

Jl 5 '22 S

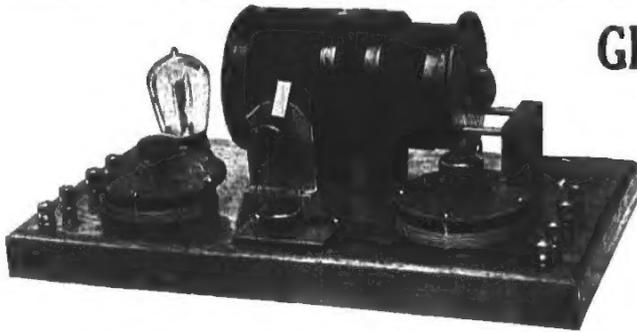
Vol. 5. No. 4 Published by A. F. Penton & Co. at 60-62 Adelaide St. E., Toronto, Ont

RADIO



Incorporating 'WIRELESS & AVIATION NEWS'

JUNE - 1922 + Price 15c



GILBERT RECEIVING SET

NON-REGENERATIVE

Guaranteed range 100 to 150 miles.

Retail Price without
Bulbs, Batteries
or Phones

\$37⁵⁰

CLEARTONE LOUD SPEAKER

A Wonderful Instrument that does not require extra power. **\$37⁵⁰** For use in any ordinary sized room.



Gilbert New Head Phones (2000 ohms.) \$9.75

Gilbert Mineral Sets - \$22.50

(With Head Phones)

Variable Condensers, Variometers, Amplifying Transformers, Binding Posts, Crystals, Horns, One Step and 2 Step Amplifiers, Lightning Arrestors, Strain Insulators, Dials, etc., etc.

Send for Catalogue

The A. C. GILBERT-MENZIES Co., Ltd.

439 KING ST. W.

TORONTO



WIRELESS AMATEURS ATTENTION!

If You Want SERVICE—Order From Us.

We carry a large stock of High Grade Wireless Apparatus of our own and other manufacturers. Let us build your special apparatus to your specifications. Experimental machine work done.

LATERAL WOUND COILS

Turns	Appr. Wave Length	Price
25	130— 375	.55
50	180— 515	.60
100	450— 1460	.80
200	930— 2850	\$1.10
300	1550— 4800	1.25
500	3000— 8500	1.50
600	4000— 12000	1.65
750	5000— 15000	1.75
1000	6200— 19000	2.50
1250	7000— 21000	2.60
1500	8200— 25000	3.00



Bakelite Plugs for Lateral Wound Coils	60c
Straps	5c
Three-Coil Mountings	\$5.00
Spider-Web Forms	25c

Special Sizes of Coils.
to order

Send for our complete list.

WIRELESS SUPPLIES

VARIABLE CONDENSERS

Chelsea, 21 plate	\$4.50
" 21 plate, with knob and dial	5.25
Murdock, 21 plate	5.00
" 43 plate	6.00
Signal 21 plate (glass case)	4.00
" 43 plate (glass case)	5.00
" 21 plate, Panel Mount	4.50
" 43 plate, Panel Mount	5.50

AMPLIFYING TRANSFORMERS

Saco Clad	\$6.95
Rhamstine*	5.15
Acme	7.45
Federal Tel. Audio Frequency	9.75
Can. Ind. Tel. Audio-Frequency Transformer	6.25

SPECIAL! MAGNAVOXES - \$62.50

SUNDRIES

3-in. Dials	\$1.00
High Frequency Buzzers	1.00
Rheostats	1.00
V. T. Sockets	50c
V. T. Sockets (Murdock)	1.35
Reliable "B" Batteries	1.10
Lightning Switches, 100 Amps.	4.00
Work Rite Variometers with Dial	6.50
Hoyt Ammeters, 0.30 Amps	3.00
Champion Telephone Plugs	1.50

AUDION BULBS

R. A. C. Audions	\$7.00
Base, with clips, for bulb	1.50
Marconi. Q. V. Valve	7.50
Mullard Detectors	6.50
Base for above tube	1.50
Galena or Silicon	15 and .30

Send 5c for our New Price List

787 Queen St. W. **J. M. PAQUIN** Toronto, Ont.
THE ELECTRICAL SHOP

NOW READY FOR DELIVERY
THE EVERYMAN
RADIOPHONE RECEIVER

*Every
part of
this set
is
made in
Canada*



PRICE
\$25⁰⁰

The EVERYMAN is a Crystal Detector Set with a receiving range up to approximately 30 miles.

The EVERYMAN is so much superior to any other Crystal Set that it is strictly in a class by itself when compared with others.

There is a lot of real enjoyment to be had with an EVERYMAN and if there is no local radio dealer that can tell you about it, write us and we will be glad to do so. Be sure to get the particulars regarding the EVERYMAN before purchasing a crystal receiving set.

ATTENTION DEALERS

We are now in production on Head Sets, Vernier Type Variable Air Condensers and Rheostats. These should be included in your stock. Particular customers who want the best will ask for them.

CANADIAN INDEPENDENT TELEPHONE CO., LIMITED

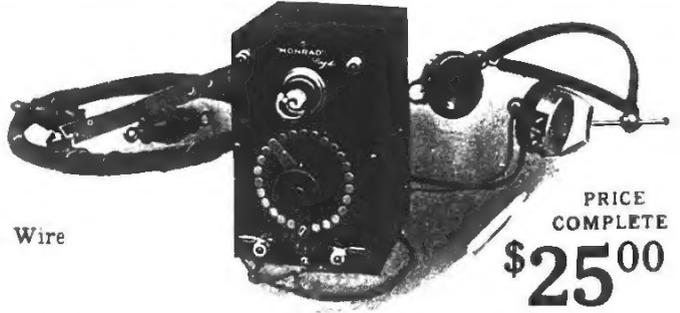
Offices : 212 KING STREET W.

Factory : WALLACE AVE., TORONTO

"MONRAD" Reg.

Radio receiving outfit comprising "MONRAD" Receiver with permanent and highly sensitive crystal Detector. 2000 O.H.M. double Ellwood Headset.

One hundred feet of 7 22 Copper Aerial Wire
Two electrode Insulators
One solid copper Ground Clamp.



PRICE
COMPLETE
\$25⁰⁰

MONTREAL RADIO SUPPLY CO., 283 BLEURY STREET, MONTREAL.

Telephone: Main 4958

TOMLINSON & FORBES

Manufacturers of

High Grade Radio Parts

LATERAL COILS

**Cabinets, Sockets, Rheostats,
Coil Mounts, Receiving and
Amplifying Radio Sets, Plugs**

216 VICTORIA ST., TORONTO, ONT.

**Manufacturers of Radio Apparatus
for Amateurs or Dealers**

LESCO RHEOSTATS - \$1.00

LESCO V.T. SOCKETS - \$1.00

THE

LESLIE RADIO SUPPLY CO.

685 SHAW ST. TORONTO

Radio - Batteries

"A" (All Rubber)



"B" (Rechargeable)

GRAY BATTERY & ELECTRIC SERVICE,
Park 4097 77 Roncesvalles Ave., TORONTO

Manufacturers of Radio Apparatus and Parts
FACTORY NOW OPEN

Immediate Delivery on Condenser Plates and Separators

Radio Electric Products

OAKVILLE

ONTARIO

Canada's Leading House for Amateur Wireless Parts

IT IS OUR BUSINESS AND OUR AIM TO GIVE SERVICE AND SATISFACTION.

IF WE HAVE NOT WHAT YOU REQUIRE WE WILL GET IT.

*BOYS Opportunity Knocked at Your Door Once Before—
How Many Failed to Open ???*

\$14⁵⁰ BROWN'S FAMOUS RECEIVERS \$14⁵⁰

Type A. Adjustable. 8000 Ohms. Reconditioned.
LIMITED SUPPLY ALL ORDERS TREATED IN ROTATION

VISCO Rheostat - \$1.00 The First Canadian Moulded Rheostat.

THE VIMY SUPPLY CO., 567 College St., TORONTO

MAIL ORDER OUR SPECIALTY

RADIO PANELS

and RADIO PARTS

Start right. The panel is the very foundation of your set. High volume and surface resistance are essential factors. Make sure that you get them in both the panel and parts that you purchase. To make doubly certain look for the dealer displaying this sign

CONDENSITE CELORON Radio Panel Service

Condensite Celoron Grade 10—approved by the Navy Department Bureau of Engineering—is a strong, handsome, waterproof material, high in resistivity and dielectric strength. It machines easily, engraves without feathering and is particularly desirable for panels. It is also widely used for making many other important radio parts, such as tube bases, platform mountings, variable condenser ends, tubes for coil winding, bases, dials, knobs, bushings etc. We are prepared to make these various parts to your own specifications.

Where economy is a factor we can supply panels of Vulcanized Fibre Veneer made of hard grey fibre veneered both sides with a waterproof, phenolic condensation product. This material has a hard, smooth, jet-black surface, machines and engraves readily and will give excellent service where very high voltages at radio frequencies are not involved.

Shielded plates (patent applied for) are made with a concealed wire shield. This shield, when properly grounded, effectively neutralizes all howl and detuning effects caused by body capacities.

