery tube and to make it a commercial success. * * *

In constructing the WD-11 tube, the tungsten filament is replaced by a platinum filament coated with certain salts that will allow greater electron emission with less battery capacity. This insures a good amplifying tube with very little energy expended in heating the filament. This development has made possible a tube having all of the desirable properties of an untreated tungsten filament tube and which can be operated from the power supplied from a common dry battery.

Although the principle upon which this tube is designed has been known for some time, it remained for Westinghouse engineers to develop it commercially so that it would be sufficiently rugged to give even a longer life than was experienced with 6 volt tubes. Through processes that have been developed recently, the WD-11 tube has been perfected to the point where, if not mistreated, its life is in the neighborhood of 1,000 hours.

The WD-11 tube is an excellent detector and when used in this capacity operates to best advantage at 22½ volts applied to the plate. Although values of grid condenser and grid leak are not at all critical, good average values are 2 megohms resistance for the grid leak and 250 micro mfd. for the grid condenser. Let it be said here that all WD-11 tubes are exhausted to an extremely high vacuum and they do not depend upon enclosed gas for their detecting properties. They are thus not critical in any adjustment either to filament current, plate voltage, or to the constants of the circuit in which they are used.

When used as an amplifier, the WD-11 tube may be supplied with plate voltages varying from 45 to 80 volts. Voltages upward to 200 volts may be used with corresponding increase in volume without damage to the tube. When using high voltages on the tube there appears at times within the cylindrical plate a blue glow that is sometimes mistaken by the uninformed as an indication of ionized gas such as would occur in a tube that has leaked or such as would be noted in a soft tube. This glow, however, in no way interferes with the operation of the tube and is thought to be caused by phosphorescence given off by the salts that are used to coat the filament. * * * * *

The WD-11 tube is designed for operation from a single cell of 1½ volts standard dry battery. When more than one tube is used in parallel an additional standard battery should be used for each additional tube, all dry batteries being

connected in parallel. Care should be used to see that dry batteries so connected are all fresh, and old batteries should never be connected in parallel with new batteries. A fresh dry battery will operate a WD-11 tube intermittently from 60 to 90 hours, depending upon the length of intervals the tube is used. Of course, the battery current should always be turned off except when the tube is actually being operated. * * *

Quite recently the public press has elected to criticize the manufacturer of this tube, suggesting that the supply was being purposely curtailed to insure price maintenance and other improper factors.

As many will remember, the radio season last fall was a month or six weeks later in the year than would normally be expected as very warm weather persisted until well into December, with the result that the radio set in the home was not as well patronized as might reasonably be expected, for the reason that people found it convenient and entertaining to participate in diversions outside of the home.

With the coming of the colder and more inclement weather about the first of January, radio again became a convenient and attractive form of entertainment for the average family, with the result that a great demand was created for radio apparatus.

The manufacturer's stock of WD-11 tubes at the beginning of the radio season was in excess of 100,000, which was considered adequate in the light of previous demand to relieve all excessive demands for a period of several months, but, coincident with the opening of the radio season, the public largely by discovery that WD-11 tubes would function satisfactorily in all forms of radio appliances, almost overnight recognized the very superior merits of this tube, with the result that the substantial stock and, in addition, the daily output of the factory was rapidly absorbed despite the fact that production facilities have been crowded to the utmost and five or six times as many tubes are being made per day now as were made prior to January 1. The demand is still in excess of the supply, but the manufacturers express great hope that everyone will be provided with these very desirable tubes within the next thirty days.

Junior Physicist Wanted in Bureau of Standards

THE United States Civil Service Commission announces that an open competitive examination will be held throughout the country on June 6. It is to fill vacancies in the Bureau of Standards, Department of Commerce, for duty in Washington, D. C., or elsewhere, at entrance salaries ranging from \$1,200 to \$1,500 a year, plus the increase of \$20 a month granted by Congress.

Applicants must have graduated with a degree from a college or university of recognized standing with the completion of at least 118 semester hours, or be a senior student in such an institution, and furnish proof of actual graduation within three months from the date of the examination. Undergraduate work must have included a course in the optional subject selected. Applicants must choose at least one of the following subjects: Heat, electricity, mechanics, optics, radio, physical metallurgy.

Competitors will be examined in the subjects of general physics, mathematics through calculus, practical questions on each optional subject chosen, and education, training, and experience. Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or custom house in any city.



This Combination Completes any RADIO RECEIVING SET



TO own a good receiving set without Magnavox equipment, is like having your house properly wired and then using only small, feeble candle-power lamps in the sockets!

Whether placed in the average living room or large dance hall, Magnavox Radio floods the desired area with clear, resonant music or speech—its volume perfectly controlled from the Magnavox Power Amplifier, constructed specially for it.

Magnavox R-3 Reproducer and Model C 2 Stage Power Amplifier - \$90.00

R-2 Magnavox Reproducer with 18-inch horn: the utmost in amplifying power, for store demonstration, large audiences, dance halls, etc. **\$60.00**

R-3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. **Price, \$35**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer. 2 stage **\$55**
3 stage **\$75**

Magnavox Products can be had of good dealers everywhere.

The Magnavox Co.,
Oakland, California

New York: 370 Seventh Avenue

Write for booklet illustrating and describing the

MAGNAVOX
Radio
The Power Amplifier
and Reproducer Supreme

New Records of the DX Nite Owls

Traded His Bed for a Morris Chair—Whoopie!

From J. E. Bradley, Box C, Justin, Texas

Have finally traded my Bed for a Morris chair, and can stay with 'em until day lite. Below is my log for my work on Monday night, 3-19-23. Left out several stations under 300 miles distance.

Call, Time, Program, Town, Miles
KSD—8:45—Announced, Market Conditions. St. Louis, Mo., 575.

WDAP—8:46—Trombone Solo, Chicago, Ill., 825.

WOS—8:47—Stephens College Glee Club, Jefferson City, Mo., 500.

WOAN—8:52—Singing, Lawrenceburg, Tenn., 600.

KLZ—8:54—Announcement, Denver, Colo., 625.

WCAY—8:58—Vocal Solo, Lady Playing own accompaniment, Milwaukee, Wis., 830.

KDKA—8:59—Band Stars & Stripes Forever. March, Time Signals, E, Pittsburgh, Pa., 1100.

WJZ—9:00—"Army Nite" Band. Medley old time tunes, Newark, N. J., 1425.

KFAF—9:10—Orchestra, Denver, Colo., 625.

WBL—9:12—Announcement, Anthony Kansas, 300.

KDYS—9:20—Vocal Solo "Man," announce Health Talk "Week," Great Falls, Mont., 1250.

WGM—9:30—Announce—Atlanta, Ga., 750.
Frank H. Jones—9:40—Orchestra "You Gave Me Your Heart" and Duet Hawaiian Guitar. Solo Hawaiian Guitar; line off 10:30 Cuban Time; Culiözna, Cuba, 1275.

KFDL—10:10—Vocal Solos, woman; Bert Wells at piano, Denver, Colo., 625.

KGW—10:37—Opera Play "12 Pounds," Portland, Ore., 1575.

WLAG—10:44—The Bachlor 4 Quartette, "Kentucky Babe," Minneapolis, Minn., 825.

WSB—10:45—Rochovels Program, Atlanta, Ga., 750.

WDAJ—10:47—Vocal Solo (Man), College Park, Ga., 750.

KHJ—11:07—Piano Solo, small girl sings and plays piano, Los Angeles, Cal., 1175.

KFDB—11:27—Orchestra "When the Leaves Come Tumbling Down," test program, San Francisco, Cal., 1400.

KFI—11:44—Messenger Boy Playing Harmonica, Los Angeles, Cal., 1175.

WDAF—11:45—Nite Hawks, Kansas City, Mo., 460.

Total number of miles, 19,465.

I keep a log like this every night I listen in.

It will be interesting in the future to look back and see what we listened to in the year 1923, won't it, eh?

I send greetings to all the DX Fellows. Are there no Lady Dx'ers???

I am still using my old 2-WD-11 tube set and it is hitting on all 2.

* * *

A One Night's Record

From Osborne Hinckley, 2436 W. 33d Ave., Denver, Colo.

