

A WORKABLE ONE-CONTROL SET (See Inside)

15c. a Copy

August 11
1923.

\$6.00 a Year

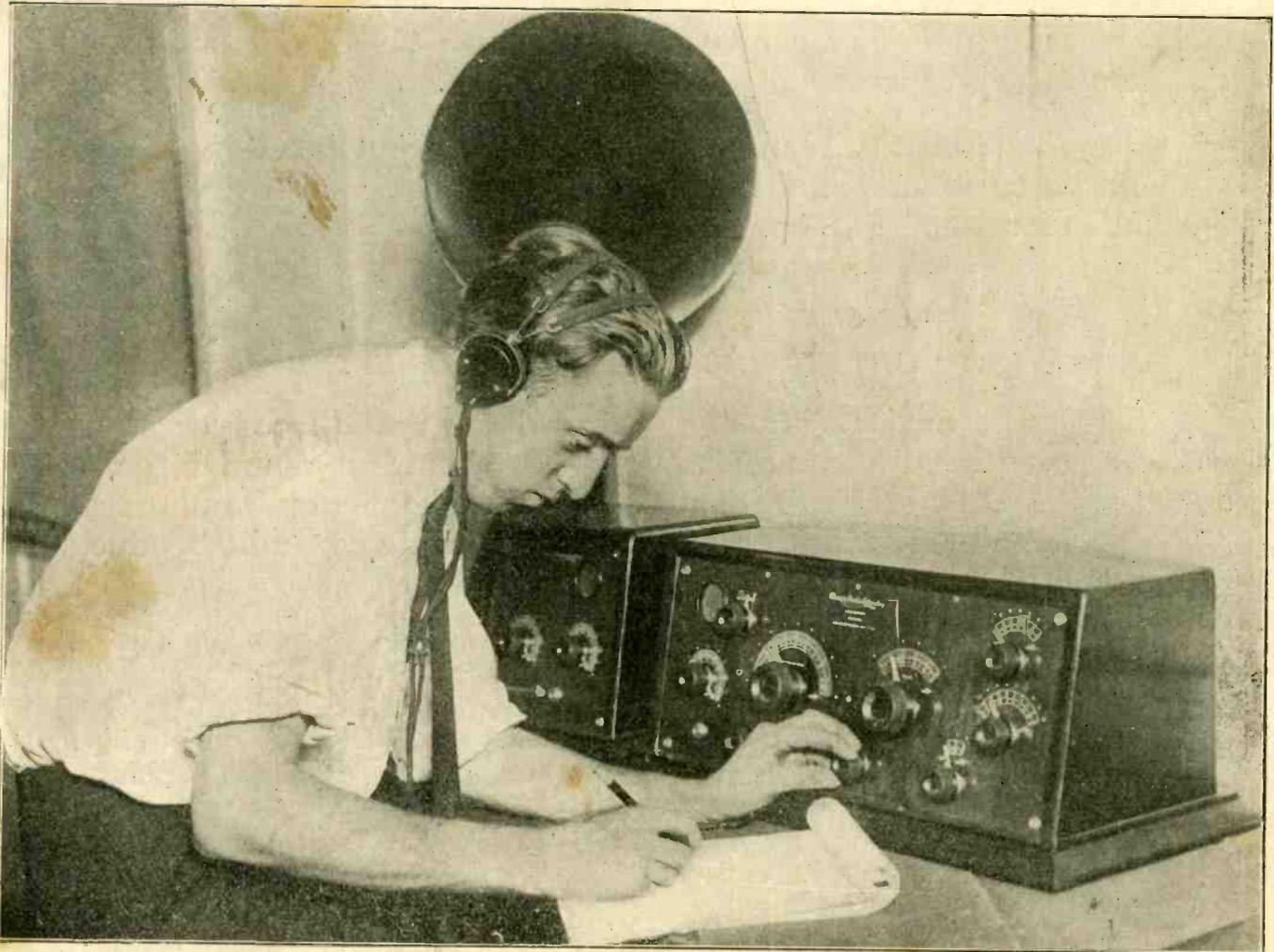
RADIO WORLD

Title Reg. U. S. Pat Off.

ILLUSTRATED

EVERY WEEK

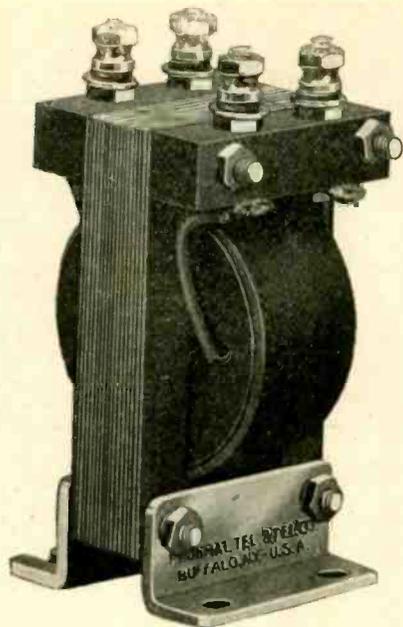
GETTING READY TO RECEIVE MESSAGES FROM THE ARCTIC



(C. Underwood & Underwood)

This picture shows D. F. Easthope at the receiving set at WJAZ, Zenith Edgewater Beach Station, Chicago, tuning in for signals from Captain MacMillan's ship, "Bowdoin," which is known as Station WNP, or Wireless North Pole.

A NEW ELECTRICAL PHENOMENON (See Inside)



*Federal Audio
Frequency
Transformer*

No. 226
Actual Size

One of the 130 guaranteed Radio Products in the Federal line—all of which are described in our new catalog. Copy sent you free upon request.

Amplification Without Distortion

THIS A. F. Transformer furnishes increased amplification and faithfulness of reproduction of both voice and orchestral music. It will prove a revelation when installed on your present set.

The Federal 226 Transformer has been pronounced by leading Radio engineers, after repeated and exhaustive tests, to excel in all essentials.

*It can be successfully used with
any vacuum tubes in common use*

The same engineering skill, based on twenty-three years' experience in the manufacture of communication apparatus, is behind this Federal Standard Audio Frequency Transformer No. 226 and the entire Federal line of Guaranteed Radio Products which includes 130 separate units.

Federal Guaranteed Radio Products

Your dealer sells the No. 226 and he can also furnish you from stock or on a quick delivery basis any article made by Federal.

Send for the NEW Federal fully illustrated catalog of Radio Products. You will find it a guide to more satisfactory Radio reception.

Federal Telephone & Telegraph Company
BUFFALO, N. Y.

RADIO WORLD

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

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 20. Whole No. 72

August 11, 1923

15c. per copy, \$6.00 a year

A New Electrical Phenomenon and Its Applications in Radio

By Dr. Alfred Gradenwitz

THE discovery of a decidedly new phenomenon by two Danish engineers, Knud Rahbek and Alfred Johnsen, a few years ago came as a surprise to those who, in the well explored realm of electricity, no longer expected any startling novelty to turn up. However, this phenomenon not only aroused



Fig. 1. Fundamental test of a new electrical phenomenon showing a metal plate clinging to a stone slab during the passage of a minute electric current.

the curiosity of those interested in the scientific side of the problem, but soon proved fruitful in remarkable applications to several branches of electrical engineering, most of all to radio telegraphy and telephony. Some of these applications which are the outcome of joint endeavors by the inventors and the Dr. Erich F. Huth Radio Company, of Berlin, are described in the following article.

The new phenomenon may be described as a powerful electrical attraction without any magnetism or iron and bids fair to oust the electro-magnet from its present monopoly in electrical industry. It is best illustrated by the following experiment:

An ordinary lithographic stone slab, 75 grams in weight, coated on one side with tin-foil, is, by means of a thin wire, connected to one of the terminals of an electric circuit, while the other terminal communicates with a brass plate placed on the opposite face of the stone. A feeble direct current is then found to flow through the stone, which, strange to say, firmly clings to the metal plate, in order immediately to be released, as the circuit is broken. The experimenter's own body can, instead of the wire, be used as conductor, thus illustrating the smallness of the electric current producing such strong effects. The plate may consist of any metal, or even of any non-metallic substance, pro-

vided that either this or the stone possesses some trace of electrical conductivity, which it, by the way, may receive by artificial means. An especially striking test consists of demonstrating the mutual attraction of two stone slabs.

In order to understand the above phenomenon, it will be well to remember that the stone slab and metal plate together constitute an electrical condenser. The stone being polished as smooth as possible, their distance in the case of what seems to be actual contact is 1/100 to 1/200 millimeter. Now, as the effect of a condenser, of course, is the stronger as the two armatures come closer together, this system is bound to exert exceptionally strong effects. Moreover, the arrangement opposes to the electric current a truly enormous resistance—in one case as much as 20 million ohms, that is, a figure so high as to make any line resistance appear negligible. It will, therefore, be understood that the current allowed to pass through the system should be quite minimal, in fact of the order of a millionth ampere. This is how a very strong attraction is produced by a current of striking smallness.

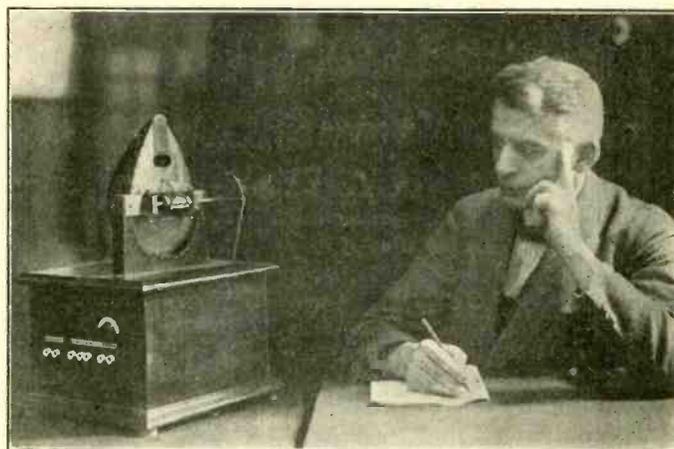


Fig. 2. A mandolin converted into a loud speaker, utilizing the principle illustrated in Fig. 1.

Being present with equal intensity in any metal, and, it seems, in most non-metallic substances, the phenomenon is much more universal than electro-magnetism. Another striking advantage is the well-nigh incredibly small energy consumption, the amount of energy required to lift a given weight being, in the case of the new phenomenon, 300-500 times less than in connection with an electro-magnet.

(Concluded on next page)

(Concluded from preceding page)

Even much stronger effects are obtained by using a *stone cylinder* in the place of a slab. One especially striking experiment shows less than 1/10 watt to be expended in retaining a weight of 5 kilograms. This, however, is one three-hundredth part of the electrical energy used up by a standard 25 candle-power incandescent lamp.

Unheard-of vistas are opened up by this new electrical phenomenon. The first application was to the construction of a call relay of unusual sensitiveness,

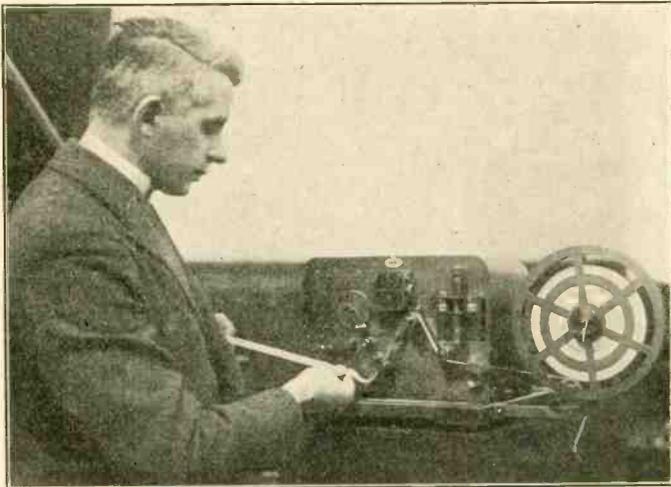


Fig. 3. Huth high-speed telegraph recorder comprising the new relay described in the accompanying article.

actuated by a current of about one millionth of an ampere. Some promising uses of this remarkable relay are enumerated in the following:

RADIO TELEPHONY FROM AND TO RAILWAY TRAINS—Messrs. Huth have on the Berlin-Hamburg railway line developed this system to such a point that any subscriber to the Berlin and Hamburg telephone systems may put himself in connection with travellers in the train, and vice versa. Electrical waves of moderate length, though low energy, generated at one of the terminal stations, are transmitted to the conductor lines serving for ordinary telegraphy and telephony along the railway track. The train carries on the roof of one or more cars a very low antenna in the form of a few wires insulated from and stretched out close to the car roof. This antenna is connected up to a small radio telephone transmitter and receiver of a few watts and is used simultaneously for talking and listening. The traveller, of course, uses an ordinary telephone, such as he is in the habit of employing at home. Inasmuch as the electric currents reaching the train or starting from it are rather weak, a most sensitive relay was required to actuate the call bell or call lamp at both ends and this is where the new relay came in very handy.

HIGH FREQUENCY TELEPHONY AND TELEGRAPHY OVER HIGH TENSION CONDUCTORS—The same system of directed radio ("wired wireless") has lately come into extensive use in connection with power plants, allowing as it does communication to be established at a moment's notice, e. g., between the generating station and its sub-stations in case of breakdown, without resorting to any special telephone line, the electric waves travelling along the high tension conductors. Such apparatus using the new sensitive relays have been installed in a number of great power plants in Germany and Switzerland, while the same possibility of "wired wireless" of course, exists in the case of ordinary telegraph or telephone lines.

NORMAL RADIO TELEGRAPHY AND TELEPHONY—There are many possibilities in store for the

new relay even in normal radio telephony and telegraphy, e. g., for calling up ships in the same manner as in the case of wired telephony, so that on small steamers, the services of a permanent telegraphist can be dispensed with. Ships in case of danger can be warned automatically.

HIGH SPEED TELEGRAPH RECORDERS—Apart from the relay using stone slabs and metal plates, the Huth company have developed apparatus comprising cylindrical stones or metal conductors. (In such cases it is generally the stone which has the form of a cylinder.) The first apparatus of this kind is a high speed telegraph apparatus able to record or retransmit Morse signals at enormous speeds, though with extremely small telegraph currents (1/100,000 amp.), the line resistance thus being of no importance. Extraordinarily thin wires (with a corresponding saving of material) can accordingly be adopted and, moreover, the speed of working can be raised to figures so far inaccessible (2000 letters per minute), without any prejudice to the distinctness of type, both in wired and wireless telegraphy.

Another interesting application is to the construction of loud-speaking telephones, where the stone cylinder system actuates a membrane in accordance with fluctuations of the current supplied. It is expected to arrange for a broadcasting service enabling any telephone subscriber at given hours to treat his

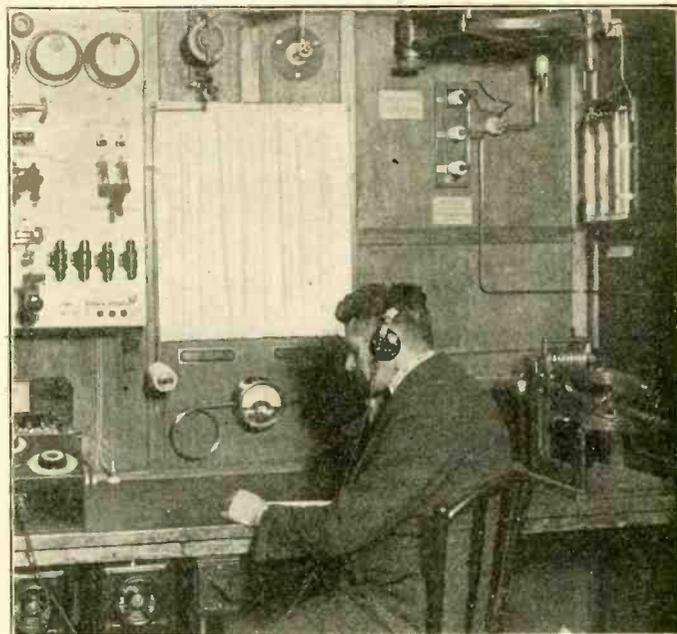


Fig. 4. Ship radio-telephone station designed on the new principle described herewith.

guests either to classical or to dancing music. Wireless transmission of speech and music has recently been effected with a 1 KW transmitter designed on the Huth system between the premises of the firm and places in Sweden, in the Isle of Borkum, in Rotterdam and elsewhere.