Are you a Radio Dealer? Let us tell you how easily and profitably Celoron Radio Panel Service enables you to supply your customers with panels machined and engraved to their specifications. Write to-day for our Dealer's Proposition, covering panels, dials, knobs and tubes.



Diamond State Fibre Company

of Canada, Limited

Head Office and Works: 235 Carlaw Ave., - Toronto, Can.

For Best Results with Your Radio Outfit Use **EVEREADY BATTERIES**

DON'T be satisfied with weak batteries. Use Eveready "A" and "B" Batteries, especially built for Radio work. Eveready Batteries are made in the largest and most modern dry and storage battery plant in Canada.

"B" Batteries are fitted with Fahstock clips. "A" Batteries have mahogany finished boxes and nickle-plated trimmings. The bail handle is supplied so that the battery may be moved or carried about with one hand.



To guard against the spilling of the sulphuric acid electrolyte, a specially designed vent is used with this type of battery.

BE sure to ask your Radio dealer for Eveready Batteries. There is a size in both "A" and "B" types for every Radio outfit.

For sale by all dealers.



CANADIAN NATIONAL CARBON CO., LIMITED
MONTREAL — TORONTO — WINNIPEG — VANCOUVER

The Electroplax Company, Ltd.

Canadian Manufacturers

Redmanol

Condensite

Bakelite

Thermoplax

Pyroplax

City Sales Office—YORK BLDG., TORONTO, Ont. • Adel. 7971

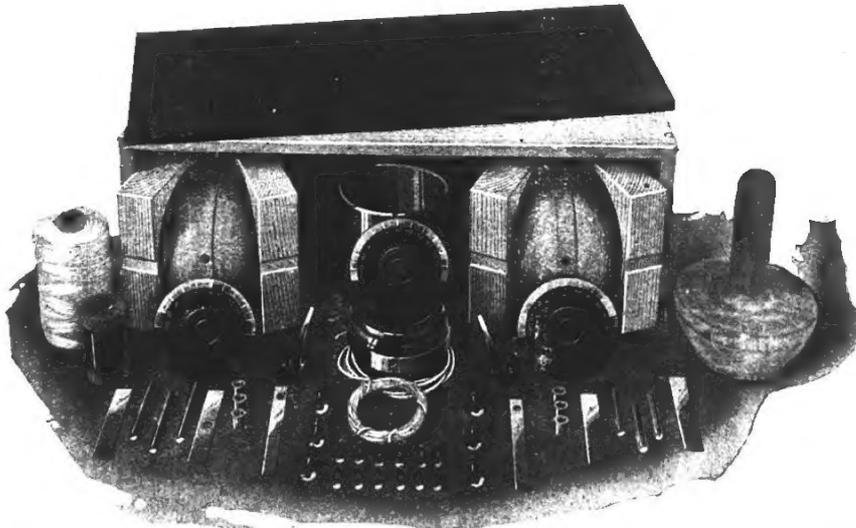
Factory—Mount Dennis, Ont.

When writing to Advertisers please mention RADIO

ASSEMBLE YOUR OWN VARIOMETER SET

\$20

Complete!



\$20

Complete!

IMMEDIATE DELIVERY GUARANTEED

The parts illustrated are all that is required to build a high class SHORT WAVE VARIOMETER TUNER, and are exactly as represented.

The set consists of:—

- 1 Hardwood cabinet 17¼-inch x 6½-inch x 7-inch, with removable back.
- 1 Polished Cerebon panel 17-inch x 6-inch x ¼-inch, accurately cut.
- 3 Moulded bakelite dials, 3-inch diameter.
- 2 Sets of variometer parts. Forms of seasoned wood and absolutely true.
- 1 Set variocoupler parts. Moulded tube, hardwood rotor.
- 2 Switch levers, bushing type.
- 6 Binding posts.
- 6 Feet spaghetti.
- 14 Switch points.

Wire for variometers.
Wire for variocoupler.
Wire for connecting instruments
All necessary hardware.

(Shipping weight 14 lbs.)

SOLD WITH A MONEY-BACK GUARANTEE

Variometers and variocouplers are not just plain wood turnings. They are made with the utmost precision.

THE COMPLETE SET OF PARTS COMES NEATLY PACKED IN INDIVIDUAL CARTONS

ORDER YOURS NOW!

Dealers should write for liberal proposition.

RADIO
APPARATUS
EXCLUSIVELY



LOWEST
PRICES IN
THE DOMINION

"Better Radio Apparatus"

136 VENDOME AVE. N.D.G. MONTREAL.P.Q.

When writing to Advertisers please mention EADIO

WE ARE PREPARED TO MAKE
PROMPT SHIPMENTS

—on—

HEAD SETS, RECEIVING APPARATUS, TUBES, Etc.

EUGENE T. TURNEY LABORATORIES

Canadian Agents for

Heinemann Electric Co. - - Stan-Bi-Radio Mfg. Co.
Pacent Electric Co. - Manhattan Electrical Supply Co.
Omnigraph Co.

Hatheway & Knott

16-22 HUDSON ST.

NEW YORK.

NEW YORK HEADQUARTERS FOR THE CANADIAN ELECTRICAL TRADE.

MARCONI RADIO

We have a complete line of Marconi Canadian made RADIO sets, parts and Audion bulbs at Standard Canadian prices. Also other lines at prices that are right. Compare these prices with our competitors.

Large tapped 'B' Batteries	\$ 2.50	Grid Condensers	\$.20
Small 'B' Batteries	1.85	Mounted fixed condensers .....	.60
Stranded Aerial Wire, 100 ft. ....	.85	Couplers, Sig. Corps Type	8.50
Aerial Insulators .....	.50 and .30	Storage Batteries, 60 amp. hr.	14.00
CGE Radiotron UV 200	7.00	80 amp. hr.	22.00
UV 201	9.00	Phonograph Coupler, fits Victor, McLagan, Columbia, etc.	1.00
UV 202, 5 watt	11.50	Lightning Switches, approved	2.00
Regenerative tuner, detector and two-stage am- plifier, Type C	120.00	Switch Points, nickel .....	.05
Moulded tube sockets	1.25	Binding Posts, screw type .....	.08
Amplifying transformers	8.00 and 6.50	hole type .....	.12
Stromberg-Carlson Double Fones	10.25	Universal Radio tested Galena .....	.25
Kellogg Double Fones	14.50	Detector, Galena, glass tube protected type	1.75
Dictograph Fones, 6,000 ohms	16.00	Zincite-Chalcopyrite Detector, or with two crys- tals	2.75
Reostats, table mounting	1.30	Dials and Knobs	up from .95
Reostats, back mounting	1.50 and 1.40	Duo-Lateral Coils	up from .80
Var. Condensers	5.25 and 6.75	No. 22 DCC Magnet Wire	lb. 1.25
Magnavox, Type R3	60.00	No. 24 Enamelled	lb. .90
Wireless Experimenters' Manual, the best treat- ise ever written on Radio	2.50	Also other items too numerous to mention.	

AMATEURS, ATTENTION! Write us for prices on Telephone and Buzzer modulated transmitting sets, 10 to 1,000 watts. Also motor-generator sets for trans mission and battery charging.

All prices f.o.b. Windsor. Mail orders filled same day as received.

All kinds of coils wound to order. Bank wound coils wound to specifications. Estimates of any installation fur-
nished.
Dealers wanted

UNIVERSAL RADIO AND ELECTRIC COMPANY, 329 Ouellette Ave., Windsor, Ont.

— **WHOLESALE ONLY** —

Leading Canadian Radio Jobbers

We handle the Best of all Standard Radio Apparatus and Equipment.

Our large orders to manufacturers enable us serve the trade promptly and efficiently.

DEALERS WANTED THROUGHOUT CANADA.

It will pay you to be able to give your customers "Dominion" Service. Write for particulars.

Dominion Radio and Supply Co. General Offices: **152 Bay St., Toronto, Ont.**

Warehouse—63 Front Street East.

RADIO CABINETS

TRY

The STANLEY PIANO CO.

Makers of

High Grade—Stanley Pianos

World Famous—Cecilian Pianos

LOW PRICES—FINE WORKMANSHIP

Write for Quotations.

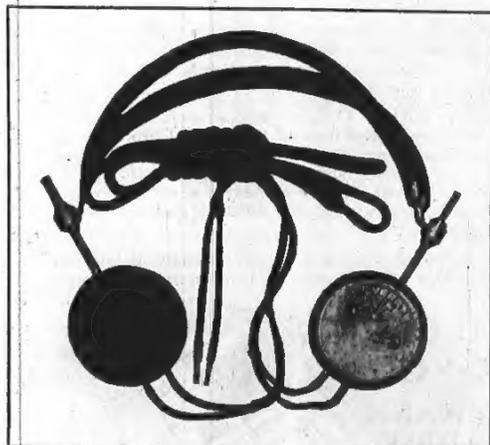
241 Yonge St.

Toronto.

A Wonderful Reception Tonight !

and Everyday hereafter—on every Receiving Set

EQUIPPED WITH



The
Everett
"EVERCLEAR"
TELEPHONE

(3000 Ohms)

Loud and clear-toned. Withstands amplification without distortion.—Mechanically perfect.—Moderately priced.—Approved by experts everywhere.

