

How High Power Vacuum Tubes Are Made (See Inside)

15c. a Copy

May 26

\$6.00 a Year

52 Numbers

1923.

RADIO

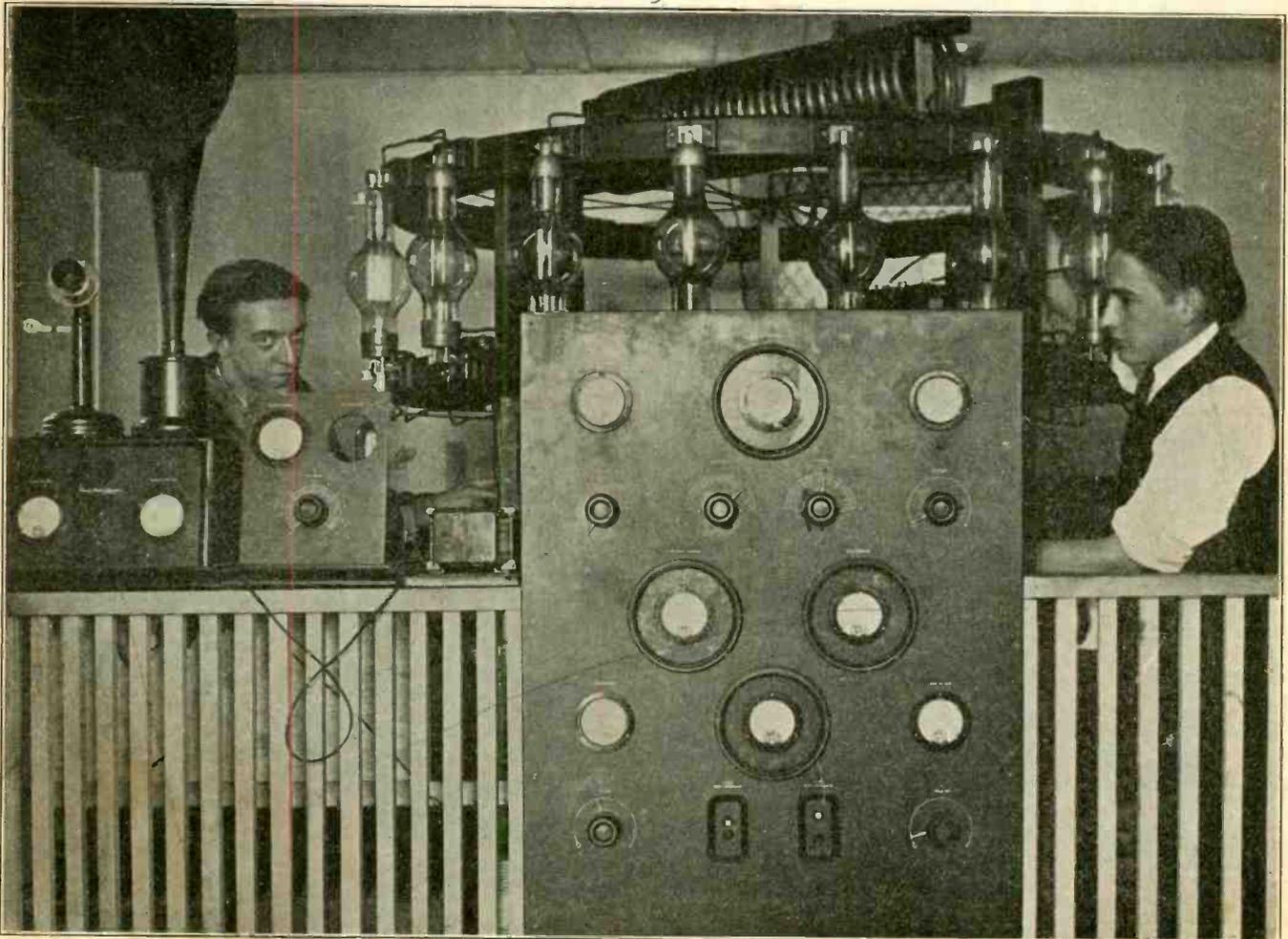
Title Reg. U. S. Pat. Off.

WORLD

ILLUSTRATED

EVERY WEEK

GIANT RADIO TRANSMITTER IN A CHICAGO HOTEL

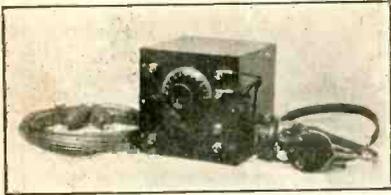


(C Underwood & Underwood.)

Here is pictured the great transmitter installed in the Edgewater Beach Hotel, Chicago. It has a radius of 3,000 miles. The aerial is 130 feet high and is made of gold-plated copper wire. The studio, on the ground floor of the hotel, is walled with plate glass so that the public may see how broadcasting is done.

Two New Broadcasting Stations Described (See Inside)

The Radio
(Trade Mark)
Flivver



Smallest and Lightest
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Receiving Set in the World

Complete with Phones, Tube, Both Batteries, and a 150-foot Braid Antenna.

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300 } **Meter Operation**
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250-watt, 1000-volt Westinghouse Motor Generator Set, reported heard in Texas, Kentucky, Maine and Missouri.

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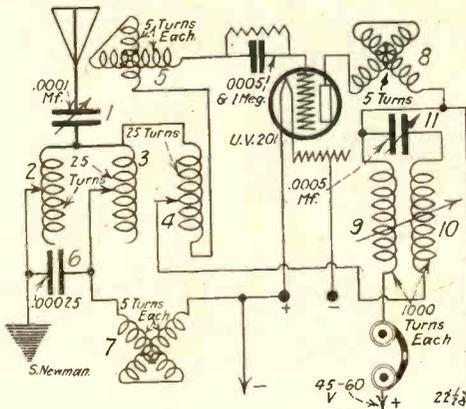
THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

Here's One for You to Try
Out—2,000 Miles on
One Tube

From Leslie Libby, Vilanhaven, Maine Box 407.

As a reader of your valuable little paper, and also as an ardent Ham, I feel that a little data on a receiver that has given me good results will help out my brother fans, as well as given them something to "Shoot at some records" with.

The hook-up below gives the idea of the set and I have found that the set works both when on my panel, and when I have the parts laying around on the table, experimenting most folks call it. I call it "just



Kind of complicated to tune—but think of the DX after it is hitting on all six?

foolin'!" I have worked all the powerful stations up to 2,000 miles with one U. V. 200 tube with about 60 volts on the plate.

I have carefully marked all the parts so that there wouldn't be any mistake made. The three coils in the primary circuit are all wound on a 3-inch tube, and I have arranged them on a board all about 1½ or two inches apart. The two 1,000 turn coils are honeycombs with the coupling variable. The coupling is fixed between the other three coils. The variometer in the grid circuit is not absolutely necessary but both the variometers in the plate and filament coupling circuit are.

I will be glad to help anyone that constructs this set, and will soon send in a complete list of all the calls that I have heard. Up to the present time I have been so busy copying them that I have not had time to try to list them.

Coming Events

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

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Cal., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Cal.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, executive committee, The Homestead, Hot Springs, Va., May 21-22, 1923. General meeting, May 23-24, 1923; Franklin Overbagh, secretary, 411 South Clinton Street, Chicago, Ill.

He's Taken It Up, Anyway

"Has he taken up radio as a fad?"
"No, as a frenzy."—Boston Transcript.

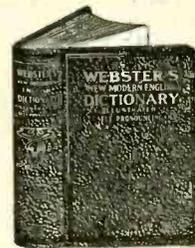
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THE COLUMBIA PRINT

1493 Broadway New York City

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CIRCUIT HOUNDS**

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

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

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

**Construction of New Type
Transatlantic Receiving Sets**

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

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

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

THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

**RADIO WORLD'S VACATION NUMBER
OUT NEXT WEEK**

VOLUME THREE OF
RADIO WORLD

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May 26, 1923

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How the Modern High Power Vacuum Tube Is Made

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

BEFORE the development of the high power tube, large transmitting stations where vacuum tubes were used to generate the high frequency oscillations were forced to connect the lower power tubes in parallel to take care of the large amount of power necessary to get a large antenna radiation. This method was not very satisfactory because vacuum tubes, when connected in parallel, generate not only the high frequency oscillations which are needed, but also generate so-called inter-tube oscillations. That is, there are present in the circuits between the tubes very high frequency oscillations which are detrimental to the efficient functioning of the set. These inter-tube oscillations became such a menace when a great many tubes were used that it was almost impossible to get

plate, for a black surface, such as lamp-black will radiate as much as thirty times the amount of heat that can be radiated by polished silver. Plates were made using a blackened plate which would radiate about nine watts per square inch of surface. To make use of this type of plate, the plate surface had to be so great that it was impracticable for very large tubes. The largest tube of this type radiated two hundred and fifty watts from its plate. The solution found for the problem of heat radiation was the water cooled tube, where

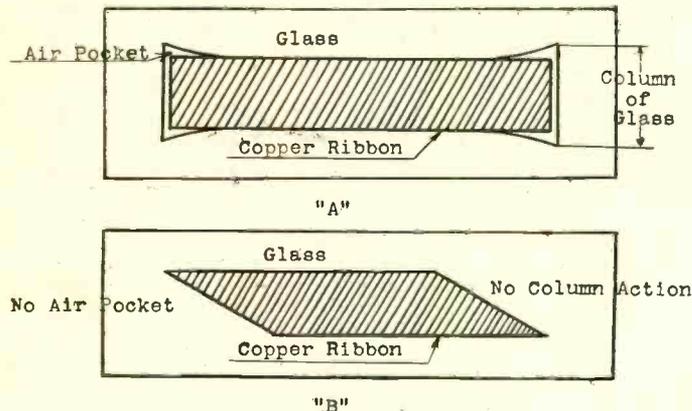
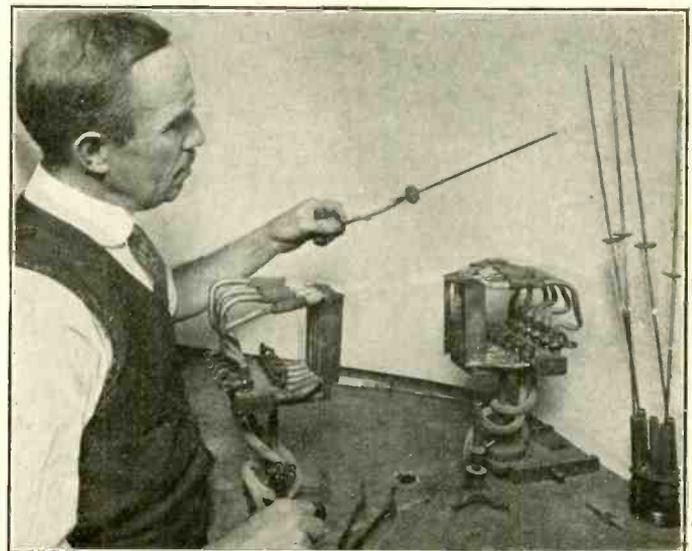


Fig. 1. Diagrams showing unsuccessful and successful methods of sealing a copper ribbon in glass.

a set to operate efficiently. The natural answer to this problem was to build vacuum tubes which would handle a large amount of power so that only a few tubes would be necessary for the largest of stations.

The limiting factor in the manufacture of large tubes has been the problem of dissipating the heat generated inside the tube. The plate in the triode tube must remain cold or at least must be prevented from getting hot in order that the tube function properly, because a hot plate will emit gas which would prevent the tube from operating. The plate therefore, must dissipate sufficient heat so that it does not get hot enough to emit gas. The bright, shiny nickel plate that is usually seen in a vacuum tube will radiate only two watts per square inch of plate surface so this type of plate was discarded as impossible for a large tube.

The next attempt was to blacken the surface of the



(C. Western Electric Co.)

Fig. 2. Assembling a copper disk seal to be used in a high-power vacuum tube.

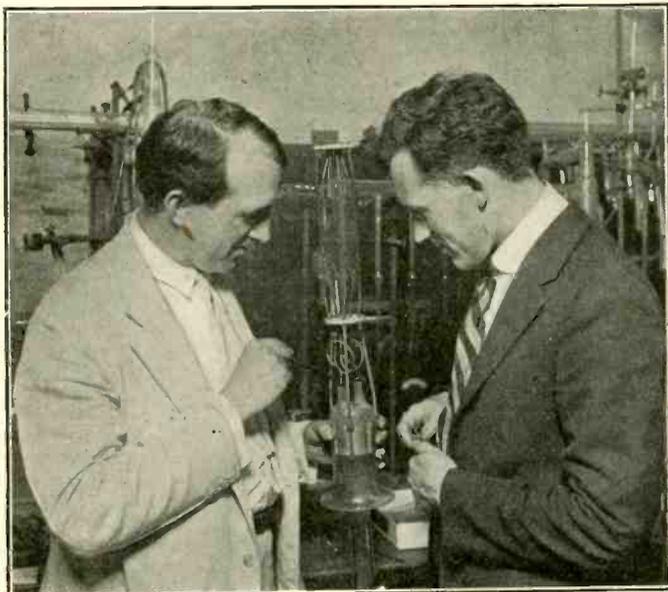
the plate forms part of the outside of the tube and can be cooled by water circulation. By this method as much as fourteen hundred watts per square inch can be dissipated.

The greatest difficulty to overcome in the development of a water cooled tube was the problem of sealing the glass part of the tube to the metal part. The lower part of the tube is a copper cylinder which serves as the plate or anode of the tube. The filament and grid are mounted inside this copper cylinder and are supported by the glass upper part. A copper-glass seal must be made between the plate and the glass and also between the filament and the grid leads in the upper part of the tube.

Up to the present time platinum has been considered
(Continued on next page)

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the only metal which can be sealed in glass. The explanation offered has been that platinum and glass, having nearly the same coefficient of expansion, did not separate upon cooling. For this reason platinum has been used for a great many years whenever a metal had to be sealed into a glass tube of any kind such as for the modern incandescent light and the vacuum tube. In the Bell System laboratories of the Western Electric Company a great deal of experimenting was carried on, trying to develop a means of sealing base metals to glass, the high cost of platinum making it impracticable to use this metal in large quantities. The starting point was the discovery of W. G. Housekeeper, of those laboratories that a piece of copper wire if flattened in one spot by a hammer blow would seal very well in glass using borax as a flux. The flat part of the wire sealed well, but the round part in contracting during cooling pulled away from the glass. This led to experimenting with copper ribbon and it was discovered that the seal was perfect with any width of



(C. Western Electric Co.)

Fig. 3. W. G. Housekeeper (left) and Dr. W. Wilson (right), of Bell System Laboratories, examining the filament-grid assembly of a 100,000 watt water-cooled tube. Mr. Housekeeper is pointing to a copper disc seal which he developed.

ribbon as long as the edges of the ribbon were sharpened. The next step was sealing without the use of borax or any flux and it was found that a flux was not necessary.

Experiments with copper ribbon lead to the belief that it was a column action of the glass that caused seals with thick ribbon to fail. This is shown in Fig. 1 where "A" represents the way the seal will fail if the ribbon is too thick and "B" represents the shape of the edge to avoid the column action of the glass. All the experiments seem to show that if the seals were so made as to avoid column action and if the copper were thin enough the seal would be perfect. The explanation of why the seal holds is that if the glass wets the copper it will hold it so that it cannot contract enough to pull away from the glass. The author has seen a piece of glass sealed on each side of a copper penny, the glass holding the penny so that it could not contract radially but contracted axially. A seal similar to this is made use of in the assembling of the power tube where the lead-in wires for the grid and filament enter the tube. A thin copper disk is soldered to lead-in wire and this copper disk is sealed to the end of a glass, glass being applied to both faces of the copper disc.

The other important seal, that between the copper anode and the glass tube is made by sealing the glass to the upper edge of the cylinder, having made this edge very thin so that the glass will keep the copper from contracting. The copper part of all these seals is really kept under tension by the glass, the only contracting of the copper being along an axis which will not affect the seal. The glass used in manufacturing these tubes is lead glass but from experiments which have been carried on, it has been concluded that any kind of glass can be sealed to any kind of metal providing the metal is thin enough so the glass will be able to hold it under tension. In making the seals the copper is first cleaned and given an evacuating treatment in a vacuum oven where the temperature is kept at about nine hundred degrees Centigrade. This oven is evacuated and the heating process drives all the air out of the copper saving considerable time in pumping out the completed tube. The copper and glass are then heated to a temperature very nearly as high as the melting point of copper. The glass is firmly pressed



(C. Western Electric Co.)

Fig. 4. J. C. Schelleng and A. A. Oswald, Bell System engineers, examining a 10,000 watt tube of the type used for trans-Atlantic telephone experiments. Behind them are two groups of ten tubes each which furnish the power for the experiments.

against the copper, care being taken to prevent the formation of air bubbles between the copper and the glass.

In constructing the grid molybdenum is used for the grid wires and for the supporting structure. It has been found that if the grid wires were welded to their supports, the joints would be brittle, so all these joints are mechanically made by tying the wires together. The grid lead passes the filament lead in the evacuated part of the tube because it has been found that otherwise a corona discharge would be formed.

The pump used to evacuate these tubes will bring the air content down to a pressure of one hundred thousandth of a millimeter of mercury, which means that for every seventy-six million parts of vacuum there will be one part of air. The method of measuring pressure inside the tube is entirely electrical and is due to Dr. O. E. Buckley of the Western Electric Company. A low voltage source is connected in series with a low reading ammeter in the plate circuit of an auxiliary tube, the minus terminal of the plate battery being connected to the plate. A source of high voltage is connected in the grid circuit with the positive terminal to the grid, thereby making the grid positive with respect to the

(Continued on next page)

A Simple Set to Take Away On Your Vacation

By A. D. Turnbull

FOR the real DX fan nothing will do except super-selectivity and ability to bring them in and lay them down, much the same as the negro in the woodshed when "thay's gonna be chickun on de table."

The little circuit described below, while not a new one in any manner, incorporates several new ideas that will pay the fellows to investigate. With this circuit and the air fairly clear of disturbance, the distance almost knocks at the door begging to be let in, and you have to lock the windows to keep from being smothered.

Of course a lot of you fellows will say that sort of talk is old stuff, and that you have heard it so often that you don't even get a thrill out of it. Well, don't pay any attention to it then, and just try out the circuit, which is all that you need to do, and you will wonder where the circuit has been hiding before.

First of all get yourself a good variometer, with 25 turns of wire on the rotor and a like amount on the stator. In most variometers they use the bearing or post that runs through as a shaft, as a means of connecting the two coils together. Just take a tap off of that lead, and go ahead and hook it up as shown in the diagram herewith.

When tuning in this circuit it will be noticed that there is a decided tendency of the tube to oscillate violently as the tube is turned past a certain point and the rotor of the variometer brought around to minimum. When this occurs, turn down your filament a bit, loosen the coupling and just bring them in to the delight of everyone. The tuning of this set is so decidedly easy that it is simplicity itself, as the main wave length control is the condenser. If you desire to listen in to 400 meters, set your condenser, and then do the rest of your

tuning with the variometer. The direct coupling, through the condenser in the plate circuit, gives capacity coupling which, while not the most efficient means of getting feedback, or regeneration, certainly makes this little circuit bring them in.