I am sending you my DX record of the stations that I head in one night. I use a very simple hook-up, having only a tapped coil and a variable condenser besides the usual socket tube rheostat and grid leak. The first night I had this set I tuned in the following stations: KFEP, Denver; KDZQ, Denver; KLZ, Denver; KFAF, Denver; DD-5, Denver; WFAA, Dallas; WMZ, Memphis; WDAF, Kansas City; KSD, St. Louis; WLK, Indianapolis;

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WLAG, Minneapolis; WAAP, Wichita; WOC, Davenport; WDAP, Chicago; KMY Oakland; KDYL, Salt Lake City; KPO, San Francisco; KFI, Los Angeles; KHJ, Los Angeles; KGW, Portland, Ore.; KFZ, Spokane, Wash.

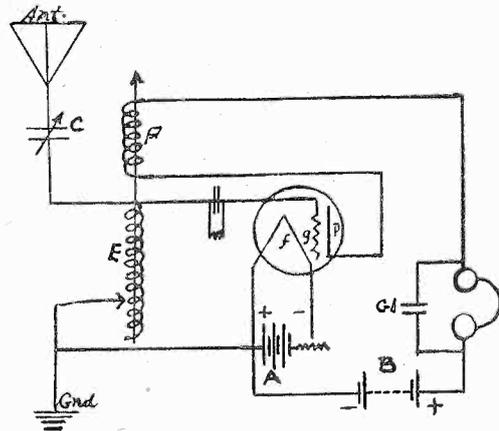
With this set I cannot tune the Denver stations out entirely when some other station is real close. But the interference is so weak that it does not bother long distance much. The stations mentioned above were heard in one night.

* * *

He Touched the Right Spot and Comes Back with More

From Frank P. McCullen, 210 West State St., Trenton, N. J.

MY hook-up, you published in the RADIO WORLD of the 24th, and my word to the effect that I would answer questions on hook-ups and how to overcome AC hum by using lights and a condenser in series on the 110 volt A.C. house circuit. Replacing the "B" Battery.



Mr. F. P. McCullen's single circuit receiver, which while conventional, gives good service.

Well! I have received 54 letters and numerous cards, requesting information, but I am game to the core. I am sticking it out answering and each day brings in more. I'll have to hire a stenographer if letters keep on coming in at the rate they are.

Have tried out another single circuit regenerative hook-up with W-D 11 tube, and in one evening picked up the following stations: WKY, WBAP, WDAF, WWAJ, CFCA, KSD, WJZ, KDKA, WGY, WFAA, WMAG, WLAG, KGW and the Atlanta Journal and Atlanta Constitution. This is not exceptional with good radio parts and above all, careful making—so many amateurs put too much speed in the making of a machine. I am sure anyone will heartily agree with me in this and also advise less speed—a few days longer makes a better job and you will never regret it.

Enclosed find hook-up that this record was made with and if there are any comments why fire away. I am ready. Yours for bigger and better radio.

With the Only Set in Town

From M. R. Smith, Gimli, Manitoba

HAVING read the records of the DX boys, I thought I'd send in mine. Mine is the only set in town. I have a single circuit, regenerative using no amplification. The following are some of the stations heard since January 30th: KWH, Los Angeles; WFAA, Dallas; WBAP, Fort Worth; KDKA, Pittsburgh; WHAZ, Troy; WHAS, Louisville; WWJ, Detroit; WLW, Cincinnati; also, WOC, WOI, WHB, KLZ, WFAF, WDAF, WCX, KDYS, KSD, WMC, WHA, CFAC, CKCK, CJCG, KYW, CKY, CJNC, WLAD, WLAG, WDAP, WAAP, WOS, WCAS.

* * *

Could Be Better, Could Be Worse, So 's 'Nuff

From A. K. Siler, Jr., 308 S. Narbeth Ave., Narberth, Pa.

I WISH to submit to the DX Nite Owls the following list of stations which I received since March 17. I listened only an hour each night and got all the close-by stations, using only one bulb (UV200), although I have a three-bulb set: KFDB, KDKA, WBZ, WOC, WMAQ, WLAG, WDAP, WLAK, WOAX, WHAZ, WHAM, WJAS, WJAX, WGR, WGI, WDAF, WHK, WHAS, WAAM, WNAC, WOAT, WEAS, KOP, WFAQ, WMAK, WOAW, WGM, KSD.

* * *

"Sparks" Comes in on DX

From C. Previti, Operator, S. S. Ponce

WISH to submit some DX work done on a neat home-made set costing \$35, using an exceptionally sensitive circuit.

Have heard following: KHJ, WOC, WDAP, KYW, WHB, WWJ, KSD, WHAS, KDKA, WMAE, WGY, WHAZ, PWX, WSB, WJZ, WFAF, WOR, WPI, WFI, WKAQ, WOO.

These are only a few of the long distance, as other stations such as Denver, Cincinnati, Cleveland, Springfield, Mass., have been heard but am not sure of call letters.

All above stations have been heard plainly and practically every night on detector only, trip after trip during my week's stay in Porto Rico. The work which I can do on detector only using present set and circuit were never done by my former regenerative set and two steps. All stations were heard both during last summer and this winter, but as you know that during summer time atmospherics are fierce in the tropics.

* * *

67 On a WD-11

From Frank Baker, 420 South 5th St., Petersburg, Ind.

I HAVE read many DX records in your magazine, and am sending mine.

My set is a single-circuit regenerative, using one WD-11 tube, one variocoupler, 43-plate V. condenser, 3,000-ohm. phones, leak, etc.

The stations are as follows: WJZ, WHA, KFAF, WCK, WOS, WOI, WDAJ, WAAF, WEAP, WFAF, WWI, PWX, WCAD, WFAA, WLAG, WMAQ, WGF, WGM, KSD, WWI, WMC, WSY, WSB, WBAP, WIAO, WCX, KDKA, WGY, WDAP, WHB, KYW, WOC, WOR, WHAS, WDAF, WIP, WTAS, WLW, WAAP, WBAV, WPA, WJAX, WLK, WOAI, WAAJ, WRAY, WGI, WKY, WGL, WDAE, WSAJ, WHAZ, 9DMB, WMAV, WMAT, WHK, 8YC, WIAR, WBZ, KFI, WCAE, KHJ, WBL, WMAK, WHAH.

The set was constructed at home.

Radio Merchandising

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

Telephone Bryant 4796.

Radio Literature Wanted

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

J. O. Korand, 519 Grand Street, Hoboken, N. J.

R. R. Rudd, P. O. Box 511, Gainesville, Florida.

Charles J. Matonsek, 4601 North Karlov Avenue, Chicago, Ill.

H. Siegel, 1204 Broadway, Brooklyn, N. Y.

Mary Frances Koger, Route 1, Box 32, Mina, Ark.

Harry W. Handy, P. O. Box 151, Troy, N. Y.

J. W. Abbott, Box 1055, Bartlesville, Okla.

A. C. Major, 65 West 14th Street, Atlanta, Ga.

A. S. Myers, 312 McDougal Street, Brooklyn, N. Y.

Fred A. Frey, 308 Madison Avenue, Roselle Park, N. J.

Arthur D. P. Born, 193 Third Avenue, Long Island City, N. Y.

Leo H. Ware, 8714 Quincy Avenue, Cleveland, Ohio.

Mrs. Irene S. Flegler, 3015 Baltimore Street, Kansas City, Mo.

W. D. Love, 3015 Baltimore Street, Kansas City, Mo.

F. P. Woodruff, 1024 Western Avenue, Topeka, Kan.

C. S. Gutermuth, secretary, Berlin Electric Light, Heat & Power Co., Berlin, N. Y.

Jackson E. Scarl, 362 Hanover Avenue, Allentown, Pa.

W. H. Short, 113 N. Limestone Street, Lexington, Ky.

Dr. O. L. Herke, 6603 Detroit Avenue, Cleveland, Ohio.

J. McCall, McCall's Garage, Decorah, Ia.

C. B. Winkler, 17 W. Lincoln Ave., Mt. Vernon, N. Y. (Especially interested in sets using indoor loop.)

R. A. George, 62 N. State Street, Concord, N. H.

Oscar T. Bucide, Argusville, North Dakota. (Wants wholesale prices on radio parts.)