Price in Canada **\$12⁵⁰**
At all Dealers

Everett Electric Corp

320 BROADWAY

NEW YORK

Place Your Order Now for
GILSON RECEIVING SETS

With our large manufacturing facilities and organization, we will shortly be in a position to fill orders in any volume.

Our low prices will prove sensational.

The trade and public are urged to write at once for literature and prices.

GILSON MANUFACTURING CO., Limited, 131 York St., Guelph, Ont.

**RADIO PANELS and OTHER INSULATION
 FOR WIRELESS WORK
 BAKELITE-DILECTO**

Grade XX Black was used by the United States Government during the War for this purpose. It is the **STANDARD of the WORLD**

THE CONTINENTAL FIBRE COMPANY, Newark, Del.

85 Plymouth Ave., South Rochester, N. Y., and 1927 First Ave., South Seattle, Wash.



RELIABLE
 GRADE BLACK

**Absolutely Noiseless
 Wireless Batteries—
 At Last**

You know how irritating those hissing and rattling noises become when receiving broadcasts.

Now they are a thing of the past. The Manufacturers of Reliable Wireless Batteries have discovered the secret of making a Wireless Battery that is absolutely noiseless, and that will give highest capacity for the lowest price in actual hours of service.

You can easily prove this by ordering a set of Reliable Wireless Batteries from your Radio or Hardware Dealer, and attaching them to your Wireless.

Manufactured only by
The Dominion Battery Co., Limited
 MONTREAL - TORONTO - WINNIPEG

RADISCO AGENTS

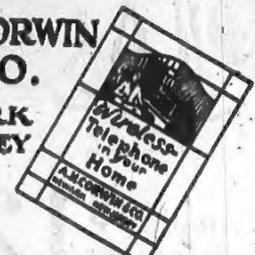
**Concentrated Buying
 For Canada**

YOU can waste a lot of time and have some sad experiences by shopping for your radio supplies among many firms, but we offer you an alternative.

We are RADISCO agents and, as such, our stock includes the entire lines of the Radio Corporation of America; Clapp-Eastham Company; John Firth & Co. Inc.; Westinghouse Electric & Manufacturing Co.; Radio Manufacturing Company; Acme Apparatus; Wm. J. Murdock Co., and certain specialties of other manufacture.

Your orders will be promptly attended to and the necessary triplicate certified invoices made out.

**A.H. CORWIN
 & CO.**
 NEWARK
 NEW JERSEY



This book "Wireless Telephone in Your Home," will be sent to you for a less-than-cost charge of 25 cents.

When writing to Advertisers please mention RADIO



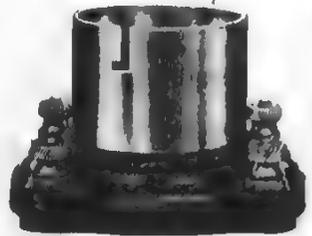
AMPLIFYING TRANSFORMER

The Chelsea Amplifying Transformer is a supreme attainment in the design of Audio Frequency Transformers. It embodies the highest grade of materials obtainable and proper design, which reflects the result attained, namely, high amplification factor. It is unequalled either in electrical characteristics or good appearance. Price as shown, \$4.50.

CHELSEA VARIABLE CONDENSERS (Die-Cast Type)



CHELSEA VARIABLE CONDENSERS (DIE-CAST TYPE)



CHELSEA BAKELITE SOCKET NO. 60

AMPLIFYING TRANSFORMER NO. 50

- No. 1—,0011 mf. mounted\$5.00
- No. 2—,0006 mf. mounted 4.50
- No. 3—,0011 mf. unmounted 4.75

- No. 3—,0011 mf. unmounted with-out dial 4.35
- No. 4—,0006 mf. unmounted 4.25
- No. 4—,0006 mf. unmounted with-out dial 3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates. Unmounted types will fit any panel and are equipped with counter-weight.

PURCHASE FROM YOUR DEALER; IF HE DOES NOT CARRY IT, SEND TO US.

CHELSEA BAKELITE SOCKET No. 60

This socket has a bakelite base supporting four external, readily accessible binding posts. The tube receptacle is highly polished nickel and will take any standard detector and amplifier tube as well as the smaller size power tubes. It is primarily designed for receiving circuits, and may be mounted on either table or panel. Positive contact springs. An added beauty to any radio station.

PRICE AS SHOWN, \$3.00. PURCHASE FROM YOUR DEALER.

CHELSEA RADIO COMPANY

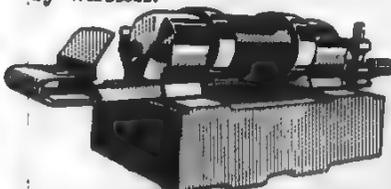
150-156 Fifth St.

Chelsea, Mass.

Manufacturers of Radio Apparatus and Moulders of Bakelite and Condensers.

BRACH vacuum LIGHTNING ARRESTER

There is no question as to the protective qualities of the BRACH Vacuum Lightning Arrester. IT PROTECTS. It spares your home and your radio outfit from the destructive lightning bolt. It does more. It drains the static with which the air is charged by every lightning storm, and which, more than direct lightning, causes fire or interferes with clear receptivity of signals by wireless.



Listed by Underwriters' Laboratories
Sold by Leading Dealers Everywhere.

You can depend upon the BRACH Arrester doing its work. Sixteen years' experience has resulted in the final adoption of the Brach Vacuum type Arrester by leading Railway Signal Systems, Police and Fire Alarm Telegraph Systems and the United States Army. Skilled engineers insist on it as the highest development in lightning protection.



PLAY SAFE by installing at once a BRACH Vacuum Lightning Arrester. It is fool-proof, works automatically, takes care of itself, requires no switching on and off, cannot become grounded.

Outdoor and Indoor Types.

L. S. BRACH MFG. Co, Newark, N. J.

16 years Specialists in Lightning Protective Apparatus.

The Highest
Possible
Quality
for the
Lowest
Possible
Price



Judge Them
by
Their
Quality
not by
Their
Price

\$9.50
from your
Dealer
2500 Ohms.

\$9.50
from your
Dealer
2500 Ohms.

Introducing **BRANSTON RADIO** Head Sets

It is a revelation to "listen in" with a "Branston Head Set." The natural rich mellow tones are there—right in your ear—clear as a bell—without ear strain.

Branston Head Sets are the successful result of long experimentation for something better than the ordinary.

Scientifically adapted to give the utmost in voice and concert reception.

You can pay more for less value, but you can't get more value at any price.

Light in weight and designed so that they can be worn for hours without discomfort.

CHAS. A. BRANSTON LTD.

355 YONGE ST., TORONTO, ONT.

MANUFACTURERS OF "QUALITY" ELECTRO MEDICAL AND RADIO APPARATUS
RECEIVING SETS—LIGHTNING PROTECTORS—TELEPHONE PLUGS, ETC.

If Your Dealer Cannot Supply You, Order Direct.

RADIO

A. F. PENTON & Co.,
Publishers.

C. E. WILLIAMS, Editor & Business Manager
60-62 ADELAIDE ST. EAST, TORONTO, CANADA.

C. LINCOLN-MITCHELL,
Publication Manager.

Volume 5.

TORONTO, JUNE, 1922.

No. 4

BROADCASTING

My brief experience of occasions like the present, teaches me that if there is anything that I particularly want to say, I must say it at the beginning, and I therefore desire, at the outset, to say that my very best thanks are due to Mr. J. O. G. Cann of the Marconi Company, and his assistants, for the demonstrations with which I hope to illustrate my talk.

If I, like a parson, to speak to a text, it would be "I'll tell the world." This slogan probably had no real meaning when it was originated, but now it beautifully epitomizes the function of the radio broadcasting station. Speaking of slogans, reminds me of that wonderful advertising slogan which the Postum Cereal Company use, and which might well form the motto of every person interested, experimentally or otherwise, in radio, and that is "There's a Reason"; because once having realized that there is a reason, a considerable step has been made towards learning what it is.

One sometimes wonders what was the reason that radiotelephonic broadcasting and all its potentialities lay pigeon-holed for some two years. It appears that it had to await the appreciation of its potentialities by the Press; they, in turn, focussed upon it the attention of the public, and, unfortunately, perhaps, this first took place in the United States.

As I understand it, your mission in life, gentlemen, is to bring business men to that frame of mind in which they are prepared to admit the excellence of their merchandise or of the service which they render.

In recent months, I have had considerable contact with men of your profession, and, as a result, I am prepared freely to admit that my Company established and regularly operated the first radiotelephone broadcasting station in North America, which means that it was the first in the whole world; and we may all admit that this station was established in Montreal.

In passing, I might say that I believe more radio history has been made in Canada than in any other country.

It is interesting to contemplate the attitude which people in different spheres of activity adopt towards the radio broadcast. They are disposed to regard it with very different feelings according to the way in which they anti-

pate that it will affect their present business. Newspaper men welcome it and say that it is a valuable adjunct to their business. I was discussing this the other day with two newspaper men, one of whom illustrated his point by saying there was no difference in principle between broadcasting news headlines by radio and broadcasting them by means of contents bills; but in the former case a far greater number of persons have their appetites whetted for further details, which they buy the paper to read.



Mr. A. H. Morse

Naming a very prominent English politician, he said, "Supposing to-morrow we broadcasted that so-and-so was assassinated to-day," when his friend interpolated, "and a very nice day for it, too."