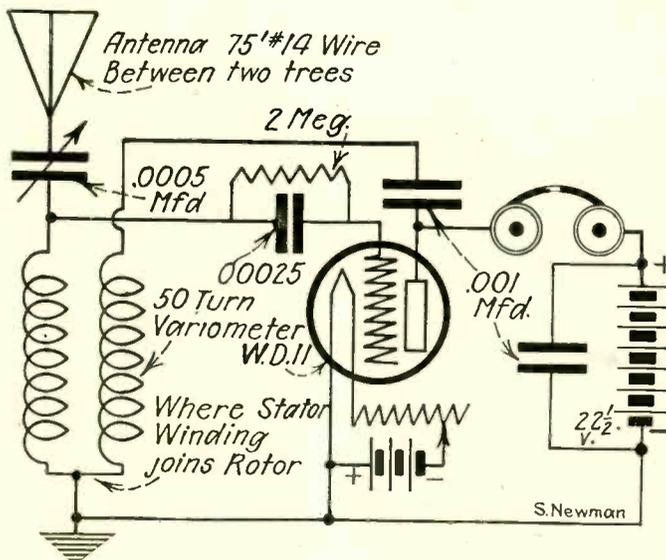
In the construction of any single circuit sets, because of their ability to oscillate, it is very hard to operate them so that they do not cause interference with other nearby sensitive sets. I have experimented with many of them, and have found out that you really do not need to have your set oscillating to receive signals strongly. The loudest signals are always received

just before the tube spills over or oscillates. This is the most efficient point, and will prevent the other receivers from being heterodyned by your receiver. With this circuit, if it is allowed to oscillate, it will cause lots of trouble with your neighbors, but by not burning your filament up bright, and always keeping the tube just inside the oscillating point, the highest regeneration will ensue and the loudest signals will be received.

If care is taken in the construction of this set, the entire receiver, batteries and all, can be accommodated in one of the smaller suitcases, such as they sell to pack lunches in. Use a neat wood or hard rubber panel

and you never need be away without your set.

When you go away, use a bare wire for a ground. Throw it in the stream, stick it in the moist earth, or drive it into a live tree by means of a spike. For the aerial, I have had wonderful success by flying a small kite with a thin piece of wire woven in among the cord, and letting the kite up to 100 or 150 feet. If you can't do that, throw an insulated wire over one end of a tree and let the other end run to your set.



Mr. Turnbull's new circuit which permits the construction of a simple set with but two controls, yet which will satisfy the seekers of super-selectivity.

(Concluded from preceding page)

filament. The filament is then lighted so that electrons will be sent out to the grid, ionizing any air that is in the tube. As the air is ionized the positive ions will be attracted to the plate causing a current to flow in the plate circuit which is proportional to the amount of air in the tube. As long as any current flows in the plate circuit there is air in the tube. The smallest scale division on this ammeter reads a pressure of one one hundredth thousandth of a millimeter of mercury, so by reading the ammeter the amount of air in the tube can be determined in millimeters of mercury.

The testing of these tubes is accomplished by forcing them to oscillate, using a plate potential of about twelve thousand volts obtained by rectifying sixty cycle alternating current. The efficiency varies with the adjustments of the circuit and tube and may be higher than eighty per cent. when all the circuits are carefully designed and balanced. However, this effi-

ciency is exceptional for the adjustments are very difficult to make.

The materials used for the construction were selected after considerable experimenting. Copper was used for the plate because it is very malleable and is not porous until its temperature reaches about six hundred degrees Centigrade. Steel was tried but proved to be too porous at low temperatures so it was discarded as unsuitable.

While the operation of vacuum tubes in parallel presents certain difficulties due to inter-tube oscillations, it must not be inferred that these difficulties are insuperable. Indeed, in the recent successful transatlantic telephone tests, carried out in co-operation by the American Telephone and Telegraph Company and the Radio Corporation of America, in which several speakers in New York talked to an audience in London, England, the power was supplied to the antenna from a bank of twenty water-cooled tubes operated in parallel. These tubes were of 10,000 watts output.

Class A Stations Now Number 75

By Carl H. Butman

WASHINGTON, D. C.—With the licensing of 21 new Class A stations and the transfer of 22 old ones from Class C, where they were operating on 360, the total number of A's was 75 on May 12.

Call	Station	Frequency Keys	Wave Lengths Meters	Power Watts
W A B G	Arnold Edwards Piano Co. Jacksonville, Fla.	1210	248	10
K F E X	Augsburg Seminary, Minneapolis, Minn.	1150	261	100
W A B C	Fulwider-Grimes Battery Co., Trenton, N. J.	1310	229	10
K F I B	Jenkins, Franklin W., St. Louis, Mo.	1230	244	10
W C B B	K. & K. Radio Supply Co., Greenville, Ohio	1250	240	100
W A B H	Lake Shore Tire Co., Sandusky, Ohio	1250	240	100
W A B F	Mt. Vernon Register-News Co., Mt. Vernon, Ill.	1220	234	250
W B B A	Newark Radio Lab., Newark, Ohio	1250	240	20
K F H L	Penn. College, Osaloosa, Iowa	1320	227	10
K F I D	Ross Arbuckle Garage, Iola, Kansas	1220	246	20
W B B C	Sterling Radio Equipment Co., Sterling Ill.	1310	229	50
K F I Q	Yakima Valley Radio Broadcasting Assn., Yakima, Wash.	1240	224	50
W A B E	Y. M. C. A., Washington, D. C.	1060	283	50
K D Z R	Bellingham Publishing Co., Bellingham, Wash.	1150	261	50
W H A L	Lansing Capital News, Lansing, Mich.	1210	248	200
W M U	Doubleday-Hill Electric Co., Washington, D. C.	1150	261	100
W O A C	Maus Radio Co., Lima, Ohio	1130	266	100
W R A L	Northern States Power Co., St. Croix Falls, Wis.	1210	248	100
K D P M	Westinghouse Elec. Mfg. Co., Cleveland, O.	1110	270	250
W F A B	Woese, Carl C., Syracuse, N. Y.	1280	234	200
W L A H	Woodworth, Samuel, Syracuse, N. Y.	1280	234	250
W M A V	Alabama Polytechnic Inst., Auburn, Alabama	1200	250	250
K F G L	Arlington Garage	1280	234	5
W Q A H	Brock Anderson Elect. Eng. Co., Lexington, Ky.	1180	254	10
W D Z	Bush, James L., Tuscola, Ill.	1080	278	10
W M A J	Drovers Telegram Co., Kansas City, Mo.	1090	275	25
W C A U	Durham & Co., Phila., Pa.	1050	286	100
K F F P	First Baptist Church, Moberly, Mo.	1090	275	50
W S A L	Franklin Electrical Co., Brookville, Ind.	1220	246	20
W M A H	General Supply Co., Lincoln, Neb.	1180	254	15
K N T	Grays Harbor Radio Co., Aberdeen, Wash.	1140	263	250
W E A D	Henry Radic & Elect. Supply, Atwood, Kans.	1120	268	100
K F H H	McCue, Ambrose A., Neah Bay, Wash.	1060	283	50
W M A Z	Mercer University, Macon, Ga.	1120	268	50
W O A V	Pennsylvania National Guard, Erie, Pa.	1240	242	100
W B A U	Republican Publishing Co., Hamilton, Ohio	1160	258	50
K G Y	St. Martin's College, Lacey, Wash.	1160	258	5

Call	Station	Frequency Keys	Wave Lengths Meters	Power Watts
W Q A F	Sandusky Register, Sandusky, Ohio	1250	240	5
W C A T	South Dakota School of Mines, Rapid City, S. D.	1250	240	100
W H A A	State University of Iowa, Iowa City, Iowa	1060	283	100
W N A N	Syracuse Radio Telephone Co., Syracuse, N. Y.	1050	286	100
W M A L	Trenton Hardware Co., Trenton, N. J.	1170	256	15
W O A X	Wolff, Franklyn J., Trenton, N. J.	1250	240	100

Thirty-four Class B Stations, each with a territorial zone, have been licensed by the Department of Commerce and began operating on May 15th.

The zone waves originally designated for Seattle and Portland have been transferred; Seattle has been assigned the 455 meter wave or 660 kilocycles, and Portland, 492 meters, or 610 k/c.

A special wave for Class B Stations in Madison, Wis., and vicinity may be designated as 345 meters if a station qualifies.

The calls and waves for 34 Class B Stations follow:

Call	Wave
California	
Los Angeles, Earle C. Anthony	KFI (395 or 469)
" Times Mirror	KHJ "
San Francisco, Hale Bros., Inc.	KPO (509 or 423)
Mercantile Trust Co.	KFDB 509
Georgia—	
Atlanta, Constitution	WGN 429
" Journal	WSB 429
Illinois—	
Chicago, Westinghouse Elec. & Mfg. Co.	KYW (?)
Daily News	WMAQ 448
Iowa—	
Davenport, Palmer School of Chiropractic	WOC 484
Kentucky—	
Louisville, Courier Journal & Times	WHAS 400
Massachusetts—	
Springfield, Westinghouse Elec. & Mfg. Co.	WBZ (337)
Michigan—	
Detroit, Free Press	
" News	WWJ 517
Minnesota—	
Minneapolis, Cutting & Washington Radio Corp.	WCF 517
	WLAG 477
Missouri—	
Kansas City, Star	WDAF 411
Sweeney School Co.	WHB 411
St. Louis, Post Dispatch	KSD 546
New Jersey—	
Newark, Bamberger & Co.	WOR 405
New York—	
New York, American Tel. & Tel. Co.	WBAY 492
" Western Electric Co.	WEAF 492
" Radio Corporation	WJY 405
" Radio Corp.	WJZ 455
Schenectady, General Electric Co.	WGY (380)
Troy, Rensselaer Polytechnic Inst.	WHAZ (380)
Oregon—	
Portland, Oregonian	KGW (492)
Ohio—	
Cincinnati, U. S. Playing Card Co.	WSAI 309
Pennsylvania—	
Philadelphia, Gimbel Bros.	WIP 509
" Lit Bros.	WDAR (395)
" Strawbridge & Clothier	WFI 395
" Wanamaker	WOO 509
Pittsburgh, Kaufmann & Baer Co.	WCAE (?)
Tennessee—	
Memphis, Commercial	WMC 500
Texas—	
Dallas, News & Journal	WFAA 476
Fort Worth, Star Telegram	WBAP 476

Stations with waves in parentheses not definitely assigned.

"Broadcast Central," New Super-Radio Station in New York City, Dedicated to the Public

"Good evening, Radio Audience, this is WJY, the new station of the Radio Corporation of America, at Aeolian Hall, West 42nd street, New York..." With these words was "Broadcast Central" located atop Aeolian Hall, officially opened to the public at 8:15 on the evening of May 14. The Radio Corporation was enabled through the kind offices of the Second District Radio Inspector, Arthur Batcheller, to officially dedicate this monstrous and wonderful achievement of broadcasting to its place in the hearts of the thousands of listeners. This impressive ceremony, which officially opened the station, was attended by a group of the foremost men in the radio world, a gathering of the very cream of the scientific world, who attended this

work that they had accomplished in making New York City the center of broadcasting. In brief he stated:

"The work of the engineers at 'Broadcast Central' is not completed. It will never be completed. Not only must the standard of the stations be maintained constantly but it must be continually improved. It is the



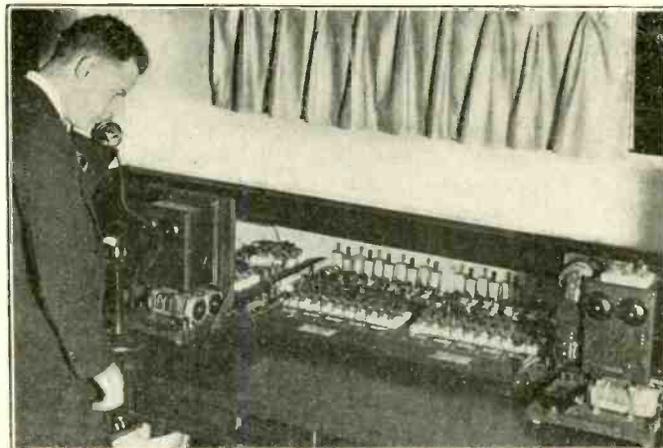
(C. Photonews)

Fig. 1. Operator E. C. Rundquist, of Broadcast Central, operating the oscillograph rectifier which is used to measure the voice waves passing through the amplifiers. There are duplicates of everything in the station for both channels in case of accident.

"house warming party" of the Radio Corporation's new station which will reach out and make happy the hearts of millions of listeners.

The opening speech was delivered by Owen D. Young, chairman of the board of the General Electric Company. He spoke on the tremendous achievement that this opening of the Radio Broadcast Central constituted. He was followed by Major General James G. Harbord, president of the Radio Corporation, who officially dedicated the station to the public service. He said in part: "It is with this thought in mind that I dedicate 'Broadcast Central' to the people of America. I dedicate it with the belief that, in a sense this station represents the world's first national theatre, for now this great metropolis is able to annihilate distance and offer its best talent simultaneously to all parts of the country from the Atlantic to the Pacific Coast—talent that will appeal to the serious minded as well as the gay and light hearted."

Upon the termination of his speech, Dr. Alfred Goldsmith was introduced to the unseen multitudes. He spoke of the many wonders that he had witnessed in the newest of arts and sciences, and of the monstrous



(C. Kadel and Herbert)

Fig. 2. Control board of the land wires used when broadcasting is being done at points outside of the studio. Any one station or church may be switched on and off at any time. There are two sets—one for the WJZ control and one for the WJY control.

plan of the Radio Corporation of America through continued research and experiment to make the stations at "Broadcast Central" even better and more effective. Radio broadcasting as shown in the present stations here is a splendid achievement, yet it is only the beginning of a great and never-ending development."



(C. Kadel and Herbert)

Fig. 3. New method of holding the transmitters inaugurated at the new radio Broadcast Central. They are held by means of rubber bands to prevent vibration. The cover is of light silk colored to represent the world. Two are provided so that if one fails the other can be switched on.

How Radio May Unite the Languages of Europe

By Arthur G. Shirt

SUPPOSE—just suppose—that when you light up the tubes in your radiophone some evening, instead of the usual well-known voices of your favorite announcers, you should hear some strange voice spluttering away in Greek, Persian, Turkish, Italian, Spanish, French, Portuguese, or in any one of the many tongues of the continent of Europe? What would you think? Oh, well, you say, that supposition is so remote that it is useless to even consider it. But what would you do if it wasn't a remote supposition, but a painful fact, as it is, or will be, with the radio amateur in central Europe? Although he may have a veritable host of broadcasting stations to choose from, only one or two will be taking in the language he understands. The interference will be something appalling, with a Tower of Babel effect that will do more toward wrecking the popularity of the radio in Europe than a series of earthquakes.

Makes us laugh, here in America, doesn't it? But it has been calmly estimated by various radio authorities that in five years there will be one million radio outfits in the United States capable of receiving speech from Europe, Latin America and the Orient! You may very well be the owner of one of these stations. For the sake of our argument, let us suppose that the European stations came in too loudly to be ignored altogether, and transmit such important speeches on world affairs, economic relations and such that we really want to hear them. Now how about it? Shall we hire an interpreter to translate what comes to us over the ocean by way of the air, or shall we, at the present moment, clamor for a "radio universal language," which will do for the radio telephone what the code does for the radio telegraph?

When the map of Europe and Asia is dotted with radiophone stations, as the map of America is now, will England shout Anglicisms into Persian ears, or will she use a tongue that is not only common to both England and Persia, but to every nation in between who cares to "listen in"? When China and Japan "open up" to address us, will we sign off in disgust, or will we, for once, understand with clear interpretative powers what proceeds from the mouth of the Orient?

Already one broadcasting station has felt the pressure of conflicting languages. CKAC, the most powerful station in Canada, situated at Montreal, transmits in both English and French. The problem of serving different nationalities is easily solved in this particular case, but if CKAC were situated in Switzerland, for example, would it transmit in practically all the known languages of the globe? Very likely not. It would feel the need of and eventually discover a radio language that would be intelligible to each and every one of its vast and widely scattered audience.

What will such a language be like? How will it sound and who will teach it? Why not adopt English as the language of the air? Now, you English-speaking people, test yourselves. Why not French? All these questions have been asked before, but not in connection with radio. For the subject of a world language is almost 300 years old.

The language meeting the requirements should be

modern, simple and flexible and readable to a large extent at a glance by any one speaking French, English, Italian, Spanish, German or Russian. At the same time, it must not be impossible to inhabitants of China, India, Japan, or Turkey, who have difficult languages of their own. It should be brief, clear, full but not redundant, and suitable for the needs of travel, commerce, labor and polite intercourse as well as for radio communication. Moreover, so that it may not undo its own purpose by promoting international jealousy, it must be strictly neutral. That is to say, while it may draw from all languages, it must be partial to none.

To be neutral, a language must be artificial. Yet in being artificial, it must not be disagreeable to the ear. Neither must it pretend to take the place of or supplant a native tongue. It should be solely an auxiliary language, adopted for the common expediency of the whole world and for the benefit of that vast army of radiophone listeners, who, when they give their attention to a station, want to know what it is talking about.

All these qualifications sum up into quite a big bill, but there are three artificial languages in existence today which fill it more or less satisfactorily. They are Esperanto, Ido and Idiom Neutral. And in the light of present day radiophone development, it is not at all unlikely that one of these three will be chosen as the language in which the radiophone of the future will speak.

More Standard Waves for Calibrating Sets

WV at the Bureau of Standards, Washington, D. C., will again transmit radio signals of standard frequency on the nights of May 29 and June 4 and 11, for calibrating wave meter and adjusting receiving and transmitting apparatus. Detailed information on methods of standardizing sets is available in Circular Letter 92 which may be obtained upon application to the Bureau at Washington.

The schedule includes the transmission of the following wave lengths starting at 11 P. M. Eastern Time each night and continuing until 12:41 A. M.:

	May 29	June 4	June 11
Kilocycles	1400	900	400
Meters	(214)	(333)	(750)
Kilocycles	1500	1000	500
Meters	(200)	(300)	(600)
Kilocycles	1600	1100	600
Meters	(187)	(273)	(500)
Kilocycles	1700	1200	700
Meters	(176)	(250)	(428)
Kilocycles	1800	1300	800
Meters	(167)	(231)	(375)
Kilocycles	1900	1400	900
Meters	(158)	(214)	(333)
Kilocycles	2000	1500	1000
Meters	(150)	(200)	(300)

A Single Tube Reflex of Great Selectivity

By W. S. Thompson

[The author informs us that he has received hundreds of letters from radio fans complaining of the lack of selectivity in the one-tube reflex set. He therefore has prepared the following article as a solution of this problem. He states that the set here described is the most selective non-regenerative set he has ever used which does not make use of a multitude of controls.—EDITOR, RADIO WORLD.]

THE modern receiving set should be selective above all other requirements, for no matter where a set may be located, there will be interference of some kind which must be tuned out before any desired signal can be received, with any degree of success. Another advantage of the highly selective receiving set is that it will be less affected by summer atmospherics.

The regenerative receiver has an advantage over the non-regenerative in this respect, for regeneration in itself makes the set selective to a high degree. Therefore, the non-regenerative set must incorporate some other means of acquiring the selectivity which it does not have due to feed back action. The reflex circuits have become popular almost over night, so today they are, the writer believes, the most popular of the non-regenerative sets. They have many advantages over a great many of the other sets, but to compete with the feed back circuits, they must be very selective. The worst offender along these lines is the single tube reflex, which, however, can be so designed that even this disadvantage can be overcome.

The hook-up shown in the diagram herewith is for a one tube reflex which will enable any user to tune out almost any interference and will eliminate atmospherics to a great extent if properly handled. The parts used are given below and lettered corresponding to the lettering in the diagram.