There are many other devices based on the use of the new relay, which have already got beyond the experimental stage, e. g., talking films, electrically operated typewriters, and others.

It Doesn't Hurt

IT doesn't hurt anyone to ask for information. They say advice is cheap. It may be cheap, but it is not always sought. If you have some problem that you are not absolutely sure about, it is better to ask questions than to do it wrong.

Making and Using the Buzzer Test

By Thomas Brainard

THERE are many times when we are not quite certain whether our receiving tube is in its most sensitive condition, or when our crystal has its most sensitive adjustment. Especially is this true when there are no stations sending for the moment. Of course, we can guess, but the only way to be really sure is to use some sort of an external exciter, such as a buzzer test outfit. The little arrangement and outfit to be described can be made for a very small sum, and besides performing the function mentioned, may be used for several other useful purposes, such as for testing circuits, exciting a wave meter and so on.

A buzzer test may be easily fitted to sets that have already been built; in most cases without marring the appearance in the least, and with little trouble. Let us take first an ordinary tube set, with a variocoupler mounted near the left hand end of the cabinet. If there are two inches or more between the coil and the wood end, the task will be comparatively easy. The parts that are needed include a flush type push button; a small three-cell flashlight battery; a small high frequency buzzer; and the necessary connecting wire and mounting screws. A strip of brass, about $\frac{1}{2}$ -inch wide and four inches long, will be needed for making a bracket to hold the battery in position.

Near the upper left hand corner of the panel, a hole should be drilled for the push button. For the ordinary flush button this should be about a $\frac{5}{8}$ -inch hole. If you have a drill large enough, you can make this hole

as possible, so that these metal parts will not appreciably interfere with the oscillating circuits.

Now the brass strip should be bent as shown, and of a shape so that it will fit snugly over the flashlight battery. A hole for a screw should be drilled in each end. After this is done it may be fastened to the cabinet, with the battery in place.

Next the wiring may be done. Most any wire will do. Ordinary bell, or annunciator wire will serve very well. Connect as shown in the circuit diagram. It is best to solder the connections on the battery terminals. The other connections you do not have to be so particular with.

About an eighth of an inch from the top of coupler winding, wind two turns of the bell wire, or some more flexible wire; and anchor it in place with some insulating varnish. This serves as a coupling coil with the coupler winding. Connect one end of this little coil to one of the terminals of the push button; the other terminal of the push button to one of the buzzer terminals; the remaining buzzer terminal to one pole of the battery; and the other pole of the battery should be connected to the free end of the little coil.

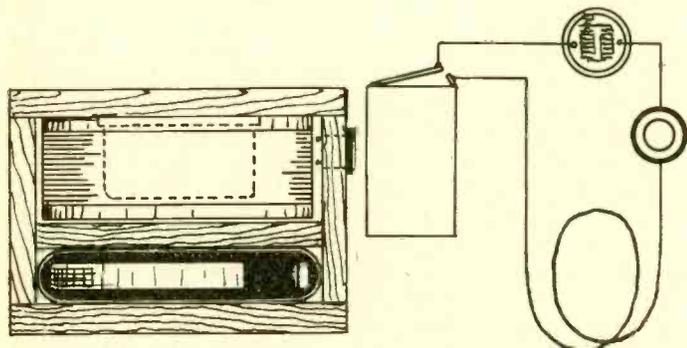


Fig. 1. Construction of a handy buzzer test and circuit diagram of connections used. A single turn of wire around the coupler or tuner is sufficient.

yourself, or you may take it to a shop where they do such work. If neither of these methods are convenient, a fairly satisfactory hole may be made by drilling a series of small holes in the form of a $\frac{5}{8}$ -inch circle, and then smoothing down the ragged edges with a file. Be sure and mark the hole out with a compass, however, and keep the outside rim of the small holes within the line. Two small holes must be drilled for the fastening. These must be tapped, if they do not go all the way through the panel. You can get a small tap for this purpose for about 10 or 15 cents.

The buzzer may be mounted on a small shelf that has been fastened on the back of the panel; or, more easily, mount it on the inside of the wood end piece of the cabinet. This latter is probably the best way, for the buzzer could be kept farther away from the coupler coil. Brass screws should always be used for fastening. Fasten the buzzer at a sufficient height to allow for the mounting of the flashlight battery directly underneath. All of these instruments are kept as near the left hand end of the cabinet, and as far from the coil

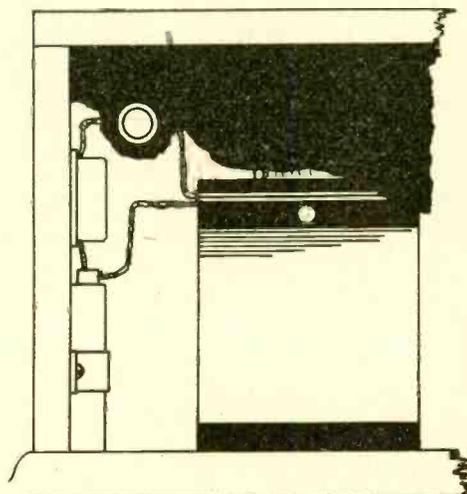


Fig. 2. Suggested method of installing a buzzer test in a cabinet set. This is the preferred method if there is room in the cabinet for the installation.

The buzzer test could be hooked up with a loose coupler set in precisely the same way, except that the little coil would in such a case be vertical; or in other words the coil should be on the same plane as the coupler coil, regardless of whatever position that may be in.

If you do not care to mount the test outfit directly on your set, you may make up a very neat little outfit that may be used whenever and wherever wanted, by mounting the necessary parts in a small box, as shown in one of the drawings. The box should be about $3\frac{1}{2}$ inches deep, $3\frac{1}{4}$ inches long, and two inches wide—inside measurements. However, the exact size should depend primarily upon the parts which you are able to obtain. The stock for the box, if you intend to make it yourself, could well be $\frac{3}{8}$ -inch.

Secure a cardboard tube, three inches in diameter and about one inch long, and wind it with about ten turns of No. 22 wire. Then mount the tube in one end of the box, as shown. In the center of this coil, to save

(Concluded on next page)

How to Read "Radio World" Profitably

By Stephen L. Coles

IT is generally admitted that there is considerable science and a great deal of hard work involved in editing and publishing a weekly journal of any kind. When a weekly requires the important added elements of technical accuracy and a sincere desire to represent broadly the industry with which it is affiliated, other burdens are added. Many years are usually required to so perfect men in this kind of work that they may be competent properly to fill their jobs.

In the course of performing their tasks day by day and week by week it is only to be expected that the editorial staff of a weekly such as RADIO WORLD should acquire an accurate, intimate knowledge of the industry it represents. This may come in various forms; such, for instance, as voluminous correspondence relating to every possible phase of the radio industry. The

is its title, and it contains simply names and addresses of people from all over the world. Yet back of these names is an important human interest story which possesses at the same time many elements of great practical business value. These names come to RADIO WORLD through the mail and are sent voluntarily by the people themselves. All of them have a sincere desire to gain information of one kind or another—or they would not take the trouble to write. Every one of them is a potential and quite probable buyer of radio goods. Some of them are only boys, but any wise merchant will tell you that if he can secure the trade of boys and serve them satisfactorily he will build up a business which will last during their entire lives.

This is well exemplified in the hobby of collecting postage stamps. Nearly every one of the prominent philatelists of today began collecting postage stamps as a boy. Many fortunes have been made by dealers in stamps and their business even now is particularly with the younger generation.

The attractions of radio for the young boy have never been exceeded by any form of constructive enjoyment in the history of time. Most of the inventors of radio devices and nearly all the high-class operators began as boys. Here is a field pregnant with immense possibilities for the manufacturer who will carefully and intelligently cultivate it.

That the manufacturer, dealer and distributor of radio supplies is not getting the most possible, nor half of it, out of this wonderfully fallow field has been amply demonstrated to RADIO WORLD through this little column of names. At various times and frequently the names of members of its staff have been inserted in this column so as to find out just how the people to whom these names should be most valuable were responding. The sum and substance of a two months' test is that full advantage of this opportunity is not being utilized. The particular fault seems to be that business men in the radio industry are not properly equipped with printed matter, catalogs and price lists with which to respond to these requests. Many of them have nothing of the kind and send in response to requests handwritten postal cards, typewritten postal cards, badly mimeographed sheets and poorly printed, out-of-date leaflets. One of the largest manufacturers in the industry responded to a request for literature with an envelope which contained nothing when it was received. Of course, this instance probably was a clerical error, but the effect on the recipient was just as unfortunate as if the episode had been clearly thought out and an insult intended.

Advertising, of course, is the basis for success in any business that manufactures reliable goods at a fair price. Advertising obviously includes printed matter with which to respond to requests for information. It would be well for radio business men to call in outside help and provide themselves with printed material of a kind and character that properly will back up their publicity of various sorts and eventually bring business.

Readers should learn to read and benefit by the publications for which they spend money. Every radio business man should, either himself or have someone for him, carefully read RADIO WORLD each week with the sole purpose in view of taking prompt advantage for himself of the wealth of information it contains—a large part of which can be turned into dollars and cents.

Radio in a Cigar Box



(C. Photonews)

Felian Garzia and his cigar box Flewelling receiver. This set has both A and B batteries, vacuum tube, and four head phones, so arranged that four people may comfortably listen in. The entire set is contained in a regulation cigar box, and weighs less than five pounds. Tuning is accomplished by the use of the rubber end of a lead pencil against the condenser plates.

questions answered in print are but a fraction of the questions asked. Some of these are answered by telephone, some by mail, and others are referred to college professors, engineers, manufacturers or specialists in the line regarding which the inquiry is made. Then, too, it would surprise the average reader to know how much information is derived from the advertising copy received in the business department. The editors frequently are asked to pass upon statements made by advertisers.

The editorial offices of RADIO WORLD seem to be a natural focal point at which gather the many and varied lines of information, to be again reflected to the world by the editorial staff.

To take up only one instance, reference is made to a column which has been appearing in RADIO WORLD for a number of weeks. "Radio Literature Wanted"

RADIO PRIMER

By Lynn Brooks

WHAT TO BUY—Many times when a particular article attracts the notice of a fan who is constructively bent, he puzzles and frowns when it comes to the act of buying the goods.

He will complain about the fact that the writer does not specify any particular make of material. He knows that there are fifteen or twenty audio-frequency transformers on the market as well as hundreds of makes of other apparatus. What can he do? What does he do? One of two things. He either lets his pocketbook dictate the apparatus, or else he writes a long letter to the author or the editor and asks a lot of questions.

Take your dealer into your confidence and if he is a good business man he will recommend a particular type of apparatus that he thinks is good. How does he know? Well, he is selling them and he knows what sells well and that is what he is going to give you.

Never let your pocketbook dictate apparatus. If you cannot afford the very best, wait a week or two until you can. You can never gain anything by scrimping. In radio just as in anything else the article is worth just what you pay for it. Sometimes it is worth considerably less, and this is generally the case with cheap apparatus. You pay less and you get considerably less than you paid.

Because it is cheap in price does not signify that it is good in quality, even though you may run across a bargain every once in a great while.

WHAT CIRCUIT TO USE—When it comes right down to the final analysis it is a pretty tough job for the uninitiated to pick the best circuit to work with. There are so many that crop up every day, every week, every month, each claiming its advantages over all the predecessors, that it is a tough problem to choose among them.

One of the greatest mistakes that an amateur can make is to tackle the more intricate circuits. There is always some little detail that he will not understand and cannot figure out.

Roughly, we can classify tube circuits into two classes: The single circuit receivers and the double circuit receivers. They each have their advantages and their disadvantages, and their relative capabilities and incapacities.

The single circuit receivers are simple to construct and tune. They have great volume and fairly sharp tuning. Most of them can be easily constructed from few parts in a couple of hours' time, if care is taken. They are simple to work, as they generally have but one or two controls.

Their disadvantage is that if they are of the regenerative type they will re-radiate, due to their being powerful oscillators. This will cause a great amount of disturbance to neighboring sets if they are not handled correctly. They cannot tune out interference as well as the double circuit sets, and for that reason it is more than likely that distance work when a local station is on will be impossible. Their salvation, however, lies in the enormous volume of which they are capable.

The double circuit sets are far more intricate of construction and the controls are tripled in most cases, as besides the coupling and other controls there is generally a primary inductance control. However, their selectivity is far greater than the single circuit, and finer tuning is possible, eliminating to a great extent the interference noticed in single circuit sets. The

range of a double circuit set compared with a single circuit set is about even, as both are capable of doing excellent work, the only drawback being that it takes more care and experience in the construction and operation of the double circuits than the single circuits, and therefore the beginner most always goes to the simpler sets.

Any circuit, whether crystal or six tube regenerator, requires care both in operation and construction if good results are to be expected.

The Radio Woman

I HAVE received the following interesting letter which I am glad to publish in the hope that it will inspire others:

"In RADIO WORLD for July 14, 1923, you published our photograph under the heading, 'Winners of non-stop radio golf contest,' but neglected to publish our names with it. We feel highly honored in having our picture published in RADIO WORLD and we are requesting that you publish our names in another issue, using the photo attached herewith or in any way you see fit. You know, Mr. Editor, that it is no 'cinch' to cover



Winners of the recent six-day non-stop radio golf contest and enthusiastic readers of RADIO WORLD. On the left, Miss Violet Vee, and on the right Miss Valerie Vee, both of New York City.

132,000 miles by radio and we are somewhat proud of our record and challenge anyone to beat us.

"It might be interesting to state here that we have been radio fans for some time (our first set being a simple crystal set), and also that we have been readers of RADIO WORLD from almost the first issue. We congratulate you for turning out such a splendid radio publication and thank you for publishing our picture. —Valerie Vee, Violet Vee."

Safety First With Tubes

DO you realize that for a few extra pennies you can safeguard your tubes and prevent them from blowing out? It is very easy. All that is necessary is two of the small flat fuses such as are used by the telephone company to safeguard the transformers. They only cost a few pennies apiece, and will stand watch over your tubes, and you do not have to worry when you are away for fear that someone will unknowingly blow your tubes and cost you money to get the set working again.

Receivers Recommended for North Pole Messages

HARTFORD, CONN.—With the coming of each radio season, particularly in the early fall, the radio amateur prepares for greater distance in receiving and transmission and those who were content last year to tune in distant broadcast stations are now preparing their equipment and lifting their antenna another notch or two for the purpose of listening in for Wireless North Pole, Donald MacMillan's radio in the Arctic.

This new extension of the amateur's prospective range, along with the novelty of hearing code dispatches from the polar exploration party, has prompted many amateurs to ask what receiving equipment is best for reception of messages from WNP.

Basing his opinion on the inspection of a large number of reports and experiments by amateurs who are putting much time and money on this very problem, Howard F. Mason, department editor of "QST," published by the American Radio Relay League, which furnished a radio operator for the Arctic ship, advises

listeners to install either a regenerative receiver with one stage of audio amplification or a superheterodyne with tuned radio amplification using the "neutrodyne principle" in the amplifier.

"As WNP is sending on amateur waves, the receivers that have been adopted by the majority of A. R. R. L. relay stations will be the most practical to use in picking up messages from the Pole," Mr. Mason believes. "The regenerative set with one stage audio is still popular. It is being improved over the older models by using coils and condensers especially designed to minimize losses.

"The superheterodyne, which has been always the ultimate in a receiver for short waves, has been reduced to a more practical basis this season than last, owing to the advent of the 'neutralizing' feature, by Professor Hazeltine, and by the new type of tubes recently placed on the market. These consume small amounts of filament current and do away with the necessity of having a large storage battery."