Telephone companies likewise, are not alarmed at the possible effect of the development of the radiotelephone, nor, in a general way, are the churches. In connection with the latter, however, it is interesting to note that many churches have conceived an obvious enthusiasm for broadcasting their services by radio and then suddenly lost their enthusiasm. It may be that the obvious advantages of broadcasting to sick members of the church are inclined to be outweighed by the prospect of other members, not sick, being content to stay in bed and hear the service. It is no

Address by Mr. A. H. Morse to the Montreal Publicity Association at their Regular Luncheon at the Queens Hotel, Montreal, on June 7th, 1922.

longer always possible to prove that your boy went to church by asking him what was the text, because he may have "listened-in" to the text in some barn in the intervals of an exciting rat-hunt.

Bernard Shaw claims that honesty varies with the strain that is put upon it. This is no doubt true—therefore, if we assume, as we may, that the racing bookmakers of the future will receive instantaneously by radio-broadcast, direct from the course, the results of every race, dishonest persons such as wiretappers, will not longer be disposed to place bets after a race is run. If this application of the radio broadcast had been applied when it was first available, many an enterprising man now in jail would no doubt be enjoying his freedom.

One of the most attractive uses of the radio broadcast is obviously the entertainment of bedridden persons. Even to-day and in this city, they have considerable facilities of this sort available, and in at least one case they were made use of over a year ago.

One needs no imagination to appreciate what the radio broadcast will mean to the farmer and to persons in isolated locations. A case came to my notice only recently where a surveyor left for the Northwest of Canada equipped with a wireless receiver for taking the broadcasted time signals to check his chronometer. He incidentally arranged with a friend having control of a broadcasting station to listen-in each night at a stated time for the news headlines and a little music. One can picture this lonely surveyor doing a two-step before his wireless receiver in the presence of a lonely landscape, brightened only by the fire kindled to cook his pork and beans.

I am not sufficiently venturesome to hazard any opinion as to what use the radio broadcast might be put in a general election, but it has already in Canada rendered very valuable service as a means of disseminating the results. Its application to merchandising is a very moot question, and we are continually turning down attractive propositions to introduce by radio some new brand of merchandise. In this connection, I thought it might interest your Association to know the official attitude to this matter, and I therefore wrote to Ottawa asking for an expression of opinion. I have this morning received from Commander C. P. Edwards, the Director of the Radio Service of Canada, the following notes which, with your indulgence, I will read:—

"Radio broadcasting is in its infancy, and the question of direct advertising is one which will have to be dealt with in the near future.

"Canada has, so far, taken no direct action in regard to advertising, and, up to the present, has not forbidden it. Should, however, the majority of the public installing 'receiving' sets indicate to the Department that they do not want to listen to advertising, then, having regard to the fact that the number of wavelengths available for broadcasting service is so distinctly limited, the Government will undoubtedly pass regulations forbidding the use of this new medium for straight advertising purposes.

"In view of this contingency, licensees who are taking out broadcasting licenses at the present time, are being warned that if they instal their sets for no other purpose than to advertise their wares, they must not be surprised if such a regulation is passed at any time.

"There is every indication from experience so far gained that the public do not want to listen to advertising; they want to be amused, and, it is worthy of note that the big commercial companies in the United States who are operating broadcasting stations have eliminated all advertising from their programmes.

"It is possible that the 'toll' broadcasting station may provide a useful means for limited indirect advertising. To make such a service successful it would be necessary to place them on a wavelength all by themselves, so that if the public did not want to listen to what they had to say, they could shift over to another wave length and cut them out.

"It is observed that the better class of moving picture houses have entirely eliminated advertising slides from their programmes, and that any film containing advertising matter is far from being appreciated by moving picture audiences, and by analogy the radio audience is likely to prove equally hostile to direct advertising by means of the radio broadcast.

"The United States Committee appointed to advise the Secretary of Commerce in regard to radio matters and representing all classes of radio interests, made the following recommendation in regard to advertising:—

"It is recommended that direct advertising in radio broadcasting service be absolutely prohibited, and that indirect advertising be limited to a statement of the call letters of the station and of the name of the concern responsible for the matter broadcasted, subject to such regulations as the Secretary of Commerce may impose."

"The British manufacturers and wireless interests appear to be of the same opinion."

This official attitude, as expressed by Commander Edwards is, I submit, thoroughly broadminded and logically sound.

I do not consider that radio broadcasting should be any source of alarm to manufacturers and dealers in phonographs, etc., because their business organizations can be so readily adapted or extended to embrace the radio field and gramophone manufacturers will no doubt do a considerable business in radiophone receivers fitted into cabinets.

I have no definite information about broadcasting in France, but I understand that it is being extensively practised there. In England, there are not yet any regular broadcasting stations, as we know them, but a considerable number of amateurs spread over England take advantage of the operation of an excellent broadcasting station in Holland.

The proposal in the United Kingdom is to license a limited number of broadcasting stations to operate between 5.00 and 11.00 each day, Sundays excepted, but I believe no such licenses have yet been issued. Fortunately, in Canada, the Government adopts a very broadminded attitude to radio broadcasting, being governed by the idea that it is best to start with as few restrictions as possible and apply them only as experience suggests.

Needless to say, the development of radio broadcasting has a greater significance for Canada than for perhaps any other country in the world, and one of the most important results will be that within a few months at least half a million square miles of territory now regarded as isolated, will become an attractive territory to prospective settlers, to whom life would be impossible if they were entirely out of touch with the culture of civilization, which, to so many, is expressed in terms of news and music.

Now what are the serious uses to which this radio broadcasting may be put? Obviously, there are many. The farmer will be able to get regular weather reports, market prices, and also from time to time will be able to listen to lectures by distinguished experts on agricultural topics. The problem of the village school will be greatly simplified, as the lectures of distinguished professors at the city colleges will be available at first hand in every school.

The time may come when the small village church will borrow its music from the city church some hundred miles away. For that matter, it may also borrow its sermon, and rely for its "local color" on the collection.

The present novelty and consequent enthusiasm will of course diminish somewhat; but, as it diminishes, the utilitarian aspect of broadcasting will surely come more and more to the fore.

One important point must always be borne in mind, and that is that, power for power, radiotelephony has only about half the range of radiotelegraphy, and that, as compared with telegraphy, telephony is a slower and less positive means of conveying intelligence.

Another point to be borne in mind is that the radiotelephone message does not make a visual record possible, and does not lend itself very readily to an aural record; whereas, it is now very simple to record a wireless telegraph message and the apparatus is neither costly to install nor difficult to operate. By the same means and at no excessive cost, the wireless telegraph message may now be automatically printed in Roman characters.

When these various points are considered, it will, I think, be evident that the mechanism being available, there is a great field for the commercial broadcasting of useful information to subscribers only, and the mechanism is available.

I have here an instrument which was largely developed in Canada, and which, I believe, has never previously been demonstrated to the public. It is called the Hall Air-Jet Relay. By means of this instrument, in conjunction with the standard Marconi equipment, it is possible to secure a tape record of any telegraph signals which are of sufficient strength to be even indistinctly audible on a telephone receiver. It is capable of recording wireless telegraph messages at a speed much above that at which the messages can be read by ear, and I have no doubt that some day it will come to be used in connection with a commercial broadcasting service such as I have already referred to. Incidentally, you may like to note that the signals are recorded by a Canadian-made Waterman pen.

The procedure will probably be as follows:—

At a given time each day, market reports, for instance, will be broadcasted at high speed, and the broadcasting company will lease to subscribers the necessary equipment to enable them to take advantage of the service. Suppose the broadcast is due at 6.00 p.m. daily. At a minute or two to six, some person at each receiving station will check all the predetermined adjustments and start the tape running. Alternatively, it will be an easy matter to arrange for the automatic starting and stopping of the tape by the transmitting station. The result will be that there will be a visual record of the broadcasted information, which information will be available only to persons equipped with the necessary recorder and can be read at leisure.

Take the case of a farmer; he might be out around his farm when the message was received. For the first few days he would decipher the message by the aid of his Morse Code Card, but any person may learn to read the Morse Code in about an hour, and consequently the farmer would not need his card after the first few days; moreover, he would be able to file away his tape record for future reference.

Conditions here in this building are about as bad as they possibly could be for a demonstration of this kind; as there are electrical elevators near at hand and street cars are continually passing within a few feet of us; and you will note also that we are not using any exterior

aerial. You may judge from this of the practicability of the use of this device when installed under the comparatively ideal radio conditions which are found at a farm.