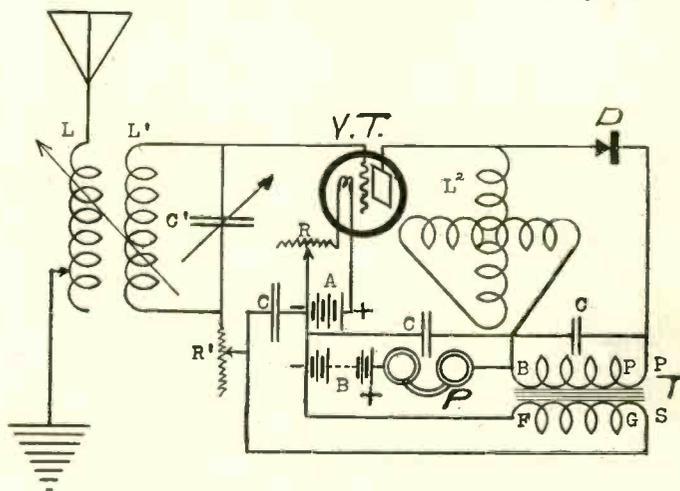
- L—Tapped primary of a vario-coupler.
- L¹—Secondary of coupler rewound with 65 turns.
- L²—Variometer.
- C'—Variable air condenser (vernier) .0005 mfd.
- C—Fixed mica condensers .002 mfd.
- R—Filament rheostat 30 ohms.
- R'—Potentiometer.
- A—Filament battery (three dry cells).
- B—Plate battery (45 volts).
- D—Crystal detector.
- T—Audio frequency transformer.
- P—Telephone receivers.
- VT—Vacuum tube (UV-199) and socket.

There are of course other tubes which may be used in this circuit, depending upon the experimenter's choice. In case any other tube is used, the values given for the filament battery and filament rheostat will have to be changed to suit the tube used. Higher plate voltage may be used and is recommended although a "C" Battery in the grid circuit will be necessary in this case.

The primary of the variocoupler should be so tapped that the number of turns can be varied one at a time. This can be accomplished if two multipoint inductance switches are used, one for coarse and the other for fine tuning. The popular variocoupler on the market at the present usually has about twenty or thirty turns of wire on the rotor. The rotor therefore, will have to be rewound using smaller wire or by bank winding until there are 65 turns of wire on it. The set will tune more sharply if the rotor is bank wound, using a larger size wire because the added resistance of the small

size wire will detract from the selectivity of the set. The secondary is tuned with a vernier condenser having about 23 plates. The vernier will enable the user to do much finer tuning which may mean the difference between hearing and not hearing a distant station or between hearing one or two stations at once. Another tuning control is the variometer which is placed in the plate circuit of the tube. By using a variometer for the radio-frequency coupling, there are several advantages gained. The experimenter will usually find that the signal strength is greater using this method of coupling, rather than transformer coupling. One reason for this is that it is very difficult to design a transformer coupled set which will give satisfactory voltage amplification through the transformer. Another advantage lies in the fact that the variometer can be used for tuning out undesirable signals.

The potentiometer R' which is connected in the grid circuit may or may not be necessary. If the experimenter is very close to a high-powered station, this potentiometer will stabilize the set and prevent the tube from oscillating. Any very loud signals tend to make the set unstable so the resistance of the potentiometer



A highly selective reflex circuit using one tube and a crystal detector.

meter will have to be adjusted for each different intensity of signal strength. If great care is taken to keep all grid circuit wires away from the plate circuit wires and by using the tube recommended, no trouble due to instability should be encountered.

In tuning this set, remember that any set will be more selective and less affected by atmospherics when the coupling between the primary and secondary is very loose. For this reason a variocoupler has been used and by its use signals otherwise unintelligible will be pulled through persistent interference.

In selecting a crystal detector, there are several points which should be kept in mind regarding the mounting. The crystal should be firmly mounted in a cup so arranged that this cup can be removed at any time without great difficulty. The cup should be held firmly in the mounting so that there will be no possibility of the cat whisker losing its adjustment. The cat whisker which can consist of one small wire or a bundle of small wires, should be mechanically rugged and have some arrangement by which its pressure on the crystal can be adjusted. The best results seem to be obtained when the contact is very light although the adjustment is very easily disturbed in this case.

WOAW, the Fine New Broadcasting Station of the Woodmen of the World

STATION WOAW, of the Woodmen of the World Life Insurance Association Headquarters at Omaha, Nebraska, has been on the air since April 2nd, when it was officially opened. Since then it has attracted the notice of "listeners in" in every part of the United States as well as distant outside points. WOAW was designed and constructed by the Western Electric Company engineers who established communication between Arlington, Virginia, and Paris, France.



(C. Western Electric)

Fig. 1. The antenna system of station WOAW, the new broadcasting station of the Woodmen of the World, at Omaha, Nebraska.

The Woodmen of the World Life Insurance Association, while fundamentally interested in insurance, has demonstrated its policy as being more than an insurance proposition. In fact, the policy of the Woodmen of the World Life Insurance Association is to keep pace with progress in all lines of human endeavor. The War Memorial Hospital to be officially dedicated at San Antonio, Texas, July 4th, has been constructed by the Woodmen of the World to care for members who have been disabled by disease. It marks a new step in the history of fraternal insurance. Plans are also being laid by the executives of the Woodmen of the World for a home for the aged members of the Society and for orphans of Woodcraft. Another feature introduced by this Society is the extension of loans to members to enable them to build their own homes. The construction of Radio Station WOAW was the culmination of this policy.

Over \$50,000.00 has already been expended in equipment and management of this station and the officers

are sparing no funds to make it one of the best privately owned commercial radio stations broadcasting in the United States.

Not only have the distance attempts met with satisfying results, but success has been achieved in procuring diversity and high quality in the broadcasting programs, as is testified by the expressed approval of "listeners in" from every state in the Union, as well as Canada, Mexico and Cuba. Station WOAW, in spite of the brief period of operation, has already reached such distant points as Los Angeles, Vancouver, Miami, Bangor, Newfoundland, Quebec, Porto Rico, Havana, Guadalajara, Mexico and Nova Scotia.

The farthest distance reception of WOAW acknowledged was a message from the radio operator on the S.S. "White," at that time located 1,200 miles south of San Pedro, California, making an approximate bee line of 3,000 miles from Omaha.

That WOAW attracted the attention of radio fans extensively is indicated not only from the point of its



(C. Western Electric)

Fig. 2. W. A. Fraser, Sovereign Commander of the Woodmen of the World, making the dedication speech at the opening of the new WOAW broadcasting station.

distance acknowledgments, but also in view of the vast number of letters, telegrams and telephone calls which have flooded the headquarters. During the first week of broadcast more than 50,000 of these communications had been received at the offices and a force of 10 telephone girls, 15 typists, 10 stenographers and numerous

(Continued on next page)

U. S. Army Finds Aid In Radio

By Carl H. Butman

EFFICIENT communication in the army is coming more and more to depend upon radio, and in order to keep abreast of its rapid development the Signal Corps of the United States Army maintains a complete and modern radio research laboratory at Camp Alfred Vail, N. J. Here the development of new and special apparatus for the several arms of the service is planned and perfected. A number of America's foremost radio engineers are engaged in the laboratory upon radio problems. A radio school for military students is also conducted at Camp Vail, where men from the different corps are trained as experts.

Functions of the Signal Corps do not comprise radio communication solely, but include all means of signaling running from visual, through the pigeon service, line telegraphy, cables, telephone work, including field service to the latest methods of radio communication. The Signal Corps also includes meteorological and electric time services.

In time of war, a signal officer pointed out recently, victory or defeat has sometimes hung upon the transmission of a single message, and the importance of communication is so great that no engagement can be successful without a well-planned system of communication. In the army efficient communication systems are maintained in time of peace as well as war. This makes it necessary for the Signal Corps to keep up to date and, when possible, to be a little ahead of the times. Many commercial devices and systems now used were originated in the Signal Corps for military use long ago.

Today a network of radio stations extends to all quarters of the country, with a message center in Washington. High powered stations carry dispatches from coast to coast in record time, and no military command is out of touch with Washington for an appreciable length of time.

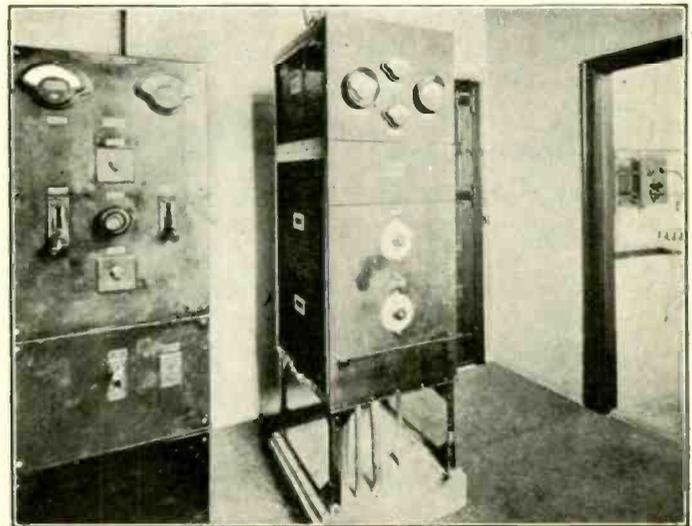
The installation of a system of modern 1½ kilowatt vacuum-tube stations connecting all centers of military activity has been practically completed. For the trans-continental circuit stations have been established at New York, Washington, Indianapolis, Omaha, Salt Lake City and San Francisco, with one nearing completion at Cheyenne. Similar stations have also been installed at Atlanta and St. Louis. In addition, all the important aviation fields will soon be connected with the radio system. Most of the big stations are equipped with remote control apparatus permitting operation of a transmitter at some distance and the reception of incoming messages by loops and six stage radio-frequency amplifiers in the main offices. Communication is maintained through these sets by means of the continuous wave telegraphy method, but the

stations are also equipped for radio telephony and buzzer, modulated radio telegraphy.

The importance of radio to an army in the field was shown during the operations of the First American Army in the Meuse-Argonne battle, when six hundred radio receiving sets were used for receiving airplane reports alone. The operation and maintenance of these receiving sets required the services of about 5,000 radio specialists, most of them recruited from the ranks of American amateurs at the outset of the war.

Radio for communication between infantry regiments and battalions is the most important link in action. Front line wired telephone and telegraph communication is constantly interrupted by shell fire and bombs. Farther to the rear, wire communication is more dependable and there radio becomes more of an auxiliary service.

With the exception of brigade to regiment commun-



(C. Western Electric)

Fig. 3. Partial view of the transmitting room of the new station of the Woodmen of the World at Omaha. A standard Western Electric transmitter is used.

ication, which is spark radio, all ground radio within an American field army is of the vacuum tube or continuous wave type.

In army corps headquarters, as well as large artillery and air units, powerful vacuum tube sets installed on tractors are employed. Divisions and regimental units in the field are equipped with compact chest-type tube sets. In advanced posts, "V"-shaped antenna supported by 20 foot bamboo poles are used.

(Continued from preceding page)

other general employees was necessary to cope with this enormous volume of communication. Over 300,000 pieces of mail matter have left Station WOAW in answer to communications from radio fans.

The studio is divided into four rooms—reception room, artists' room, operating room and power plant. The reception room and artists' room are furnished with beautiful velvet lounges and mahogany chairs for the convenience of both performers and visitors or guests of honor. Gorgeous draperies of plush are used not only for purposes of decoration, but also to muffle all sounds. Sound-proof glass doors and heavy rugs

make the studio practically sound-proof at all times.

At the present writing one of Nebraska's well-known artists, Mr. Henri Domshyte, is painting a series of canvases for the studio. Mr. Domshyte is a modern impressionist and his work has been attracting much attention of late. In view of the fact that his pictures are being made to fit the color scheme of the studio as well as to express his philosophy of painting, it is expected that thousands of people will visit this studio not merely to learn about the radio station, but also to satisfy their interest in art. In fact, WOAW is claimed to be the only station in the country that can boast of this unique decorative arrangement.

A Simple Variable Grid Leak

By "Sigma"

TUBES of various makes require different values of grid leaks. These values vary from $1\frac{1}{2}$ to 5 megohms, and the correct size can be found only by experiment. Although different leaks manufactured in cartridge form are very good, there is the expense to look at, as several would have to be bought of different values while only one would be used. For this reason the leak described below should be very

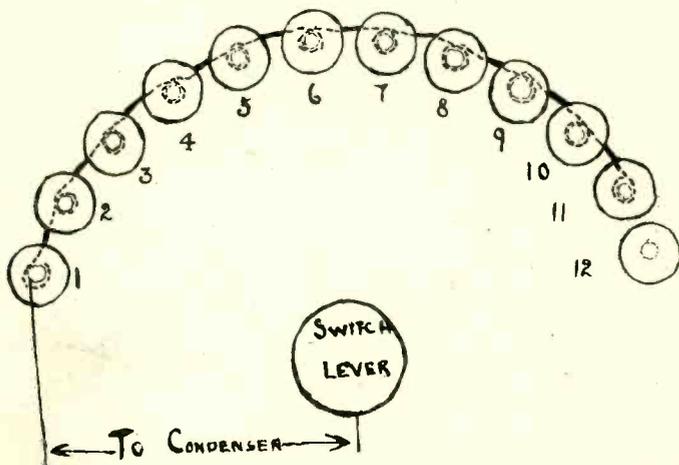


Fig. 1. Method of making a variable grid leak by fastening an India ink soaked string under the nuts of taps.

popular and, in addition, the appearance is not an eye sore.

The parts to make up this piece of apparatus are easily obtainable and should not cost more than an

ordinary grid leak. The following will be required: A switch lever, 12 contact studs with two washers each, about a foot of thin twine, some India ink and the hard rubber or other insulating material for mounting.

Drilling the holes to mount the switch lever and contact studs is carried out in the usual manner. The twine is soaked in India ink and allowed to dry. When perfectly dry it is taken between the washers on the contact studs from 1 to 11, the last stud being left disconnected. The leak should now be connected to the condenser as shown; thus, when the switch is at 1 the condenser is short-circuited, while from 2 to 11 different values of leaks are obtained. When on stud

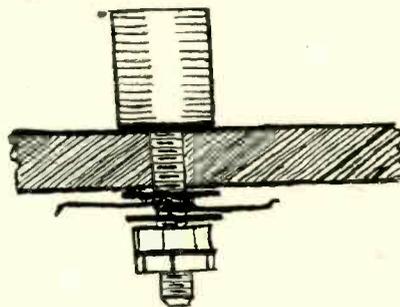


Fig. 2. Method of fastening the string to get good contact. It is wrapped around the shank under the washer.

12 the leak is entirely disconnected; thus all the combinations normally required are easily obtained with a simple and cheap piece of apparatus, which the average experimenter can make up in about an hour.

Importance of Minor Things in Radio

By R. L. Dougherty

FEW people, either when they are constructing or operating a radio set fully realize the importance of some of the "minor things" they overlook or carelessly neglect. Some of these things may appear trifling but when they are multiplied together it is a wonder that some sets even as much as peep. A few of the "minor things" are:

Using too much flux when soldering connections. This causes a high resistance leak because of the habit of the flux to spread and collect dust and dirt, thus lowering the efficiency of the set.

Not soldering connections. Brass and copper have the habit of corroding. When you make a connection and simply fasten it under a screw, you are courting high resistance because the metallic parts will corrode. *Solder all your connections.*

Not insulating your lead-in properly. People have a bad habit of just letting their lead-in come through the top of an open window, touching the walls. In general they bring it in "any old way at all." Were you to visit a commercial station, or take a look at the radio shack aboard a naval vessel, you would note the fact that the lead-in was very well insulated by insulators hanging from the ceiling, or some other method, and that also the inside lead-in was of very heavy copper wire, No. 2 or No. 0 being used.

Letting dust collect. Many sets do not receive a good cleaning from the time they are installed until they are broken up or relegated to the "junk pile."

Dust collects between the switchpoints, binding posts and every place possible, forming innumerable paths of escape for the minute currents and seriously cutting down the efficiency of the set.

Insulating. Where leads cross on the interior of a set in close proximity, it is better to use a few inches of insulating material in the form of spaghetti or rubber tubing than to take chances of a short when the set is moved or an adjustment changes some interior part of the set. An ounce of precaution, or an inch of insulation, is worth \$6.50 or a couple of new tubes or a new pair of phones.

Phones. These devices were constructed as a means of hearing signals, not as a means of showing your friends how much you know about the workmanship of different parts. Do not take off the ear pieces, tap the diaphragms, or fool with the wiring, unless you understand just what you are doing. The phones took a couple of hours of an expert's time to adjust and your taking the caps off destroys his work. Phones are sensitive instruments and wired with copper wire that is finer than the hair on a man's head. They will not stand abuse. Do not test them out by putting them across a battery. They will click if you simply touch the two ends to your tongue, and rub the terminals together. If they don't work, after you have been using them, take them back to the manufacturer and let him fix them. He will be able to do it—but not if you try to do it first.

A CW Hook-up That Really Works

By R. W. Emerson Decker, 2UA

THERE have been so many different hook-ups and various suggestions about CW sets that the novice starting in the transmitting game is really bewildered.

For CW work an aerial of about sixty to seventy feet should be used. Four wires spread three feet apart is necessary. Good porcelain insulators should be used and the guy wires should be broken up with insulators every ten feet or so. This tends to stop the reradiation which is common with CW transmitters.

The lead-in should be a cage about six inches in diameter and carefully insulated throughout. Be very careful when bringing it through to the set.

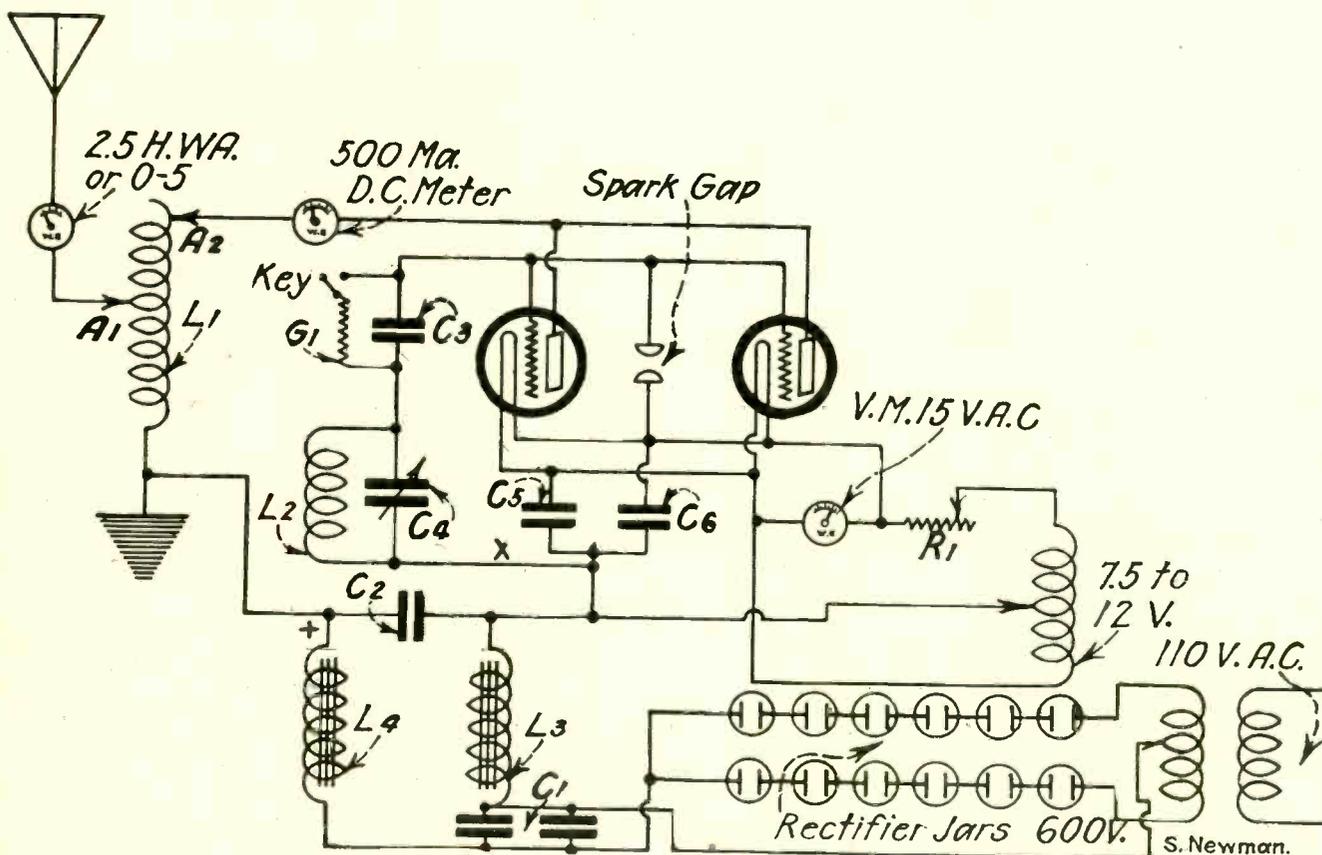
A counterpoise should be used and this should be

member is to insulate this thoroughly. It should be six inches in diameter.