Weather Maps Aid Amateurs to Foretell Radio Reception

MINNEAPOLIS, MINN.—Radio fans may have to add a barometer to their equipment and study maps issued by the weather bureau to determine their range of transmission or reception if the theory that radio waves tend to follow isobars, or lines of equal pressure area, advanced by Donald C. Wallace, assistant division manager of the American Radio Relay League, is correct. From experiments made at his amateur station in this city, Mr. Wallace is convinced that radio reception may be foretold with a fair degree of reliability.

The subject is comparatively new and the most that can be said for it is that it makes a start at explaining why reception is poor at certain times and why stations at various points of the compass are heard with changing strength regardless of their actual distance. "If a daily weather map is used," says Mr. Wallace, "it will be found that not only do waves tend to follow the lines

of equal pressure, but the range of one's set can be determined some hours in advance.

"Recently a striking example of the effect of these high and low pressure areas occurred. A tornado passed through Louisiana making a low pressure area, while in the northern part of the country there were no disturbances and a high pressure area existed. Radio fans heard nothing more than 100 miles distant.

"Sometimes signals take a round-about course and follow the isobars, and in this case, marked fading exists. This is due to the fluctuation at the edge of the high pressure area that exists in between. On some nights the whole country has the same barometric pressure, and on those nights, stations from all sides come in. The Mississippi Valley often has the same barometric pressure; thus signals north and south are apt to be consistently loud while they vary east and west where barometric differences are greater."

Let Strange Wires Alone!

A LETTER has reached RADIO WORLD from the engineer of a western power and lighting plant, telling how a young radio enthusiast was nearly killed. It is designed as a warning to all well-meaning young men who see an opportunity of using a wire for an antenna, without first considering just what that wire is.

This young follower of radio was prevented from erecting an antenna because of the fact that the neighbors on both sides of his house objected to his stringing the wire on their property. As there was an electric light pole outside his house, and about 20 feet from his bedroom window, he climbed the pole, insulated wire in hand, and attached the wire to the incoming side of the transformer, or the side that delivers 110 volts.

As the wood was dry and he was wearing rubber soled shoes, nothing happened. He threw his wire across the lawn, and later attached it to a string, preparatory to hauling it in his window. As he pulled the wire it crossed the high tension side of the transformer. He had just touched the wire when there was a flash, and that whole section of the town went dark. He went to the hospital, badly burned, and crippled on his right side for life, but lucky to be alive. The supply was 20,000 volts—enough to kill him instantly had he made good contact.

This should be a warning to many fans who are tempted to string their antenna across the nearest light pole, or attach it to some handy and convenient wire that is already strung up. Don't do it!

Washington Now Has Two Powerful Broadcasting Stations

By Carl H. Butman

WASHINGTON, D. C.—Radio fans in the Nation's Capital are agog with interest in the two new Class B broadcasting stations, WCAP and WRC. Enthusiasts, even several hundred miles from Washington, are beginning to listen in to the high class entertainment from a new radio center. It has been an army and naval radio center for some time but good, private broadcasting has been scarce.

Recently WCAP, of the Chesapeake and Potomac Telephone Company, went on the air, broadcasting a duplicate of WEAf's program in New York. The telephone company's first strictly local effort was the broadcasting of the U. S. Marine Band, which brought in many enthusiastic returns. WCAP was included in the six stations which were to have broadcast President Harding's speech at San Francisco on July 31, connection to be made by telephone wires from the Pacific Coast to their transmitters. Within a month, it is understood, WCAP will be sending a regular program, dividing the time with WRC on 469 meters.

On August 1, WRC, the new station of the Radio Corporation, named the "Voice of the Capital," was christened at 8:00 p. m. Its regular programs will be broadcast Tuesday, Thursday, Saturday and Sunday afternoons, and Monday, Wednesday and Friday evenings, the telephone company's station WCAP broadcasting the alternate evenings and afternoons.

Col. Theodore Roosevelt, Assistant Secretary of the Navy, made a speech at the dedication of the new Radio Corporation's station on Wednesday last. Major Gen. John L. Hines, Deputy Chief of Staff, U. S. A., spoke for the army, while Acting Secretary of Commerce S. B. Davis talked on commercial and public interest in radio.

The opening ceremonies of WRC included a radio message from General Harbord, president of the corporation, who is abroad; talks by David Sarnoff, general manager, and Dr. Alfred Goldsmith, in charge of radio research.

The initial program arranged by Mr. Ralph Edmunds of WRC, was not to be entirely devoted to talks, however, as special musical numbers were broadcast by the U. S. Marine Band, Taylor Bronson leading. Celebrated artists on the program, including Charles C. Tittman, bass soloist; Elias Breeskin, Russian violinist; Ruth Peter, soprano; Victor Golibart, tenor, and Clelia Fioravanti, mezzo-soprano.

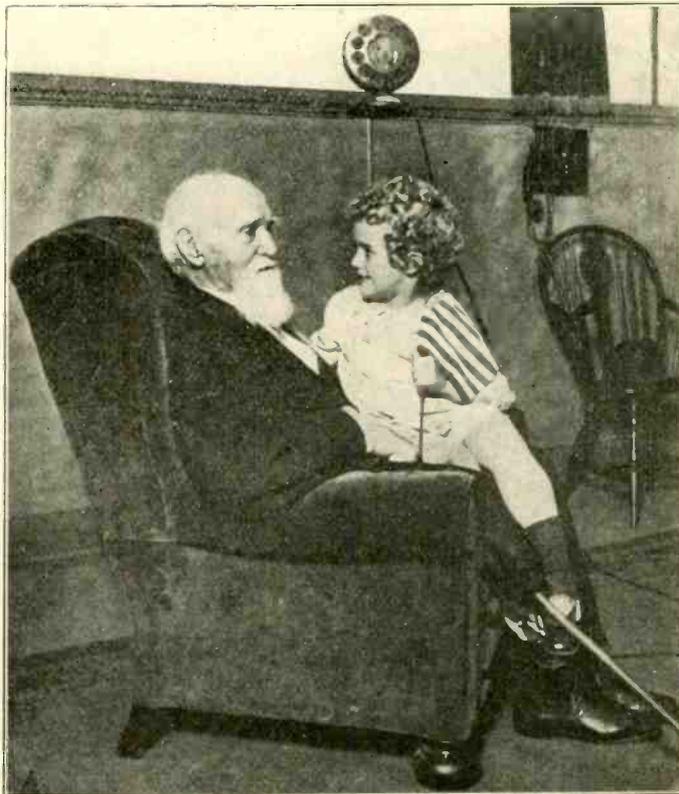
WRC has been described technically already; it is a duplicate of the corporation's stations in New York and is rated at 500 watts. Having two sets of apparatus, however, it could in an emergency put out 1000 watts and reach every corner of the continent. Every precaution is taken to insure excellent broadcasting, from the especially sound and echo-proof station, where the artists perform, to the small receiving set on which the operator listens in to his own station and for distress calls from ships with which the broadcasting might interfere.

The new station is under the personal direction of Mr. S. P. Guthrie, superintendent of the Washington District. Mr. W. L. Tesch is local engineer, assisted by Operators Oliver and Rundquist. Mr. Ralph Edmunds is program manager, and is assisted by Announcers Gannon and Berkeley. On opening night Announcer Cross, of WJZ, also assisted. A special

feature of the regular WRC program will be a daily "children's hour" from six to 6:20 broadcast by Mrs. Edward Albion who is experienced in child entertainment. She will write all her talks and handle them in a little more personal manner than most broadcasters in an effort to effect a closer relationship with her young audience.

On Monday, August 6, WRC staged a Marine Corps night, at which Brig. Gen. Logan Feland, Marine Corps, spoke and the Marine Band played.

Centenarian and Child Prodigy Make Radio Address



(C. Pacific & Atlantic Photos)

Former Senator Cornelius Cole, 100 years of age, and tiny Richard Headrick, violin prodigy and film star, combined forces in one of the most unusual programs yet broadcast from a radio station when they appeared jointly in a patriotic speech at Station KHJ, the Los Angeles "Times." The two extremes of human age thus combined in one made a striking picture, as well as a most unusual address.

Do You Know?

MANY owners of sets just know that they have to twist the dials and turn on the rheostat in order to receive signals. They do not understand why. Do you realize how much more fun it would be if you had a working knowledge of why a certain thing had to be done? A few dollars invested in good text books on the subject would make the art of tuning and working a set all the more interesting because you would then understand what you are doing.

Station WRC Is On The Air

By J. L. Bernard

Radio Corporation of America

THE new giant broadcasting station WRC, located on the New Riggs Bank Building at 14th street and Park road, Washington, D. C., began a regular broadcasting service on Wednesday evening, August 1. The Radio Corporation of America owns and will operate the new station.

Located in the Mount Pleasant District, one of the highest points in the city, where the antenna wires are suspended 150 feet above the street level, the waves radiating from the station have an unobstructed path in all directions. With the antenna system energized by a powerful 500 watt transmitting set, radio reception from the station in Delaware, Maryland, Virginia, West Virginia, Eastern Pennsylvania and Southern New Jersey should be particularly good, while in the District of Columbia strong signals will be received at all times during the day and evening when the station is on the air. Radio interest in the district and adjoining states should now be markedly stimulated as reception in this section has been unsatisfactory due to "dead spots" in the ether which act as a barrier between the local receiving stations and broadcast stations in New York and elsewhere.

Not only will Washington and vicinity have adequate radio service, but to every corner of the United States, this powerful station may carry the words of great men in political and diplomatic life, the progress of world events as they transpire and the music of other nations as rendered by visiting musicians. This station provides an instantaneous link between the country's political center and every American home and a better understanding of government, of the issues involved in political campaigns, and of the questions which arise in our relations with foreign countries, cannot fail to result from its operation.

There is a wealth of material available in Washington from which to make the programs of WRC most enjoyable and educational. At once it is possible that the ceremonies accompanying the dedications of memorials to great Americans, the features of the many conventions held in that city, and the spiritual counsel of the clergy may be carried to the transmitter and set forth so that the whole country may hear and appreciate them.

Momentous events, of interest to the nation, do not occur every day. The greater part of this station's operating hours will be devoted to the broadcasting of the musical and dramatic talent of Washington and other events of special interest to residents of that city. Washington is rich in both professional and amateur talent and every effort will be made by those in charge of station WRC to arrange programs so that those local interpreters of music and drama may be heard from time to time not only by their fellow-townsmen but by citizens of neighboring cities.

The studio, as well as the transmitting apparatus and office, is located in one section of the building. The studio is of acoustically correct construction and prevents even the minutest echo which might otherwise blur the clearness of transmission necessary to enjoyable entertainment.

This room is a very vital part of the several broadcasting stations of the Radio Corporation of America. Behind several huge panels are vacuum tubes of medium size used to strengthen or amplify the elec-

trical currents which carry voice or music before actually reaching the transmitter. Their use is especially necessary when the program is being brought to the station over a wire a few miles in length, otherwise there would be insufficient energy to materially affect the radio waves. Used in connection with programs taking place in the studio, they are invaluable. The artist may move away from the microphone, may sway closer to it in his earnestness, but by a touch of a knob, the man at the control board can offset these variations.

Close to the operator, and occupying the greater part of the room, are the powerful transmitters. Although but one will be in use at any time, two complete sets are provided that a reserve unit may be in instant readiness should the active set fail for any reason. It is planned to operate these outfits alternately on alternate days. Either set is the equal in power, range and clearness of any now in use, being rated at 500 watts effective output, but if the two sets are combined for the broadcasting of some special event, the range of this station will far surpass that of any other in the country.

Each is complete in itself and contains all necessary tubes, inductions, condensers and transformers, this equipment being mounted behind a large panel and completely shielded by a perforated steel cabinet. This not only eliminates any chance of interaction between the radio-and audio-frequency currents, but protects the operators from accidentally coming in contact with bare surfaces carrying 2000 volts.

The operating table is in front of the transmitters and on it is a small box through which the operators may throw in either of the powerful transmitters and listen to the outgoing program at various stages of its progress. On this table also is a microphone that the operator on duty may cut-in and talk to the "unseen audience" himself should this be necessary at any time. By means of an intercommunicating phone he may talk to office, studio and reception room or be called by them. Because the law requires that a transmitting station must constantly listen-in for distress signals from ships, a highly efficient receiver is provided.

The motor-generators are housed in an adjoining sound-proof room, that their low hum may not disturb either artists or operators. Two machines are provided, one for each transmitter. Each of these powerful units consists of a single motor driving two generators, one of which supplies 2000 volts for the oscillator and modulator tubes and 1000 volts for the amplifier tubes, while the other furnishes the 125 volts used to operate the automatic relays and the 88 volts which heat the filaments of the large vacuum tubes.

A unique feature of this station, and one which further assures perfect transmission of programs, is a device known as the oscillograph, by which the operators have before them "a working picture of the voice." The delicate instrument may be switched into any one of the many circuits and shows, by means of an undulating, ever-varying beam of light, exactly how the artist's voice or music is affecting the electrical and radio currents. By watching this little tell-tale beam, as reflected from revolving mirrors, the observer knows instantly whether the sound waves are too weak, too great in volume or blurred.

A Workable One-Control Set

By Byrt C. Caldwell

THE tendency in the design of radio sets today seems to be towards simplicity of control and low cost of operation. The set which will ultimately win the stamp of approval from the millions of radio fans, and which will be accepted as the final word in radio receiving sets will be a one-tube set, capable of

and a UV199 or C299 tube. This tube is not critical, I have found, as to plate and filament current requirements and therefore no rheostat or potentiometer is necessary. The inductance is of a fixed value and the only control is a .0005 or .001 condenser. This set is far more selective than you would suppose it to be with only one control, and with the new wave length allotments, is all that is to be desired. No interference is encountered.

The panel is size six by eight inches, and is marked out for the instruments as shown in the diagram, Fig. 2. The antenna and ground connections are at the top of the panel, and the inductance coil is directly beneath these. The condenser, which should for best results be of the two-plate mica dielectric type, is mounted under the coil, and the tube is mounted on the base. The grid leak and condenser is fastened directly to the grid post of the tube socket. The coil may be mounted either on the front or on the rear of the panel. The arrangement of the instruments given is best for short straight connections and should not be changed.

For those who wish to make the set with a one-step amplifier, I give the second diagram, Fig. 3. The set still has but one control and is made on the same size panel. The only difference is that the detector tube is moved to the left to make room for the amplifier, and the transformer and a jack is inserted in the cen-

receiving several thousands of miles, and of using a loud speaker on the local stations—a set which requires no filament battery, only a low voltage B battery, and which has only one control. This set is far

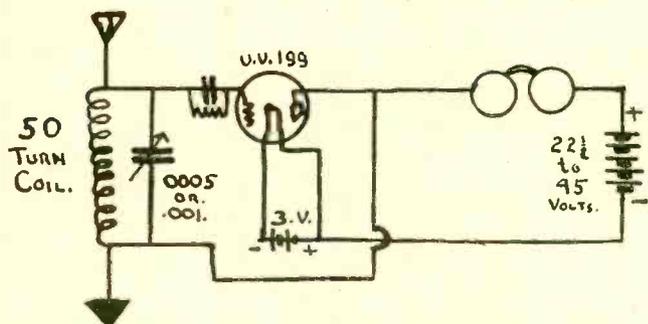


Fig. 1. Circuit diagram for the single control set. Note that the only variable feature of the set is the condenser dial, even the rheostat being done away with.