The Van Blaricorn Company, 20 South Main Street, Helena, Mont.

Sandy Bennett, Camas, Wash.

C. O. Wheeler, R. F. "A," Box No. 1, Miami, Fla.

Rochester Radio Experimenting Laboratories, 524 Cross Street, Rochester, N. Y.

Houston Electric Company, 214 Vine Street, St. Louis, Mo.

Julius Miller, 121 West 114th Street, New York City.

William Wake, 4018 West 25th Street, Chicago, Ill.

Daniel Feder, 312 Cherry Street, New York City.

Fred P. Ronnan, 37 Sackville Street, Halifax, N. S., Canada.

R. B. Fleming, 1215 Peabody Avenue, Dallas, Texas.

D. F. Finger, 27½ South Tryon Street, Charlotte, N. C.

E. T. Day, So. Connellsville, Pa.

E. A. Rean, 1317 Banks Avenue, Superior, Wis.

Ralph Anderson, 514 Fiftieth Street, Milwaukee, Wis.

No More Loose Phone Connections

Manufactured by the Saturn Mfg. & Sales Co., Inc., 48 Beekman Street, New York City.



A PLUG recently put on the market by this firm incorporates a novel and useful feature. By the use of this plug all screws and slip connections are entirely eliminated, it only being necessary

to slip the phone tips into the proper holes in the back. A tooth-slip of hardened copper takes hold of each tip, and the harder you pull on the cord the more solid the grip exerted on the tip itself. When it is desired to change the phone tips, or remove the phones from the plug, all that is required is to press a small projection on the back of the plug and the tips are released. Besides this novel idea it is also made up of the best materials, and the brass nipple and sleeve of the plug itself is machined and polished to a fine degree. It is a very well manufactured piece of apparatus of its type.

Radio Stocks

(Quotations as of April 11, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	7*
American Marconi, Unstamped.	\$5	\$7
American Tel. & Tel.....	122½	123
Canadian Marconi	2¼	3
De Forest Radio.....	7	10
Dubilier Condenser	12	12¼
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel., Cal.....	5	5½
General Electric	180	181
Hennessy Radio Corp. 8% pfd.	9	11
Mackay Companies com.....	111	113
Manhattan Elec. Supply.....	58	59
Marconi Int. Marine.....	7	9
Radio Corporation com.....	4¾	4¾
Radio Corporation pfd.....	3¾	3¾
Spanish Marconi	1	3
Western Union	110½	111
Westinghouse E. & M.....	59½	60

*Cents per share.

Radar Adjustable Leak

THE Radar Instrument Company, 224 Market Street, Newark, N. J., is manufacturing an adjustable leak which is unique in design and has some interesting features. The Radar is entirely enclosed, so that its parts are protected from dust and dampness. It can be mounted inside of the panel with its control knob on the outside of the panel, and it can be fastened on the base without requiring a standard mount. These features and the fact that the Radar fits any standard grid leak mount should make it a very popular article.

New Distributors of Radio Supplies

ONE of the largest automobile supply distributors in the country—the Times Square Auto Supply Company, New York City—has added a radio supply department to its business.

Amsco Products, Inc., is a New Combination

ON May 1, 1923, the Mortimer Radio Corporation, manufacturers of the "Melco Supreme" radio-frequency receiving set, and the Advance Metal Stamping Company, manufacturers of high-grade parts, both of New York City, will consolidate and be known in the future as Amsco Products, Inc.

The "Melco Supreme" radio-frequency receiver will continue to be marketed under its own name, while a complete line of parts will be available at all good dealers under the "Amsco" brand. The new home of Amsco Products, Inc., will be in the Fairbanks Building, Broome and Lafayette Streets, New York City. Ideal manufacturing facilities will enable this concern to give even better service than was possible before the consolidation.

Short Cut Antenna an Ingenious Device

THE Short Cut Radio Corporation, 243 West 54th Street, New York City, have just brought out a new product, "Short Cut Antenna," which they claim eliminates the aerial as well as loops, electric light plugs, etc. The nature of the "Short Cut" is that of a super-condenser though its peculiar and valuable properties are due to certain patented features. The fact that the product makes a set portable in addition to clarifying signals, eliminating code and reducing interference troubles generally to a minimum, should make it of especial interest to dealers, now that the summer season is coming on.

"The A, B, C of Radio"

RADIO enthusiasts will be interested in "The A B C of Radio," which Modells advertise for distribution to RADIO WORLD readers. This is a 62-page book, replete with diagrams and drawings, and was written by the former editor of a popular scientific magazine. It is claimed that 200,000 copies of "The A B C of Radio" have been sold at the retail price of 25 cents. Modells have purchased a quantity for distribution to RADIO WORLD readers, who will be placed upon the mailing list which this concern keeps on file. There is a charge of 10 cents to cover cost of forwarding. An announcement regarding this is made by Modells in this issue of RADIO WORLD.

Neon Lightning Arrester

THE Neon lightning arrester, manufactured by the Neon Lamp Works, 62 West 114th Street, New York City, makes use of neon gas, which is absorbed from the air by a very complicated chemical process. Neon gas is an excellent electrical conductor, and its resistance, compared with that of air, is 1:165. This means that the discharging efficiency of a lightning arrester with neon gas is excellent, and it is guaranteed to discharge over 220 volts. The Neon lightning arrester can be also used as a rectifier for small currents.

A New Radio Company

Radio Improvement Co., New York City, \$25,000; P. D. Wesson, H. J. Fitzpatrick, E. Luiscomb. (Attorney, P. S. Jones, 300 Madison Avenue.)



The Saturn Automatic Radio Plug

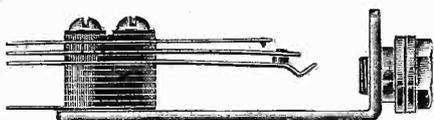
The Plug with the RED SEAL

**No Screwdriver required!
Not necessary to dissemble!**

To make connection just insert terminal tips, and contact is made. The more you pull, the better the contact. To take terminals out, just press the release lug and the tips fall out.

Every plug sealed and fully guaranteed. Sells now for \$1.25

The Saturn "PERFECT" Jack



An improvement on all others.

Crowfoot offset: Allows easy soldering.

Bracket, the mainstay of every jack, made of specially rolled Brass, with rounded edges. This insures uniformity, strength, appearance.

Blades: Spring temper German Silver, enforced where needed.

Contact Points: Genuine Sterling Silver.

Nipples: Shoulder type, with two 1/16" washers, insuring perfect fit to the panelboard.

All parts, except Blades, nicked and highly polished.

- No. 1. Single Circuit, Open... \$0.50
- No. 2. Single Circuit, Closed... .55
- No. 3. Double Circuit, Closed... .70
- No. 4. Single Filament Control... .75
- No. 5. Double Filament Control... .80

The Saturn Mfg. & Sales Co., Inc.
Dept. R. W.

48 Beekman Street
New York, N. Y.

Blueprints of Sets and Circuits

IN reply to hundreds of inquiries, RADIO WORLD desires to state that it does not supply blueprints of sets and circuits published in its columns unless the articles in question so state specifically. This announcement is made to save time and avoid disappointment to readers.

Private Radio Broadcasting Starts in Japan

SEVERAL private Japanese concerns are now permitted to broadcast government reports, speeches and music by radio, the government having relaxed its rigid policy, advices from Japan to the Department of Commerce state. Only a few financially sound companies in Tokyo and Osaka, and perhaps one or two other large cities, will be licensed. A broadcasting tax is required by the government after April 1. The companies will charge subscribers a fee for the service rendered, which the government will collect, returning a percentage to the broadcasters. Individual users of broadcasting and receiving sets will not be permitted to communicate with each other, it is stated. Complete receiving sets will cost between 20 and 30 yen, or between \$10 and \$15, it is anticipated by Japanese experts.