There has been quite some argument on the merits of ribbon or heavy wire for inductance, but wire is generally used.

L^2 is the grid coil and is made with fifteen turns of wire on a tube slightly smaller in diameter than L^1 . This coil is placed in the bottom of the main inductance and the wire should be wound in the opposite direction to that of the other coil.

L^3 and L^4 are iron chokes, $1\frac{1}{2}$ henry, and 500 M. A. C^1 and C^2 are 1 mfd. condensers. The Western Electric 21-A.A. condensers can be used here and work very well.



A neat and powerful CW or phone transmitter circuit. If you have been looking for an efficient transmitter construct this and you won't go wrong.

also carefully insulated. This should fan out under the aerial for a diameter of about forty feet and should extend past the aerial a few feet. The height of the counterpoise from the ground should be about ten to fifteen feet. If the space about the station does not permit the erection of the counterpoise under the aerial have it at right angles; it works equally as well and the wave seems to be sharper.

Now that we have the aerial and counterpoise ready we should start on the transmitter itself.

The circuit used here is very easy to operate and adjust and will work with practically no adjustment, but with some hard study and careful tuning will step out in great style. This hook-up can be used with five-watt tubes or the next size, 203 or fifty watters.

On looking the circuit over it is easily seen that L^1 is the main inductance. This is a tube 7 inches long with 30 turns of No. 10 BSC wire. A point here to re-

C^3 is a mica or air condenser of .0005 or .005 mfd. capacity; C^4 is a variable condenser of about .0005 to .001 mfd.

C^5 and C^6 are .001 fixed paper condensers.

G^1 is the grid leak of 10,000 to 15,000 ohms resistance. R^1 is a heavy rheostat. This should be able to carry 5 amperes continuously without heating. While some claim a rheostat is not necessary here, it is much safer to use it as the voltage may change at times and a rheostat is cheaper than burning out tubes.

A^1 is the wave length tap; A^2 controls the coupling; the hot wire meter should read to 0-2½ or more. The meter near A^2 is a 500 M.A. D.C. meter.

An AC 10 to 15 volt meter should be used in the filament lead, as in the diagram.

At the point marked X the lead may be broken and the secondary of the modulation transformer inserted.

(Continued on next page)

Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained
in Plain Language for the New
Radio Enthusiast

By Lynn Brooks

ABSORPTION: The loss of electrical energy radiated into space, due to the electric conductivity of surrounding objects. This effect is noticeable more in congested districts containing a number of steel or metallic structures, or objects that will conduct and absorb the energy radiated into space. It is very noticeable in places where there is a great deal of foliage, such as in or near forests. Absorption is frequently the reason for some signals being received from certain distances more easily than from others, and if you receive signals easier from the south than from the north a survey of the surrounding country will nine times out of ten prove that some intervening body, such as a forest, or a number of tall buildings is absorbing most of the energy from the northern point before it gets to you.

VARIOCOUPLER: A method of transferring the received energy from the antenna circuit to the detector circuit must be had if any amount of selectivity is to be achieved. To accomplish this a coupler generally is used. A coupler consists of a tube (stator) on which is wound numerous turns of wire. The inductance on this tube is varied by means of tapping it at various places. Inside of this tube there is a smaller tube or ball (called a rotor) placed so that it may freely rotate inside of the first tube. On this there is also wound a number of turns of wire. The wire on this tube is not variable, but is calculated to cover a certain number of wave bands and is variable by capacity when shunted by a condenser. In use, when the central tube or rotor is exactly parallel to the first tube and the wires in both tubes are running in the same plane the transference of energy from one winding to the other is maximum, and the coupling is said to be close. As the rotor is turned the transference varies, because of the

inability of the lines of force generated by the first tube to cut as many wires as before, and the tuning is then said to be loosened. When the two coils are at right angles, the transference is at its minimum.

WAVE METER: A wave meter is a device by which it is possible to measure the frequency of an emanated electrical wave. It generally consists of an inductance of fixed value, a variable capacitance, a means of detecting or rectifying the impulse and a pair of phones, or small glow lamp so as to enable the user to determine when the circuit to be measured and the measuring circuit are in perfect resonance. On the condenser is placed a scale reading from 1 to 180°. This is generally plotted in the form of a curve on a graph in terms of an empirical scale. The coil of the wave meter, the constants of which have first been checked and the wave length plotted against a standard instrument, is placed near to the instrument to be measured, and the condenser is varied. If a received signal is to be measured, the detector and phones are used, and if a transmitter is to be checked, the small lamp is used in place of the phones and detector. As the condenser is rotated, the signal will be heard in the phones, or the small lamp will light up. At the point where the transference of energy is the greatest, the two circuits are in perfect resonance, and by looking at the scale, the wave length will be found.

SELECTIVITY: In the reception of signals, especially where a number of transmitters are located within a comparatively small distance, some means must be had of separating the different transmitters from one another. This can be accomplished in several ways. The most common method is to use a tuned circuit, or a circuit using inductive coupling rather than direct or capacity coupling. The reason for this is that as the coupling can be varied directly between the antenna circuit and the detector circuit, the signal that is undesired can be reduced to a minimum, without desired signal being diminished to any great extent. If the desired signal can be held without decreasing it in direct proportion to the undesired signal it is apparent that it will drown out the other or undesired signal. In obtaining selectivity in a circuit it is sometimes necessary to sacrifice the volume of a signal, but this is balanced by clear and untroubled reception of the wanted station. It is sometimes possible to obtain selectivity in a single circuit receiver because of the circuit's regenerative abilities. A regenerative circuit will always tune sharper and is therefore more selective than a non-regenerative one, but at the same time it has the disadvantage of re-radiating.

(Continued from preceding page)

The transformer secondary should be shunted with an .001 condenser. The transformer secondary should be short circuited when CW is used. It will also be necessary to change the value of the condenser C⁴ every time the set is changed from voice to CW.

The rectifier used is the electrolytic type. The plates should be about three inches long and from 1/8 to 1/2 inch in width. They will pass 200 M.A. easily if about 1-32 of an inch in thickness. A point here necessary to advise is to use only pure aluminum and lead. Distilled water must be used.

The solution is made up of borax and water and it is also well to get good borax. If there is sparking in the rectifier it shows that poor aluminum has been used. Overheating and a great loss of efficiency will then take place.

L⁴ and L³, together with the condenser C¹ and C², will make a good filter system and will take the ripple out.

If U.V. 203, the 50-watt tubes are used, the grid leak may be left out at 750 volts, while with 1,000 volts plate current the grid leak should have a resistance of 250 ohms. If one tube is used about 500 ohms will be sufficient.

The condensers in the filter system will have to stand at least 2,500 volts.

This CW set is the best for short waves and it is fine for the 150 to 200 meter work.

Rectifying tubes can be used in place of the rectifier, but are more expensive to use than the jars.

If the set is put into a panel it will present a very fine appearance, but first the set should be experimented with and carefully wired so that no high resistance joints be made.

At a local station this hook-up was used with two five-watt tubes and a DX of 2,000 miles was obtained.

Be sure that you have wired the set correctly before testing out the tubes, as a mistake can easily be made, and a burned out tube may be the result.

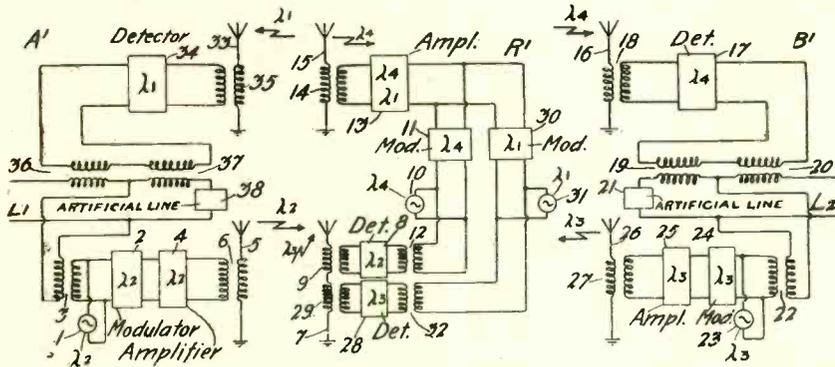
Latest Radio Patents

High Frequency Signaling

No. 1,452,957: Patented April 24, 1923. Patentee: E. H. Colpitts, East Orange, N. J.

THIS invention relates to high frequency signaling, and more particularly to the relaying or repeating of telephonic messages transmitted by means of high frequency carrier oscillations, modulated in accordance with the form of the message wave.

this by receiving at a repeating station a modulated wave transmitted from either or both of two terminal stations. On receiving a modulated wave at the repeating station a new carrier frequency is substituted having a value different from the carrier frequency for which the repeating station's receiving apparatus is tuned. In other words,



Colpitts' new method of modulating telephone signals.

It is an object of the invention to provide a system for two-way repeating and to prevent, at a repeating station, a useless local circulation of power, which gives rise to the objectionable phenomenon known as "sing-ing."

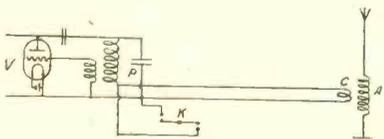
The invention provides for accomplishing

the receiving apparatus at the repeating station will not be receptive to the carrier wave transmitted from that repeating station, and the objectionable local circulation of power is prevented. However, the new carrier wave is received at the proper terminal station.

Wireless Transmitter

No. 1,452,960: Patented April 24, 1923. Patentee: W. T. Ditcham, Twickenham, England.

THIS invention relates to wireless transmitters of the inductively coupled type. In accordance with this invention the in-



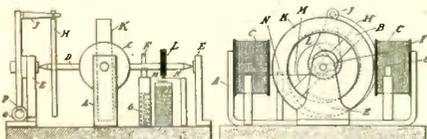
W. T. Ditcham's method of using inductive coupling in sustained wave transmission.

ventor utilizes a primary and a secondary circuit, in which a portion of the inductance of one of the circuits is extended to affect the other circuit, and means is provided for short-circuiting the extended portion for the production of signals.

Wireless Telegraph Calling

No. 1,452,925: Patented April 24, 1923. Patentees: W. H. Nottage and T. D. Parkin, Chelmsford, England.

THIS invention relates to wireless telegraphic calling devices of the type in which impulses are transmitted at regular



W. H. Nottage's system of calling or ringing bells by radio at predetermined times.

intervals and are received by a balance wheel relay, or the like, which has a natural oscillation period equal to the interval between successive impulses so that, though

the relay may be unaffected by ordinary signals, yet when a train of impulses at predetermined intervals is incident upon the receiver the oscillations of the relay are increased by the impulses sufficiently to enable it to actuate a bell or other signal or operate in some way an electric circuit for the control of apparatus.

According to this invention we employ for transmitting and receiving the impulses timing mechanism, comprising a spring controlled balance wheel oscillated by an electromagnet, the circuit of which is interrupted by the oscillations of the wheel.

Telephone Receiver

No. 1,452,850: Patented April 24, 1923. Patentee: Lambert Schmidt, Brooklyn, N. Y.

THIS invention relates to a loud-speaking receiver for use in connection with apparatus employed for the purpose of establishing wireless telephonic communication.

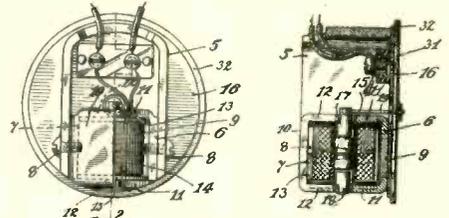
Generically considered, it is the primary object and purpose of the invention to provide a receiver of the magnet type which will be highly sensitive and instantly responsive to the slightest variations in polarity of the alternating currents coming in over the line.

More particularly the invention comprehends a radically new form and construction of the armature, having a resiliently balanced suspension in the bore of the translating coil spool. This armature is of cylindrical form, and the pole shoes of the permanent magnet are so related to the ends of the armature at opposite sides thereof that the magnetic flux, acting over a relatively small area, produces an instantaneous responsive movement of the armature to the slightest pulsations of the alternating currents passing through the translating coil.

As a detail item of improvement in instruments of this character, the inventor pro-

vides a two-part armature and fulcrum means therefor, which is secured and held in assembled relation with the armature parts when the latter are connected so that the armature and its fulcrum in fact constitute a single unit and capable of assemblage in operative position by the mere insertion of the armature through the bore of the coil spool.

In general the present improvements provide a telephone receiver as above characterized, which, though highly sensitive in its



New method of locating the magnets of a telephone with regard to the diaphragm.

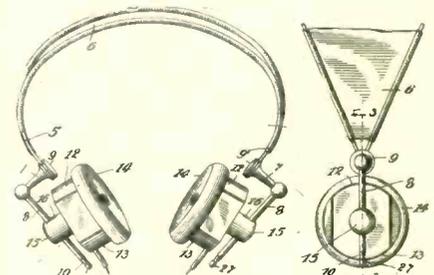
action, is nevertheless composed of simply and substantially constructed elements which are capable of operative association in very compact relation and may be confined within a casing of appreciably smaller size than it is possible to use in instruments of this character as heretofore constructed.

Head Receiver for Telephones

No. 1,452,851: Patented April 24, 1923. Patentee: Lambert Schmidt, Brooklyn, N. Y.

THIS invention relates to head receivers for telephones, and is more particularly designed for use in connection with radio-telephone apparatus, though not necessarily limited in this respect. It is the primary object and purpose of the present invention to provide a head receiver for telephones of that type wherein the two receivers are connected by a more or less elastic or flexible head band or bridge.

More particularly it is the aim and purpose to provide an improved adjustable connecting means between the receivers and the



Schmidt's flexible headband for telephone receivers.

ends of the head band whereby the receivers may be readily positioned in accordance with the size or physical peculiarities of the wearer's head so that they will fit snugly against the ears and thereby exclude extraneous sounds or noises.

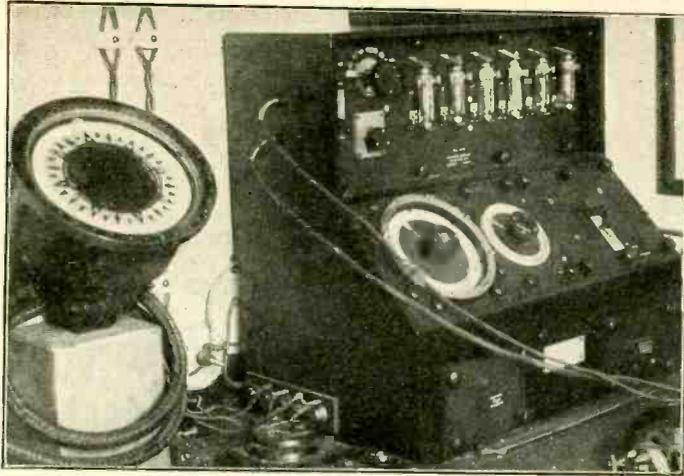
Radio Supervision in Samoa

ALTHOUGH the radio regulations for New Zealand have been extended to apply to Samoa, it is reported that more latitude is given the amateurs, and that an effort to regulate broadcasting stations is being made before interference begins. Samoa is designated as the Fifth New Zealand Radio District, with the officer in charge of the Apia radio station as inspector of local reception and transmission.

Except that it is necessary to secure a license and pay a small license fee, amateurs are unrestricted in radio reception; but licenses are not to be issued for circuits which cause interference. Amateur transmitting stations in Grade I require the supervision of a licensed operator.

Hoover Allocates the Waves

Captions by Robert



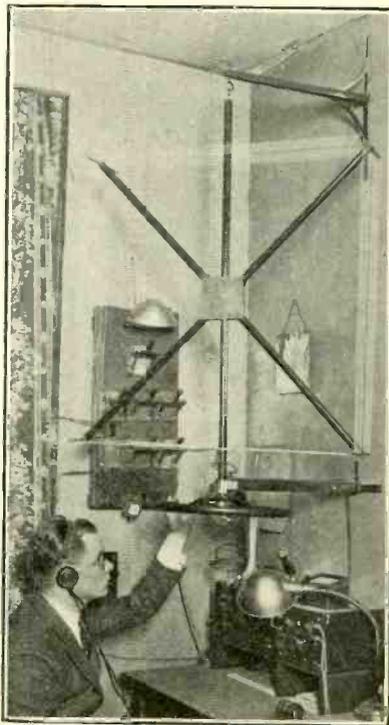
(C. Kadel and Herbert)
One of the seven wonders of the seas, and one of the most important and up-to-the-minute devices—the Radio Compass. The illustration shows the latest aid to maritime men, the "DF" or Radio Compass. The machine is a Sperry gyro repeater in connection with a powerful receiver built so that direction effects are charted right in front of the operator's eyes without any figuring or mapping.



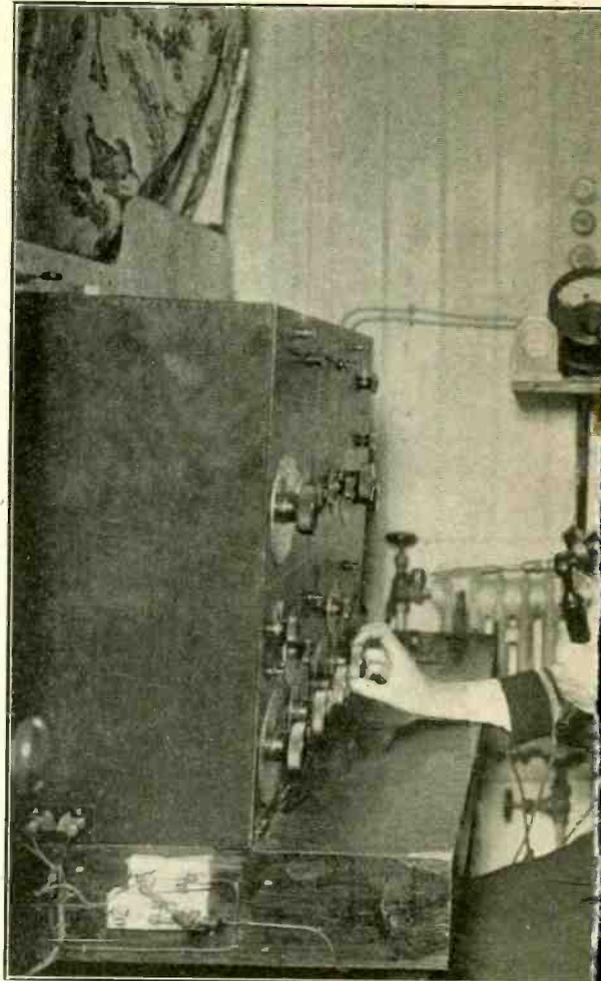
(C. Keystone Views Co.)
France has gone the radio world one better in the matter of radio entertainment. They have equipped the Seine River steamers with complete receiving sets with loud speakers to enable the passengers to hear the local and long distance broadcast programs. The illustration shows one of the loud speakers located on the deck of a boat furnishing the passengers with radio music.