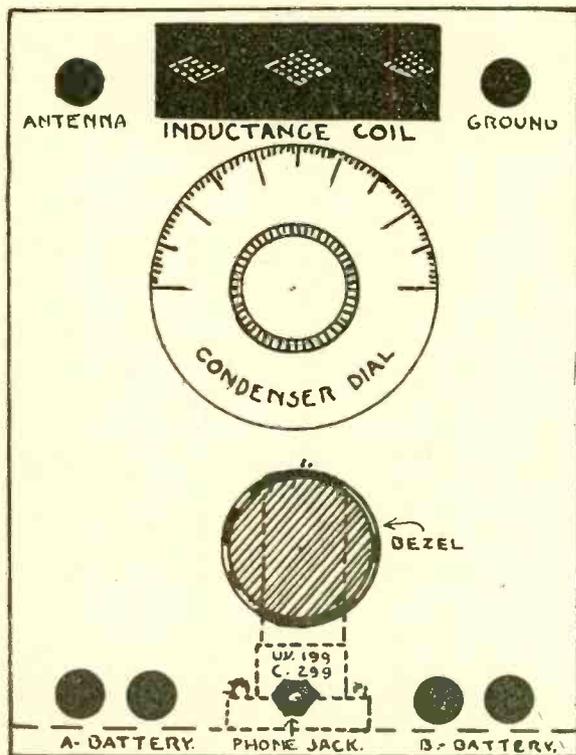


Fig. 2. Panel layout for a set embodying a single detector tube.

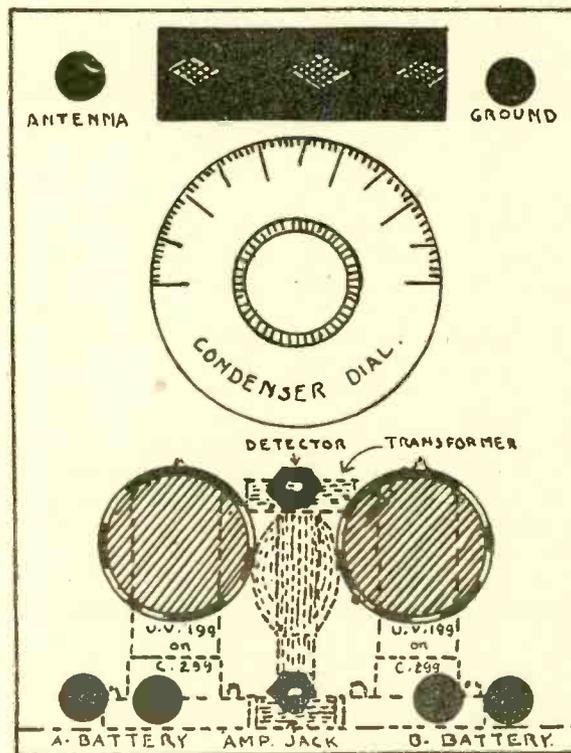


Fig. 3. Panel layout suggested for a detector and one stage set.

from being only a fantastic dream. We are already far on the road towards the realization of such a set as this, and it will not be many years before the seemingly impossible has been accomplished.

With all this in mind, the writer designed a one-tube, one-control receiver which brings in the distant stations, has a low initial cost, and an almost negligible cost of upkeep. The set is a single circuit regenerative, using a honeycomb coil (or spiderweb) for inductance,

ter of the panel, so that the detector alone may be used if desired.

No hook-up is given for the amplifier, as any standard hook-up will do.

I would give the same precautions that are usually given. Use heavy wire, make the shortest possible leads between connections, and do not run two wires parallel for any distance.

(Concluded on next page)

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY
PHRASED FOR OUR BUSY READERS

Amrad WGI, broadcasting station of the American Radio and Research Corporation at Medford Hillside, Mass., after making some alterations in their transmitter, are again on the air.
* * *

The **British Government** will probably establish an imperial wireless service in conjunction with the Marconi organization and will have a high-power station erected at Rugby in little more than a year.
* * *

What **Ben Bolt** can't understand is why Oliver Herford, or anybody else, should want to throw an egg into an electric fan. "Hasn't Edison," he asks, "already yolked the lightning?"—*F. P. A., in New York World.*
* * *

Capt. R. W. McNeely has been designated to relieve Commander S. C. Hooper as chief of radio section, Bureau of Engineering, U. S. Navy. Commander Hooper left to become Fleet Radio Officer under Admiral Coontz on July 14.
* * *

Radio talks on the prevention of forest fires are being broadcast every two weeks from the Portland, Ore., office of the Forest Service, United States Department of Agriculture, through an arrangement with the *Portland Oregonian*. Definite dates have been fixed for these talks, which, according to estimates, reach from 10,000 to 15,000 people.
* * *

Statistics are always interesting and often surprising. As witness the fact that P. C. Kullman & Company, a New York brokerage house specializing in wireless securities, has developed the information that Italian Somaliland (a part of former German East Africa), contains as many wireless telegraph land stations as the whole of Russia. Alaska possesses more wireless stations than France and Algeria. The United States and its possessions operate more land stations (excluding ship and amateur stations) than all the rest of the world.
* * *

PRESIDENT HARDING

WITH sincere sorrow and genuine regret, **RADIO WORLD** performs the duty of recording the death at San Francisco on August 2, 1923, of Warren Gamaliel Harding, twenty-ninth President of the United States.

He was a calm, urbane, courageous man with a cheerful, friendly personality that endeared him to all with whom he came in contact.

His handling of the stupendous tasks of the post-war period, enabling the United States quickly to recover from the great struggle to preserve civilization, will go down in history as the work of a remarkable man and statesman.

We have lost a great President.

(Concluded from preceding page)

This set is extremely easy to build. It is, however, an ideal set for the more experienced fan, as well as the youngest beginner. Its one-control makes it popular with the housewife who, during the day, wishes to listen to the numerous programs, but does not like to work away at a set of dials for a long time.

The one step of audio amplification makes it possible to use the set on a loud talker. Of course two steps of A.F. amplification may be used if desired, and radio-frequency amplification may also be added. The only changes will be an increase in the size of the panel, and a slightly different arrangement of the instruments.

Try this set. You will be more than satisfied.

A carload of toothpicks was shipped to Japan recently by a factory in Strong, Maine, on an order received by radio.
* * *

The **Shipping Board** vessel "Eastern Glade" reported to the Navy Department at Washington, D. C., last week, it had heard the Annapolis high-powered radio station throughout a recent voyage to South Africa, 6,800 miles away.
* * *

Natural steam, obtained from a 400-foot geyser boring, generated 21 kilowatts of electricity in tests made recently at Santa Rosa, Cal. It is said to have been the first time such a feat has been accomplished in the United States.
* * *

A contract has been signed between the Western Union Telegraph Company and Italian Submarine Cables Company, represented in New York by its president, G. Carosio, for the establishment of direct cable communication between the United States and Italy, via the Azores.
* * *

Captain Herbert Hartley, of the S. S. "Leviathan," announced by radio last week that visitors would be welcome aboard the big ship as she lay at her New York dock. The people with radio sets, about 4,000 of them, accepted with alacrity on sailing day and caused considerable confusion among visitors who came to see friends off on the second voyage of the vessel.
* * *

The engagement is announced of Miss Eleanor Lee Whitman, of Cambridge, Mass., to Mr. Charles Jacob Young, of New York City. Mr. Young, who is pursuing radio research development for the General Electric Company, at Schenectady, N. Y., is the son of Owen D. Young, chairman of the board of directors of the General Electric Company and of the Radio Corporation of America.
* * *

Few radio fans realize that the transmission of code travels much greater distances than is possible when similar waves are modulated by sound vibrations, which explains why the radio telegraph code, rather than phone, is employed by the MacMillan Arctic exploration party to establish communication with civilized countries in the Northern Hemisphere, thus bringing into direct contact individuals who are living in two extremes of temperature. Learn the code and listen in for Operator Mix of WNP!
* * *

No radio in Sing Sing Prison was the verdict last week of James L. Long, deputy superintendent of state prisons. This is the first official statement definitely settling whether the radio presented by the Salvation Army for condemned slayers in the death house would be installed. Several Sing Sing attaches were strongly opposed to the idea. They pointed out that, with cold-blooded murders going on outside, the impression should not be given to the criminal class that life in the death house awaiting execution is enjoyable.

Broadcasting Changes

THREE new Class A broadcasting stations were licensed by the Department of Commerce during the past week and five were transferred to Class A from Class C.

New Class A Stations

Call	Station	Meters	Keys	Watts
WTAD	Compton, Robt. E., Carthage, Ill. (formerly WCAZ)	229	1310	50
WSAX	Chicago Radio Laboratory, Chicago, Ill.	268	1120	20
KFJJ	Carrollton Radio Shop, Carrollton, Mo.	236	1270	50

Transferred C to A

WEAH	Wichita Board of Trade, Wichita, Kan.	244	1230	100
WIAQ	Chronicle Pub. Co., Marion, Ind.	226	1330	10
WMAY	Kingshighway Presby. Church, St. Louis, Mo.	280	1070	10
WOAB	Valley Radio, Grand Forks, N. D.	280	1070	5
KNJ	Roswell Public Service Co., Roswell, N. M.	250	1200	150

A Universal Wave Length Radio-Frequency Set

By R. L. Dougherty

TO many amateurs radio-frequency presents the only means of getting distance. They are handicapped by being in closely confined cities with tall steel buildings all around them and they know from sad experience that the regulation regenerative sets will not give them the distance they desire.

They have, however, tried radio-frequency amplification and find to their disgust that they cannot do anything with it. It seems that they are handicapped by some force beyond their control.

The probable trouble is that their radio-frequency amplifiers are sadly inefficient. They respond to waves of one length more readily than to any other. What the remedy is they do not know, and they continue to be satisfied with mediocre results until someone finally comes along and shows them a simple and efficient means of accomplishing the desired effect.

The receiver described herewith overcomes all the objections to the common brand of radio-frequency receivers, inasmuch as it will respond to 25,000 meters as efficiently as to 200, and with no extra trouble. You will be able to tune your radio-frequency amplifier to 460 meters along with your detector tube and you may be sure that you are getting all that is possible on that wave.

The apparatus needed for this set consists of: one double honeycomb mounting; one single honeycomb mounting; two tubes; two sockets; two rheostats; one .0005 variable condenser; one .001 variable condenser; one .00025 fixed condenser; one 2 megohm grid leak; one 400 ohm potentiometer.

As can be seen by the bill of materials this is to be a honeycomb coil set, and is therefore applicable to any wave lengths that you wish to listen in on.

The radio-frequency amplifier is what is known as a tuned impedance coil, and it is by this means that the wonderful selectivity is possible with this receiver. It is not only able to respond to any wave length but it can be tuned around with the rest of the receiver and the best tuning accomplished. Other stations on nearby waves will not have a chance.

Special care should be taken not to let the coil in the radio-frequency circuit be within the range of the two primary and secondary coils. If this is done, there will be feedback, and the advantage of fine tuning will be lost. For that reason the coil can be mounted in the back of the cabinet or some other out of the way place where it will not cause interference.

The set is tuned much the same as an ordinary non-regenerative circuit, varying the coupling between the primary and secondary and varying the condenser capacity.

For broadcast work the coil that should be used in the tuned impedance is DL 35 which will have a range of from 360 to 480 meters. For higher waves a 50 or 75 can be used. If commercial is desired a 100 should be used.

As a help to the uninitiated, it is always a good plan to use a size smaller coil in the tuned impedance than is used in the secondary of the coupler.

Assume that the builder has constructed his set, has paid particular attention to the polarity of his batteries and the wiring and now desires to receive signals. Turn up the two tubes, putting the condenser in the

primary circuit at about 80° and the condenser across the tuned impedance coil at about 50°. Vary the coupling between the two coils until the desired station is heard, bringing it in loud and clear as possible by means of the condenser and the coupling. Then vary the condenser across the tuned impedance until it is absolutely clear, finally adjusting the potentiometer across the first tube for loudness. This completes the entire adjustment of the receiver and from that time on all the tuning is done, or rather can be done by means of the two condensers.

If the signals do not come in as clear as you would like them try using a larger tuned impedance coil. For the benefit of those who contemplate the construction of this receiver, the following honeycomb coils will allow reception over all the broadcast wave lengths: One 25 DL; two 35 DL; one 50 DL; one 75 DL. These can be purchased for a small amount and the builder will then have a receiver that is capable of bringing in the distance. If longer waves are desired the coils can

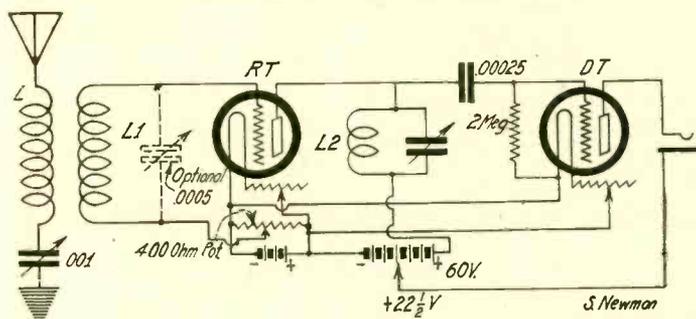


Diagram illustrating a radio-frequency set using honeycomb coils. L, primary honeycomb coil. L1, secondary honeycomb coil. L2, tuned impedance coil used as radio-frequency amplifier. The condenser shunting should be .0005 mfd.

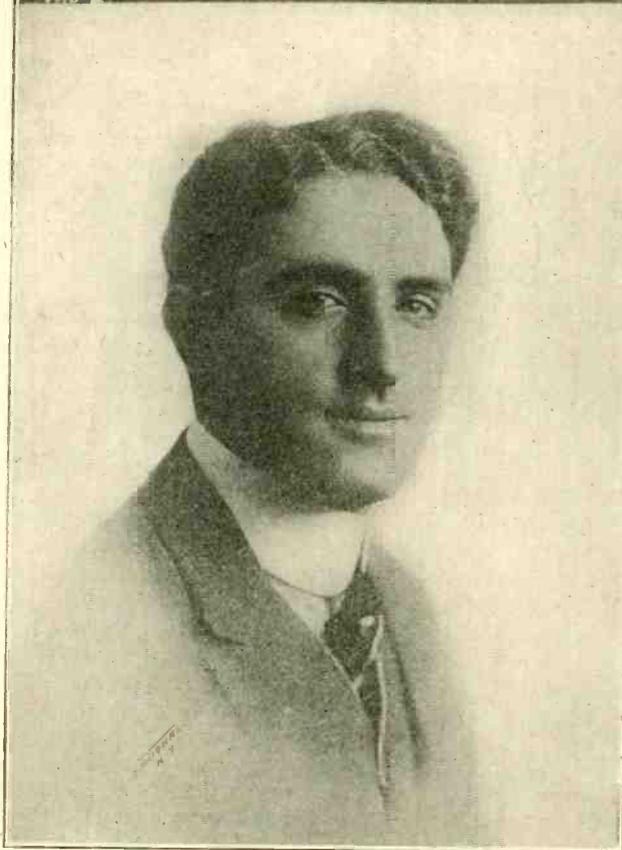
be brought up to 750, which will then allow reception up to 3,500 meters with ease.

One point of caution for the fan who expects wonders of volume from this set. One stage of tuned impedance radio-frequency will allow greater distance than can be gotten on any single tube regenerative, but the volume will be about the same as with the single circuit set. So do not construct it with the idea that your first tube will give you signals equal to a stage of audio. It will not, but the distance over which you can hear with the circuit will be vastly improved. Radio-frequency amplification does not improve the volume of the signals as much as the distance over which they can be received, and as it is distance that is necessary to the success of most circuits, the aforementioned circuit will prove a pleasure to the fans who do not have to fill the room with music. Remarkably clear reception will be noticed, which is so different from noisy regeneration.

Maybe It's Your Grid Leak

MANY sets function poorly because the grid leak resistance is not correct. If you do not happen to own a variable grid leak, keep several fixed ones on hand, and substitute them for each other occasionally to see if you can't obtain better results.

Here Are Some of the People B



Four of the Many Prominent Artists Whose Talents Are Broadcast Free to the Radio Public by Radio Broadcast Central, New York City.

In the upper left hand picture is shown Frank La Forge, one of the most famous pianists in New York, snapped during a concert from Broadcast Central.

William Van Hoogstraten, the eminent conductor of the New York Philharmonic Orchestra, whose Stadium Concerts have been a feature of WJZ programs for the entire summer season, is pictured at the upper right. (Photo C. Underwood & Underwood.)