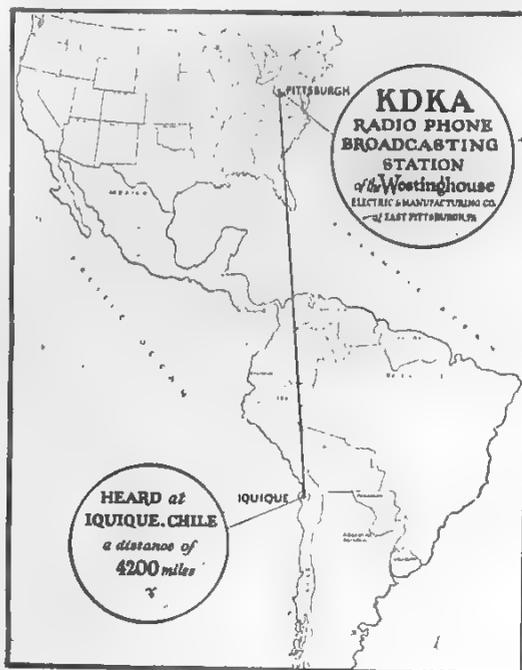
KDKA IS FIRST AMERICAN RADIOPHONE STATION HEARD SOUTH OF THE EQUATOR

KDKA, the radiophone broadcasting station of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., first station in the world to broadcast concerts on a schedule basis and pioneer in feature broadcasting, has established a new record. It has been the first of the American radiophone stations to be heard south of the Equator, having been picked up by a ship operator while in the port of Iquique, Chile.

The news that KDKA had been heard so far south—Iquique is approximately 4,200 miles from East Pittsburgh, Pa.—was conveyed in a letter written the radio division of the Westinghouse Company by Mr. Frank E. Reb, chief operator of the S.S. Santa Luisa, who caught the signals.

It is quite possible that other call letters, which Mr. Reb states in his letter sounded like WFD, were WJZ, the call of the Westinghouse Radio Corporation station at Newark, N.J. In any event Mr. Reb heard two Westinghouse stations, KDKA and WJZ, the same night, both of which are located over 4,000 miles from Chile.

KDKA, whose call letters are never mistaken, has made history in radio broadcasting. Starting as the pioneer, every time a new feature was introduced, it was usually KDKA, or one of the other Westinghouse stations, which was responsible. Now that it has been heard over such



an enormous distance, some of the predictions made as to long distance phone transmitting may not look so improbable. It appears that every day opens some new possibility for the radiophone.

Instead of soldering connections in the aerial, an ordinary clean splice joint can be made, covered with tin foil and then taped. This will keep out moisture and last a long time.

Suggestions Contained in Circular Letter Issued by U. S. Bureau of Standards Department of Commerce

PROPOSED REVISION OF RULE 86 OF THE "NATIONAL ELECTRICAL CODE" ON RADIO EQUIPMENT

The following requirements were submitted as proposed revisions of Rule 86 National Electrical Code:

86 Radio Equipment.

NOTE: These rules do not apply to Radio Equipment installed on shipboard.

IN SETTING UP RADIO EQUIPMENT ALL WIRING PERTAINING THERETO MUST CONFORM TO THE GENERAL REQUIREMENTS OF THIS CODE FOR THE CLASS OF WORK INSTALLED AND THE FOLLOWING ADDITIONAL SPECIFICATIONS:

FOR RECEIVING STATIONS ONLY.

Antenna.

(a) Antennas outside of buildings shall not cross over or under electric light or power wires of any circuit of more than six hundred (600) volts or railway trolley or feeder wires nor shall it be so located that a failure of either antenna or of the above-mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

Antennas shall be constructed and installed in a strong and durable manner and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

Splices and joints in the antenna span, unless made with approved clamps or splicing devices, shall be soldered.

Antennas installed inside of buildings are not covered by the above specifications.

Lead-in Wires.

(b) Lead-in wires shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively, and in no case shall they be smaller than No. 14, B. & S. gauge, except that approved copper-clad steel not less than No. 17, B. & S. gauge, may be used.

Lead-in wires on the outside of buildings shall not come nearer than four (4) inches to electric light and power wires unless separated therefrom by a continuous and firmly-fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

Lead-in wires shall enter building through a non-combustible, non-absorptive insulating bushing.

Protective Device.

(c) Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside) as near as practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust of flyings of combustible materials.

The protective device shall be an approved lightning arrester which will operate at a potential of five hundred (500) volts or less.

The use of an antenna grounding switch is desirable, but does not obviate the necessity for the approved protective device required in this section. The antenna

grounding switch if installed shall, in its closed position, form a shunt around the protective device.

Protective Ground Wire.

(d) The ground wire may be bare or insulated and shall be of copper or approved copper-clad steel. If of copper the ground wire shall be not smaller than No. 14, B. & S. gauge, and if of approved copper-clad steel, it shall be not smaller than No. 17, B. & S. gauge. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for grounding protective devices. Other permissible grounds are grounded steel frames of buildings or other grounded metallic work in the building and artificial grounds such as driven pipes, plates, cones, etc.

The ground wire shall be protected against mechanical injury. An approved ground clamp shall be used wherever the ground wire is connected to pipes or piping.

Wires Inside Buildings.

(e) Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than two (2) inches to any electric light or power wire unless separated therefrom by some continuous and firmly fixed non-conductor, making a permanent separation. This non-conductor shall be in addition to any regular insulation on the wire. Porcelain tubing or approved flexible tubing may be used for encasing wires to comply with this rule.

Receiving Equipment Ground Wire.

(f) The ground conductor may be bare or insulated and shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively under existing conditions, and in no case shall the ground wire be less than No. 14, B. & S. gauge, except that approved copper-clad steel not less than No. 17, B. & S. gauge, may be used.

The ground wire may be run inside or outside of building. When receiving equipment ground wire is run in full compliance with rules for Protective Ground Wire, in Section (d), it may be used as the ground conductor for the protective device.

DISCUSSION AND EXPLANATION OF THE ABOVE PROPOSED REVISION OF RULE 86 ON RADIO EQUIPMENT

These rules do not apply to radio equipment installed on shipboard, but have been prepared with reference to land stations.

Receiving Equipment.

(a) *Antenna.*—Indoor receiving antennas are not included within the requirements of this proposed rule, which provides for the protection of radio equipment against lightning. Indoor receiving antennas and auxiliary apparatus are, however, included in the general requirements covering the wiring of signal systems, for it is obviously desirable to insure, for example, the freedom of all receiving apparatus from contact with electric power circuits either inside or outside of buildings.

It is desirable that electrical construction companies install radio antennas and apparatus for persons who are

not familiar with electric wiring. This will tend to insure the installation of antennas and apparatus in a strong and durable manner. It is important that antenna wire be used in such size and tensile strength as to avoid its coming in contact with any electric power wires whatsoever.

The size and material of which the antenna is made should depend, to some extent, upon the length of the span which the antenna must bridge. It is suggested that for the ordinary receiving antenna about 100 feet long No. 14, B. & S. gauge, soft drawn copper wire can safely be used. If other materials are used, the size which is chosen should be such as to insure tensile strength at least equal to that of the No. 14 soft copper wire suggested above.

The requirements covering splices and joints in the antenna span are for the purpose of avoiding accidental falling of such wires upon light or power wires, of less than 600 volts, where it is found necessary to cross such lines. The rules, it will be noted, permit crossings with lines of 600 volts or less, if they do not happen to be trolley wires or feeders to trolley wires. In such a case, it is desirable to use wire of a larger size than No. 14, B. & S. gauge, in order to minimize the chance of accidental contact of the antenna with the power wires.

The interchangeable use of copper and of approved copper-clad conductor is suggested on account of the fact that these two kinds of wire are practically equivalent in their conductivity for high-frequency current.

(b) *Lead-in Wires.*—No mention is made of the insulation from the building of the receiving antenna or lead-in wire except that this lead-in wire should be run through a bushing. The latter provision is chiefly to protect the wiring against the possibility of short-circuiting with electric power lines which may run in the wall and whose location may be unknown to the persons installing the radio equipment. This requirement serves also to protect the antenna lead-in wire against contact with metal lath or other metal parts of the building.

From a signaling standpoint, it is desirable to use insulators for receiving antennas in order that wet weather may not cause the antenna to become partly short-circuited to the ground.

(c) *Protective Device.*—The requirement for a protective device to be connected between antenna and ground terminals of the receiving set is for the purpose of carrying lightning discharges or less violent discharges caused by induction or by atmospheric electricity to the ground with a minimum chance of damage to the receiving apparatus, building, or operator. A fuse is not required as a part of the protective device, though lightning arresters which are provided with fuses will not necessarily fail to receive approval. If a fused lightning arrester is used, it makes it less likely that the antenna terminal of a receiving set will be put at a high voltage in case the antenna falls upon an electric light or power wire. The absence of the fuse, on the other hand, makes it possible for the antenna, if it accidentally falls across the power wires, to become fused at the point of contact and thus fall to the ground and eliminate the hazard. The antenna terminal of the receiving set should be connected to the point of junction of the fuse with the arrester.

Lightning arresters may be used inside the building, and in such a case they will receive better protection from moisture and mechanical injury than lightning arresters placed on the outside of a building wall.

Protective devices of reliable manufacture are approved by the Underwriters' Laboratories, and can be depended

upon to operate at the required voltage. The use of a cheaply constructed home-made arrester is not recommended, since it may easily get out of order and fail to operate at the low voltage which is desirable. Arresters should be enclosed in such a way as to protect the breakdown gap from dust. One disadvantage of the vacuum tube type of arrester is that it may cease to function without giving warning that it is inoperative. A list of the approved protective devices and ground clamps is contained in the "List of Inspected Electrical Appliances," published by the Underwriters' Laboratories. This list is revised semi-annually and may be consulted upon application to the principal office of the Underwriters' Laboratories, Inc., 207 East Ohio St., Chicago, Ill., and at offices and agencies throughout the United States and Canada.