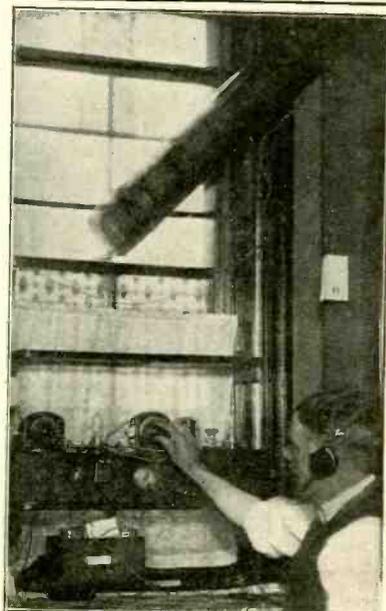
(C. Kadel and Herbert)
Folks, meet "Jiggs," the versatile mascot of the U. S. Marines, who is taking his "daily dozen" (?) via the air. He used to be a favorite with the aviation forces until they started in to broadcast, when he promptly deserted the air for "the airs from the air."



(C. Kadel and Herbert)
Here is one way to beat atmospherics this summer, as shown by Wendall Kilmer, a New York amateur. He has mounted his loop on brackets and suspended it from the wall. Because of a loop's directional effect and the ease with which such a set (3 tube radio frequency) is manipulated great distances can be covered.



(C. General Electric)
The S. S. "America's" duplex transmitter. A two-way conversation between the S. S. "America" and the S. S. "E. F. W. Alexanderson," chief engineer of the Radio Corporation, has been established between ships at sea. The transmitter which made this feat possible is shown directly in front of the operator. All the controls for both the receiver and the transmitter are visible in the foreground.



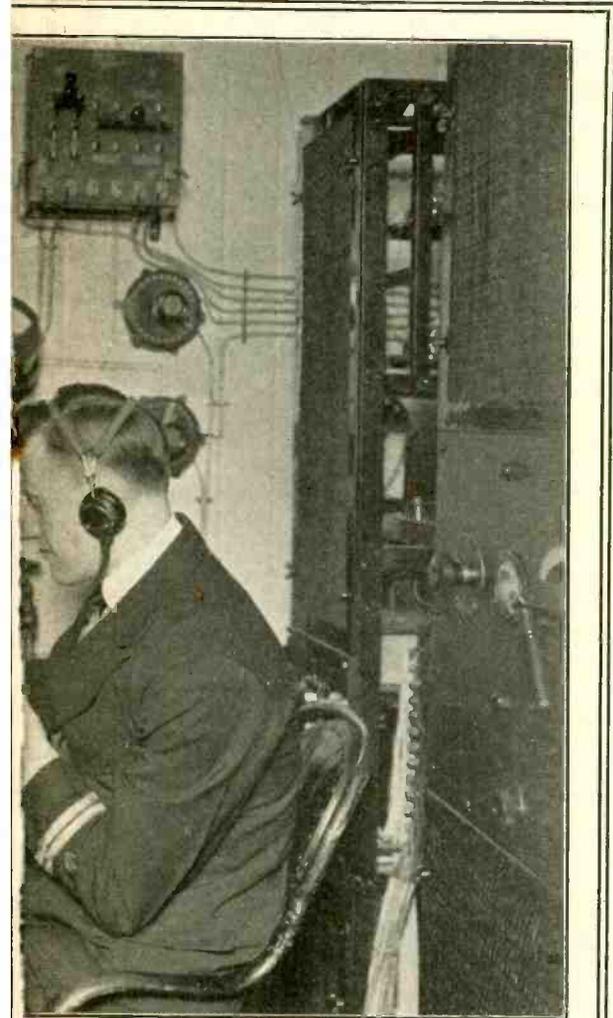
(C. Photonews)
Edward Kelly, of New York City, has solved the antenna problem. Living in a crowded section, and unable to erect an aerial (he has a landlord, too), he simply wound a large tube with wire, and attaching one end to his receiver succeeded in bringing in all the DX stations.



Radio fans and enthusiasts
Batcheller, of New York City, is the Second District gentleman who is the "all he hears" and it is the Second District of successful allocation of broadcast, and the interference!

aves—We the Pictures!

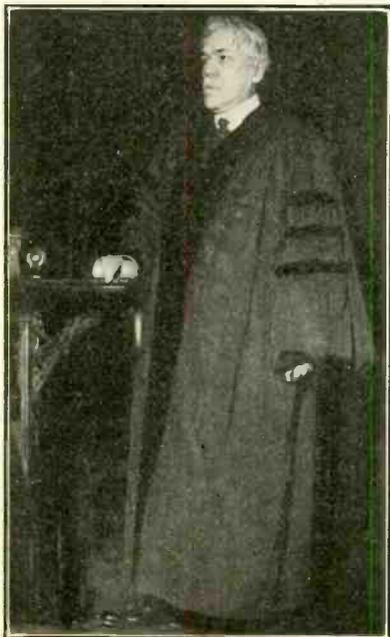
t L. Dougherty



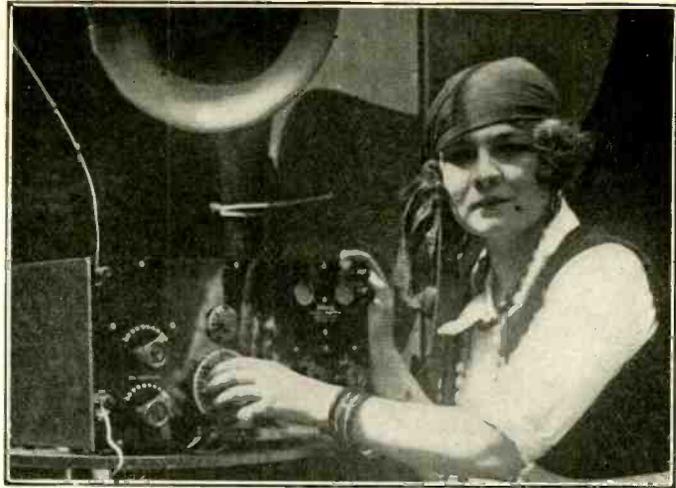
on was carried on while the ship was 1,000 miles at sea with Schenectady, N. Y. This is the first time that simultaneous and people located on land, and marks an epoch in the radio atly behind the operator, while the duplex receiver is on the ver and transmitter are centralized and are in front of ator.



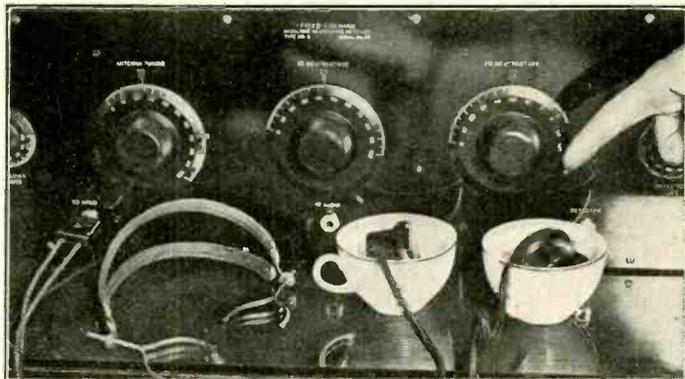
asts, meet Arthur t City, the super- dio District. This ute "monarch of e him that we of e all our powerful alleviation of the ughear.



(C. Fotograms)
The Rev. Dr. Newell Dwight Hillis, noted author, lecturer and educator, pastor of Plymouth Church of Brooklyn, and a minister well known to all broadcast Esteners.



(C. Kadel and Herbert)
Miss Betty Beardsley manipulating the radio at the street fair held on Park Avenue, New York City. This fair was held for the crippled children, and all the "400" officiated.



(C. Kadel and Herbert)
Why bother with loud speakers, when two of mother's tea-cups will serve just as well?



(C. Underwood and Underwood)
Frank Houck, nicknamed by the nurses and doctors "the sunshine of Hahnemann," who for months has been in a plaster cast being treated for curvature of the spine, and recovering still smile and laugh when he listens to the radio.



(C. Underwood and Underwood)
Miss Frieda Hampel, famed concert singer, singing "Home Sweet Home" in commemoration of the centenary of the writing of that famous song poem.



Located in a place which because of its surroundings did not permit the proper erection of an antenna, these members of the Radio Association of Greater New York built this 100-foot mast to get the best results out of their sets. The chief operator of the club, R. May, is seated atop the tower.

Radio and the Woman By Crystal D. Tector

Last Saturday, F. H. was laid up with his usual spring assortment of sneezes and coughs that he pleasantly calls his "daily dozen," and therefore could not attend the Milk Fund Boxing Exhibition. He was grouchy all day long until about two o'clock. You know how a husband gets when he has "a bad cod in by ead." Well, after numerous friends had dropped in during the morning to sympathize with him and try to tell him that there wouldn't be a "scrap" anyway on account of the rain, and then rushed off in their cars for the fight, he felt real nice. We had the laugh on them after all, because we sat home and heard the entire fight right down to the last blow and Humphries making the announcement, and were cozy and warm when the other folks were hurrying home in the rain, and had to buck the crowds n'everything. Then he cheered up and commented again on the wonders of radio.

* * *

Another thing that put friend husband's nose out of joint was the fact that we received an invitation to go to the dedication ceremonies of the new "Broadcast Central" of the Radio Corporation, at Aeolian Hall. Of course he couldn't go, so I told his brother Jack that he would have to escort me. Well, I never have been in a real big studio before, and I haven't gotten over it yet.

We got off at the sixth floor and found a small quiet crowd of people standing conversing quietly and all seeming to know one another. We hadn't been standing there more than a minute when a man appeared mysteriously at our elbow and asked us if we wouldn't like to look around the studios. Before escorting us through he explained that there were two studios, one called the Jazz studio and the other the Classical studio, but for briefness sake he called them studio A and B.

They didn't go very wrong when they called A the "Jazz" studio. The color effect of the hangings and walls is enough to make anyone want to "raise the dickens with a sax." The walls were finished in light blue and green and all the woodwork in salmon pink,

with the hangings and draperies the most vivid colored cretonne that you could imagine. Even the furniture is brightly colored, and how anyone could even sit still in this room is more than I can imagine.

The studio "B" or classical studio is just the antithesis of the Jazz room. It is quietly done in old ivory and brown with dark hangings of maroon and old gold. It was the most quieting and soothing thing in the world, and one was instinctively hushed by the very quietness of it. It is simply marvelous what an interior decorator can do with your feelings with a few artistically placed lights and some wonderful quiet colors. Here the chairs were all deep, roomy, comfy and cushiony, and just the type to rest one.

What impressed me the most was the very "deadness" of both of these places. You actually could think out loud without disturbing yourself. Our guide explained that this was accomplished by special walls, which are of wax treated muslin held away from the real wall, with a dead air space between. It was wonderful.

Then we were taken into the control room and, wonder of wonders, we met OON and OHN, the two announcers that are so familiar to all of us. I just talked to them as though I had known them all my life. Isn't it funny how well acquainted you can become by radio with a person?

After a while, when we had gone upstairs and absorbed a lot of technical explanations that I can't remember, we went down and heard all the dedication speeches.

Then the Radio Corporation very kindly provided the nicest little supper and we were left to wander around and poke and question till we became tired and went home, feeling like we had stepped from a fairy land of delights and never ceasing wonders.

And all this time, Friend Husband was sitting home hearing the speeches, and wondering what kind of a time we were having. Oh dear, some men do have hard luck, don't they?

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

A *whisper* into the microphone of a radio broadcasting station sets up vibrations which encircle the globe $7\frac{1}{2}$ times in one second.

* * *

The *Havana, Cuba*, opera season was opened recently by the San Carlo Grand Opera Company. The first performance, which was marked with great enthusiasm, was broadcast by the Cuban Telephone Company.

* * *

A *katydid*, by rubbing its legs over its wings and making the sound familiar to every country boy, sets into vibration a cubic mile of air, weighing 6,000,000 tons. The sound is distinguishable at a distance of half a mile on a quiet night.

* * *

Mother's Day received its just share of space on the crowded program of Crosley Radio Station WLW, Cincinnati. All of the holidays are given special attention and programs are arranged especially to commemorate the days for the radio public.

* * *

Christian C. Holtum, a bass singer in "The Clinging Vine," at the Knickerbocker Theatre, New York City, owes his success to radio. It was his voice heard by radio from Newark that attracted Henry W. Savage, an ardent radio fan. Mr. Savage has given Mr. Holtum a long contract, which stipulates that the singer must devote a certain amount of his time to radio concerts.

Keeping fit by wireless has been added to WSB's service through a series of "setting-up" exercises conducted on the Atlanta Journal's 10:45 broadcast. I. C. Matheny, physical director of the Atlanta Y. M. C. A., designed and conducts the course of six simple drills every Tuesday, Thursday and Saturday night at 11 o'clock. Music sets the tempo for the calisthenics, which occupy but a five-minute session.

* * *

The *anniversary* of the first church service broadcast south of the Mason-Dixon line was celebrated recently by the First Presbyterian Church, Atlanta, Ga. A year ago, the Atlanta Journal station, WSB, installed the requisite relay apparatus and morning worship via radio has been a regular Sabbath feature ever since. The anniversary service included a special sermon by the pastor, Rev. J. Sprole Lyons, on "The Voice in the Air."

* * *

One of the largest railway electrification projects yet undertaken is involved in the contract just closed by the Westinghouse Electric & Manufacturing Company with the Virginian Railway Company. It calls for the electrification of 213 miles of track between Roanoke, Va., and Mullens, W. Va., and includes an order for electric locomotives, power house, transformer stations, and other necessary apparatus. The division to be electrified crosses the Allegheny Mountains. The contract, which is the largest of its kind ever consummated, involves the expenditure of \$15,000,000.

Play These DX Nite Owl Records on Your Radio

Another Slam at Mike Podhorn—WOW—44 States!

From Bart Geib, Shreve, Ohio

WAS just looking over RADIO WORLD and noticed some of the slams at Mike Podhorn. Although I did not get the issue containing his letter I think, after he sees my record, he will "seek the cause within himself."

I would like to know what type and kind of apparatus he is using. Well, here goes for my record:

Alabama—WMAV, WHAN, WSY, 5XR; Arizona—KDZA; Arkansas—WOK; California—KHJ, 6XA, 6ZK, KWH, KFI, KWG; Canada—CFCA, CFCF, CFAC, CJCG, CJCD; Colorado—KFAF, 9XAO, 9ZAF, KLZ; Connecticut—IZKA; District of Columbia—NOF, WCAS, WMW; Florida—WDAE, WDAL, WIAZ; Georgia—WSB, WGM, WDAJ; Illinois—WMAQ, KYW, WDAP, 9XU, WOAG, WAAF, 9ZK, 9ZM; Indiana—WOZ, WLK, WOH; Iowa—WGF, WOC, WLAS, WEAB, WOI, WEAZ; Kansas—WEAD, WBL, WAAP; Kentucky—WHAS, WIAR; Maine—WLAN; Maryland—WEAR; Massachusetts—WGI, WMAF, 1XA, 1XJ, WBZ, WNAC, 1XAE; Michigan—WCX, WWJ, WWI, KOP, WHW, 8XF, 8XAE; Minnesota—WLAG, WJAP, WAAL, WMAF, WCAS; Missouri—WHB, WDAF, KSD, WOS, WCK, WAAN, WOAL; Nebraska—WAAW, WIAK, WFAV, WCAJ; New Jersey—WOR, WJZ, WAAM, WBAF; New Mexico—KOB, 5YQ; New York—WGY, WGR, 2XI, WRW, WHAZ, WEA, WHAM, WMAC, 2XB, 2XY, WBAY, 2ZK, 2XL, WHN; North Carolina—WBL; Ohio—WJAX, WHK, 8YD, WBAV, WOC, WWB, AN4, WLW, WMH, WAA, WFO, AQ6, WPAL, WBAJ, 8YAE, WPL, WEAH, WRK, WJAK, 8XR, WOAC, WMC, WMAN, WJD, 8ZO, WQAF; Oklahoma—WKY, WLAL, 5XZ, WPAC; Oregon—7XI; Pennsylvania—KDKA, WCAE, WIP, WBAK, KQV, WQAA, WGL, 3CDP, WFI, 8ZAE, WNAL; Porto Rico—WKAQ, WGAD, 4OI; South Dakota—WCAF; Tennessee—WKN, WPO, WNAV, WAC; Texas—WPA, WBAP, WFAA, WJAD, 5XAD, WOAI, WCM, WSAV; Utah—KZN, KDYL; Vermont—WCAX; Virginia—NAA; Washington—KNE, KOT, KFZ; West Virginia—WAAO; Wisconsin—WIAO, WCA, 9XM, WHA, WAAK; Cuba—PWX; Louisiana—5YR; Wyoming—KFBF. Steamships—KKW, WCL, WGN.

That's a record to be proud of, I think. I am using Clapp-Eastham H. R., with H. Z. amplifier and Magnavox. I am an ardent radio-golf fan since it started. I've started a list like the following three or four entries: WHAS—Alamo Theatre Orchestra; WDAP—Jack Chapman's Orchestra; WJZ—Vincent Lopez's Orchestra.

Let's see who can get the biggest list like that. Don't list the same orchestra twice, but you can list the station twice, with a different orchestra, church, pipe organ, chimes, instrumental trio, quartette, etc.

I've got 58, and will send in my list as soon as I get 75.

Well, I think my record will make even Mr. Lindstrom sit up and take notice. I've got the date and acknowledgment of signals heard from most of these stations.

The U. S. at Your Finger Ends

From Paul Richardson, 408 Baltimore Bldg., Oklahoma City, Okla.

I BUY the RADIO WORLD each week and enjoy it very much, for the reading is fine. I have a single set circuit that I have made and have heard from coast to coast

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.

and from Winnipeg, Canada. South to Houston, Texas. Here are a few stations that I have heard: KSD, WGM, WSB, KYW, WDAP, WAAD, WLW, WFAA, WOC, KLZ, KOP, WWJ, WCX, WBAP, WEV, WLW, WDAF, WHB, WGAT, WHAS, KHJ, WGI, WHAD, WAAB, WBAY, WGY, WOAI, KZN, WMAF, WEB, CHCF, WOAE, WSY, WHA,

N. J.; WGF, Des Moines, Ia.; WHB, WDAF, WOO, WMAJ, Kansas City, Mo.; WLW, Cincinnati, O.; WOS, Jefferson City, Mo.

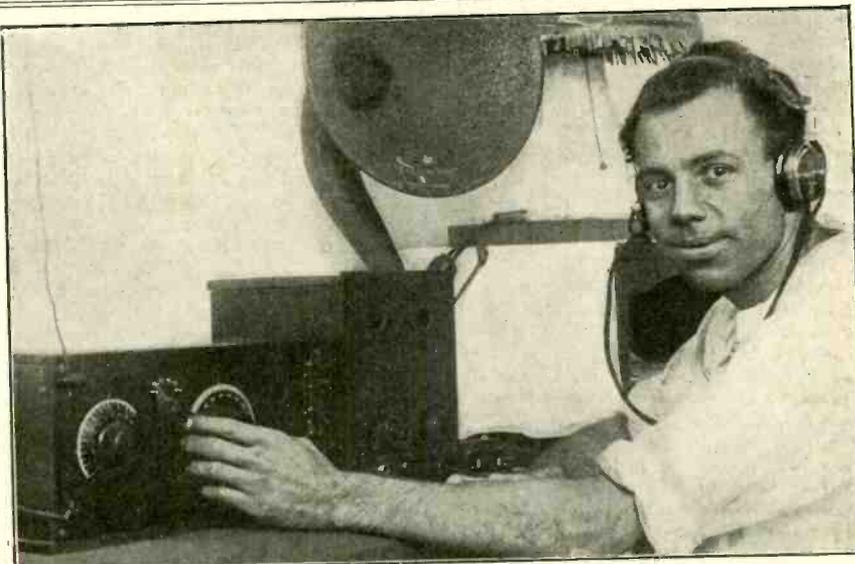
I have received as many as 28 stations in one night. To date I have received 79 stations. Who can beat this with one peanut tube? Let's hear from you DX Nite Owls!