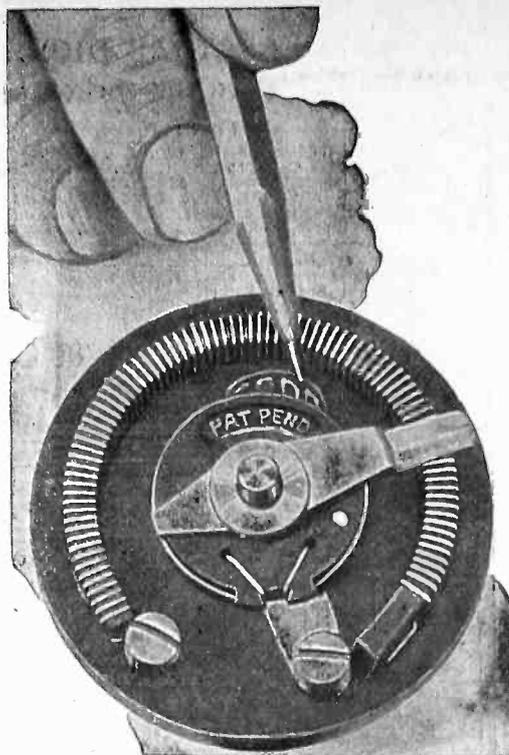
Milwaukee Radio Amateurs' Club Active

THE Milwaukee Amateurs' Radio Club has been incorporated under the laws of the State of Wisconsin as a non-stock body, and its name changed to The Milwaukee Radio Amateurs' Club, Inc. The incorporators were L. S. Baird, C. N. Crapo, and Attorney L. J. Topolinski, the society's general counsel, through whose efforts state incorporation was brought about. In addition to including the past purposes of the club and those of the American Radio Relay League, Inc., the articles of organization provide that the society may own and operate an amateur radio station and may associate itself with the A. R. R. L. as a Milwaukee section or local chapter.

Meetings continue to be held weekly at 7:45 P. M., Thursdays, in the Trustees' Room of the Milwaukee Public Museum. Business Manager L. S. Baird recently received the appointment as A. R. R. L. Central Division Publicity Manager, and in order to devote proper attention to his new duties his chairmanship of the Meetings and Papers Committee has been transferred to H. F. Wareing, president of the society. This committee is now arranging for a series of lectures on timely radio topics. R. E. Lathrop, 9ATX, of the club's technical committee, represented Wisconsin at the Michigan State A. R. R. L. convention held at Flint, Mich., and upon his return gave the Milwaukee club members a lengthy report.

Radio frequency amplification has been the subject of several general discussions at meetings, and a paper entitled "Intervalve Radio Frequency Transformers" was presented by I. H. Strassman, 9AHO. Mr. Strassman, who is A. R. R. L. City Manager, has also reported from time to time the progress being made in ridding the air of unlicensed stations. These offenders have operated much to the discomfort of both the radiophone listeners and the amateurs.

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used on your radio receiver brings in broadcasted concerts from stations thousands of miles away—by giving super-delicate control of the filament current of the detector tube.

Fada rheostats and potentiometers are practically standard with hundreds of thousands of radiophans who construct their own radio receivers.

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- 121-A Power Rheostat (1 1/2 ohm) 1.20
- 150-A Vernier Rheostat (5 ohm) 1.25
- 151-A Ver. Attachment..... .50
- 152-A Potentiometer (200 ohm) . 1.00
- 153-A Rheostat (8 ohm)..... 1.00
- 154-A Potentiometer (400 ohm) . 1.00
- 155-A Vernier Rheostat (8 ohm) 1.50

Send 10c for a copy of the *FADA Handbook*—a real aid to your experimental work.

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PHONES		TUBES	
\$8.00 Brandes Superior Phones.....	\$5.95	\$6.50 DeForest Detector and Amplifier...	\$5.95
\$8.00 Federal Phones.....	5.25	\$6.50 U. V. 201.....	5.95
\$5.50 Murdock Phones, 3000 Ohms.....	4.35	\$6.50 Cunningham 301.....	5.75
\$5.50 Rice Phones, 3000 Ohms.....	4.35	1/2-Volt Tube, guaranteed.....	4.75
\$12.00 Baldwin Phones.....	8.95		
\$6.00 Single Baldwin.....	4.50		
Acme Transformer.....		\$5.00 Fischer Variometer.....	\$2.10
Bakelite Sockets.....		\$5.00 Fischer Variocoupler.....	2.10
Cortlandt Special Sockets.....		23 Plate Variable Condenser.....	1.85
Rheostat Special.....		43 Plate Variable Condenser.....	2.35
	.48	W.D. 11 Transformer.....	3.45

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OUR RADIO PUP SET

We get favorable comments from all who have built it.

IT HAS MADE GOOD! THE BEST BUY OF ITS KIND EVER ASSEMBLED!

We have all the "Hard-to-Get" Radio Supplies at Prices That Are Right.

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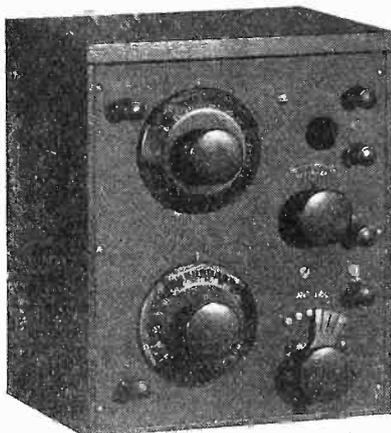
Electric Service Engineering Co., 105 West 47th Street, New York
Bryant 2743

Buy That Set NOW

The Clapp-Eastham Regenerative Receiver is a wonderful set. Well worth the regular price of \$40.00. At our special price of

\$25.00

it is the most wonderful set you can buy. A limited number to be sold at this price.



The type HZ two stage amplifier is equipped with the new Maximus Amplifying Transformers, and will increase the range of any receiving set. The regular price is \$40.00; our special price

\$25.00

WHITALL RADIO CO., SPRINGFIELD, MASS.

FILL OUT AND MAIL NOW

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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City

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

SUBSCRIPTION RATES:

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

Partial Program from WGI (360 Meters)

STATION WGI, operated by the American Radio & Research Corporation, Medford Hillside, Mass., announces the following program for the dates named:

Saturday, April 21, 1923

- 6:00 P. M.—New England Weather Forecast, furnished by the U. S. Weather Bureau. Late News Flashes, Early Sports—Boston American.
- 6:15 P. M.—Condition of the Massachusetts Highways, furnished by the Automobile Legal Association.
- 6:30 P. M.—Boston Police Reports—Boston Police Headquarters. Amrad Bulletin Board.
- 6:45 P. M.—Code Practice, Lesson Number Thirty-eight.
- 8:00 P. M.—Evening Program.
 1. Third of a series of talks on New England Problems, under direction of the New England Business League.
 2. Concert by Coyne's Orchestra of Lawrence; Mr. Matthew T. Coyne, Director.

Sunday, April 22, 1923.

- 4:00 P. M.—Twilight Concert.
- 8:30 P. M.—Federation Church Service, conducted by Rev. Fred Alban Weil, Pastor of the First Parish Church of Quincy; assisted in the music by the Quartette of the Church.
- 9:00 P. M.—Musical by the Quartette of the First Parish Church of Quincy. Mrs. James H. Slade, Soprano; Miss Angela C. McCarthy, Contralto; Winthrop D. Webb, Tenor; John E. Greene, Bass; John D. Buckingham, A.G.O., Director and Organist.

Broadcasting Schedule of the Detroit News

The present broadcasting schedule of the Detroit News, Detroit, Mich., station WWJ, is as follows, the regular evening program beginning at 7 o'clock one week and at 8.30 the next week, alternately:

Week days, every day in the year, except as otherwise noted:

- 9.30 to 9.45 a. m.—Hints to housewives.
- 9.45 to 10.25 a. m.—Health or economic talks (Uncle Sam).
- 10.25 to 10.30 a. m.—Weather report.
- 11.55 to 12.00 noon—U. S. Naval observatory time signals.
- 12.05 to 12.45 p. m.—Impromptu musical selections (usually).
- 3.00 to 3.30 p. m.—Detroit News Orchestra (usually).
- 3.30 to 3.35 p. m.—Weather report.
- 3.35 to 4.15 p. m.—Market quotations.
- 5.00 to 6.00 p. m.—Miscellaneous, markets and Government messages.

Week nights except Saturday: For weeks of April 1, April 15, April 29, etc., 7.00 to 8.30 p. m.—Concert. For weeks of April 8, April 22, etc., 8.30 to 10.00 p. m.—Concert.