L. Wolfe Gilbert, one of America's favorite song writers, is a habitué of WJZ, his programs being most popular with the fans. His picture is at the lower left. (Photo by National, N. Y.)

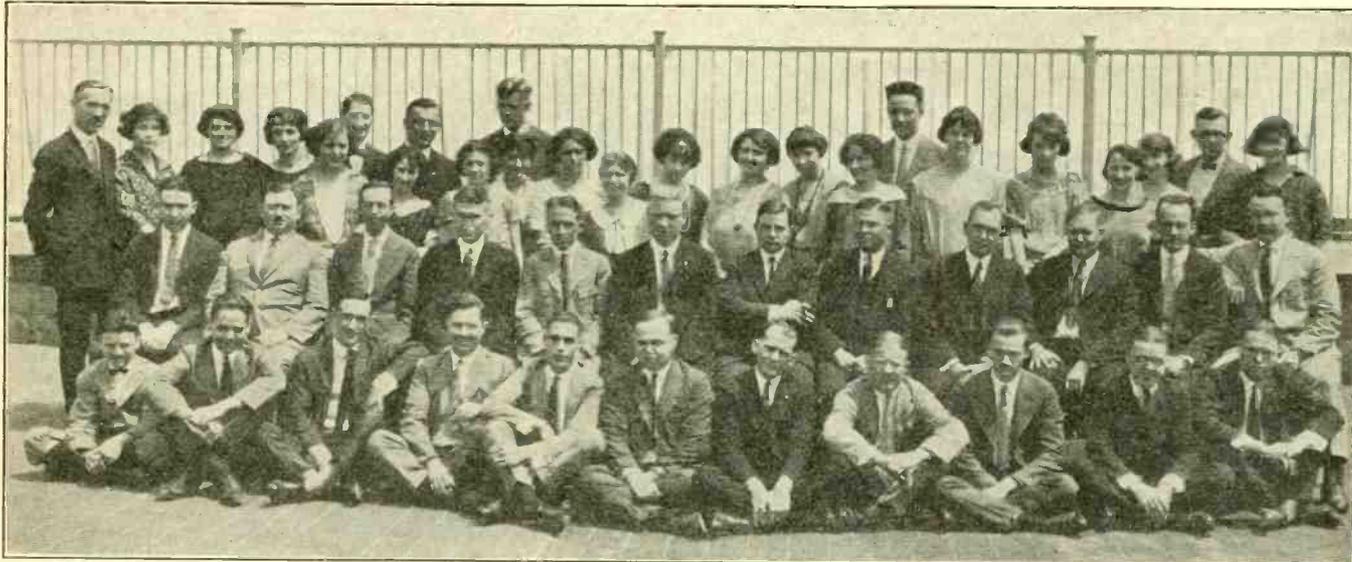
Miss Margaret Madigan, well known soprano, who has proved a great favorite with WJZ audiences, is shown in a charming pose at the lower right.

Back of the Broadcasting Scenes



Personnel of Radio Broadcast Central, Stations WJZ and WJY, New York.

Standing, left to right—Carl Dreher, assistant station engineer; Miller, research engineer; E. C. Rundquist, operator; G. W. Rogers, operator; C. B. Popenoe, program manager; J. Weinberger, research engineer; George Oliver, operator; R. B. Lum, announcer OLN; George Ellis, operator.
 Seated, left to right—Raymond Guy, operator; Bertha Brainard, assistant to program manager; Walter Hesch, engineer in charge; E. E. Freeman, operator.
 Seated on floor, left to right—D. F. Stair, operator; T. H. Cowan, an nouncer ACN.
 Absent on duty—Milton J. Cross, announcer AJN; M. Beckerman, operator; Gerald Gray, operator; John Hutton, operator; B. Jackson, operator; P. F. Falkner, operator.



"This Is Station WEAF"—Personnel of the American Telephone & Telegraph Company's Broadcasting Station in New York City.

Left to right, lower row—B. Donnelly, E. R. Raguse, E. F. Grossman, E. J. Content, W. A. Irvin, G. E. Stewart, D. McKey, M. J. Woods, E. H. Felix, G. W. Johnstone, H. F. McKeon.
 Second row, seated—R. H. Caldwell, H. Schoenberger, O. B. Hanson, E. R. Taylor, F. S. Spring, office manager; W. E. Harkness, manager of broadcasting; G. F. McClelland, in charge of commercial department; S. L. Ross, director of programs; V. A. Randall, studio director; H. C. Smith, G. Chatfield, G. J. Podyen.
 Third row, standing—A. V. Lufrio, M. Lamphere, N. A. Connor, A. Hunt, A. Chevreaux, E. E. Sniffin, G. Weightman, A. Piana, H. F. Starrett, E. L. Schneeweiss, J. Land, H. Hann, W. F. Barr, G. Turner, E. Howland, A. F. Castleman, M. Jackson, E. M. Charles, W. Rickert, M. Adler.
 Fourth row, standing—(Left) A. Ropps, G. McElrath, A. H. Saxton; (right) J. J. Beloungny.
 Away on duty—J. G. Truesdell, in charge of plant department; J. L. Reynolds, R. S. Fenimore, A. W. Protzman, M. Lorenzen, G. McNamee, A. I. Healey, W. Sweeney, E. R. Cullen.

Bureau of Mines Plans Further Radio Experiments in Interests of Life Saving

WASHINGTON, D. C.—In connection with its efforts to keep apace with all safety and rescue developments, the Bureau of Mines of the Department of the Interior is planning to continue its investigations with radio communication underground. The development of radio has been rapid and officials of the bureau feel that any application to mine rescue work must not be neglected.

Mr. J. J. Jakowsky, mechanical engineer, has been designated to undertake certain experiments in radio communication at the bureau's experimental coal mine at Bruceton, Pa. Mr. Jakowsky was attached to the Signal Corps during the war, where he had considerable experience with radio work. The co-operation of the Radio Supervisor at Pittsburgh has been promised by the Department of Commerce in the new radio experiments.

Some months ago preliminary radio experiments in sending and receiving underground at the Bruceton mine were conducted with partial success. In reporting on the matter the Bureau of Mines stated that the experiments consisted in receiving signals from without the mine by means of a receiver located inside the mine, and in sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA station, East Pittsburgh,

Pa., could be heard distinctly at a distance of about 18 miles from the experimental mine. In sending waves underground, a Westinghouse 20-watt B. T. model T. F. transmitter was used in such a manner as to send out continuous waves of 200 to 300 meters length. On account of the limited time no attempt was made to modify the apparatus in such a manner as to produce waves of greater length. It was found that signals could be heard distinctly through fifty feet of coal strata, but that the audibility fell off rapidly as this distance was increased. In all experiments a vertical antenna was found to give the better results. The horizontal antenna gave practically no reception. A loop of a single turn was used with fair results. All these experiments were tried with a wave length of 200 to 300 meters, except the reception from KDKA which was 360 meters. In conclusion the report stated:

"The present preliminary experiments, while unsuccessful in indicating any practical method of using wireless waves for underground communications, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The 'absorption' or loss of intensity with distance is very great for the short wave lengths used in these experiments. Longer wave lengths are known to suffer less absorption and may possibly be found practically effective under certain conditions."

Transpacifics Renew Radio Contest

LOS ANGELES, CAL.—But one obstacle stands in the way of successful transoceanic traffic by amateur radio telegraph stations—direct two-way communication—and reports from Australia giving results of the Transpacific tests leave but one question in amateur circles, namely over which ocean will this final barrier be removed, the Pacific or the Atlantic? Naturally this will result in a rival contest between East and West coast amateurs of the American Radio Relay League.

Already the committee which handled the Transpacific tests in May, including the Long Beach Club of California, the management of the *Radio Journal* of Los Angeles, working with the Victoria Section of the Wireless Institute of Australia, are lining up West coast hams for another trial in October when two-way talks may be tried with Australia and New Zealand.

Reception of signals from high power amateur transmitters in the United States has aroused so much enthusiasm in the land of the Kangaroo that local hams

look forward to a two-way leap in the fall, while rumors from the Radio Society of Great Britain indicate that a similar attempt will be made over the Atlantic Ocean in conjunction with American hams through the American Radio Relay League.

The race is on, with present records on either coast standing about equal, and the amateur who first succeeds in establishing two-way communication over either ocean will win the highest honors to date for the Pacific or Atlantic amateur traffic. The choice appears to be between two members of the A. R. R. L., Irving Vermilya, operator of station 1ZE at New Bedford, Mass., and V. M. Bitz, operator of station 6JD at Los Angeles, Cal.

Both of these amateurs have succeeded in sending a complete message via the ocean wave, one over the Atlantic during the famous "Transatlantics" of last year, the other over the Pacific during the "Transpacifics" just completed. Amateur radio awaits with interest the final outcome of the oceanic radio battle.

New Radio Installation at Annapolis, Md.

WORK of installing new 500 k. w. arc apparatus at Annapolis was begun by the navy recently in an effort to eliminate the local interference consisting of mush and harmonics, complained of recently by eastern commercial and private radio operators. A new building is being erected for radio operations, and here the condenser and inductor of the coupled circuit will be installed. No date of completion has as yet been announced but it is reported that the

work is now going forward fairly well. Similar work will be started soon at the naval radio station in Honolulu, T. H. Eventually improvements will also be made in the set at Balboa, C. Z. Recent tests conducted by the radio section of the Bureau of Engineering at San Diego and San Francisco with up-to-date transmitting material have resulted in several improvements which will now be adapted to other important naval transmitting stations.

Latest Radio Patents

Transmission Circuits

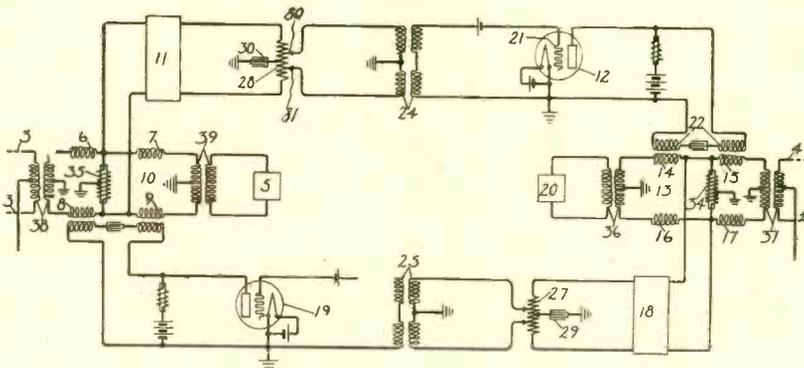
No. 1,456,510: Patented May 29, 1923. Patentee: R. C. Mathes, New York, N. Y.

This invention relates to transmission circuits and more particularly it relates to two-way repeating systems.

As is well known in the art, it is frequently found desirable to provide a repeating or amplifying system between two transmission lines. In one form such a repeating system may have, the transmission lines are terminated in a Wheatstone bridge type of circuit for securing two-way transmission from unidirectional amplifying systems. As is well known, the conjugate condition of such bridge circuits is maintained by providing networks which closely simulate the impedance of the transmission line, or by balancing two similar transmission lines against each other. It is further well known in the art that if a high degree of con-

net work which causes the transmission of electrical energy between the two circuits designed to be conjugate, such a condition will further limit the amount of gain which can be obtained from the set.

It has been found in practical arrangements of telephone repeater equipment that the capacities between the primary and secondary windings of the transformers employed afford a path for the transmission of energy between the parts of the circuit presumably conjugate. As the transmission of such undesired potentials is through a series capacity, it is most efficient at high frequencies so that it may even result in a sustained singing at an inaudible frequency. This result, while not interfering as direct tone, seriously impairs the normal telephone transmission through the circuit and so necessitates a reduction in amplification.



Circuit used in two-way repeater system utilizing vacuum tubes.

jugacy is not obtained there is a critical amount of amplification beyond which one cannot go without setting up a local circulation of energy in the form of a sustained tone, commonly known as singing. It is evident therefore that if any condition exists other than the unbalance between line and

In accordance with this invention, this objectionable loss in transmission efficiency of a two-way repeater circuit may be overcome by shunting these undesired potentials through a low impedance path to ground. One way this may be accomplished is by grounding one or more neutral points.

Wireless Receiving System

No. 1,455,767: Patented May 15, 1923. Patentee: J. Slepian, Swisvale, Pa.

This invention relates to amplifying devices and particularly to wireless receiving systems.

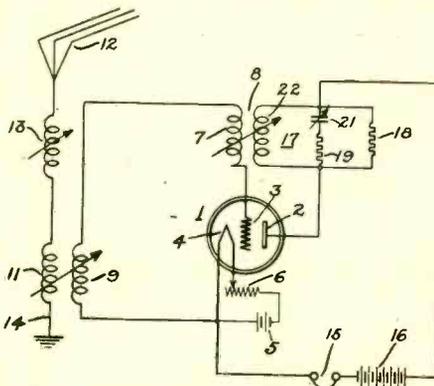
The principal object of the invention is to provide an improved wireless receiving system, wherein received signal impulses are enormously amplified.

Another object of the invention is to provide a wireless receiving system wherein undamped, continuous-wave signal impulses may be readily received without the customary heterodyning step heretofore employed.

Other objects of the invention will be apparent from the following description of the nature, mode of operation and advantages of the invention.

According to the invention, I impress the signal impulses to be detected upon a regenerative feed-back system adjusted to what, heretofore, has been considered an undesirable state, that is to say, one in which an increase in the amplitude of the oscillations causes a more than proportional increase in the feed-back power, tending to maintain the oscillations continuously.

The unbalanced condition of the system, which is effective following the application of the signal impulses, is made stable a predetermined time interval thereafter by means of thermally responsive ele-



Arrangement whereby enormous self-amplification is possible on one tube.

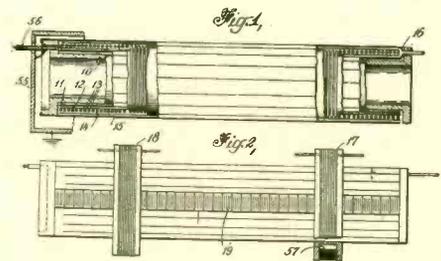
ments having a time lag in their response. The maximum amplitude attained by the oscillations at the end of said time lag is dependent upon the intensity of the impulses tending to unbalance the system.

Wave Conductor

No. 1,456,909: Patented May 29, 1923. Patentee: Michael Idvorsky Pripin, Norfolk, Conn.

This invention relates to apparatus for balancing in phase and amplitude pulsating or alternating electromotive force waves, and has for its object the provision of an apparatus of this character.

The balancing in phase and amplitude of a pulsating or alternating electromotive force wave, and in particular of high frequency waves, has many practical applications, certain of which will be hereinafter described in connection with the wave balance of the present invention. In its broad aspect, the wave balance of the present invention comprises a wave conductor having substantially uniformly distributed inductance, capacity and resistance associated with secondary circuits so arranged that the electromotive forces induced therein, by an alternating or pulsating electromotive force impressed on the conductor, can be relatively varied in amplitude and time phase. The balancing in amplitude and phase may take place directly between the electromotive forces induced in the secondary circuits, or may take place between the electromotive force induced in one of these circuits and an electromotive force modified or influenced by



Apparatus used as a wave balancer.

the electromotive force induced in the other circuit. Thus, the invention contemplates the provision of a wave balance having a wave conductor by means of which induced electromotive forces of predetermined amplitude and phase are produced from a given impressed alternating electromotive force, together with means for the utilization of these induced electromotive forces for the purpose of modifying the electromagnetic reactions in electrical circuits, which are subject to the action of the impressed electromotive force.

More Artificial Static

EDITOR RADIO WORLD: I have noted with interest the words of one of your readers, who stated that to chew on celery or a nice, hard apple while receiving a church sermon will result in not being bothered with interference.

I am very fond of popcorn and had been in the habit of making a Sunday evening meal on the fluffy stuff. However, I found that whether listening to a sermon or anything else while chewing on the popcorn, the static was something awful. If anyone who has a receiver is not yet fully aware of the noises he receives in his set that are referred to as static, let him set a pan of juicy popcorn by his side while trying to listen to something he is very anxious to get, and he will have a fairly good imitation of static.