A Nice Month's Work

From Osborne Huckley, 2436 W. 33rd Street, Denver, Colo.

I AM sending you my record for one month's reception:

KDKA, Pittsburgh; KDYL, Salt Lake City; KDYS, Great Falls; KDZQ, Denver; KFAB, Portland; KFAD, Phoenix; KFAE, Pullman, Wash.; KFAF, Denver; KFBK, Sacramento; KFCL, Los Angeles; KFDF, Casper; KFEL, Denver; KFEP, Denver; KFFQ, Colorado Springs; KFZ, Spokane; KFI, Los Angeles; KGW, Portland; KHD, Colorado Springs; KHJ, Los Angeles; KUS, Los Angeles; KLN, Del Monte, Cal.;



(C. Photonews)

Brooklyn to the fore! William Delaney in order to hold up the record for Brooklyn and show them that they can do it in that man's town as well as any other, made a DX record of receiving 49 stations in one evening. The receiver is entirely home made. As a starter, he charted a station 1600 miles away and then worked around, stretching his legs at every step. Canada, Cuba, Texas, Nebraska and all the intervening territory was covered on detector and two stages of audio-frequency. How's zat?

WLAG, WMY, RFAF. My antenna is 40 feet high, 75 feet long, ground runs five feet to water pipe.

From Smith to Smith— Oh, Smith!

From A. L. Smith, 676 Euclid Ave., Beaumont, Texas

IT seems that everybody is taking a crack at Kenneth Smith, of Birmingham, Ala., so I will take one just to be in style.

My set is a single-tube set (WD-11 tube), using a 43-plate condenser, variocoupler and grid leak. Some of the stations I have heard are as follows: KHJ, KWH, KFI, Los Angeles, Cal.; KPO, KUO, San Francisco, Cal.; WLAG, WLB, Minneapolis, Minn.; WCX, WWJ, Detroit, Mich.; WWI, Dearborn, Mich.; WGY, Schenectady, N. Y.; WOC, Davenport, Ia.; KDKA, Pittsburgh, Pa.; WJAZ, WDAP, KYW, Chicago, Ill.; KGO, Altadena, Cal.; PWX, Havana, Cuba; WSB, WGM, Atlanta, Ga.; WOI, Ames, Ia.; WHA, Madison, Wis.; KDZU, KFAF, WFEL, KLZ, Denver, Colo.; WJZ, Newark,

KLZ, Denver; KPO, San Francisco; KYW, Chicago; KZM, Oakland; KZN, Salt Lake City; WAAH, St. Paul; WAAL, Minneapolis; WAAP, Wichita, Kansas; WBAP, Worth; WRAD, Marion, Kansas; WRR, WCAS, Minneapolis; WDAF, Kansas City; WDAO, Dallas; WDAP, Chicago; WEAH, Wichita, WEAY, Houston; WFAA, Dallas; WGM, Atlanta; WHAS, Louisville; WHA, Madison, Wis.; WHB, Kansas City; WIP, Philadelphia; WUAP, Duluth; WLAG, Minneapolis; WLAU, Waco, Tex.; WLAZ, Warren, Okla.; WLK, Indianapolis; WLW, Cincinnati; WMAU, Kansas City; WMAQ, Chicago; WMC, Memphis; WOAI, San Antonio; WOC, Davenport; WOO, Philadelphia; WOS, Jefferson City; WPA, Fort Worth; WRAD, Marion, Kansas; WRR, Dallas; WSB, Atlanta; WWU, Detroit; CFCN, Calgary, Can.; CHBC, Calgary, Can.; CKCK, Regina, Sask., Can.; CFAC, Calgary, Can.; AA-3, Denver.

I am using a radiotron WD-11 (peanut) tube and get best result with a "B" battery of 18 volts. My aerial is one wire 40 feet high and 100 feet long. Any further information concerning this set will be furnished on receipt of stamp.

Answers to Readers of Radio World

Where can I obtain a complete hook-up of the circuit shown by C. White in RADIO WORLD for March 3, on page 11? What voltage is necessary to obtain good results with this circuit?—Henry M. Schwab, 201 Buell Street, Muscatine, Iowa.

The circuit was shown complete in the issue you mention. As previously stated we do not furnish blue prints. $1\frac{1}{2}$ volts for the A battery and $22\frac{1}{2}$ volts for the B will be sufficient.

* * *

In RADIO WORLD for May 20, 1922, you published a diagram of a three circuit regenerative set. Will you kindly advise me where I can obtain a diagram for an additional two stages of amplification? What is the grid condenser and leak capacity in the diagram?—James B. Thompson, Toronto Water Works, Toronto, Canada.

If you will refer to page 26 of RADIO WORLD for March 31, you will find the diagram you desire. The grid leak in the diagram can be omitted, as it is not necessary with the circuit you mention. In the original diagram the condenser and grid leak should be .0025 mfd. and 1-2 megohms. If you intend using the $1\frac{1}{2}$ volt tubes would advise using a variable grid leak, as these tubes are somewhat critical as to leak resistance, and better results can oftentimes be had by the use of a slightly different capacity of leak.

* * *

In RADIO WORLD for March 24 there appeared an article by C. White on combining radio-frequency and regeneration, and mention is made of using a condenser of .25 mfd. capacity. Can these be purchased, or do they have to be made? If I have to make them kindly give me the directions.—H. E. Worlton, 1205 Pacific Ave., Peoria, Ill.

If you will refer to page 8 of RADIO WORLD for April 14 you will find the information you desire as to the construction of large size telephone condensers. The article is by C. White and fully describes the method of determining the capacity of a condenser and how to build it up to any desired capacity.

* * *

Kindly refer me to a back issue containing a hook-up for the following apparatus: coupler, 43 plate vernier condenser, vernier, rheostat, grid leak, tube and all other necessary articles to make a one tube regenerative circuit.—A. A. Willaugham, 190 Major St., Toronto, Canada.

We refer you to any one of the following back issues in which you will find the hook-up you desire: RADIO WORLD, January 27, page 4; February 24, page 20; March 23, page 9 and page 13; March 10, page 20. Take your pick of any of these. They are all good circuits.

* * *

I HAVE constructed the Reinartz tuner hook-up as enclosed without using either the exterior coil or the amplifier, but cannot get anything except local stations, and even those are very weak. Can you suggest any way of alleviating my trouble?—O. C. Houser, McClure, Ohio.

The tube you mention is not exceptionally efficient in this circuit. Would suggest that you use the U. V.-200 as detector, or U. V.-201A. Use the regular Reinartz coils as inductance. Circuit diagram and full directions for the winding of these coils were given on page 23 of RADIO WORLD for January 13, 1923.

* * *

In RADIO WORLD for April 21 you published an article by Mr. Turner on using the

two-unit tube in connection with a receiver. When he states that he used the "other circuit," does he mean the one without the variable potentiometer in the circuit? Can I replace the coil with a variometer, and will a variable condenser increase the volume of signals in the receiver? Will $22\frac{1}{2}$ volts in the plate circuit be sufficient? How should the circuit be tuned? Will the variometer mentioned work better than the tapped coil that is supposed to be used?—Ellwood F. Jahn, 5526 Catherine Street, West Philadelphia, Pa.

When he states the "other circuit" he means the one without the potentiometer. Yes, you can replace the coil with the variometer. This will increase your selectivity to a great extent and give you much finer control of your tuning. The condenser will not increase the volume of your signals but will simply tend to make your set more selective and enable you to get much finer tuning. If you intend to use a variometer, would suggest that you place a tapped coil in series with it, to enable you to tune to the higher wave lengths when necessary. A coil $3\frac{1}{2}$ inches in diameter and 6 inches long, wound with No. 22 SSC wire for five inches of its length and tapped at every 20 turns will suffice for this, unless you care to utilize honeycomb coils, which are much more efficient. The condenser you mention (11 plate) will be perfectly correct. $22\frac{1}{2}$ volts B battery will be sufficient for one tube, but you will probably have more volume if you place 45 volts on the plate. In tuning this circuit you should throw your condenser to full capacity (100) and swing the variometer around until you hear signals. If you hear two stations on together, bring your condenser down and repeat the operation until your stations are separated and you are only hearing one at a time. If you are using the potentiometer, then bring the potentiometer into play until the signals have cleared up and the volume is the strongest with the least amount of distortion. The variometer will simplify your controls and make tuning easier.

* * *

In RADIO WORLD for April 7, 1923, you published an article by Rumford in connection with "An All Wave Universal Receiver." Can I use a panel $9 \times 12 \times \frac{1}{4}$ instead of the 7×14 specified? He states that the directions must be carried out specifically.—Michael Teaschner, 831 Van Duzen Street, Stapleton, Staten Island, N. Y.

You may use any size, shape, or kind of a panel you wish. It makes no difference what size panel you use in the construction of a set, as long as the wiring is O. K.

* * *

Where may I find a circuit diagram for the following apparatus: Variocoupler, variable condenser, WD-11 tube, batteries, phones, and all other necessary apparatus to make a single circuit receiver. Are these tubes as good detectors as the ordinary six-volt storage battery tube? Where can the tubes be obtained?—R. D. Thornton, 1906 County Street, Portsmouth, Va.

We refer you to RADIO WORLD for April 21, page 21, column 2 (DX page) where you will find the circuit you desire. The WD-11 are classed as excellent detectors, and are extremely efficient and economical. When compared with tubes such as the U. V. 200 or 201 A, or the other six-volt tubes, the only difference is a slight decrease in the volume. They can be obtained in any up-to-date radio shop.

I have constructed a receiver, put up an outside antenna, and have been told by a neighbor that I must take down my wire because it crosses one corner of his garage. It is not attached to his property, and is 25 feet above his roof. He threatens to prosecute me, saying that I am disobeying the fire laws. The other end is anchored to a corner of a building, and I have full permission of the other to leave my antenna there. Can my neighbor make me remove my wire?—A constant RADIO WORLD reader, Los Angeles, Cal.

You are guilty of trespass and can be made to remove your wire. You are not disobeying the fire laws, but you are trespassing on another man's property. You will have to run your wire in such a manner that you do not cross his property, unless you get full permission from him, or anybody over whose property you pass.

* * *

I have recently tried out the new 201 A tube in connection with my receiver, and find that I cannot get as good results with it in connection with my detector as I do with my U. V. 200 tubes. I find that it is a much better amplifier than a detector.—D. R. Kilgore, Okemah, Oklahoma.

This tube is used as both detector and amplifier, but works much better as amplifier than as detector. It will work well as detector, but the ideal combination is to use it as amplifier with the regular U. V. 200 as detector. You will be able to obtain much better results in any circuit employing regeneration if you use variable grid leaks.

* * *

I have built the Sorenson circuit described by Ortherus Gordon in your issue of Jan. 20, and have had wonderful results with it, but fear that I will have to junk it after May 15. Can this be fixed so that I can retain the circuit and set? Using the coils mentioned and a .001 variable condenser I can just reach 485. How can I get the higher waves that are going to be assigned?—W. H. McKee, Wynn, Ark.

You can very easily overcome the trouble that you anticipate by substituting larger coils, preferably No. 100 and 75 DL or honeycomb coils. This will enable you to reach to all the wave lengths that will be assigned under the new regulations. You can very easily do this by simply connecting the new coils in the circuit.

* * *

I note that there is a new law going into effect to stop amateurs working their sets between the hours of 7:30 and 10:30 P. M. Does this mean that we will not be able to use our receivers between these hours or does it only affect the amateurs that hold Government licenses?—Henry Herbert, 569 West Street, Hoboken, N. J.

The new regulation means that amateurs owning transmitters will not be able to use them between those hours. This is to eliminate any interference between the broadcasters and the amateurs. It means that the broadcasters will have clear air between those hours.

Radio Left No Record

Barrister: But couldn't you let me have some of his love letters?

Breach of Promise Client: There weren't any. We had wireless sets.—London Answers.

You Simply Cannot Keep Up to the Latest Radio Developments Unless You Read Radio World—Here's Proof

THE following text and news pictorial features appeared first in RADIO WORLD—in some cases six weeks ahead of every other radio publication:

Second Annual Radio Show, April 1, 1922.
E. H. Armstrong's Super-Regenerative, a device for amplifying signals 100,000 times, June 4, 1922.

First Radio Photograph, June 4, 1922.

The Armstrong Principle of Super-Regeneration Fully Explained, July 1, 1922.

A Wonderful Hook-up Utilizing Major Armstrong's Invention in a New Manner, August 19, 1922.

The Super-Heterodyne Principle Applied to the Armstrong Super-Regenerative Circuit, October 7, 1922.

Wired Wireless Insures Secrecy in the

Sending and Receiving of Messages, February 3, 1923.

Leroy Satterlee's New Amplifying Circuit, February 3, 1923.

Hook-up for Building Your Own Power Amplifier, February 24, 1923.

Hazeltine's Neutrodyne Receiver, March 10, 1923.

High Lights on the Third Annual Convention of the Second District, March 17, 1923.

Newark Apartment Building Gives First Complete Radio Service to Tenants, March 31, 1923.

The Hazeltine Neutrodyne Receiver Explained, March 31, 1923.

And others—as our files will show.

Read RADIO WORLD and get the news and developments in radio FIRST.

Audio-Frequency Amplifier Unit for Simple Radio Receiving Set

VERY simple radio receiving outfits are described in a series of circulars issued by the Bureau of Standards of the Department of Commerce, and published at the request of the States Relation Service of the Department of Agriculture. The circulars are fully illustrated.

The first two, which are Bureau of Standards Circulars Nos. 120 and 121, describe receiving sets using crystal detectors. Circular 120 describes the receiving antenna and ground connection also. Circular No. 133 describes an electron tube detector unit which can be substituted for the crystal detector in either of the two sets previously described. Circular No. 137 describes telephone shunt and series antenna condensers and a loading coil for use with the simple receiving sets.

The fifth circular of this series is No. 141. It describes an audio frequency amplifier unit of such proportions that in external appearance it matches the electron tube detector unit. One or two of these amplifier units may be used with the equipment previously described to amplify the signals detected by the electron tube detector unit, or the detector unit may be omitted and one or two amplifier units used with the crystal detector. In either case the addition of the amplifier units results in a considerable increase of the volume of the received signal and increases the receiving range somewhat.

Copies of these circulars may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price of Circular 141 is ten cents. The others are five cents.

How Religious Services Are Broadcast *By C. H. Huntley*

HAVE you ever wondered how a radio broadcasting station with its fixed equipment manages to send out religious services weekly from churches many miles away from the sending station?

The operating staff of WGY, the Schenectady, N. Y., station of the General Electric Company, has so developed church service broadcasting that thousands of letters of appreciation are sent in from far and near. Furthermore, clergymen who were frankly skeptical at first of the value of broadcast religious services and who doubted that the dignity and beauty of these services could be conveyed through the air, now pronounce radio an invaluable aid.

The installation necessary for broadcasting the services of the Second Presbyterian Church, Amsterdam, N. Y., on a recent Sunday, is typical and will give the radio fan an idea of how it is accomplished.

In the church were four microphones, two of them spares for emergency use. One microphone and a spare were placed at the reading desk to get the words of the clergyman in scripture reading, prayer, sermon and announcements and a microphone and spare were hung above and in front of the choir and organ. These microphones or pick-ups were the only evidence to the congregation that the service it was hearing was going out to countless thousands many miles away. There is nothing in the church installation to distract the attention of the congregation from the service.

At one side of the church, hidden from

view but in a position where he could follow the service, was stationed one of the WGY staff who switched the microphones on and off as the service progressed. If the minister was speaking his microphone was brought into the circuit and the choir microphone was switched off.

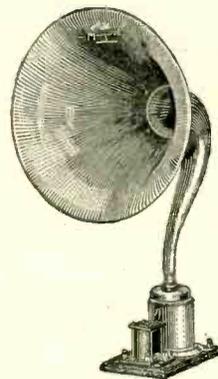
Two other operators were situated in an adjoining room where a portable control equipment had been installed. In this room one of the operators controlled the amplification of speech and music. The amplifying outfit consisted of two five-watt tubes, one 50-watt tube and other necessary apparatus. Sufficient amplification was used to overcome line noise on the 20 miles of telephone wire necessary to carry the electrical oscillations set up in the microphone to the control room of WGY in Schenectady, N. Y. The second operator in the side room was in constant communication by special land wire with the control room at WGY.

In the control room in Schenectady the church services were again amplified, this time on equipment which consisted of one five-watt tube and two 50-watt tubes. From this point the electrical oscillations passed to the power apparatus and were impressed on the modulator and oscillator tube going thence to the antenna and the air.

Between church and control apparatus the church service passed through three exchanges of the New York Telephone Company—the Amsterdam exchange, the Schenectady exchange and finally the exchange of the General Electric Company.

MAGNAVOX

Radio Products



R2
Magnavox
Radio
The
Reproducer
Supreme

The Utmost in Sound Amplification

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

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

Without Magnavox equipment, no Radio receiving set is complete.

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

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

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

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

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

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

The Magnavox Co.

Oakland, California

New York Office: 370 Seventh Avenue

"When you come right down to it a profitable business is principally dependent upon two things—a salable article of quality, and advertising."—William Wrigley, Jr.