While an arrester connected between the antenna and ground is regarded by many as sufficient protection, it is somewhat safer to install a switch in parallel with it as an added protection. Particularly if the arrester is inside of the building and the ground connection is made to a radiator, it is desirable to use in addition the outside ground connection.

If the antenna is properly connected to the ground, such connection prevents the antenna from becoming a hazard to the building and its contents and may act to supplement the protection given by lightning rods. The arrester should have the most direct connection to the ground which it is feasible to make, otherwise the antenna may become a hazard with respect to lightning.

(d) *Protective Ground Wire.*—While it is desirable to run the protective ground wire in as direct a line to ground as possible, it is more important to provide a satisfactory contact at the ground itself than to avoid a few bands in the ground wire.

(f) *Receiving Equipment Ground Wires.*—If the ground wire of a receiving set passes through a wall, it should be insulated for the same reasons as the antenna lead-in wire referred to in paragraph (a) above.

If the ground wire is exposed at all to mechanical injury it should be of larger size than the minimum permitted under the rules and certainly not smaller than No. 10, B. & S. gauge. It should, for mechanical protection, be enclosed in wood moulding or other insulating material. Ground wires should not be run through iron pipe or conduit because of the choking effect at radio and lightning frequencies.



Balance to Come.

Drawn by "Radio" Staff Artist—Sherlock.

How to Build Amplifying Transformer

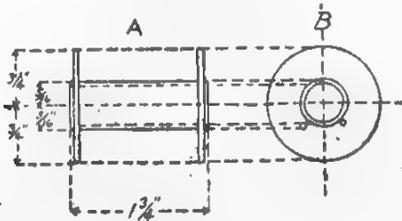
By F. D. Pearne

As a rule, the real radio fan likes to make his own apparatus, as it is an education to him.

I will explain how to make an amplifying transformer having a ratio of 4 to 1, which may be used in connection with an audion detector.

First procure a piece of fibre tubing $1\frac{1}{4}$ inches long, $\frac{3}{8}$ of an inch outside diameter, and having a $1/16$ -inch wall. Square the ends with a file, and then cut out two fibre discs $1\frac{1}{2}$ inches in diameter from a piece of black sheet fibre $1/16$ of an inch thick. Drill a hole $\frac{5}{8}$ of an inch in diameter in the centre of each of these discs and force them on to the ends of the tube as shown at "A," figure 1.

FIGURE 1



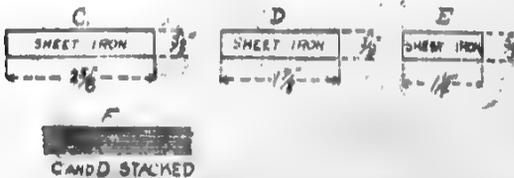
This is the spool upon which the wire is to be wound. In one of the discs, drill two holes with a No. 53 drill, one of which is placed as close to the fibre tube as possible, and the other just opposite, at a distance of $3/16$ of an inch from the tube, as shown at "B," figure 1.

Winding of Coil

In the other end drill two holes of the same size, one of which is $3/16$ of an inch from the tube, and the other opposite and as close to the outside edge as possible without breaking through. Wind the inside coil on the spool by putting the wire, No. 39 enamel insulated, through the inside hole, leaving about six inches of the wire protruding from the fibre end.

Wind 4,000 turns, and then put the end of the wire through the other hole in the same end, also leaving about six inches of wire protruding for connections. Next start the secondary winding. After putting a layer of paper over the first coil, proceed with the secondary winding, which is placed directly on top of the first coil.

FIGURE 2



The terminals of this coil are put through the small holes in the other end. This coil consists of 16,000 turns of the same kind and size of wire used on the first coil.

Covering for Coil

When the winding is completed the coil should be covered with a layer of binder's cloth, fastened with a little paste. The coil is now finished and the next step is the construction of the iron core and the brackets. For this you will require some very thin, soft sheet iron. Silicon steel is the best, but as that is out of the reach of most of our readers, soft iron will have to be used. This should be $.018$ of an inch or less in thickness. Cut out

enough pieces $2\frac{3}{8}$ inches long and $\frac{3}{8}$ inch wide to stack up in a pile $\frac{3}{8}$ of an inch high when tightly pressed together. The drawing of this is shown at "C," figure 2. Cut the same number of pieces $1\frac{7}{8}$ inches long and $\frac{3}{8}$ of an inch wide, as shown at "D," figure 2. Now cut enough pieces $1\frac{1}{4}$ inches long and $\frac{3}{8}$ wide to stack up $\frac{1}{4}$ of an inch high.

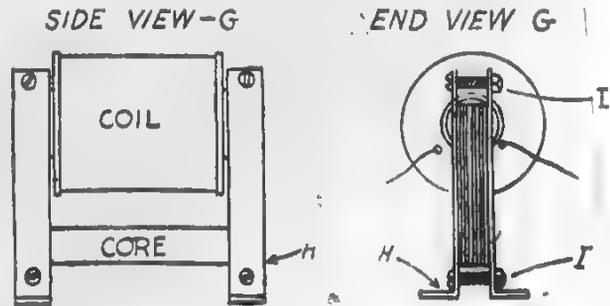
Construction of Core

Now make up the core which is to go inside the spool by stacking first one of the pieces "C" and then one of the pieces "D," as shown at "E," figure 2, using enough of the pieces to make a core $\frac{3}{8}$ of an inch square. Press these together tightly and bind them together with a layer of tape, being careful to see that the tape only covers the solid part of the core and does not extend out over the ends of the short pieces. Now build another core just like the first one and tape it up in the same way.

When this is finished, put one of the cores through the tube of the coil, and if the instructions have been carefully followed the short pieces will extend out of both ends of the tube about $1/16$ of an inch and the long ones will protrude $7/16$ of an inch. Now place the bottom core in the position shown in the finished transformer "G" and build up the ends of the core with the pieces "E."

Place one of these pieces between two of the long pieces of the bottom core and let it come just even with the bottom of the long piece on the top core; the next piece goes between the long pieces of the top core and

FIGURE 3



just comes even with the long piece on the bottom core. Continue this way until the entire core is assembled.

After the assembling is well under way, the core will hold itself together, with the exception of the pieces on the outside, which can be slipped into place when the brass brackets are put on.

These brackets are made of brass strips $\frac{3}{8}$ inch wide and $1/16$ inch thick bent into the shape shown at "H," figure 3, which are clamped to the sides of the transformer by means of 8-32 brass machine screws and nuts as shown at "I." This transformer will give excellent results if the directions are carefully followed.

The power used, the weather, season of year, skill of the operator and the quality of the receiving instrument, are all factors in the distance a transmitting station can send its message.

Radio in Free Ballooning

By C. D. Wagoner, General Electric Company.

Radio in free ballooning was used for the first time in the U. S. National Balloon Race which started from Milwaukee May 31. The test proved highly successful and materially aided Major Oscar Westover, ranking army pilot in the race, to win, according to word received from him a few hours after he landed 300 miles north of Quebec at Lake St. Jean. His distance was 850 miles from the starting point, or more than 300 miles greater than that covered by any of the other eleven contestants.

Experiments made in a hotel room at Milwaukee previous to the race and after the apparatus had been installed in the balloon, proved the practicability of using radio in a balloon. Having no precedent to go by, tests made in providing a ground for the radio set were interesting. Two plans were suggested. One was to use a wire of equal length of the antenna and dropped from the opposite side of the basket. The other was of lining the basket with copper mesh wire. The latter proved entirely successful in tests, and was adopted in Major Westover's balloon.

For the test, 15 feet of copper wire similar to that used for fly screening, was secured. The ends were soldered together, making a loop of sufficient size to line the balloon basket. This was stretched about chairs and thus insulated from the floor of a room on the seventh floor of a Milwaukee hotel. One hundred and twenty-five feet of aerial was dropped from the hotel window, which gave conditions about the same as when the outfit would be installed in the balloon. Musical programmes were picked up, and several code stations heard, which proved it workable.

The next move was to the balloon park. After the wire had been placed in the basket, and a thousand pounds or so of wet sand ballast piled in alongside it, another test was made, and again signals were received. So with this copper screening lined inside the basket for the counterpoise or ground and 125 feet of aircraft aerial wound up in readiness to drop from the side of the basket, the outfit was ready.

A standard two-stage G-E receiving set with ordinary head phones, since there is no noise in ballooning, was used. Major Westover thoroughly acquainted himself with the use of the apparatus with tests in the hotel and understood how to adjust the various knobs, etc., to pick up the various broadcasting stations, which had promised to send him special weather reports at noon and midnight each day until he came down.

Major Westover has not yet made a complete report on the use of the set, but in his telegram from Lake St. Jean, sent the day he landed, he said:

"Tested set satisfactorily. For code message it proved excellent. Will write when I return to the States."

His report, which will probably relate use of the set at high altitudes and under other peculiar conditions, is awaited with interest by radio engineers.