With apologies to no one, I remain

Yours very truly,
R. J. McCUTCHEON.

The Colorado Fuel & Iron Co.,
Pueblo, Colorado.

P. S.—The popcorn being popped is a very good imitation of the kind of static I have been getting for the last couple of nights.

Answers to Readers of Radio World

I built the White Circuit described in RADIO WORLD for April 14 and have had good results. I live in an apartment house and have tried using the water and gas pipes as a ground. When I connect it to either of these I get the 110 volt hum. I cannot get an outside ground, yet cannot use either of these. Can you suggest some way of getting around my trouble?—(Unsigned letter.)

The only manner in which you could stop your trouble is by using a counterpoise, or adapting your set to a loop antenna.

Is it possible to use audio-frequency amplifying transformers in radio-frequency circuits? Can a potentiometer be used as a rheostat? Can I use a six ohm rheostat as a potentiometer? Will an old-fashioned loosecoupler primary wound with 300 turns of No. 20 DCC wire on a tube seven inches in diameter, secondary wound with 450 turns of No. 26 DCS on a six inch tube and tapped every inch of winding allow me to receive phone music on 360 meters? It is to be used with a Fleming type valve detector.—Guy de Laufellet, Baton Rouge, La.

It is not possible to use audio-frequency transformers in place of radio-frequency transformers. The resistance in potentiometers is extremely high, and if used in place of rheostats they would have so very little of their useful resistance used that it would be negligible, as five or ten turns of the wire would be all that could be used. A rheostat cannot be used as a potentiometer. The coupler you mention is entirely too large for work on the wave lengths you specify. The dead-end loss in couplers of that size is so large that it would cut your volume and range down immensely, especially as you intend using a Fleming valve detector, which we take to mean the two electrode type which is only slightly more sensitive than a crystal detector.

Which is more sensitive, a galena crystal or a zincite-bornite combination? Is it always necessary to shunt the phones in a crystal circuit with a condenser? Where is the best place to locate a 43 plate condenser in a set consisting of a coupler, crystal detector, fixed condenser, phones and lightning arrester?—Leonard Hirtz, Albany, N. Y.

The galena is slightly more sensitive, but the combination has the advantage of stability which more than overcomes the very slight difference. Of course you understand that in crystal detectors the whole secret of success depends upon the crystal, as it is sometimes necessary to go through pounds and pounds of the raw mineral before finding one suitable sensitive crystal. Most all of the crystals sold are sensitive, but even tested minerals vary greatly. It is not absolutely necessary to shunt the phones, but the added clearness of reception fully warrants it. Suggest that you connect your condenser across the secondary of the coupler.

In one of the articles written by J. E. Anderson he mentions making neutralizing capacities by winding two lengths of insulated wire together. What length wire should be used when making these?—Charles Kouff, Pittsburgh, Pa.

You will have to find the correct capacity for your particular tube by winding various lengths together, but two pieces 2½ or three inches long should serve the purpose, winding or unwinding them until the correct capacity is found. An easier and much better method of making neutralizing capacities

was suggested in RADIO WORLD for June 9, page 9, by the same writer.

I am located three houses from the local telephone exchange. Every evening at about 9 P. M. they start their generators. I can hear these all over my set, no matter how I tune. My antenna is 60 feet high and 75 feet long, and does not cross any telephone wires that are exposed. Is there any way to alleviate my trouble, other than using filters or tuned choke coils in my antenna circuit, as neither of these work? Would the use of a loop be of any help?—M. Blumenthal, Bronx, N. Y.

Since you mention that filters and choking systems do not have any effect, the only probable solution to your problem lies in the use of a loop. You might, however, before doing that experiment with a counterpoise instead of a ground as it may be that your trouble lies in the fact that your ground and the ground of some part of the telephone system interlink in a manner to cause your trouble. If a counterpoise does not help you out your only solution is a loop receiver. You might inform the telephone engineers of your trouble, and they might be able to help you, and at the same time correct some trouble of their own that they are unaware of.

Is there any reason for my getting clicks in my set every time the elevator in the building runs up and down? It seems to vary in wave length, being at its highest when the elevator is at the bottom, and gradually going down to about 100 meters when the elevator is at the top floor. How can I remedy this?—Harry Silvertine, 370 Broadway, New York City.

The cause of the noise is the fact that the motor of the elevator is sparking at the commutator, and the cables are acting as an antenna. When the elevator is at the ground floor the cables are longest, and when at the top they are shortest. Remove your antenna from the proximity of the elevator penthouse as far as possible, and also tell the elevator man that he has sparking brushes and to have them corrected. Try using a different ground. You may be getting the clicks due to the fact that the ground you are using is in some manner connected with the iron work of the elevator system.

I have my set in the car, using a loop antenna for its operation. When running the car I get induction from the spark coils. Can this be due to the fact that I am using the same battery to light my tubes as the one which runs the car? Will grounding one side of the loop as suggested in several technical articles remove my trouble? Would shielding the filament battery be of any use?—J. Namara, Pittsfield, Pa.

The induction you note might be due to the fact that you are using the same A battery for both the car and the tubes. Try using separate batteries. Grounding one side of the loop will not help, and may short your battery if one side of the battery uses the frame of the car as a ground as some cars do. Shielding the battery would be of no use as you are not getting induction from the battery, but the induction coils. Examine the high tension coils carefully and see if they are not sparking unnecessarily. If they are take a small flat file and file the interruptor points smooth and readjust so that they do not spark. You must have some direct connection, otherwise you would be able to

tune it out. It is the best practice to use a separate battery in a case of your kind.

In RADIO WORLD, June 23 you published a circuit diagram of the three tube De Forest D7 reflex. What ratio are the transformers? Are all three tubes of the hard type? Should the R. F. transformers be of the reflex type? Can W. D. 12 tubes be used? What are the two large black dots at the left hand side of the diagram? What is the capacity of the variable condenser? What is the size of the condenser across the secondary of the last transformer? What wave length does this set tune to using a loop? Using an outside antenna? How does this set compare with a set using detector, two stages of R. F. and two stages of audio? What size panel should I use? Is single control for the filaments better than separate control?—D. J. Smith, Blackfoot, Idaho. Box 427.

We presume you mean the ratio of the audio-frequency transformers. If you use about 4½ or 5 to one transformers it will be O. K. The three tubes should all be of the amplifier or hard type. It is not necessary that the reflex type transformer be used. You can use the W. D. 12 tubes with this set. The two dots are just a way of showing that the tuning unit can be separate from the set if necessary. They signify connections. The variable condenser should be .001. The fixed condenser should be .002 mfd. Using the proper wave length radio-frequency transformers this set will respond to waves up to 600 meters, whether using antenna and ground with coupler, or loop. It is more efficient than a set using two stages of radio, detector, and two of audio, inasmuch as you are using three stages of radio, crystal detector, and three stages of audio-frequency. We cannot specify what size panel to use, but by careful constructional work and planning, you should be able to accommodate the whole set to a panel about 12 by 12, which is the size of the manufactured set. Single control is advisable as it simplifies the controls, and as all tubes are operated at the same temperature, nothing will be gained by using separate control.

In regard to the circuit diagram published in RADIO WORLD, Jan. 20, by Ortherus Gordon, would it be advisable to use DL 75 and 100 in order to meet the new wave lengths? Would two stages of audio-frequency be sufficient to operate a loud speaker? Would W. D. 12 tubes function properly as amplifiers? Where can I obtain a circuit diagram of two stages of audio-frequency to use with this circuit? I have all your numbers.—Don Roy, 1857 E. 19th Street, Cleveland, Ohio.

You can use these coils for the new wave lengths. You will have sufficient amplification by the use of two stages to operate a loud speaker. The tubes you mention will work satisfactorily. You will find the circuit diagram for two stages of amplification on page 26 of RADIO WORLD, March 31. Take out the grid leak across the first transformer.

In the July 14th issue of RADIO WORLD you publish a circuit by A. D. Turnbull. He uses a potentiometer, but I am puzzled as to the connections. Should the two outside connections, or one outside and one inside connection be used?—G. D. Somprey, 1332 S. Peoria Ave., Tulsa, Okla.

Use one side of the resistance. The other connection is the one that connects to the slider.

True Piano Music from New Microphone at WGY

TRANSMISSION of true piano quality has been a real problem for the radio engineer. The difficulty is similar to that which has confronted the maker of phonograph records. The blows of the hammers on a piano are distinguishable, but the singing quality and the overtones which are relatively weak have not been reproduced through loud speakers or phones.

P. R. Fortin, of the radio department of the General Electric Company, has devoted a great deal of time to the solution of the problem, and he has now developed a device which will make the piano solo a real feature of a broadcasting program.

The device, in brief, consists of a magnetic system between the poles of which is pivoted a suitable coil system. The magnet is firmly fastened to the frame of the piano and the coil is anchored to the sound board. By means of this pick-up device all tones in the piano are faithfully converted into corresponding electric currents which control the radio transmitter. When heard on the loud speaker the piano is no longer a tinkling sound. The listener gets all the characteristics of this percussion type of instrument, the blow of the hammer, the singing tone and the overtones.

The piano pick-up is free from the familiar hiss of the carbon microphone as well as the objectionable blasting that takes place when an artist plays too loudly for the microphone.

When the carbon or condenser microphone is used to pick up a vocal solo with piano accompaniment the problem is to place the microphone in such a position that it picks up both voice and instrument in their proper ratio. The position of the microphone must be changed for each artist. The radio listener has probably noticed that as the singer increases the volume the accompaniment fades out, in other words the soloist "paralyzes" the microphone. When the piano magneto-microphone is used the intensity of the

piano may be adjusted electrically in the control room, even while the selection is being rendered, as the voice is recorded on the customary carbon or condenser microphone.

In the grand piano at WGY there are three of these devices, one in the extreme treble, one in the middle register and one in the base. These three outputs can be readily balanced in the control room for the best results on receiving sets without tampering in any way with the instrument.

Another feature of the magneto-microphone is that it allows WGY to correct for the shortcomings of the present loud speakers. All loud speakers subdue the sounds of lower frequencies, from approximately middle C on the piano down. To give good piano music for users of the loud speaker it would be necessary for the transmitting station to distort the music from the instrument, making the lower section of the piano several times as loud as the treble. Some stations have actually tried to regrade their pianos to improve them for broadcasting. This means that the music, as heard by the musician at the keyboard, is distorted and the good musician, even though convinced that his radio audience is getting perfect tones, cannot do his best work on a re-graded piano.

The magneto-microphone may also be used in broadcasting phonograph music where the federal license of the station permits the use of "record" music. When the carbon microphone is used the mechanical energy of the phonograph is converted into sound energy in the usual way and is picked up by the microphone. With the magneto-microphone the needle is attached to the coil and the mechanical energy is converted directly into electrical energy without recourse to any sound whatever, thus giving truer production of the record. By proper design and the use of suitable filters in the electrical circuit of the coil a large amount of the needle scratch may be eliminated.

Put Your Electric Fan on the Floor

THE whole theory of placing electric fans high up in a room to cool it is wrong, is the contention of Julius Wodiska, a veteran manufacturing jeweler of New York. Mr. Wodiska's mechanical bent is attested by the numerous patents he has taken out from time to time outside the field of jewelry. His receipt for a cool room, as given to the New York Times, is this:

"Open the windows half way from the top and half from the bottom. Then place the fan in a convenient place on the floor. It is commonly known that heated air is much lighter than cold air and that, for that reason, heated air in a room accumulates from the ceiling down. If the upper parts of the windows are closed, the heated air has no way to escape, and the room will be filled with it until it reaches sufficient volume to extend down to the lower, or open, part of the window.

"Under the present system of placing electric fans about two-thirds of the way up the wall, the heated air is driven down and reinhaled by the occupants of the room. Under these conditions the room remains as hot as though there were no fan at all. By opening the windows and placing the fan on the floor, however, the heated air is forced out through the

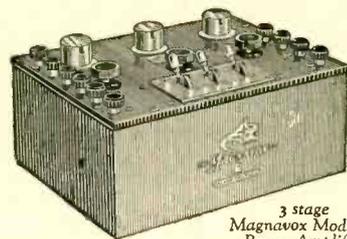
upper part of the window. Fresher and cooler air comes in through the bottom to replace it, and is kept fresh by the whirling fan blades. A room treated in this way will be from five to ten degrees cooler than when the fan is placed where most persons use it. Where there are children, the fan easily can be guarded and accidents avoided."

Naval Radio Efficiency Increasing

NAVAL radio communication efficiency is increasing daily according to Rear Admiral A. H. Robertson, U. S. N., Assistant Chief of Naval Operations. Recently the battleship "Oklahoma," at anchor off Bainbridge Island, Puget Sound, sent an important dispatch for the commander of the battle fleet then at sea off California. The dispatch was relayed three times going down and the answer three times returning; but the reply was received in two hours and twenty minutes. From the "Oklahoma" to Radio Station Puget Sound the message went direct, being relayed to San Francisco from Puget Sound, thence relayed to the battle fleet, consuming one hour and forty-four minutes. Most of the time was consumed in clearing the message from Puget Sound. The return message was faster, requiring only sixteen minutes. The Admiral evidently took twenty minutes to read and answer the dispatch.

MAGNAVOX

Radio Products



3 stage
Magnavox Model C
Power Amplifier

The Power Amplifier for your Magnavox Reproducer

The Magnavox Power Amplifier Model C, as illustrated, is a true Power Amplifier, and free from elements of distortion.

Switching from stage to stage is made easy by master switches. Any standard amplifying tube can be used.

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

Radio and Artificial Lightning

ARTIFICIAL lightning, when it is wanted and where it is wanted, is one of the growing wants of the engineer engaged in high power radio work.

The radio engineer at the giant trans-oceanic station uses tremendous voltages for testing purposes, which at times exceed a quarter of a million volts, with the same freedom from concern as the radio fan who connects a six volt battery to his receiving set.

But the use of such unusually high potentials which, when in action, resemble a mimic electrical storm, have an important place in the laboratory and field apparatus of the modern engineering staff the chief use for which is the testing of the insulation material at the high power stations of the Radio Corporation of America. These stations are engaged day in and day out in exchanging over twenty-five percent of the message traffic between New York and four countries in Europe. In fair weather and in foul, subjected to high wind pressure, sleet and snow, the aerial insulators which hang from towers ranging in height from 350 feet to 750 feet must carry the strain of voltage which is impressed upon them with the least possible chance of mechanical or electrical failure. How shall we know whether the insulators in the antenna will safely carry their burden without electrical breakdown? They are essential to uninterrupted communications as the

wheels of a locomotive are to continuous transportation. Insignificant as they may seem, elevated to great heights where they appear as mere black specks against the sky, these insulators must be thoroughly tested before installation. They must be tested under the most severe conditions that actual service might impose upon them.

The function of artificial lightning is to imitate these service conditions in the field or laboratory so as to enable an accurate observation of the electrical behavior of the insulator to be made.

It might be asked, "Cannot approximate calculations be made to show without the use of the high voltage and apparent attending hazards just how efficient an insulator is?" This must be answered in the negative. Defects of various kinds evade an attempt by the engineer to apply his mathematical reasoning with certainty.

The generator used to produce the high voltage for testing insulators has a power of 200,000 watts or over 200 horse-power. It is connected through a circuit which increases its voltage to about 150,000. The test insulator has its metal connecting ends joined to the generating circuit and the power is turned on. One of two things can happen to the insulator; it will either allow current to pass through it in which case it will explode into bits or will force the surrounding air to break down under the influence of the high potentials in which case its insulating properties are good and is acceptable for use in the aerial.

During these tests, artificial rain is produced which moistens the insulator in the same manner as an actual rain storm. If the insulator survives the wet and dry test it is fit for service and takes its place in the aerial when needed.