Thursday special—On alternate Thursday nights this station is now giving a program between 11 and 12 p. m. for the special benefit of listeners at distant points. This "midnight special" falls on those weeks which have regular programs from 8.30 to 10.00, as scheduled above.

The Detroit News does not broadcast on Saturday nights, this omission being a courtesy to Detroit people who wish to tune in distant stations.

Sundays—Sundays of April 15, April 29, etc., 11.00 a. m.—Church services at St. Paul's Episcopal Cathedral. The Very Rev. Warren L. Rogers, dean, is usually the preacher. 5.30 p. m.—The Detroit News Orchestra. Sundays of April 8, April 22, etc., 2.00 p. m.—Detroit News Orchestra. 7.30 p. m.—Church services at St. Paul's.

Western Union Feels Radio Competition

ALTHOUGH the business of the Western Union Telegraph Company was larger and more profitable in 1922 than in 1921, President Newcomb Carlton devotes a considerable portion of his annual statement to stockholders to a résumé of the competition with its cable business caused by the rapid development of radio communication. President Carlton says in part: "Radio has made substantial progress during the year, not only in improved service, but in capturing additional business with low rates from the cable companies. The advantages still lie with the cables, but they need waking up. The cable art has not advanced as it might have advanced, and as it must advance, under the stimulus of a cheaper means of communication. Whether the radio is in fact cheaper than the cables cannot be answered now, but this much can be said: 'That the present radio rates were not based on the cost of operation. These rates were arbitrarily fixed to attract business.'

"Now that business has been attracted, and the investment necessary to transmit business between the United States, Great Britain and Europe is mounting to important figures, the investor will no doubt show an increasing interest in the question of the adequacy or inadequacy of radio rates. These rates between the United States and Europe are about 30 per cent. less than the cable rates, and, principally because of their lower charges, the radio has captured 20 per cent. of the United States-European business.

"It has been our view that the resources of radio will be combined with those of the cable in the development of a system of world communication that will place the United States first among all countries for capacity and reasonable rates, provided the government will adopt a progressive and business-like method of dealing with cable companies.

"We are disposed, therefore, to think of the radio in terms of a great medium of transmission, and as a potential ally rather than in terms of a continuing competitor. Whatever way the question may be decided, and regardless of the downward trend of rates, it should be borne in mind by Western Union shareholders that more than 90 per cent. of the income available for dividends in 1922 came from their nation-wide system of land line services, which does approximately 85 per cent. of the land line telegraph business in the United States. In fine, if there had been no net income from the cables in 1922 the company's net income would not have been materially reduced."

The operating revenues of the company for 1922 are reported as \$105,447,748, compared with \$104,155,113 in the previous year. Net operating revenues totaled \$13,796,473, against \$10,196,029. After crediting other income, deducting interest charges and appropriating \$2,000,000 for the development of ocean cables, there was a balance of \$11,158,180 available for the capital stock, equal to \$11.17 a share earned on the \$99,817,000 stock outstanding. In 1921 the balance was \$9,633,808, equal to \$9.65 a share on the stock. The general balance sheet on December 31, 1922, showed net current assets of \$38,393,265 and net current liabilities of \$26,045,369.

DX Radiomania

THE man who used to grunt and groan and stay awake nights said it was insomnia, but now when he gets to the office looking as though he needed sleep he generally blames it on—"Dawgone, he didn't sign off, and then some blame nuisance butted in and I couldn't get his call." It's all one, whether you call it radiomania or insomnia—it keeps you up just the same.

Makes Your Set Portable



Pat. Pending

Good Bye Aerials!

USE

Short Cut Antenna

An ingenious device (a super-Condenser) that replaces aerials, loops, electric light plugs, etc.

Postpaid, Anywhere, for \$5.00

Satisfaction Guaranteed

Short Cut Radio Corp.
243 West 54th St. New York



SUNBEAM

\$8.00
Dictograph
Phones
\$5.95

None Better Made at Any Price

\$8.00 Brandes Phones
Matched Tone, \$5.75

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Farm Lighting Plants at Bargain Prices. For Yachts, Motor Boats and Country Homes

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expert, explaining the underlying principles of

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With Diagrams, Drawings and Glossary

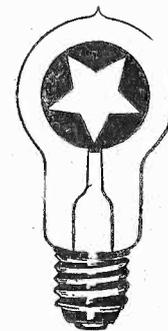
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Have you seen the hook-up with complete panel layout in full size and all constructional details in **RADIO WORLD** No. 43, dated Jan. 20? This hook-up actually goes out and draws the distance in, and lays it at your table. All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it? If you haven't this copy, send 15 cents to **Radio World**, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

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bring in DX



The invention of this non-magnetic shield cuts out electro-static effects between vacuum tubes, which cause distortion, make it difficult to tune in distant stations—Guard tubes against breakage.

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U. S. Patent Pending

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High Speed Communication at Sea

ON the last voyage of the White Star Liner "Majestic" the world's greatest steamship, radio messages were exchanged with shore stations of Radio Corporation of America at speeds of over 80 words per minute when the vessel was 1,000 miles at sea. Ordinarily speeds in excess of about 25 words per minute cannot be attained by hand sending and in order to meet the demands of increasing radiogram traffic created by the large passengers liners, machine sending must be used in which case a given message can be sent and received in one-third the time required by manual methods.

The earlier experiments aboard the "Majestic" permitted only one way high speed transmission, namely, from ship to shore, there being no apparatus on board the vessel capable of receiving high speed transmission. In order to effect two-way

high speed telegraphic service on the vessel during its last voyage to New York, it was equipped by the Marconi Company with a high speed receiver which worked most satisfactorily. High speed signals were also received from Paris at a distance of eight hundred (800) miles at a speed of 80 words per minute. Wireless press was completely and perfectly recorded by the automatic receiver through medium static from the station of RCA at Chatham, Mass. At the same time that this automatic high speed reception was carried out it was possible for the operator on watch to listen in on the ordinary ship's wave length for general "ship to ship" wireless.

Not only does the use of automatic high speed receiving and sending apparatus enable operators to handle more traffic in less time and thereby provide freedom of the ether for other vessels to operate their radio sets but in addition secrecy of communication is maintained, owing to the great rapidity with which the dots and dashes are transmitted. It is difficult for the average operator to copy over 30 words per minute for any length of time, consequently when working at double speed the telegraphic symbols follow in such rapid succession that they cannot be deciphered.

A Revision of the Gibbons Circuit

In RADIO WORLD for March 31, 1923, was published a diagram of a circuit as used by Mr. Earl E. Gibbons, which contains an error.

The potentiometer should be in shunt of the 6-volt A Battery. This puts the detector rheostat in series with the potentiometer from the negative A Battery, which will make it inoperative.

The first and second step rheostats are in series with the potentiometer from the negative A Battery, with positive returns. Thus, the potentiometer being of high resistance, would make the filament controls useless.

In order to correct the error, the potentiometer should be shunted across the 6-volt battery and the polarity of the battery should be changed.

New Use for the Panama Canal

First Bug—"Say Al, you know I picked up Seattle, Washington, last night? Came through great. Three thousand miles. Some stuff for DX, what?"

Second Bug—"Stand by, stand by, brother! You can't tune me to that wave. That's overland, buddy, and the old stuff don't skip over terra firma like she does over the water."

First Bug—"Aw, say! Lay off the QRM! May be my stuff came through the Panama Canal!"

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of the Famous MAWHINNEY RECEIVING APPARATUS

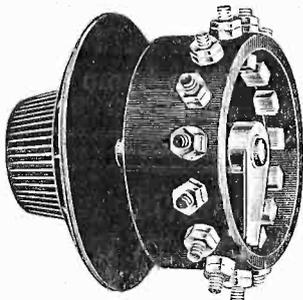
A series of 7 blue prints giving in full detail all the necessary information, specifications, and method of construction, and assembling of the MAWHINNEY RECEIVING Apparatus. This is the 5-tube receiving set that picked 5 stations in California, recently written about in Literary Digest and Radio Globe. The Blue Prints tell you in a very simple and clear manner just how to construct a duplicate of MAWHINNEY'S trans-continental receiving set.

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Complete, with dial calibrated from 0 to 14.

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Price, complete with dial \$2.00

Special prices to Dealers and Jobbers.