First plans had been made to use this radio set in Ralph Upson's balloon. For a month or more, Upson had quietly discussed the possibilities of installing a radio outfit and having special weather reports broadcasted him while in the air. Until two days before the start of the race, none of the other contestants knew of his plan or are believed to have thought of using radio. Yet after having made all these arrangements, he sacrificed the radio outfit to Major Westover because the officer offered him the use of an

extra gas bag the army had on the field to use in case of emergency. This may have caused Upson to lose the race. Although ranking as the foremost civilian balloonist in the world, Upson in this race dropped about 300 miles from the starting point and did not even qualify as an entry in the international race to be held in Switzerland, a reward coveted far above the money prize of the national race.

Upson was offered both a sending and a receiving set, but because of weight, accepted only the receiving set. A sending apparatus, which involved a 24 volt storage battery and a motor generator, weighs about 150 pounds. The receiving outfit weighed but 50 pounds with a 20 ampere hour battery.

But Upson encountered eleventh-hour trouble. His gas bag, supplied him by the Michigan Aero Club, which he represented in the race, was so full of holes that repairing was considered by some an impossibility. Yet Upson, uncomplaining, worked night and day with his aides in patching the holes and hoping he could get the balloon in readiness for the getaway on schedule. Monday afternoon, two days before the race, found him with his aides still busy in this patchwork out in the big shed at the Wisconsin state fair grounds. All balloons were scheduled to be at the baseball park the next night, ready to be inflated, and Army officers, realizing that Upson had but one chance in a hundred to get his bag into condition, asked him if he would not use a spare gas bag they had brought with them. He accepted on one condition, that of giving them his radio set—the thing he had planned on for weeks

KEEP
YOUR
CANADIAN DOLLARS

CIRCULATING
IN CANADA

ATTENTION

RADIO JOBBERS

RADIO MANUFACTURERS

We Are Equipped To Fabricate Radio Accessories And Crystal Receivers For You. Our Facilities Are Being Rapidly Expanded.

Submit Sample Apparatus To Us And We Will Estimate Upon Same, Quoting Quantity Prices For Continuous Future Delivery

CARON BROTHERS (INC.)

233 BLEURY ST.
MONTREAL

to use and which he considered one of his most valuable assets in connection with his hopes of winning the national race.

So the General Electric radio set, a two-stage amplifying apparatus with a receiving radius of 1,000 miles or more, was transferred to the balloon to be piloted by Westover. At first he would not consider the sacrifice he believed Upson was making, and only accepted when Upson declared:

"Major, you take this. I have already arranged for

another. I want you to get accustomed to using it so you will know how to receive signals before the race starts. My other set will be here to-morrow (Tuesday) morning."

Whether or not any such arrangements had been made by Upson I was unable to learn, but it was not until noon Wednesday, the day of the race, that he did get a radio set, which was hurriedly installed in the few hours that remained when everything was excitement about the balloon field. How well it operated I have not learned.

Theory of Wireless Explained by Expert

By H. E. BUSSEY, District Engineer, General Electric Company.

There was a time, not far back, when what the man of science, the physicist, the engineer, and the chemist, had to say, had interest for few people. That time is no more. The layman has come to realize that the work of these men is not all dry plodding, but is full of romance of greater interest than any novel. The scientist has pulled aside the veil, revealing many things in nature's storehouses.

I have been asked to write on the subject of wireless-radio. The coming of the radio telephone has popularized the subject to an undreamed-of extent, and there are many people who are just beginning to take up the use of receiving sets, to whom I shall speak, as well as the more advanced amateurs.

Many ask how the voice travels through space. Frankly, I don't know. There are many theories about it, and the general laws governing radio transmission are well understood, but the exact way the waves travel no one as yet knows. We know that they travel at the same speed as light—186,000 miles per second—or, in metric units, 300,000,000 meters per second (a meter being about 39 $\frac{1}{2}$ inches).

What is wave length? Another frequent question. It is the distance from the crest of one wave to the crest of the next one—just as in waves in the water of the ocean.

What is meant by tuning in a station? That is a very innocent-sounding one, but difficult to make clear to one not having a thorough knowledge of electricity, but here goes: We are all familiar, more or less, with the nature of sound waves. We know that as the number of vibrations per second in a violin string are increased by tightening the string the pitch of the note produced by bowing or plucking the string increases, or, conversely, the pitch gets lower in the musical scale if the string is loosened; that is, the frequency (number of complete vibrations per second) is varied by "tuning" the violin string. When we get the rate on the string on another instrument, piano, violin, etc., even though several yards away, the second string will give out a faint note when the first is bowed or plucked, then the two strings are said to be in resonance. Remember that word.

The only apparent difference between sound waves and radio waves is that of speed and frequency of vibration. Let us say that The Journal's broadcasting station is sending on a wave of 360 meters. This corresponds to 833,300 complete vibrations per second. Now, if we adjust our receiving set to that same pitch, or frequency, or wave length, we get what they are sending, and the set does not respond to other stations sending on different wave lengths.

We do not, of course, tighten or loosen a string, as in the case of a musical instrument, but electrically we do the same thing by adjusting the knobs, which in turn control the rate of vibration or time, to which we wish to respond, and the set is in resonance with the sending station.

Another question: What does the vacuum tube or detector do? You have noticed that the V. T. contains three things—a filament like an ordinary incandescent lamp, a lot of little wires called the grid, and outside of that, the plate. There is quite a long and interesting story in one of these little bottles, but how they work may be explained without going too deeply into that. Any hot body (the filament when lighted) sends off at enormous speed a swarm of small individuals called electrons. In a vacuum tube, these, in effect, render the space between the filament and the plate more or less conducting, depending on how many of these electrons reach the plate after being shot out from the filament. We have a local battery of from 20 to 100 volts connected with its positive end to the plate and the negative to the filament. The phones are in series with this circuit.

The part played by the grid is to form a variable gate through which the electrons pass to the plate, and the amount the gate is opened or closed depends on the variations of the radio waves coming in, thereby causing the power of the local plate battery to be utilized to give a much louder signal than would be possible with the energy of the signal alone.

In other words, the grid action is like that of a very small man working the handle of an elevator. The man himself cannot exert even a small fraction of the effort to lift the weights that he can easily control from the elevator handle by turning on and off the electric power at the proper times.

To illustrate, we will say that a small disturbance is set up in the antenna by distant transmitting station, and to all intents and purposes, goes down through the variable tuning condenser and the primary coil of the tuner to ground. By what is called magnetic induction, this small disturbance communicates itself to the secondary winding of the tuner and passes from the secondary through a small condenser to the grid. It is as yet a very minute disturbance or signal, and would not have sufficient power to operate the phones and make an audible sound, but due to the action of the audion or vacuum tube previously described, the small disturbance on the grid is exactly repeated in the plate circuit through the phones and battery, very much amplified.

Toronto Star Opens New Broadcasting Station

On the night of Thursday, June 22nd, the Daily Star broadcasted its first programme on the new set which has been installed in their building. Up to this time The Star had been broadcasting from the Canadian Independent Telephone Company, under the call sign, CKCE; the call sign which they now use is CFCA. The programmes are broadcasted nightly at 7 p.m. on a wave length of 400 metres. In tests this station has been heard at a distance of from five to seven hundred miles. This means that not only are the Ontario fans able to listen in on a select musical programme, but that the same concert is heard by thousands of fans in the States of New York, Pennsylvania, Vermont, New Jersey, Michigan, Wisconsin, Indiana, etc.

Some idea of the energy which will be radiated from

CFCA may be gained from the fact that it will use four 500-watt DeForest vacuum tubes, as oscillators, with two 250-watt DeForest tubes as modulators. The power equipment employs a five horse-power Crocker-Wheeler motor to run a 2,000-volt generator, for supplying current to the plates of the oscillating tubes, and another 20-volt generator for supplying current to the filaments of the tubes!

The modulator tubes get their current from an 18-volt storage battery, which are recharged by another part of the apparatus when necessary. The antenna is a five-wire, T type, supported by two 80-foot steel towers, which cover an area of 441 feet of the Star Building roof. The length of each of the five wires of the antenna is 200 feet. This means that, when the lead-in of 100 feet is included, 1,500 feet of wire is used in the aerial. In tests the current on the antenna has averaged over six amperes.

The broadcasting studio is suitably draped and carpeted, to comply with requirements of a modern transmitting station. The motors are housed in a sound-proof vault, and the transmitter itself is in a separate sound-proof room. In the studio itself the only radio apparatus will be a microphone.

In addition to the transmitting set, a long-range receiving outfit will be used, enabling communications from the principal high powered stations of Europe, America, and in fact, all over the western hemisphere, to be heard.



Toronto Star's Aerial

RUDOLPH SCHMIDT & Co.

District Headquarters for

All Standard Wireless Apparatus

WHOLESALE AND RETAIL

Catalogue on request.

81 E. MAIN STREET

ROCHESTER, N. Y.

PATENTS

PROCURED in ALL Countries.

Long Experience in Patent Litigation.

Send for Hand Book. Phone Main 2552

RIDOUT & MAYBEE

Kent Building, Yonge Street

TORONTO, CANADA

PATENTS

HERBERT J. S. DENNISON

Mechanical Engineer and Registered Attorney

Expert in Patents, Trade Marks, Designs, Copyrights and Infringements.

Over 30 Years' Experience in Patents and Practical Engineering.