On one occasion at the RCA station at New Brunswick, N. J., the generator was driving an abnormal charge into the antenna when a rain storm came up and drenched the aerial insulators. This was at a time when, during the war, radio stations are most carefully guarded against damage by wartime fanatics. Late

in the evening an insulator broke down under the heavy strain and crashed into bits which flew in all directions. The report accompanying the destroying of the insulator caused the military guard a great deal of confusion as they suspected a bomb had been thrown into the radio station.

Radio Replaces Flowers and Fruit at Hospital

IN the old days, when you went to see a hospital patient, you brought him food in the old-fashioned notion that hospitals neglected the culinary niceties, and it was your duty to smuggle in something that the sick person would enjoy. You knew he would, because you were bringing him his favorite dish, and you never could understand that smarty nurse's edict that he couldn't have it now.

Or you went to the florist and tried to choose between roses tied with a ribbon and carnations gracefully arranged in a basket. And you were always amazed to find that some one else had thought of the same thing, only with more success.

Now, all you have to do to be a little different is to get there first with a radio outfit, and that will soon cease to be a mark of particular attention to your sick friend unless you haul up the latest in tube sets which will "get" the Fiji Islands or wherever it is that the most remote station happens to be.

"Sometimes we have as many as 20 sets in the hospital at once," said Miss Louise Arnold, superintendent of Ellis Hospital, in Schenectady, N. Y. "The General Electric people who have friends here bring in apparatus as soon as the patient is able to enjoy radio. Many are of the crystal type that will catch WGY only. However, as the sick are rarely here long enough to need the greater diversion that might come from being able to listen in throughout the country, they are a great help in passing time. As soon as convalescence begins, radio can be enjoyed."

Some hospitals use it in treating their patients. New York institutions report success in rheumatism and other chronic afflictions where the ether waves are made to act as a sedative. Doctors there say it has cut down the administration of drugs, because in listening to music by radio, the sufferer is made to forget his condition. Others who are in great pain find the programs an ally in stifling the complaints that are forced when the mind has nothing but pain to dwell upon.

Ellis Hospital has seen it so far merely as a diversion, one that is an unquestioned bulwark to the morale of the patient who has long hours alone. Under daylight saving, the programs begin only a little while before visitors must leave, and they continue long enough to top off a day as pleasantly as it is ended at home.

The hospital owns a portable tube set which is taken to the bedside of any patient who expresses a desire to have it and it is in use nightly.

"I read the other day about a hospital in Philadelphia where there is an arrangement whereby radio can be turned on or off anywhere in the place at will," Miss Arnold said. "The whole building is equipped, and any patient who wishes to hear the programs, is able to, while those who tire of it need not be annoyed. Maybe some day we'll have one like that."

WD-11 and WD-12 TUBES REPAIRED

WD-11 or WD-12	\$8.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
C-302 or UV-202	3.50
C-301A or UV-201A	3.50
Moorehead Detectors	2.75
Moorehead Amplifiers	3.00
DV-6 or DV-6A	2.00
Also the new UV-199	2.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"

NEW DX 1 1/2 VOLT TUBES..... \$4.00

RADIO TUBE CORP.

55 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

Do You Want LONG DISTANCE on Your Set?

The following stations have been heard with a COAST COUPLER

- WDAP—Chicago
- CFCN—Calgary
- WWJ—Detroit
- PWS—Havana
- WSB—Atlanta

And Many More



The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory, it has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—\$5.00

Write for catalogue.

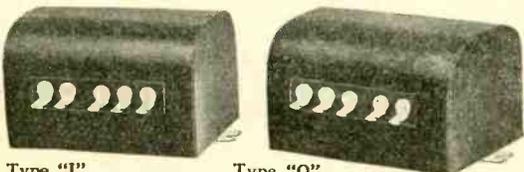
COAST COUPLER COMPANY

245 EAST SEVENTH STREET

LONG BEACH, CALIFORNIA

COMO DUPLEX TRANSFORMERS

The COMO DUPLEX SYSTEM of audio-frequency amplification gives the maximum volume without distortion and tube noise.



Type "I" Type "O"
COMO APPARATUS COMPANY
168 DARTMOUTH STREET BOSTON, MASS.

There is a combined filtering action which assures perfect results when ordinary amplification fails.

It can be added to your present amplifier, giving you power amplification on the weak signals that more of the ordinary amplification would kill.

Sold only in matched Pairs, \$12.50

A copy of C. White's "HOW TO MAKE A POWER AMPLIFIER" is yours for the asking.

WOULD YOU LIKE TO RECEIVE RADIO ADVERTISING MATTER?

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

ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY



Pruden Reliable Radio Specialties for Good Results

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN, Inc.
893 Bergen Ave., Jersey City, N. J.

Popularity of the Radio Drama Proven

IN concluding a season's run of forty-three performances the WGY Players stepped from their parts during the production of "It Pays to Advertise," and addressed their radio listeners. Figuratively, they "stepped before the curtain" and told of the pleasure and interest they had found in this new development of the drama.

If any doubt of the popularity of the radio drama had lingered after this long run by the WGY Players at the Schenectady station of the General Electric Company, it was brushed aside by the hundreds of letters which have literally poured into the station since the announcement that the players would not be heard during the summer months. The outstanding sentiment of the letters was that the listener feels that each of the players is a personal friend. Practically the same cast has been maintained during the long run and these same voices coming into a home week after week have won recognition for the players and a place in the hearts of the listeners. Each radio fan, sitting at his set, feels that a production is something put on just for him and the curtain speeches of the actors helped to cement that feeling of friendliness which exists between performer and listener, no matter how many miles might stretch between them.

A York, Pa., correspondent remonstrates at the discontinuance of the drama as follows: "I would like to know why they (the Players) quit now. In a theatre, of course, it is too hot at this time of the year, but not where I go—my radio set. I take a seat way up front and nobody interrupts me changing seats, no women's hats get in the way, no music or candy hawkers interfere with my enjoyment; there are no long intermissions and you don't even have to dress."

"It seemed like parting with intimate friends and we shall miss you," wrote a radio fan living at East Greenbush, N. Y. "We are glad it will not be long and we shall be anxiously waiting to hear your pleasant voices again in the fall."

Since the initial performance of the WGY Players, "The Wolf," the organization has remained practically the same. Six players who have appeared during the entire season have been: Viola Karwowska, Ida Myrick, Ruth Schilling, Edward E. Schilling, Frank Oliver and Edward H. Smith, director.

The players who addressed the radio audience and who have been with the organization since the first play, "The Wolf," were: Viola Karwowska, Ida Myrick, Ruth Schilling, Edward E. St. Louis, Frank Oliver and Edward H. Smith, director.

These pioneers in the radio drama suffered at first, felt handicapped in their efforts to find inspiration from a microphone in a quiet studio. The audience was unseen and it is rather difficult to find inspiration in something silent and unseen. Then the letters began to come in and these letters established contact between performer and listener. The actor began to feel that he was addressing old friends who were tolerant of weaknesses in a production and enthusiastic when a situation in a plot was put over successfully.

Perfect Performance Guaranteed

Ace Type V, Armstrong Regenerative Receiver, \$20—No receiver at its price can equal it for performance. An Evansville man writes: "The other night I tuned in Kamach, Hawaii, and held the concert for an hour. The music was clear and the speaking distinct."

Ace Receivers are licensed under Armstrong U. S. Patent 1,113,149.

All Ace sets are equipped with the Crosley multistat, the universal filament control rheostat, for all makes of tubes.

Free Catalog on Request

The Precision Equipment Co.

POWEL CROSLY, JR., PRESIDENT
8402 Gilbert Ave. Cincinnati, O.

Wave length range
200 to 600 meters
Jobbers and Dealers
will be interested
in the Precision plan



Cyclone



WORLD'S BEST

"A" and "B" BATTERIES specially built for your Radio Set in all types. Highest quality GUARANTEED for DISTANCE, CLEARNESS, and LONG LIFE.

Standard Electric Novelty Co.

NEW YORK CITY
Best proposition for Jobbers and Dealers. Some territory still available for New Distributors. Write for details at once.



Tubes at One-Half Cost

IT HAS HAPPENED TO ALL OF YOU IN A FRACTION OF A SECOND!

WHEN the filament burns out, at least \$5.00 goes with it to put the set in operation again.

WHY not save nearly one-half the cost of a new tube by sending us your burned out or broken tube to be repaired?

WE REPAIR EVERY TYPE OF tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

HARVARD RADIO LABORATORIES

BOSTON P. O. BOX 1781 MASS.

COMPLETE LIST OF BROADCASTING STATIONS

Appeared in Radio World Dated June 9, 16, and 23

Get these three copies and you will have the latest list of broadcasters published. 15c. a copy or the three for 45c. Or you may start your subscription with any number. RADIO WORLD, 1493 Broadway, New York.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City

Please send me RADIO WORLD for months, for which

please find enclosed \$.....

SUBSCRIPTION RATES:

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



ON APPROVAL FOR 30¢
ZOBEL-STEIN LABORATORIES
322 9th ST. BROOKLYN, N.Y. SOUTH 2650

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

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

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

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

AUTOMATIC LONG RANGE HEADPHONES, 3200 ohms, \$5.00; Brach suspension type weather-proof lightning arresters, \$1.50; efficiency variometers, \$2.00; Carter two-way plugs, handles two headsets, \$0.50; Home-chargers, \$10.00; FF Battery Boosters, \$14.00; Carter 43 plate variable condensers, \$1.50; Carter 23 plate variable condensers, \$1.00; code practice sets consisting of standard key and Century Buzzer, \$1.10; Federal dials, 4-inch, 1/4 and 3/16 shaft, \$0.75; Radion hard rubber dials, 4-inch for quarter inch shaft, \$0.50; plans and detailed drawings for construction of regenerative receiver, \$0.15. Powell May, Box 241, Knoxville, Tenn.

WANTED—Letters from 69th C. A. C. Radio Operators. Vic. Wilson, New Castle, Neb.

"BARNEY GOOGLE," THE FAMOUS SONG, mailed, postpaid, for 25 cents per copy. Get the song that is sweeping the country. The Columbia Print, 1493 Broadway, N. Y. City.

RADIO "TROUBLE FINDING" CHART. It locates immediately the trouble in your radio set! Sent Postpaid 25 cents. The Radio Service Shop, 496 Provident Ave., Winnetka, Ill.

BROADCASTING POST CARDS—Receiving Station Cards and Sending Station Reply Cards, per dozen, 15c. Peanut Set, everything complete, \$30. Cabinet Crystal Sets, \$3 to \$5. Stamp for catalog. PACIFIC SCREW CO., Dept. R, 645 N. E. 53rd St., Portland, Ore.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the camper. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

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

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

VARIABLE CONDENSER—Postpaid, one dollar. Radio Apparatus House, 140 Maiden Lane, New York City.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

GUARANTEED BAMBOO FOUNTAIN PEN Non-corrosive pen point. Will not scratch or leak. Writes carbon copies. Price \$1.00. Stamps not accepted. Atlas Novelties, Box 355, Beverly, Mass.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

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

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

STANDARD ELECTRICAL DICTIONARY—By Prof. T. O'Connor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science. 767 pages, 477 illustrations. (See page 18 for fuller description.) Price, \$5.00. The Columbia Print, 1493 Broadway, New York City.

CUTTING AND WASHINGTON detector and 2-stage audio amplifier complete with tubes, B Batteries, Storage Battery (100 ampere hour), two sets phones; Dictograph Loud Speaker. Range, 2,200 miles. \$75.00. K. C. Matheson, Box 186, Clinton, Nebraska.

SAXOPHONE, silver plated soprano, and Beason silver and gold plated CORNET, practically new, to sell or exchange for radio parts. W. Alton Clifton, Eufaula, Ala.

STAMP COLLECTORS! Free packet, all foreign, to applicants for 50 per cent. discount approvals. W. K. Rose, Fayetteville, Ark.

MAGNAVOX TYPE R3—Latest curvex, improved acoustic models, in original sealed factory cartons. List \$35. Introductory offer \$25. RADIO CENTRAL, Dept. W, Abilene, Kans.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for \$1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

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

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

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

CALLS HEARD POSTAL CARDS for DX reports. Station call letters in color. Printed on government or plain postals. \$.80 hundred up. "Used Everywhere—Go Everywhere." Write for samples. Radio Print Shop, Box 582, Kokomo, Indiana.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

Cram's Radio Broadcasting Map of United States and Canada

With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 8 1/2 x 11 1/2.
PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS. The Most UP-TO-DATE MAP out!
35c. (Postpaid)

THE COLUMBIA PRINT
1493 BROADWAY, NEW YORK CITY

DID YOU GET THE VACATION NUMBER OF RADIO WORLD

It had page after page of interesting and practical ideas and hook-ups for people who are going camping, canoeing, yachting, or just vacationing up in the mountains. You really can't afford to be without it, if you intend leaving the city behind this summer and want to take your radio with you. Dated June 2. Mailed for 15c.
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 wavemeters for testing and experimenting.

Sent P. O. prepaid, on receipt of price, by
THE COLUMBIA PRINT
1493 BROADWAY, NEW YORK CITY

HOOK-UP AND 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:

- Good 2 tube WD-11 Circuit for DX.....Jan. 27
- Satterlee CircuitFeb. 3
- G. W. May's Wonder Circuit.....Feb. 17
- Multi-tube Reflex Circuits.....March 3
- One tube Superregenerative.....March 3
- Lewis Three Tube Circuit.....March 10
- Regenerative Radio Frequency Circuit for 5 tubesMarch 24
- Hazeltine Neutrodyne Receiver.....March 31
- 2VK's Transmitter circuit.....April 21
- Compact Universal Receiver.....April 28
- Stoekelburg 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 RlenartzMay 10

Any number for 15c. Any 7 numbers for \$1.00. All 12 numbers for \$1.50. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

Preparing for the New School Term

Radio World wants a representative in every grammar, high and preparatory school in the United States and Canada. We have a special proposition that will enable representatives to make money. Appointments made now. Give name of school you will attend in the Fall.
Address Circulation Dept., RADIO WORLD, 1493 Broadway, New York City.



A Twist of the Wrist — **IT'S SET**

YELLOW TIP

MICROMETER ADJUSTING
CRYSTAL DETECTOR

Increases the Efficiency of Your Crystal Set!

Finer tuning, clearest possible reception, constant adjustment until you wish to change, then—"A Twist of the Wrist—It's Set." Excellent for reflex and other circuits. **\$2**

Write for folder and name of your nearest dealer.

Wholesale Radio Equipment Co.
Exclusive Factory Representatives
37 William Street Newark, N. J.
Dealers and Jobbers Write for Attractive Proposition

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y. BY HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY,
President and Editor

M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

European Representative: The International News Co., Brema's Bldgs., Chancery Lane, London, Eng.
Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor Technical Editor
Stephen L. Coles Robert L. Dougherty

Field Representatives:
New York—Arnold D. Friedman, W. H. Oke.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
Los Angeles—Stevens & Baumann, Inc., Higgins Building.
San Francisco—Stevens & Baumann, Inc., Holbrook Building.

SUBSCRIPTION RATES
Fifteen cents a copy. \$6.00 a year. \$8.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES
One page: One time—\$150.00.
Half Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—\$5.00. Per agate line \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS
Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE
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.

RADIO TUBES REPAIRED

\$2.00

New filaments inserted in

U.V. 200—C. 300	\$2.00
U.V. 201A—C. 301A—U.V. 199—C. 200—D.V. 6A	3.00
U.V. 201—C. 301—D.V. 6	2.25
U.V. 202—C. 302	3.00

WD11-12, VT-1, VT-2, VT-216A Not Accepted

24 Hour Service, and on the Above Types ONLY.

Terms—Cash with order. We will ship C. O. D. if 1/3 price is remitted with order. All tubes are guaranteed to operate like new and to arrive in good working order.

DEAL DIRECT !!

SPECIAL—Ship us 5 of the above named tubes and we will ship by return mail one repaired tube FREE of all cost. What do you say? Swap?