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:

- O. H. Kloss, 2504 N. Alder Street, Philadelphia, Pa.
 George H. Brown, 9 Bowdoin Street, Dorchester, Mass. (Retailer.)
 Sherman Diefenbacher, R. F. D. 14, Box 99-A, Mt. Healthy, Ohio.
 Horne Drug Co., P. O. Box 276, Jonesboro, Ind.
 George Scharmer, 110A Yale Avenue, Jersey City, N. J.
 J. Brezcale, 1404 Main Street, Fort Worth, Texas.
 Howard C. Denny, 803 Fifth Avenue, Coraopolis, Pa.
 South Side Electric Shop, W. L. Miller, 231 East Smith Street, Herkimer, N. Y.
 Harry J. Durborow, 4933 Chancellor Street, Philadelphia, Pa. (Interested in loud-speakers and loud-speaker units to be installed in special resonators.)
 L. B. Mohr, 3417 Lexington Street, Chicago, Ill.
 Harry E. Watson, 642 East Thayer Street, Philadelphia, Pa.
 Clyde Case, 1223 East 57th Street, Chicago, Ill.
 Colonel G. E. Barnhardt, U. S. A., The Marlborough, 917 18th Street, N. W., Washington, D. C.
 Merlin Haag, 303 South Prairie Street, White-water, Wis.
 R. Sullivan, 247 East 58th Street, New York City.
 Guy W. Hooper, Box 733, Marlow, Okla. (Wants dealers' prices.)
 Berry's Radio Shop, Y. M. C. A. Bldg., Water-ville, Me. (Retailer.)
 R. Bublitz, Winthrop, Minn.
 Wilber I. Bissonette, Mahtomedi, Minn.
 Raymond A. Riedner, P. O. Box 177, Republic, Wash. (Retail radio supplies and service.)
 A. T. Hagenkamp, 2911 Sixteenth Street, San Francisco, Cal.
 Julius Dietrich, 1004 South Main Street, Bloomington, Ill.
 J. Leifson, 810 Seventh Avenue, Seattle, Wash.
 Joseph Lonergan, Ellendale, Minn.
 Midland Electric Mfg. Co., Indianapolis, Ind.
 Harold C. Canfield, 384 Jefferson Avenue, Rochester, N. Y.
 Robert Gray, Union Bridge, Md.
 The McWalters Agency, P. O. Box 131, Hoboken, N. J.
 V. Brown, Edgerton, Wis.
 Jos. Trainor, Box 94, Station B. Brooklyn, N. Y.
 George F. Pyne, 51 School Street, Milford, Mass. (Dealer.)
 J. H. Hensberger, Box 51, Yukon, Pa. (Electrical supplies.)
 Chas. H. Brumfield, Box 162, Forrest City, Ark.
 Joe W. Warren, 1325 Main Street, Cherokee, S. C. (Dealer. Wants wholesale prices.)
 Bert Carroll, 109 Duboce Avenue, San Francisco, Cal.
 C. B. Tucker, 21 Summer Street, Marblehead, Mass.
 A. M. Connett, 564 Washington Street, Boston, Mass. (Manufacturers' representative. Wants radio line.)
 Edwin F. Windham, 215 Somerset Street, North Plainfield, N. J. (Wants wholesale and retail prices.)
 Chas. L. Furry, Alden, Ia. (Retailer.)
 Joseph R. White, Radio Hill, Holmes, N. Y.
 William R. Harvey, 800 Altgeld Street, Chicago, Ill.
 H. Johnson, 150 Wilkins Avenue, Portchester, N. Y.
 W. Edward Treahy, Box 121, Manville, N. Y.
 Allyn H. Jones, 81 Vaughan Road, Toronto, Canada.
 Henry Ives Cobb III, Groton School, Groton, Mass.
 A. L. Boyce, West Oneonta, N. Y. (Distributor.)
 James Colas, 75 East Main Street, Salem, Ohio. (Wants dealers' prices.)
 Wm. D. Huber, 716 Woods Run Avenue, North Side, Pittsburgh, Pa.
 N. Wesley Grubb, 460 Highland Street, Mannington, W. Va.
 T. H. Cole, P. O. Box 256, Millerton, N. Y.
 William E. Baumann, 1260 24th Street, Milwaukee, Wis.
 Howard N. Mower, 1703 Summerfield Street, Ridgewood, Long Island.
 Wigo Nymon, Box 398, Fargo, N. D.

Can't Copy This Circuit

A NEW receiver which has a remarkable circuit that cannot be imitated has been perfected by the Atlantic & Pacific Radio Company, New York City. This receiver is so constructed that if taken apart the circuit is entirely destroyed. This makes the new circuit incapable of being copied, as its method of construction does not permit it.

The receiver is very selective and sensitive, having a range of 1,000 miles using one of the dry cell tubes. All connec-



(C. Photonews)

A new uni-control receiver which cannot be examined or taken apart without destroying the circuit.

tions are plainly marked and ample binding posts conveniently located are provided.

It is a single control set and operates with extreme clearness and sharpness of tuning. The entire set, with the exception of the batteries, encompasses a space of only 2x6x8 inches.

Variation to the Nth Degree

A NEW grid leak recently brought out by the Arthur Pudlin Engineering Company, 1540 Broadway, New York City, has several merits that would pay the up-to-date builder to investigate if he wants fine variation in grid leaks. The apparatus is a small bakelite tube with metallic ends, facilitating mounting in the various types of condensers that are made for use without combining grid leaks. Inside this tube is a special composition. A small wire with a handle projecting from one of the ends enables the user to obtain infinite variations and, as this is what is really needed, it should meet with a great demand by radio users and builders. It is either furnished complete with a grid condenser and mount, or by itself.

Radio Stocks

(Quotations as of May 16, 1923, furnished by Frank T. Stanton & Co., 15 Broad St., New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	20*
American Marconi, Unstamped	\$5	\$7
American Tel. & Tel.....	121½	122
Canadian Marconi	2	2½
De Forest Radio.....	8	10
Dubilier Condenser	10	10½
English Marconi com.....	10	15
English Marconi pfd.....	10½	16
Federal Tel. Co., Cal.....	4	5
General Electric	175½	176
Hennessy Radio Pub. 8% pfd.	10	12½
Mackay Companies com.....	112	115
Marconi Int. Marine.....	8	10
Manhattan Elec. Supply.....	50¼	51
Radio Corporation com.....	3½	3½
Radio Corporation pfd.....	3½	3½
Spanish Marconi	1	3
Western Union	107	108
Westinghouse E. & M.....	54½	54¾

*Cents per share.

Series Parallel Switch for Panel Mount

THE Marvel Switch Company, 28 West 25th Street, New York City, have recently put on the market a new type of series-parallel switch which is small and unique in construction. Inasmuch as it is small and is meant for panel mount, it should furnish the builders of sets with an easy solution of series-parallel condenser connections. The entire switch is very little larger than the conventional knob. There are three positions marked on the switch, with a marker and stop for each position. The series and parallel positions are made by means of two double arms on four points, and a comprehensive drawing comes with each switch, enabling the user to make the connections easily and quickly. By drilling a few holes, for which the plate of the switch can be used as a template, the switch can neatly be mounted on the panel.

New Radio and Electric Firms

Park Auto and Radio Supply Corp., New York City, \$5,000; I. Teitelbaum, B. and J. Bluestein. (Attorney, B. Indigo, 299 Broadway.)

Selko Electric Co., Brooklyn, N. Y., \$10,000; J. Selikowitz, E. L. Braverman, S. H. Feinson. (Attorney, J. Feinson, 299 Broadway.)

Experimenter Publishing Co., New York City has increased its capital stock from \$15,000 to \$250,000.

Jenick Electric Co., New York City, general contracting. \$5,000; A. and E. Jenick, P. Arnold. (Attorney, M. Remson, 342 Madison avenue.)

Far-Wes-Ton Electric Co., Jamestown, N. Y., \$25,000; L. D. Norton, W. C. Westerman, C. E. Farren. (Attorney, H. R. Lewsi, Jamestown.)

Whiteland Radio Co., Brooklyn, N. Y., \$50,000; J. L. Spence, J. Hoyt.

New List of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. Additions to the list will be published in succeeding issues of RADIO WORLD:

- Miss Gertrude Wood, Box 416, Maplewood, N. J.
 Miss Corinne B. Arnold, 1419 Master St., Philadelphia, Pa.
 G. L. Meylan, M.D., Columbia University, New York.
 Miss L. Juliette Meylan, 468 West 141st St., New York.
 G. L. Meylan, A.M., M.D., Columbia University, New York.
 Arnold M. Lehman, 311 West 94th St., New York.
 Abraham Mandelstam, 230 West 107th St., New York.
 Sumner R. Hooper, Rockwood, Me.
 Frederick L. Guggenheimer, 36 West 68th St., New York.
 Hubert, L. Rand, 21 Heminway Rd., Salem, Mass.
 P. H. & R. H. Cobb, Denmark, Me.
 Frederick H. Wilson, M.D., Kingsley School, Essex Falls, N. J.
 Frank D. Smith, 353 East 163d St., New York.
 H. W. Gibson, 167 Tremont St., Boston, Mass.
 Mrs. Sarah B. Hayes, Ashland, Mass.
 Ralph C. Hill, Utica (N. Y.) Country Day School
 Walter Overton, Camp Bob White, Ashland, Mass.
 Mrs. Dwight L. Rogers, 8 Parkside Rd., Providence, R. I.
 Dwight L. Rogers, Jr., Mountain Ave., Westfield, N. J.
 Miss Lillian Millhauser, 220 West 110th St., New York.
 Arthur W. Millhauser, 52 Broadway, New York.
 Catherine E. Morrison, Ward-Belmont, Nashville, Tenn.
 Emma I. Sisson, Ward-Belmont, Nashville, Tenn.
 Mrs. Morris Stark, 925 West End Ave., New York.
 James E. Harvey, 1807 Riggs Pl., N. E., Washington, D. C.
 M. A. Harvey, 1807 Riggs Pl., N. E., Washington, D. C.
 Miss Lucile R. Ryttenberg, 5 West 65th St., New York.
 Eugene H. Lehman, Highland Manor, Tarrytown, N. Y.
 Mrs. Madeline D. Lehman, Highland Manor, Tarrytown, N. Y.
 Miss Estelle B. Davidsburg, Highland Manor, Tarrytown, N. Y.
 Helen C. Culin, Ogontz, Pa.
 Irving G. McColl, Hotel McAlpin, New York.
 Mr. and Mrs. G. R. Branch, 64 Fruit St., Worcester, Mass.
 Mrs. Charlotte V. Gulick, South Casco, Me.
 Miss A. R. Webster, 1325 Cypress St., Cincinnati, Ohio.
 G. W. Rieger, Jr., 1103 Harrison St., Philadelphia, Pa.
 F. Helen Mays, 16 Montview St., Boston 32, Mass.
 Miss Clara Henderson, 1619 Eutaw Pl., Baltimore, Md.
 Miss Mary North, 77 Orange Rd., Montclair, N. J.
 Orrin J. Dickey, Belfast, Maine.
 G. Rodman Bouck, 830 Yale Station, New Haven, Conn.
 Roy E. Adams, 11 Marlborough Rd., Millbourne, Philadelphia.
 Price B. Engle, 4699 Castor Rd., Philadelphia, Pa.
 Arthur M. Condon, Northampton, Mass.
 Dr. W. A. Keyes, 139 West 91st St., New York.
 Eugene Hayden, North East Carry, Me.
 H. J. Storer, Sec. 74 Fayette St., Cambridge, Mass.
 Dr. M. Thorne, 2672 Boulevard, Jersey City, N. J.
 H. B. Handy, 2218a Grove Ave., Richmond, Va.
 Whitman G. Stickney, M.D., Beverly, Mass.
 Carl O. Warren, 55 Hanson Pl., Brooklyn, N. Y.
 A. H. Smith, 161 Albemarle St., Springfield, Mass.
 N. Y.
 Miss Laura I. Matoon, Jackson Hts., Elmhurst, N. Y.
 George Ann Lillard, 5329 Kenmore Ave., Chicago, Ill.
 Miss Helen Keyes, 144 Whiteford Ave., Nutley, N. J.
 Miss Dora W. Eastman, Northampton, Mass.
 Miss Elaine G. Eastman, Northampton, Mass.
 Miss Gertrude M. Stevens, 8 Plympton St., Cambridge, Mass.
 Dr. C. E. Stevens, 419 Boylston St., Boston, Mass.
 Mrs. F. H. White, Dana Hall, Wellesley, Mass.
 Miss Helen R. Edgar, 411 Springfield Ave., Cranford, N. J.
 Dr. Dudley A. Sargent, Cambridge, Mass.
 Carl L. Schrader, 58 Payson Rd., Belmont, Mass.
 L. W. Sargent, Sargent School, Cambridge, Mass.
 Miss Jennie B. Wilson, 16 Oxford St., Cambridge, Mass.
 Mrs. Mary G. Frick, 559 West End Ave., New York.
 Miss Anna W. Coale, Hotel Earle, 103 Waverly Pl., New York.
 Miss Mary Arabella Coale, 323 W. 83d St., New York.
 F. W. Luehring, University of Minnesota, Minneapolis, Minn.
 Mrs. M. R. Wolfard, Cambridge, Mass.
 (Continued in next column)
 Alice A. Kranz, 745 Riverside Drive, New York.
 Henry S. Pettit, 106 Gates Ave., Brooklyn, N. Y.
 Miss Gertrude Bilhuber, Maywood, N. J.
 Miss Ida B. Post, 509 W. 121st St., New York.

Radio Limericks

(Silly little things we call 'em, but they amuse a light-hearted world. Send us your limerick, with name and address.)

There was a housemaid of Elmira,
 And naught in the U. S. would tire her.
 'Til a radio set caught her fast in its net—
 And she loafed 'til the folks had to fire her.

—F. P. Marsden, Madison, Wis.

I am a young fellow of Philly,
 Who, although you may say I am silly,
 Can build an antenna, and work it, and then a
 Cop brings it down with his billy.

—James B. Skoon, Philadelphia, Pa.

There was a smart girl of Canarsie,
 Bought a radio set to let pa see.
 She got lost in the ether above and beneath her,
 And father said: "Don't go too far—see!"

—Jack S. Palmer, Portland, Me.

"And the Mules Came Back"

WHILE in Atlanta, Ga., recently on a radio inspection trip Commissioner Carson, of the Department of Commerce, was advised that his best team of mules had disappeared from his farm in a nearby state, and, being later in the broadcasting station of a local paper, he let their loss be broadcast with a description. A few days afterwards when in Nashville, Tenn., he was advised that his mules had been found wandering miles from home. Whether radio was responsible for their discovery or not cannot be proved, the commissioner says, but he believes it was instrumental in their release from temporary confinement. "I was glad to get them back," he added. "They were good mules."

- Miss Eleanor Deming, 945 West End Ave., New York.
 Miss Agathe Deming, 945 West End Ave., New York.
 Miss Josephine Cowhey, 1061 St. Nicholas Ave., New York.
 Miss Jeannette Frank, 529 West 179th St., New York.
 Mr. and Mrs. M. Gordon, 854 West 180th St., New York.
 Mr. Joseph Lowe, 13 Astor Place, New York.
 Mrs. L. Schwarzkopf, 611 West 158th St., New York.
 Dr. Henry S. Pettit, 106 Gates Ave., Brooklyn, N. Y.
 Miss Marcia C. Noyes, 1211 Cathedral St., Baltimore, Md.
 M. L. Fielding, 776 Hewitt Place, New York.
 E. E. Lyons, 251 Smith St., Brooklyn, N. Y.
 Bertha Lipstein, 5000 15th Ave., Brooklyn, N. Y.
 Rev. J. R. Sevier, D.D., First Presbyterian Church, Augusta, Ga.
 Mrs. Sevier.
 Miss Evelina Reamley, 12 Beacon St., Gloucester, Mass.
 Miss Florence E. Griswold, 313 Hope St., Providence, R. I.
 John B. May, M.D., Cohasset, Mass.
 Ethan Allen Shaw, Northfield, Vt.
 Mrs. A. C. Fontaine, Roslyn Heights, N. Y.
 Andre C. Fontaine, Roslyn Heights, N. Y.
 Mother M. Loretta, R. S. U., Ursuline Convent, Middletown, N. Y.
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 Ray K. Phillips, 949 Broadway, New York.
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 (To be continued)

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 7.50 Stromberg-Carlson Head Sets... 5.75
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Scale 100 miles to the inch in two colors—Size 34x28"

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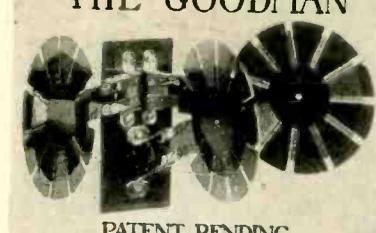
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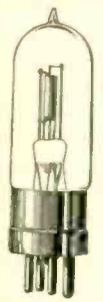
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RADIO WORLD

TELEPHONE, BRYANT 4798

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M. B. HENNESSY, Vice-President

FRED S. CLARK, Secretary and Manager

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Entered as second-class matter, March 28, 1923, at the Post Office at New York, New York, under the act of March 3, 1879.

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

Summer Park Concerts to Be Broadcast

ALTHOUGH the broadcasting of a government's band concerts by NAA, Arlington, will cease during the summer months, radio fans within several hundred miles of Washington, D. C., will be able to pick up some concerts if the plans of the Chesapeake and Potomac Telephone Company are carried out.

By June 15 this company hopes to complete its new station in Washington and start broadcasting the open-air public concerts from the White Lot and local parks, where the marine, navy and army bands will play almost daily.

Through the aid of a new portable "input apparatus," recently perfected by the telephone engineers, the C. & P. company expects to furnish the added "juice" necessary to pick up concerts and transmit them by wire to their station for radio broadcasting. This apparatus is mounted on a motor truck, and can be dispatched anywhere in the city where something is to be broadcast.

Representatives of the company say that it is also sometimes difficult to relay speeches and music from private residences via telephone lines to broadcasting stations, due to lack of current, but with the new "booster" they expect to overcome this handicap.

Important speeches and some concerts will also be put on a land line to New York and broadcast simultaneously from WEAJ on a different wave length.

Most of us still prefer the telegraph. They don't send bedtime stories over that.—Wall Street Journal.

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Correct in PRINCIPLE PERFECT RESULTS

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180° Variocoupler Built for Results

Has no solid dielectric in rotor. Rotor built of self-supporting parabolic coils. Lowest possible resistance, resulting in increased selectivity.

Requires only 1 1/2" width on panel, no more than dial. Range, 200-700 meters.

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A 3-volt dry cell tube, using a 22 1/2-volt B Battery. Can be used as a detector in any successful circuit.

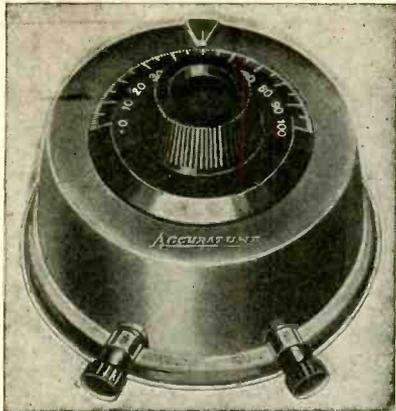
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Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

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RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Band McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each. The Band McNally Radio Map of United States is 33x30 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 Each

THE COLUMBIA PRINT

1493 BROADWAY NEW YORK CITY

THE ANNIVERSARY NUMBER of Radio World was increased in size and is 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.

WOR Opens Its New Studio

At eight o'clock on the evening of May 16 L. Bamberger & Company's radio broadcasting station, WOR, at Newark, N. J., was officially opened for use. The new studio is located on the main floor at the Bank street entrance of their store.

Instead of the common practice of having just one large studio this station now has two. One is a room forty feet long and thirty feet wide, hung with heavy gray draperies and furnished with heavy rugs.

In this studio will be accommodated all the large bands, dance orchestras, singers—in fact, every program that requires a spacious place to produce good results.

Adjoining this main studio is another one, much smaller, which is to be used in broadcasting speeches and programs not necessitating the use of the larger room. It is furnished in the same manner as the other, but is deadened even more than the larger one. Across the hall is the reception room, where the artists and guests can gather before the program.

This station has accomplished some wonderful work in the past; but, with the aid of the newer and larger quarters and increased facilities, everything will be easier to handle, and, therefore, better results will be produced.

The Future of Radio Visualized

C. FRANCIS JENKINS, of Washington, D. C., delivered an address on "Radio Photography, Movies and Vision," before the annual convention of the Society of Motion Picture Engineers last week at Atlantic City, N. J.

"No newspaper can possibly put a distant news event before the public as quickly as the theatre can with radio pictures," he said. "It is possible, perhaps probable, that a news bulletin in pictures and type may be broadcast and the photographic negative thereof be used in the printing of the usual news bulletin sheet either by direct photographic process or by a photo-etching process, the etched plate for use in the printing press. This would eliminate the necessity of local typesetting plants.

"The police departments of the various cities of the country would also doubtless be customers for picture distribution service, as photographs of criminals, as well as their thumb prints could be readily distributed. Bankers and business executives could in a few minutes verify signatures to checks, drafts or documents; indeed contracts and other forms of credit could be exchanged across the continent within the hour."