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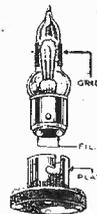
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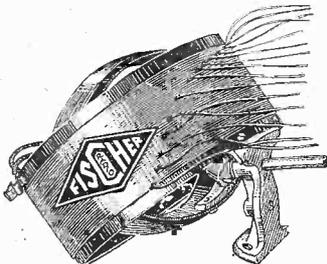
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To Radio World readers who may have missed recent numbers

The newsstand sales of Radio World have increased so rapidly for several weeks past that some of our readers were disappointed to find their regular newsdealers had sold out their supplies. This is for you; if you are among the disappointed ones: Send 15c. per copy and we will mail you any of the recent issues that you may have missed, so that you can complete your files.

RADIO WORLD

1493 Broadway New York

General Broadcasting Schedule of Station WDAP

THE general broadcasting schedule of Station WDAP, Drake Hotel, Chicago, which is also the official station of the Chicago Board of Trade, is given below. The market reports are sent on 485 meters and the concerts on 360 meters. Following is the schedule for all business days:

- 9:30 A. M.—Receipts and shipments; estimated carlots; local weather report; opening future markets: wheat, corn, oats, rye, barley, pork, lard and ribs.
 - 10:00 A. M.—Future quotations; live-stock receipts and prices.
 - 10:30 A. M.—Future quotations.
 - 11:00 A. M.—Future quotations.
 - 11:30 A. M.—Future quotations.
 - 12:00 Noon—Future quotations and cash grain prices.
 - 12:30 P. M.—Future quotations.
 - 1:00 P. M.—Future quotations.
 - 1:15 P. M.—Musical program by Henry Selinger and the Drake Concert Ensemble.
 - 1:25 P. M.—Closing future quotations and high and low for day; cash grain prices; gross bids for cash grain to arrive.
 - 3:15 P. M.—Closing quotations, Chicago Stock Exchange, by Paul H. Davis & Co.
 - 6:00 P. M.—Closing quotations; news items. (On Saturdays the closing prices are sent at 12:05 P. M. instead of 1:20 P. M. The Visible Supply changes are sent when posted.)
- Regular Concert-Sending Schedule.
10:00 P. M., Tuesday, Thursday and Saturday evenings; 9:15 P. M., Sunday evenings.
Announcement of Special Programs or Features will be made from the Station.
On Tuesday, Thursday and Saturday nights the program is divided between artists in the studio and Jack Chapman's Orchestra, playing dance music in the main dining room of the Drake Hotel.
On Sunday nights the program is divided between exceptional artists in the studio and Henry Selinger and the Drake Concert Ensemble, playing in the main dining room.

Partial Program of WGY for Week of April 22

WGY, General Electric Company, Schenectady, N. Y., will broadcast the music and speeches of the annual dinner of St. George's Society of Albany, N. Y. Monday evening, April 23. The principal speaker will be Captain Kilroy Harris, D.S.O. Captain Harris was king's messenger, and, following injuries received during the war, he was appointed official war lecturer for the British and United States governments.

Sunday, April 22, WGY will broadcast the morning and evening services of the Second Presbyterian Church of Amsterdam, N. Y. In the afternoon, at 4 o'clock, the WGY Symphony Orchestra will give a program, assisted by William Demorest, boy soprano.

William DeMille's play, "Strongheart," will be produced Tuesday evening, April 24, by the WGY Players, headed by Edward H. Smith.

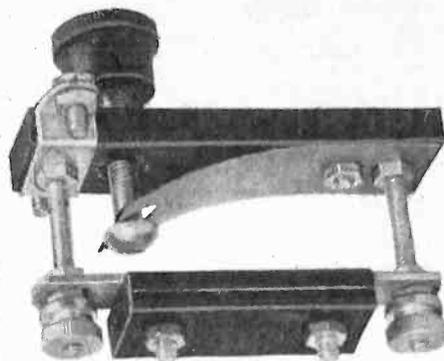
Wednesday evening is "Silent Night" at WGY, and the following night the American Locomotive Company Band will give a concert.

The Commercial Bank Club of Albany will entertain from the General Electric station Friday night, April 27. The program will consist of orchestral numbers, quartet and solo selections. Saturday night, from 9 to 11 o'clock, Cain's Castle Orchestra will play.

New Radio Firms

Barclay Electric Co., New York City, \$20,000; Stelz, D. Grossman, J. McCoy; attorneys, Reit & Kaminsky, 305 Broadway. Imperial Radio Corp., Jersey City, N. J., radio, \$500,000. E. Russell Carlisle, R. E. Albin, New York; C. E. Grant, Canada.

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Horton Variable Grid Leak

Unbroken Range 0-9 Megohms

1000 Variations by fine Vernier adjustment. No pencil lines or leaky, smeary graphite to harden with age. Once set it stays set until readjusted. Nothing shows outside panel but small Bakelite adjustment knob, thereby completely eliminating body capacity and howl.

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Woodhorn Loud Speaker5.50
King 600 Meter Variometer3.00
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Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

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1493 BROADWAY, NEW YORK CITY

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Sensitive over the entire surface.

Dealers—Write for unusual proposition.

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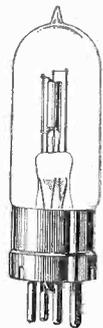
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By LESTER L. JONES Formerly Expert Radio Aid. U. S. N.

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COMPARE IT WITH WHAT YOU ARE NOW USING

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A Plan for Selling Radio Sets to American Legion Posts

RADIO dealers and retailers should be interested in the plan described below by which the J. Burt Pratt Post, of the American Legion, at Virginia, Minnesota, financed the purchase of a radio set. A similar plan might be proposed by dealers to American Legion posts in their local territory. A. R. Hulbut, publicity officer of the post named above, sends to the American Legion Weekly the details of the plan as follows:

"Three hundred shares of stock were issued to sell at one dollar a share. Any member could buy up to five shares. After enough shares were sold we bought an outfit and a radio club was formed. The post then agreed to take up the shares at their face value, merely transferring them into dues accounts. This was not done all at once; in fact, it is being done only as the post gets money enough in its treasury so it can spare the dues, but the members of the radio club know that eventually the post will repay them for their stock. Although we have no radio in the club at present, we are not worrying, because we only got rid of the old one to buy a better one.

"I would recommend the above procedure to any post, and have no hesitancy in stating that radio will make the post clubrooms a greater gathering place than ever. We in Virginia had the opportunity to hear a snappy talk by Department Adjutant Stafford King by radio just a few days ago, the significance of this being that eventually every Legion post will have a set and we will find it possible to have a Legion radio night throughout the country, and can open our meetings with talks from national as well as department officers while we are sitting right in our own clubrooms.

"I have often thought of a National Headquarters broadcasting station at Indianapolis, which I believe would do more to advertise the Legion than any other medium. Such a station would now reach over a million people and would eventually mean a radio in every Legion post. Imagine a night, known as 'Legion Meeting Night' throughout the United States, when every post would meet and could hear a message from the National Commander."