Send all tubes parcel post prepaid to

Radio Tube Repair Co.
192 Main St., Milford, Mass.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN
Patent Lawyer
32 Owen Building, Washington, D. C.
2876-P Woolworth Bldg., New York City

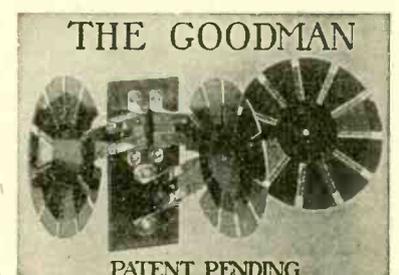
President Harding Greeted

CAPTAIN DONALD B. MACMILLAN, who is somewhere north of Labrador on his way to the Arctic where he will determine whether there is to be another ice age, has sent a wireless message of greeting to President Harding, a copy of which was received at Hartford, Conn., by the A. R. R. L.

The text of the explorer's greeting, which was sent from his schooner, the "Bowdoin," in the vicinity of Jack Lanes Bay, Labrador, follows:

"Greetings from the crew of the 'Bowdoin' from the Atlantic to the Pacific. All hope that you are thoroughly enjoying your sub-Arctic trip."

This message was forwarded across the Continent by amateur radio.



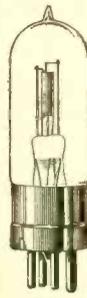
THE GOODMAN

PATENT PENDING

The Niftiest Short Wave Tuner on the Market Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The Goodman is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.



WE REPAIR
WD-11, \$3.50
AND POSTAGE

Also other vacuum tubes, excepting VT-1 and VT-2.

Mall orders solicited and promptly attended to.

H. & H. RADIO CO.
514 Clinton Avenue Newark, N. J.

YOU SAVE 50% OF THE USUAL COST



WORLD RADIO
Batteries

Are Guaranteed 2 years in Writing Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.

World Battery Co.
Dept. 17
1219 So. Wabash Ave. Chicago, Ill.

2 VOLT STORAGE BATTERY for WD11—WD12	\$5.00	6 Volt, 100 Amps.	\$14.50
6 V., 60 Amps.	\$10.00	6 Volt, 120 Amps.	16.00
6 V., 80 Amps.	12.50		

Expecting Too Much

ONE of the editors of RADIO WORLD called by telephone a prominent manufacturing company whose name features the word "radio." When the connection was established, here's what happened:

Operator—"This is Siwash 4,000."
Editor—"RADIO WORLD speaking. Is Mr. Brown in?"
Operator—"I don't get the first word."
Editor—"Radio—RADIO WORLD."
Operator—"I don't get it."
Editor—"Radio—radio—R-A-D-I-O. You certainly ought to be familiar with that word."
Operator—"Well, I'm not. This is my first day here!"

YOU DON'T NEED Tubes to get out of town. Even in the summer I hear Omaha, Kansas City, Fort Worth and Davenport on my crystal set without amplification. Works over 1,000 miles in winter. Send self-addressed envelope for further information or \$1.00 for complete copyrighted drawings and instructions. Everything clearly explained. Satisfaction GUARANTEED.

Leon Lambert, 562 South Volusia, Wichita, Kas.



Sell Shirts

Sell Madison "Better Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition.

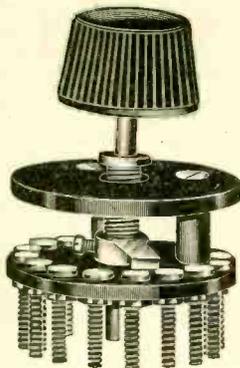
WRITE FOR FREE SAMPLES.
MADISON SHIRT CO., 503 B'way, N. Y. City

PATENTS
promptly procured. Trade Marks designed & registered
FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7212

FREE MANUFACTURERS PATENT CO. INC.
8010 520 FIFTH AVE. NEW YORK

Aetaco Back Mounting Inductance Switch

12 Points Sure Contact



For convenience in mounting the set and for continued reliable service, the AETACO back mounting inductance switch is unsurpassed. The AETACO trade mark is sufficient guarantee of its quality and workmanship.

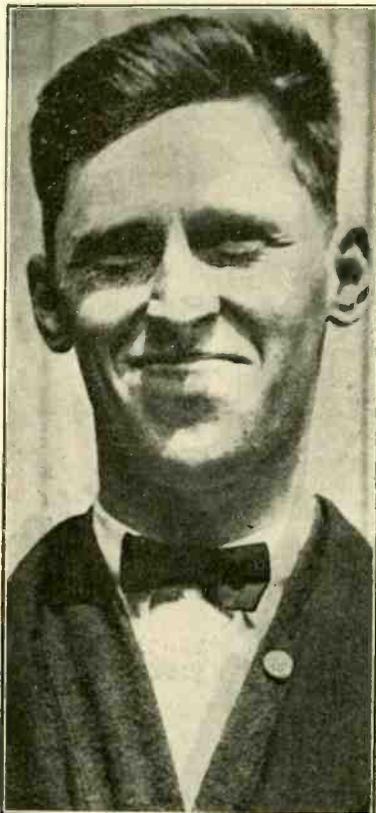
AETACO Condensers

Fine Adjustment.	Accurate Spacing
43 Plate Condenser.....	\$1.75
23 Plate Condenser.....	\$1.35
17 Plate Condenser.....	\$1.25
11 Plate Condenser.....	\$1.00
3 Plate Condenser.....	60c.

Attractive proposition to dealers and jobbers.

American Radio Stores
235 Fulton Street New York City

Operator Mix of WNP (Wireless North Pole)



(C. Paul Thompson)
Donald H. Mix, of Bristol, Conn., amateur radio operator of the McMillan expedition to the North Pole. Amateurs will recognize him when they know that he is the old operator of Station ITS. It is through him that listeners back in civilization will learn of the new discoveries and conditions existing around the North Pole.



10 DAY EXTENSION

SUNBEAM SPECIAL DICTOGRAPH PHONES

\$5.25

We supply information and prices on any set you may want to build, or we will build from your plans.

Send us your address—Get our Special Weekly Offerings.

SUNBEAM ELECTRIC CO.
71 THIRD AVE. 207 EAST 14th ST. NEW YORK

AN AUDIO FREQUENCY TRANSFORMER THAT IS WORTH WHILE

ALEMCO



Specially designed to produce superior results with any standard tube. Produces maximum amplification without distortion or howling. Moisture, hard knocks and abuse will not affect its efficiency. Windings completely surrounded with laminated iron and sealed in a non-inductive bakelite housing eliminating leakage. Adaptable to any stage of amplification.

Ratio 4 to 1

The Alemco Coil also gives equal or better results on the first stage than transformers on the market wound as high as 9 or 10 to 1. Will stand any voltage.

Price, \$5.50 Postpaid
A L E M C O, Poughkeepsie, N. Y.

DON'T WAIT

SPECIAL INTRODUCTORY OFFER

BRAND NEW
(Type R-3)
Magnavox Loud Speakers

\$26.98 **\$26.98**

COREY HILL BATTERY CO.
1354 Commonwealth Ave. Boston 34, Mass.

DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWIN.

—Two Variometers and the fixed Coupler?
SEND 10c for the June issue of RADIO AND MODEL ENGINEERING.

SLEEPER RADIO CORPORATION
28 W. Park Place New York City

Subscribe for RADIO WORLD, \$6.00 a year.

Six Months Subscription for Radio World and Popular Radio or Wireless Age, or Radio News or Radio Dealer or Radio (San Francisco) for the Price of a Subscription for Radio World Alone

This Is a Special Offer for the Summer Only:
DO IT NOW!

Radio World for six months (26 numbers) is.....	\$3.00
Popular Radio at 20c a copy for six months would be.....	1.20
	<u>\$4.20</u>
or	
Radio World for six months.....	\$3.00
Wireless Age (or Radio) at 25c a copy, for six months.....	1.50
	<u>\$4.50</u>

Send us remittance for \$3.00 and we will send you Radio World for six months and Popular Radio, or Wireless Age, or Radio News, or Radio Dealer, or Radio (San Francisco), for six months, to one or different addresses, or send through your newsdealer.

This offer is good only for one month from date.

Take advantage of this offer today and send in the accompanying subscription blank. If you are already a subscriber you can take advantage of the offer by sending us \$3.00 and renewing your subscription for six months beyond your present date of expiration.

Special Combination Offer of Radio World and Popular Radio or Wireless Age or Radio

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find remittance for \$3.00, for which send me Radio World for six months, beginning with issue dated and Popular Radio, or Radio News, or Radio Dealer, or Wireless Age, or Radio for six months beginning with issue dated..... and it is understood that there is to be no extra charge of any kind. Please mail copies to the following address:

If you wish you may send us \$6.00 for Radio World for one year (52 issues), and Popular Radio or Wireless Age, or Radio News or Radio Dealer, or Radio for twelve months, both postpaid. This offer good only if mailed by September 10, 1923.

Name

Street Address

City and State.....

Broadcast Bill's Radiolays

By William E. Douglass



"When crack upon my dome came the blow of an umbrella."

SAKES alive! You should a seen me last week on a trip down East. Lots of folks don't like to travel. I don't mind it in the least. Saw New York an'

Coney Island, 'Lantic City an' the rest but of all the places vis'ted I liked 'Lantic City best. Mebbe some of you have been there. Like as not I'll go again. If I

do I'll bet a dollar I don't tell nobody when. Lots of funny things will happen when a feller starts to roam, things I never would of thought of in my peaceful quiet home. Why one day when I went swimmin' where the waves come rollin' in an' the sunshine, fer you know it, burns some blisters on yer skin. I attracted more attention as I sat there on the beach an' it wuzn't fifteen seconds till I'd spotted one fair peach. In the first place after swimmin' I thought I would rest awhile in the sand an' watch the bathers fer it seemed to be the style. 'Course I had my loop antenna an' my good ol' wireless set. I may leave my wife an' family but I haven't left it yet. Riggin' up the set as usual 'twuzzn't long till I "tuned in" on the local sendin station so I tuned an' with a grin sez to this here babe I'd spotted "Want to listen in with me?" "Sure" she sez (the smile she give me wuz as pretty as could be.) Since I only had one head set we were sittin' side by side, to myself I kept repeatin' "Let your conscience be your guide." 'Twuzn't long till there were others waitin' 'round so they could hear, an' my sentiments are always "Try to please the ladies dear." While I didn't mind their lis'nin', it wuz quite a pleasant duty, wuz it Radio attractin' them er just my style of beauty? Anyway I had a waitin' list of twenty-five er thirty. There were Genevieves an' Helens, Eleanors an' dainty Gerty. Things were gettin' mighty interestin' when crack up on my dome came the blow of an umbrella. 'Twuz a message "straight frum home." Next time I start out to travel, sometime I may go again to the seashore I'll just betcha I don't tell my family when.
—Copyright, 1923, Westinghouse Electric & Manufacturing Co.

Advertiser Reaches Army of Dealers with Radio World, a Fan Publication

SLEEPER
RADIO CORPORATION
88 PARK PLACE, NEW YORK

Radio World,
1493 Broadway,
New York City.

Attention of Mr. Clark

Gentlemen:—

Advertising is a wonderful thing but in some four years of experience in using radio and trade papers, we have never known of such instantaneous and far-reaching results as we secured from the full page back cover advertisement which we had in "Radio World" of July 21st.

We chose "Radio World" as the quickest way of announcing the new Sleeper Monotrol which we have just perfected as the first commercial application of the Grimes Inverse Duplex Circuit. We expected that a great many would be interested in details of the new set and in the fact that Mr. David Grimes is with us as our Chief Engineer, but we never believed that such floods of letters could pour in on us so quickly. They came from practically every state in the union and what is most pleasing to us, over 60% are from dealers rather than individuals.

You are at liberty to use this endorsement of the advertising power of "Radio World" in any way you care to because you have given us results that other advertisers are entitled to know about.

Yours very truly,
SLEEPER RADIO CORPORATION.
(Signed) Gordon C. Sleeper, President.

July 27, 1923.

The Condenser Sensation of Modern Radio



Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Stokers of energy and rectifiers of Radio Current are the very heart of a well-built radio set.

The proper fixed condenser will make all the difference in the world in the reception, clarity and selectivity your set affords.

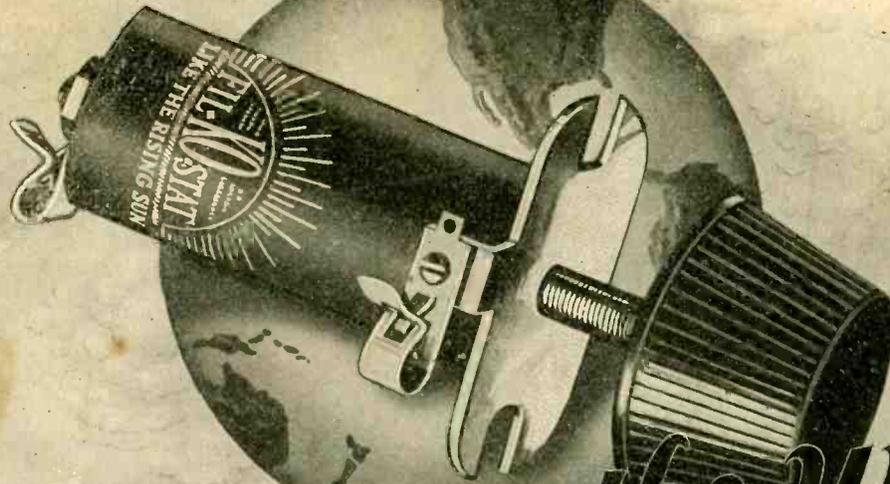
Capacity	Each	Capacity	Each
.0001	.....\$ .35	.002	.....\$ .40
.00015	..... .35	.0025	..... .50
.00025	..... .35	.003	..... .60
.0002	..... .35	.004	..... .75
.0003	..... .35	.005	..... .75
.00035	..... .39	.006	..... .75
.0005	..... .35	.008	..... 1.00
.0006	..... .40	.01	..... 1.00
.0008	..... .40	.015	..... 1.50
.001	..... .40	.02	..... 2.00
.0015	..... .40	.025	..... 2.50

The FRESHMAN is so designed that constant equal pressure is exerted on the condenser plates over the entire area. They are the only condensers that do this and therefore the only condensers that avoid noises, which are due to variable pressure on the plates.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 SEVENTH AVE., NEW YORK

proven best filament control



— challenges the world

**2000 Miles on 1 Tube
with a FIL-KO-STAT**

*From Paul H. Woodruff
Editor Industrial Power, Chicago.*

"I am of the opinion that the Fil-Ko-Stat is the best filament control and have recommended it highly. It is a fact that I picked up two Los Angeles stations, KHJ and KWH with a single tube regenerative detector shortly after installing it."

*Recommended and sold by
dealers in high quality
radio supplies.*

**Takes the place of your rheostat!
Occupies little space on panel.
No redrilling necessary.**

Made and guaranteed by



PRICE

\$2

Proven by every test to surpass any and all rheostats and filament controls, Fil-Ko-Stat rightly challenges the world.

Laboratory research proves Fil-Ko-Stat to have a fine adjustment area (which means ability to control filament heat and electronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

Actual use proves Fil-Ko-Stat the most accurate control for any tube from "peanut" to "power." Full resistance 30 ohms.

—it has no screws or adjustments to tamper with. It is triple tested and regulated at the factory to the ideal "off" position for

UV 200, 201, 201A, WD11, WD12,
UV199, DV6A, W. E. Peanut, etc., etc.

—it is non-microphonic, operates noiselessly, eliminating all "frying."

—it has no disks to break or chip and its reliability and durability are guaranteed by the manufacturer.

If you have never tried tuning with your filament control, start with a Fil-Ko-Stat. It brings in strong and clear D. X. stations you never heard before.

If your dealer has no Fil-Ko-Stats in stock, send his name and your remittance direct to

RADIO STORES CORPORATION

Sole International Distributors

Dept. RW811 • 218-222 West 34th Street, New York

The filament kontrol **FIL-KO-STAT** of infinite adjustment

FIL-KO-STAT

DISTINCTLY DESIGNED TO UTILIZE THE GREAT TUNING POSSIBILITIES OF THE VACUUM TUBE ITSELF.