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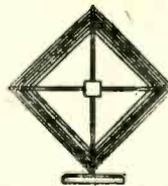
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You can make yours in an evening. Get my complete set of instructions, patterns, list of parts, etc. Price \$1

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Reference: International Trust Co., Boston

To the DX Nite Owls

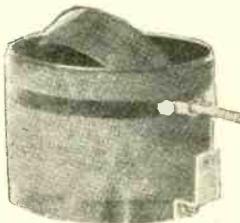
and anyone else interested in radio! If you missed RADIO WORLD, dated Feb. 24, with the famous Flewelling Circuit, get it now and get your EARS WET! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

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LOOK THESE OVER

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PWX, Havana, Cuba	WDAP, Chicago, Ill.
WWJ, Detroit, Mich.	CFCN, Calgary, Can.
WSB, Atlanta, Ga.	WBAP, Ft. Worth, Texas
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Only one hook-up will do this. Only one tube is necessary if this Coast Coupler is used.

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Music Publishers Give in to Broadcasters

Radio World's Suggestion That Broadcasters Are Able to Popularize Their Own Music Helps to Bring About a Quick Showdown

THE Music Publishers' Association of the United States, following the recent announcement in RADIO WORLD that broadcasters could popularize their own music, has helped to solve the situation satisfactorily. A few days ago, the Music Publishers' Association agreed to permit the broadcasting, without fee, of the music controlled by their members, at least temporarily.

The members of the Association are perfectly well aware of the fact that the broadcasters, following the suggestion of RADIO WORLD and the lead of the Westinghouse Electric and Manufacturing Company in cutting out all copyrighted music from their broadcasting programs, solved the situation, and made it necessary for the Association to come to terms immediately or lose the tremendous advertising possible through broadcasting. At the meeting of broadcasters held recently in Chicago, certain strenuous lines of action were decided upon. This combination of circumstances made the publishers see a strong light.

M. E. Tompkins, of G. Schirmer, Inc., New York, publishers, chairman of the committee, in a statement said: "Our Association, which has been in existence since 1895, represents particularly the so-called 'standard' publishers, which make up a majority of its forty-nine members, as distinct from publishers of popular music, although a

number of the latter are also members.

"Our committee has been carefully investigating the broadcasting of copyrighted music since last November. In our report, just adopted by the Association, we point out that music publishers are vitally interested in radio broadcasting as a great future user of music and that our rights in the use of our copyrighted music in public performances must be protected. However, we appreciate the fact that radio broadcasting is still in a chaotic and experimental state and that, while ultimately it will have to be placed on a commercial basis if it is to develop its potentialities, nevertheless the commercial side of the broadcasting problem has not yet been solved.

"In view of these facts and also because we desire to cooperate in developing the music possibilities of radio, we believe that we should allow the use of our copyrighted musical compositions for broadcasting without charge for the present, and without prejudice in our rights."

While the action of the Music Publishers' Association does not bind its members, but merely recommends, it is understood that most of the large standard publishers in its membership will follow the recommendations of the Association. The following representative standard publishers have definitely decided to follow the recommendations: Carl

Fischer, G. Schirmer, Inc., C. H. Ditson Company, John Church Company, Boosey & Company, and Hinds, Hayden & Eldredge of New York City; Oliver Ditson Company and B. H. Wood Music Company of Boston; Paul A. Schmitt of Minneapolis and Clayton Summy of Chicago.

The Producing Managers' Association, of New York, has lined up with the music publishers and is in favor of releasing copyrighted music to broadcasters without demanding fees. This was demonstrated by Arthur Hammerstein, as chairman of the managers' committee on radio, which has been looking into the subject for a month.

"We are not at all averse to the broadcasting of our music by radio," he declared. "In fact, we are very much for it. We believe in letting the public hear the scores in our productions. It's good advertising, and is a strong boost for business.

"It is the composer who is protesting against the use of the music, and on what grounds I haven't been able to figure out. To begin with the music is the property of the producer. He purchased it and has a right to let it be broadcast if he wants to. As it happens, we all do want to." Accordingly, the radio committee of the Producers' Association will take steps to open the music of the various shows to the broadcasting stations without charge.

Cockaday Circuit

The newest and most startling development in radio

Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 1200 Miles. Telephone Range of 2400 Miles. Complete Parts for This Circuit.

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Include the following:

1 Special Coil	3.25
2 Variable Condensers (Bakelite Ends)	3.00
1 Socket (Genuine Bakelite)	.50
1 Vernier Rheostat (Cutler-Hammer)	1.30
1 Panel (Genuine Bakelite), 7 x 18	2.50
1 Grid Condenser, Mica Dubilier .00025	.35
1 Switch Lever, 7 Points, 2 Stops	.31
8 Binding Posts	.40
1 Grid Leak (Cartridge Type) and Bakelite Holder	.60
2 Dials, 3 Inch	.50
Total	\$12.71

One Stage Amplifying Unit to This Set, Additional	\$5.00
Two Stages, Additional	11.00
Cabinets, Piano Mahogany Finish, One Bulb Set	\$3.75
Two and Three Bulb Set	4.75

Complete Parts for Flewelling and Reflex Circuits.

U. V. 200 Tubes	\$3.95
DeForest DV6A, Wonderful as an amplifying tube	6.00
22½ Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	8.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95
45 V. "B" Batteries (each)	2.25

All orders must be accompanied with a money order postage included.

GRAND RADIO CO.

1789 Third Ave. 1714 Second Ave.
NEW YORK CITY

Pointers You Should Know When Installing

A FEW pointers regarding the installation of the receiving set should prove valuable for every one who owns a radio set. As a matter of fact one need pay little attention to the installation of the simple sets, for the reason that their simplicity limits their efficiency, so that finer details of installation hardly apply to them. When it comes to elaborate vacuum tube receiving sets, it may be well to give a little thought to the installation for the purpose of obtaining the utmost efficiency. So says the New York "Globe," and continues:

To begin with the receiving apparatus should be placed so as to permit the shortest possible leads from the receiving where the lead-in enters the room. The lead-in should be short as possible. Sufficient space should be provided between the instruments and the desk of operating table so as to make easy the manipulations of the receiver.

The antenna leading from the lightning switch should pass through an insulator when coming through the wall and the ground wire, which is number 14 rubber-covered copper wire, should be brought in very carefully. With all these in mind we should be able then to check up our weakness elsewhere should we have the occasion to do so.

SHORT CUT

Replaces aeriels, loops, electric light plugs, etc. Brings clearer signals and truer tone.

Postpaid \$5.00

SHORT CUT RADIO CORP.
243 W. 54th ST. NEW YORK

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This binder is securely made, is attractive in appearance, and each copy can be added weekly without any difficulty.

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65 cents each

(Sent parcel post prepaid.)

Address Sub. Department

RADIO WORLD

1493 BROADWAY NEW YORK

Dead Line for Changes in Advertising

Owing to the increase in the sales of Radio World and the fact that the paper has to be sent to press earlier than formerly, no cancellation of or changes in advertisements can be accepted after Wednesday of the week preceding publication.

Guaranteed
No Disks to
Break or Chip
Operates
Silently

Proven
the Best



by Laboratory tests, fine adjustment area 18 times that of wire rheostat and several times that of next best filament control.

**Ideal Control
For UV 199's**

And ALL TUBES

permits Accurate Control of "A" Battery current with infinite adjustment at critical operating point. Utilizes the great tuning possibilities of the tube itself, increasing range of your set.

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The Filament Control
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No. 400

**Old WJZ Signs Off For
The Last Time**

WJZ signed off—for the last time. Station closed down. All's Well!

The operator in charge made this entry in the station log book of WJZ, Newark, N. J., on the night of May 14. It was his last official act. They had ordered away not only his outfit but even his call letters. Old WJZ passed out of the broadcasting firmament in military fashion—quickly, quietly and with dignity.

"Broadcast Central," on top of Aeolian Hall, New York City, inherited the call WJZ and began operations the next night with shiny, new, strictly up-to-the-minute equipment. The juggernaut of progress knows no sentiment.

There are radio fans who swear by old WJZ. It was the first station that many of them ever heard, their ABC in radio broadcasting. WJZ led the field for one and a half years. This is a long life for a broadcasting station, and in that time many others have been built and operated. When WJZ began its first famous broadcast on October 12, 1921, there were only three or four stations broadcasting throughout the land. Today, there are about 600, but in spite of this immense increase WJZ has held its own and in many ways has blazed the trail.

Old WJZ enjoys the distinction of being the first broadcasting station to have its complete program published by a metropolitan newspaper. Lately, over 1,100 newspapers in the United States and foreign countries published the WJZ program.

WJZ could claim a transmitting radius of 2,000 miles. It was heard almost nightly in California and in England. It had followers in Australia, Cuba, South America and Europe. On one occasion, its signals were heard simultaneously in Honolulu and Bremerhaven, Germany, some 10,000 miles!

Mr. William H. Easton, retiring director, made a little farewell speech which was broadcast just before WJZ closed down. He concluded by saying:

"We shall never forget you of the radio audience and we trust that no matter how wonderful the new WJZ may be, you will never forget the first to bear that name. In behalf of the Westinghouse Company, I want to thank you for the splendid cooperation you have given us. I want also to thank the artists who have honored this station with their presence and who have given to you the best of the world's music and thought. And finally, I wish to thank our fellow broadcasting stations for the friendly spirit they have shown us at all times. The Westinghouse Company is not giving up broadcasting, as it will continue the operation of KDKA, Pittsburgh; KYW, Chicago; and WBZ, Springfield. But the voice of WJZ, Newark, N. J., is to be stilled forever. Well, good night, friends—and goodbye!"

**From Near the Equator to
Schenectady**

WGY was recently picked up by the steamship Ebro of the Pacific Steam Navigation Company when one day out from the Juan Fernandez Island, west of Valparaiso, Chili, about 5,400 miles from Schenectady, N. Y., the home of the General Electric Company broadcasting station. Information of the long distance reception was contained in a letter from W. F. Robertson of Cincinnati, Ohio, who was a passenger on the boat. Mr. Robertson stated that the ship's radio operators were using his set.

WGY has been heard greater distances than Mr. Robertson reports, but reception has never been reported as far south as the Juan Fernandez Islands. The distance is remarkable because of the heavy interference customarily encountered by operators when ten to twenty degrees north or south of the equator.



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

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Our goods are new in original packages, and our guarantee provides you satisfaction or your money back, we will repay transportation charges if not satisfied.

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7.00 Auth	4.00
RADIOEAVE LOUD SPEAKER UNIT	3.75
AMPL-TONE PHONES, 2200 Ohms	
TESTED AND GUARANTEED	3.75

TRANSFORMERS

\$7.00 U. V. 712 R. C.	\$5.85
7.00 Federal	4.75
5.00 Aeme	3.75
5.75 Kardon	3.50

CONDENSERS

Radio Stores Corp., Bakelite Ends, 23 plate	\$3.75
A. B. C., 23 Plate	1.60
Radiant with Beared Vernier:	
23 Plate	5.50
43 Plate	6.00

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Type A, Plain, 14 Plate	\$4.50
Type B, Plain, 26 Plate	5.00
Type C, Plain, 46 Plate	6.00
Type A, Vernier, 14 Plate	6.00
Type B, Vernier, 26 Plate	6.50
Type C, Vernier, 46 Plate	7.50

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Bestone, Solid Bakelite	\$0.75
Eagle, Bakelite	.60
Good Bakelite Sockets	.50
John Firth	.39
Composite Base	

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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).

BROADCASTING OUTFIT using five fifty watt tubes to be sacrificed. Everything complete. Make us an offer. Park City Radio Company, Bowling Green, Ky.

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AUTOMOBILE REPAIRING MADE EASY—By Victor W. Pagé. A thoroughly practical book containing complete directions for making repairs to all parts of the motor car mechanism. Written in a thorough but non-technical manner. Gives plans for workshop construction, suggestions for equipment, power needed, machinery and tools necessary to carry on business successfully. Tells how to overhaul and repair all parts of all automobiles. The information given is founded on practical experience, everything is explained so simply that motorists and students can acquire a full working knowledge of automobile repairing. Other works dealing with repairing cover only certain parts of the car—this work starts with the engine, then considers carburetion, ignition, cooling and lubrication systems. The clutch, change speed gearing and transmission systems are considered in detail. Contains instruction for repairing all types of axles, steering gears and other chassis parts. Many tables, short cuts in figuring and rules of practice are given for the mechanic. Explains fully valve and magneto timing, "tuning" engines, systematic location of trouble, repair of ball and roller bearing, shop kinks, first aid to injured and a multitude of subjects of interest to all in the garage and repair business. This book also contains Special Instructions on Electric Starting, Lighting and Ignition Systems, Tire Repairing and Rebuilding, Autogenous Welding, Brazing and Soldering, Heat Treatment of Steel, Latest Timing Practice, Eight and Twelve-Cylinder Motors, etc., etc. You will never "Get Stuck" on a job if you own this book. 1,000 specially made engravings on 500 plates. 1,056 pages (5 1/2 x 8). New Edition. Price, \$4.00. THE COLUMBIA PRINT, 1493 Broadway, New York City.

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ELEMENTS OF RADIO TELEPHONY, by Wm. C. Ballard, Jr. A standard book on radio telephony, the work of a recognized authority. Accurate, simple, clear, reliable and strictly up-to-date. For the technical man who wants to post himself on radio and for the radio enthusiast who wants the fundamental principles of radio and their application tersely and entertainingly presented. Price, postpaid, \$1.50. The Columbia Print, 1493 Broadway, New York.

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Short Radio Waves Transmitted in Beam Like Searchlight Reduce Interference

WITH the development of radiotelephone transmitting apparatus the transmission of the voice or music broadcast by radio has assumed an important place in the radio field. Radio waves which are transmitting the voice or music occupy a wider band of wave lengths than a "sharp" wave transmitting radiotelegraph signals. Because of this great increase in a kind of service which requires a wide band of wave lengths there is already considerable interference among broadcasting stations, and between broadcasting stations and radiotelegraph stations.

These authorities state that, for point-to-point communication, there are two important ways of reducing such interference; that is, to direct the waves radiated from the transmitting stations in a narrow beam toward the receiving station, and to use short wave lengths which are not at present employed.

Some English investigators have recently reported on the results of their investigations on directive short-wave transmission.

Experiments have recently been conducted at the Bureau of Standards on transmitting apparatus employing electron tubes, which transmits a directed beam of radio waves, and employs waves as short as 10 meters. This system, therefore, offers substantial relief from interference difficulties. It also has possible military applications. The apparatus has been used for communication by both radiotelegraphy and radiotelephony.

In the experiments at the Bureau of Standards a reflector has been used consisting of short parallel vertical wires, arranged on a frame shaped like a parabola. This reflector acts much like an ordinary mirror would for light waves. The radio waves are, in fact, the same kind of waves as light waves, but of considerably longer length. Forty vertical wires were used, and the generating set with its small antenna was placed at the focus of the parabola. Each wire was tuned separately to 10 meters by adjusting its length. It was found that about 75 per cent of the radiated energy could be confined within an angle of about 75 degrees.

This apparatus is described in Scientific Paper No. 469 of the Bureau of Standards, entitled "Directive Radio Transmission on a Wave Length of Ten Meters," by F. W. Dunmore and F. H. Engel. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 10 cents.

Opportunity for Radio Development in China

THE time seems ripe for radio broadcasting in China," says G. W. Van Tubergen, of the International Western Electric Co., who has just returned from that country. Radio should prove a distinct advantage to the Chinese people as those living in the small cities and villages even though only a few hundred miles from the larger cities are shut off from all direct contact with the larger life of their own country to say nothing of international happenings. Communication between villages is very restricted. It is literally by oxcart. And it is said that these places make up 90 per cent of China.

"It is very evident to those of us who daily enjoy the advantages of radio that these people living in the interior villages could have the privilege of listening to news reports, music, lectures and sermons and the like broadcast for them from Tientsin and other large centers by clubbing together and buying radio receiving sets."

Radio Control in Great Britain

RECENT developments in England indicate that a strong effort will soon be made to relieve the amateur radio operator in that country from having to pay a proposed increase in license and buy his apparatus from the British Broadcasting Company. Radical steps to break the alleged monopoly are predicted, although they may not remove the bar against foreign manufactured radiotelephone sets. If development is to be permitted the whole situation must be simplified, many believe.

The new postmaster-general is said not to be especially sympathetic toward the present arrangement, but it is felt he will insist that apparatus be of United Kingdom manufacture. Many fans in Great Britain want to make their own receiving sets and utilize some manufactured parts. Today these radio fans can only secure an experimenter's license, but after receiving their permits they can use any kind of a set or part they desire, and listen in on all stations. These licenses, it is reported, remove them from the control of the British Broadcasting Company. It is assumed that they are engaged in experimental work, but they undoubtedly listen in on all broadcasting concerts.

The Radio Manufacturers' Association has suggested abandoning the present method of securing revenue for the broadcasting company by license fees and royalties, and collecting the amount necessary for adequate revenue from the license fee. Restrictions against the so-called "pirate" would then be tightened.

According to a statement in Parliament 35,383 experimental licenses have been issued, while as many more applications are on file. It is estimated that 200,000 individuals are using sets without licenses because they cannot secure the licenses they desire.

Studying Foreign Languages by Radio

SCHOOLS in Sheffield, England, recently had the privilege of listening to French prose and poetry broadcast from a French radio station. The director-general of the French Radio Service consented to cooperate with Mr. F. Lloyd, president of the Sheffield District Wireless Society, in an effort to provide for foreign language students the broadcasting of standard and classical foreign literature. It is hoped that this first-hand instruction can be extended to include the broadcasting of English, German, Italian and Spanish language lessons.

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How to Construct, Protect and Operate a Storage Battery, by George W. May.
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Design for an Amateur's Receiving Set, by C. White.
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Radio Receiver for Short Waves, by George W. May.
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How to Construct One- and Two-Slide Tuning Coils, by George W. May.

JUNE 17.

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JULY 1.

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How Wave Lengths Travel, by Fred. Chas. Ehlert.
Radio World's Revised Dictionary, by Fred. Chas. Ehlert.
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Broadcasting in India

BROADCASTING in India will probably be limited to a single company, composed of British and Indian firms, according to a report of the recent Delhi conference forwarded to the Department of Commerce by Vice Consul Harold Shantz, Calcutta. Non-British firms will not be allowed to participate, it is said.

The Director of Wireless has pointed out that under the proposed license an imported set of apparatus would only be authorized if of British manufacture but that it would be permissible to buy parts from the United States or other foreign countries and assemble them in India. The director said that the proposed company would be essentially an Indian one, registered in India and with headquarters there.

It is understood that the manufacture of receiving sets is to be undertaken in India as soon as practicable by the new broadcasting company; this will probably at first consist of the importation of some parts, the local manufacture of others, and the assembling of complete sets.

In this connection it may be observed that at the present time no wireless equipment can be imported into India which is not for Government use, except under a special import license from the Director of Wireless, and by persons who are licensed to operate.

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Radio Situation in Ireland

NO definite policy has been announced by the Irish Government up to date regarding its position with respect to wireless broadcasting, or the operation of private receiving sets. There is a small market for this class of equipment, which, since the regulations of the British Post Office and the British Broadcasting Company do not apply in Ireland, is open to foreign manufacturers.

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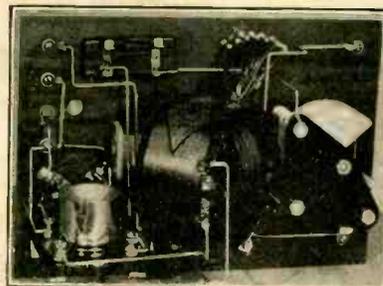
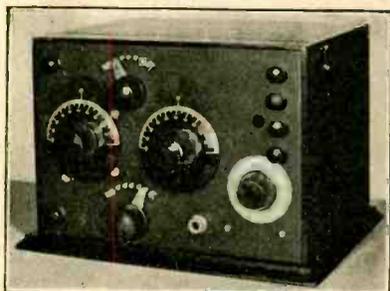
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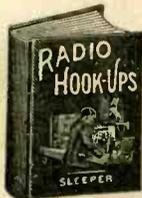
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