PATENTS

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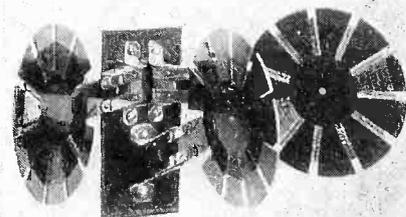
	List Price	Our Price
Framingham Plain Rheostats.....	\$.75	\$.85
Framingham Vernier Rheostats.....	1.25	1.10
Klesner Vernier Rheostats.....	1.50	.90
Klesner Vernier with Dial.....	1.50	1.30
Freshman Variable Grid Leak.....	1.00	.70
Rapco WD-11 Transformers.....	5.00	3.95
Olco Two-Way Plugs.....	1.00	.75
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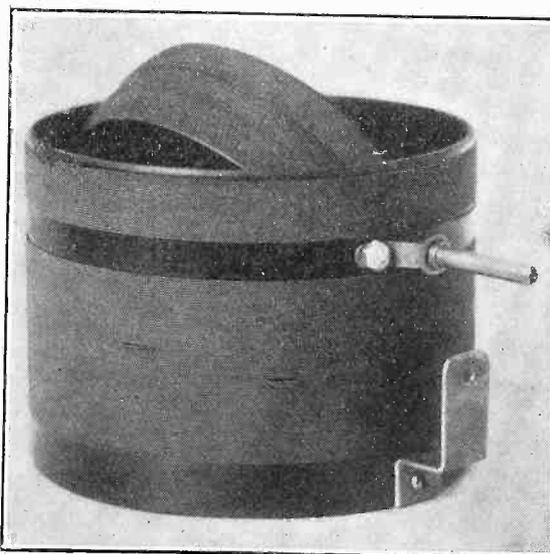
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USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

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- WWJ, Detroit, Mich.
- WSB, Atlanta, Ga.
- WDAP, Chicago, Ill.
- CFCN, Calgary, Can.
- WBAP, Ft. Worth, Texas



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 Can be used in any tube set or to convert any crystal set into tube set. Used on 3 dry cells or one 6-V "A" battery.
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 Technical Editor: Robert L. Dougherty

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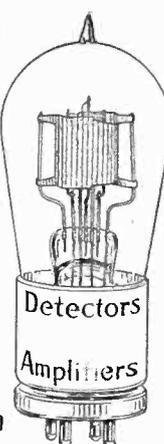
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"Twice as Near Is Half as Far"
WORDS spoken in a public hall in Schenectady, N. Y., reached a radio listener in San Francisco, Cal.—2,550 miles away—before they were heard by a listener 150 feet from the speaker.
 That statement looks a bit fantastic, but it is mathematically true. The apparent absurdity becomes reasonable when it is realized that the speed of sound is 1,126 feet per second at a temperature of 69 degrees Fahrenheit, and the speed of electrical vibrations, or radio waves, is 186,000 miles per second.
 The listener in the back of the hall in Schenectady—150 feet from the speaker—heard the words in 0.1332 seconds.
 A microphone connected to the radio transmitting equipment of WGY, the General Electric Company station, was two feet in front of the speaker, and picked up the words in 0.002 seconds.
 Time required to transform sound waves into electrical energy, 0.002 seconds.
 Time required for electrical vibrations or waves to pass from Schenectady to San Francisco, 0.0137 seconds.
 Time required at receiving end to convert electrical vibrations into sound vibrations, 0.001 seconds.
 Total elapsed time from the speaker in Schenectady to the radio listener in San Francisco, 0.0187 seconds.
 Listener in hall heard words in 0.1332 seconds.
 The period of time elapsing between the spoken word and its reception via radio, 2,550 miles away, can be illustrated as follows: 0.0187 seconds is time required for a spectator at a baseball game to hear the impact of bat against ball when he is standing twenty-one feet from the batter.

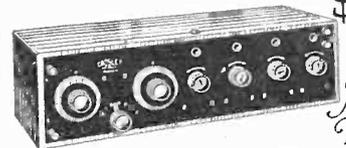
FREE VACUUM TUBE RADIO SET
 The Set you always Wanted, FREE
 A real RADIO SET—Listen in on Concerts, Lectures, Singing, etc. Can receive 75 to 100 miles and more.
 RUSH your name and address and we will tell you HOW you can get a VACUUM TUBE RADIO SET
ABSOLUTELY FREE
 Don't delay. Write today for FREE RADIO PLAN.
HOME SUPPLY CO.
 Dept. 570
 131 Duane St., New York

SABLO
 BUTTON CONTROL FOR INCREASING HEAT
 MADE IN 3 SIZES \$6.00 UP
The 2 HEAT
ELECTRIC SOLDERING IRON
 SEND FOR DESCRIPTIVE FOLDER
STRAUSS & BLUM INC.
 255 1/2 W. 4th St. NEW YORK CITY

GUARANTEED REPAIRS
 Broken and Burned-Out
VACUUM TUBES
 W.D.-11 not accepted for repair
 Your dealer should know, but if he does not, send direct to
HARVARD RADIO LABORATORIES
 Boston 9, Mass.
 Tubes returned Parcel Post C. O. D.



CROSLEY Model X
\$55
 A 4 tube Radio Frequency Set
The Hit of the Radio World
 Every day letters are received telling of the distant stations heard by owners of the Model X. This set offers the greatest value in the radio market to-day. Not until you have listened in on a Crosley Model X can you appreciate the wonders of radio. The Model X consists of one stage of tuned radio frequency, detector and one and two stages of audio frequency amplification.
FOR SALE BY GOOD DEALERS EVERYWHERE
 Free Catalog on Request.
CROSLEY MANUFACTURING COMPANY
 4403 Alfred Street Cincinnati, O.



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

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

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

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

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal set. We guarantee this wonderful Contact to be **MORE SENSITIVE THAN ANY OTHER CAT-WHISKER MADE**; and that IT WILL NOT JAR OUT. WITH A "PT" MYRLE WOOD HEARD 46 PHONE STATIONS, IN A THOUSAND-MILE RADIUS! Others likewise testify that the "PT" has given results equaling tube equipment. Simple to install in any crystal detector. Price only twenty-five cents coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, BOSTON.

FOR SALE—\$24.00 Edison 22-volt Storage B battery. I will furnish you with 30 famous chrome nickel plates, 15 containers, separators, wire, etc., in fact, everything. Nothing to buy extra. Complete with all instructions for making, charging, etc. Prepaid for \$3.15. B. H. SMITH, JR., 32 Padanaram Ave., Danbury, Conn.

FOR SALE OR TRADE—Long wave receiving set, with detector and bulb, \$20.00. Violet ray outfit, \$8.00. Omnigraph, \$8.00. Want wrestling mat, guns, or what have you? CARL ELLISON, Box 258, Corning, N. Y.

IMPROVE the efficiency of your radio set 100%. Directions, 25c. FOLEY, 324 Big Horn, Alliance, Nebr.

VERNIER CONDENSERS, 78c; Powerful Electric Magnets, 48c; Detectors, 19c; Spiderweb Coil, 98c; Lighting Switch, \$1.48; Condensers, 18c. GARTH HECKMAN, Ft. Recovery, Ohio.

GUARANTEED WIRING AND REPAIRING—We can make any set work. Radio questions answered. Service charge, 20c per question. Send your set today and let us look it over. ALBERT STEIN, Cold Spring, Minn.

NEW MAGNAVOXES, \$29.00; Brandes Phones, \$7.00; C301A Amplifiers, ¼ ampere, \$7.75; Erla Radio Frequency Transformers, \$3.70; Acme, \$4.40; Homchargers, \$15.50. Honest service. List for stamp. EMRY STUEDLE, care Oklahoma University, Norman, Okla.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Cal.

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

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

IF YOU ARE A REGULAR RADIO fan and like to hear the stations in the four corners of the United States come in with a bang, then you will want the Flewelling Circuit. If you do, send 15c for RADIO WORLD, issue of Feb. 24, which contains complete description and directions for the manipulation of the circuit. RADIO WORLD, 1493 Broadway, New York.

Manufacturers' Representation Wanted

EDITOR, RADIO WORLD: The writer, with others, is forming a company to distribute radio apparatus and supplies in northeast Ohio and northwest Pennsylvania.

Can you place me in touch with manufacturers who would desire exclusive representation in the territory mentioned? Have manufacturers quote jobbers' prices, and give complete information necessary in first communication.

Yours very truly,
Andover, O.

J. G. Loe.

DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

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

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

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

BUILDERS AND EXPERIMENTERS. Do you know that the Reflex circuit is one of the most interesting circuits to construct? You can not guess how much fun you are missing if you fail to try out at least one of these circuits. See RADIO WORLD issues of Feb. 24 and March 3. They contain two fine articles by W. S. Thompson, with plenty of new Reflex circuits to experiment with. Don't miss these! 15c a copy. RADIO WORLD, 1493 Broadway, New York City.

TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES—Edited by Gardner D. Hiscox. This book of 800 pages is the most complete book of recipes ever published, giving thousands of recipes for the manufacture of valuable articles for every-day use. Hints, helps, practical ideas and secret processes are revealed within its pages. It covers every branch of the useful arts and tells thousands of ways of making money and is just the book everyone should have at his command. The pages are filled with matters of intense interest and immeasurable practical value to the photographer, the perfumer, the painter, the manufacturer of glues, pastes, cements and mucilages, the physician, the druggist, the electrician, the dentist, the engineer, the foundryman, the machinist, the potter, the tanner, the confectioner, the chiropodist, the manufacturer of chemic novelties and toilet preparations, the dyer, the electroplater, the enameler, the engraver, the glass worker, the gold-beater, the watchmaker, the jeweler, the ink manufacturer, the optician, the farmer, the dairyman, the paper maker, the metal worker, the soap maker and the technologist in general. A book to which you may turn with confidence that you will find what you are looking for. A mine of information up-to-date in every respect. Contains an immense number of formulas that everyone ought to have that are not found in any other work. New edition. 807 octavo pages. Cloth binding. Price, \$4.00. The Columbia Print, 1493 Broadway, New York City.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

FOR SALE—Reinartz set in cabinet, \$15. M. Stumpfel, Lake Mahopac, N. Y.

FOR SALE—Two-step amplifier in cabinet, \$20.00. DeForest Audio Transformer, \$4.50. Raymond Schlegal, 1118 N. Negley Ave., Pittsburgh, Pa.

IMPROVED MADE TOYS WANTED—MANUFACTURERS on large scale. Also houseworkers to manufacture metal toys and novelties. Thousands needed of Whistling Birds, Wild Animals, Crowing Roosters, Automobiles, Baseball Players, Statue of Liberty, Indians, Toy Soldiers, Cowboys, Bathing Girls, Souvenirs, and others. Wonderful opportunity. We guarantee Casting Forms furnished to manufacturers with complete outfit from \$3.50 up. No tools or experience necessary. Thousands paid for finished goods. Spot cash. Contract orders given out. THE IMPROVED METAL CASTING CO., 342 East 145th St., New York.

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

THE ANNIVERSARY NUMBER of Radio World was increased in size and an exceptional issue. A few copies left at 15c, each, or you may start your subscription with that number. Radio World, 1493 Broadway, New York.

SWISS VOLTMETER 3-0-3. Stained wood case, brass hinges, catches and spring terminals on Ebonite panel, carrying strap, three gravity cells; weight eight pounds, 11x8½x5½x4½ inches. Best cash offer or consider exchange. Fred P. Honnan, Halifax, Canada.

BEAUTIFUL WHITE TEETH—YOU can have beautiful white teeth without toothbrush, pastes or powders. No matter how badly discolored your teeth are, this harmless secret will make them white. Economical, sanitary. Price, 25c. AMERICAN SALES CO., Box 1278, San Francisco, Calif.

RADIO FREQUENCY AMPLIFICATION. Get the best results with radiophone reception. Long distance reception, purity and volume of tone reproduction, static reduction and selectivity. We have working plans, blue prints, with exact specifications of parts to assemble to construct a three tube set. Gives marvelous results. Save worry and experimentation in building one of these sets. Any amateur can build. Guaranteed results. Sent for \$1.00, postpaid. Research Laboratories, Carthage, Mo.

RAND-MCNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. The Columbia Print, 1493 Broadway, New York City.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS. Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

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

RADIO EXHIBITORS OF BROOKLYN, general exposition of radio apparatus and accessories. Signal Corps Armory, Dean St. and Washington Ave., Brooklyn, N. Y., April 23 to April 28, inclusive.

Capsules Used to Protect Crystals in Shipment

A NOVEL idea has been put into effect by the Specialty Service Company, 552 Pacific Street, Brooklyn, N. Y., in the protection of their DX radio crystals during transit to purchasers. The crystal and a circuit diagram showing how to use the crystal set in connection with a supplementary tube are packed in a transparent capsule. This affords ample protection for the crystal and makes a package attractive in appearance. It is encouraging to find manufacturers paying more attention to packages.

"My 'Sunshine' Friend"

"TO soothe you, like the silences of open places; like the satisfaction of complete repose; like the strains of dreamy music—I recommend my 'sunshine' friend—Ridgways Tea."

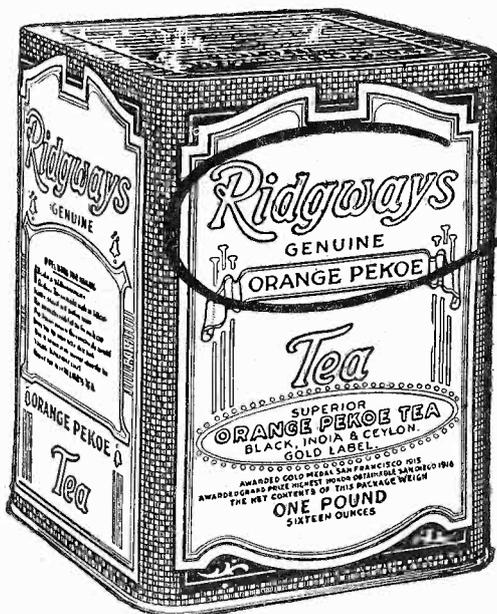


AWARDED THE HIGHEST HONORS OBTAINABLE

Gold Medal
San Francisco 1915

Grand Prize
San Diego 1916

Ridgways Tea



Genuine

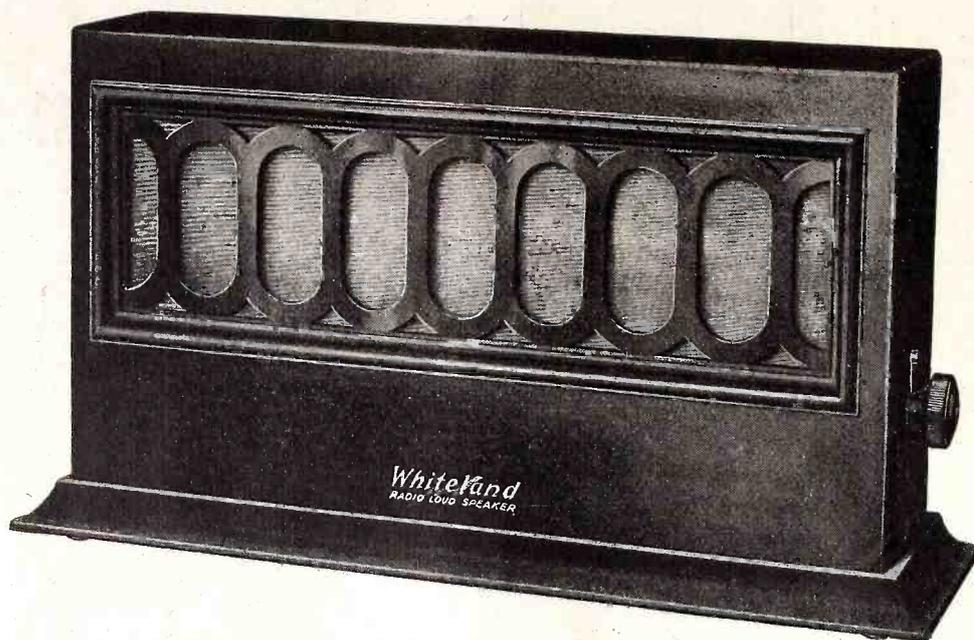
Orange Pekoe Tea

Sold in 1 lb., ½ lb., ¼ lb. and 15c Tins

A GENEROUS SAMPLE WILL BE SENT ON REQUEST

Address: Ridgways Tea Co., Dept. B,
60 Warren Street, New York.

The Finest Tea the World Produces



Looks Better—Sounds Better Than A Horn

The WHITELAND is an improved Loud Speaker—Improved in every way.

The fine mahogany cabinet encloses the latest ideas for perfect tone reproduction. The volume of sound is controlled by a knob on the right side.

The WHITELAND harmonizes with the furniture in the finest homes and its tone quality is just as superior as its looks.

PRICE \$25.00

With Special Power Amplifying Attachment \$40.00

If the radio store in your neighborhood does not have the WHITELAND in stock, send money order direct to us and we will ship at once. If you are not satisfied with the WHITELAND return it and your money will be refunded.

Whiteland
RADIO LOUD SPEAKER

WHITELAND MANUFACTURING CORPORATION

For 10 Years Manufacturers of Radio Apparatus

Washington Avenue, from 6th to 7th Avenue, Long Island City, NEW YORK

RADIO DEALERS:
Write for the Whiteland Dealer Proposition