KENT BUILDING,

YONGE and RICHMOND STS.,

TORONTO

"Say it with Flowers"

H. G. DILLEMUTH

123 King Street West

Toronto

Complete List N. American Broadcasting Stations

CANADIAN BROADCASTING STATIONS

Montreal		Name		Wavelength	Call Signal
Name	Wavelength	Call Signal	Name	Wavelength	Call Signal
Marconi Company	440 metres	CFCF	Geo. Melrose Bell	430 metres	CFAC
Dupius Freres	420 "	CJBC	Albertan Publishing Co.	410 "	CHBC
Northern Electric Co.	410 "	CHYC	Western Radio Co.	400 "	CHCQ
La Presse	430 "	CKAC	Edmonton		
			The Journal	450 metres	CJCA
			Nelson, B.C.		
Toronto			J. G. Bennett	400 metres	CJCB
Independent Tel. Co.	450 metres	CKCE	St. John, N.B.		
Marconi Company	440 "	CHCB	McLean, Holt & Co.	400 metres	CJCI
Evening Telegram	430 "	CJSC	Winnipeg		
Globe	420 "	CHCZ	Geo. Melrose Bell	430 metres	CHCF
T. Eaton Co.	410 "	CJCD	Lynn V. Salton	420 "	CKZC
Star	400 "	CFCA	Manitoba Free Press	410 "	CJCG
Metropolitan Motors	410 "	CHVC	Tribune	400 "	CJNC
Simons Agnew Company	410 "	CJCN	Regina		
			Geo. Melrose Bell	420 metres	CKCK
London			Vancouver		
Radio Shoppe	410 metres	CHCS	Marconi Company	440 metres	CFCB
Radio Supply Co.	410 "	CKOC	Geo. Melrose Bell	430 "	CHCA
Free Press	430 "	CJGC	Vancouver Daily Sun	420 "	CJCE
Hamilton			Vancouver Daily Province	410 "	CKCD
Wentworth Radio Supply Co.	410 metres	CKOC	Vancouver World	400 "	CFYC
Ottawa			Halifax		
J. R. Booth, Jr.	400 metres	CHXC	Marconi Company	440 metres	CFCE
Fort Frances, Ont.			Eastern Telephone & Tel. Co.	410 "	CJCS
International Radio Dev. Co.	400 metres	CFPC			
Calgary					

UNITED STATES BROADCASTING STATIONS

Owner of Station and Location	W. Lengths	C. Signal	Owner of Station and Location	W. Lengths	C. Signal
Alabama Power Co., Birmingham, Ala.	360	WSY	DeForest Radio Telephone & Telegraph Co., New York, N.Y.	360	WJX
Aldrich Marble & Granite Co. C.F., Colorado Springs, Colo.	485	KHD	Deseret News, Salt Lake City, Utah	360	KZN
Allen, Preston, D., Oakland, Calif.	360	KZM	Detroit News, Detroit, Mich.	360, 485	WWJ
Altadena Radio Laboratory, Altadena, Calif.	360	KGO	Detroit Police Dept., Detroit, Mich.	360	KOP
American Radio & Research Corporation, Medford Hillside, Mass.	360	WGI	Diamond State Fibre Co., Bridgeport, Pa.	360	WBAG
Anthony, Earl C., Los Angeles, Calif.	360	KFI	Doerr-Mitchell Elec. Co., Spokane, Wash.	360	KFZ
Arrow Radio Laboratories, Anderson, Ind.	360	WMA	Doran Brothers Elec. Co., Hamilton, O.	360	WRK
Atlanta Constitution, Atlanta, Ga.	360, 485	WGM	Doubleday-Hill Elec. Co., Pittsburgh, Pa.	360	KOV
Atlanta Journal, Atlanta, Ga.	360, 485	WSB	Double-day-Hill Elec. Co., Washington, D.C.	360	WMU
Atlantic-Pacific Radio Supplies Co., Oakland, Calif.	360	KZY	Duck Co., William B., Toledo, Ohio	360	WHU
Auburn Electrical Co., Auburn, Me.	360	WMB	Dunn & Co., J. J., Pasadena, Calif.	360	KLB
Baumberger & Co., L., Newark, N.J.	360	WOR	Eastern Radio Institute, Boston, Mass.	360	WAAJ
Beacon Light Co., Los Angeles, Calif.	360	KNR	Electric Equipment Co., Erie, Pa.	360	WJT
Benwood Co., St. Louis, Mo.	360	WEB	Electric Lighting Supply Co., Hollywood, Calif.	360	KGC
Bible Institute of Los Angeles, Los Angeles, Calif.	360	KJS	Electric Power & Appliance Co., Yakima, Wash.	360	KOT
Blue Diamond Elec. Co., Hood River, Ore.	360	KQP	Electric Supply Co., Clearfield, Pa.	360	WPI
Bradley Polytechnic Institute, Peoria, Ill.	360	WBAE	Elliott Electric Co., Shreveport, La.	360	WAAG
Braun Corporation, Los Angeles, Calif.	360	KXS	Emporium, The, San Francisco, Calif.	360	KSL
Buckeye Radio Service Co., Akron, Ohio	360	WOE	Eric Radio Co., Erie, Pa.	360	WSX
Bullock's, Los Angeles, Calif.	360	KNN	Examiner Print. Co., San Francisco, Calif.	360	KUO
Bush, James L., Tuscola, Ill.	360	WDZ	Fair, The, Chicago, Ill.	360	WGU
Central Radio Co., Kansas City, Mo.	360	WPE	Federal Institute of Radio Telegraphy, Camden, N.J.	360	WRP
Church of the Covenant, Washington, D.C.	360	WDM	Federal Telephone & Telegraph Co., Buffalo, N.Y.	360, 485	WGR
Chicago, City of, Chicago, Ill.	360	WBU	Fergus Electric Co., Zanesville, O.	360	WPL
Cino Radio Mfg. Co., Cincinnati, O.	360	WIZ	Findley Electric Co., Minneapolis, Minn.	360	WCE
City Dye Works & Laundry Co., Los Angeles, Calif.	360	KUS	Firat Presbyterian Church, Seattle, Wash.	360	KTW
Clark University, Worcester, Mass.	360, 485	WCN	Ford Motor Co., Dearborn, Mich.	360	WWI
Coast Radio Company, El Monte, Calif.	360	KUY	Fort Worth Record, Fort Worth, Tex.	360	WPA
Columbia Radio Co., Youngstown, O.	360	WMC	Foster-Bradbury Radio Store, Yakima, Wash.	360	KFV
Commonwealth Elec. Co., St. Paul, Minn.	360	WAAH	General Electric Co., Schenectady, N.Y.	360	WGY
Continental Electric Supply Co., Washington, D.C.	360	WIL	Gilbert Co., A. C., New Haven, Conn.	360	WCJ
Cooper, Irving S., Los Angeles, Calif.	360	KZI	Gimbel Brothers, Milwaukee, Wis.	360	WAAK
Cosradio Co., Wichita, Kansas	360, 485	WEY	Gimbel Brothers, Philadelphia, Pa.	360	WIP
Cox, Warren R., Cleveland, O.	360	WHK	Gould, C. O., Stockton, Calif.	360	KJQ
Crosley Manufacturing Co., Cincinnati, O.	360	WLW	Groves-Thornton Hardware Co., Huntington, W. Va.	360	WAAR
Daily News Printing Co., Canton, O.	360	WWB	Hale & Co., San Jose, Calif.	360	KSC
Dallas, City of, Dallas, Tex.	360, 485	WRR			
Dayton Co., Minneapolis, Minn.	360	WBAH			

UNITED STATES STATIONS—Continued

Owner of Station and Location	W. Lengths	C. Signal	Radio Construction & Electric Co., Wash- ington, D.C.	
Hallock & Watson Radio Service, Portland, Ore.	360	KGG	Radio Service Co., Charleston, W.Va.	360 WDW
Hamilton Mfg. Co., Indianapolis, Ind.	360	WLK	Radio Shop, The, Sunnyvale, Calif.	360 WAAO
Hathel Electric Co., Indianapolis, Ind.	360	WOH	Radio Telephone Shop, The, San Francisco, Calif.	360 KJJ
Hawley, Willard P., Jr., Portland, Ore.	360	KYG	Radio Supply Co., Los Angeles, Calif.	360 KYY
Herald Publishing Co., Modesto, Calif.	360	KXD	Register & Tribune, The, Des Moines, Iowa	360 KNV
Herrold, Charles D., San Jose, Calif.	360	KQW	Rike-Kumler Co., Dayton, O.	360 WGF
Hobrecht, J. C., Sacramento, Calif.	360	KVO	Keynotes Radio Co., Denver, Colo.	360 WBAM
Hollister-Miller Motor Co., Emporia, Kan.	360	WAAZ	Ridgewood Times Printing & Publishing Co., Ridgewood, N.Y.	360, 485 KLZ
Holzwasser Inc., San Diego, Calif.	360	KON	Riechman-Crosby Co., Memphis, Tenn.	360 WHN
Howe, Richard H., Granville, Ohio	360	WJD	Rocchester Times Union, Rochester, N.Y.	360, 485 WKN
Howlett, Thomas F. J., Philadelphia, Pa.	360	WGL	Roswell Public Service Co., Roswell, New Mexico	360, 485 WFO
Hunter, L. M. & G. L., Carrington, Little Rock, Ark.	360	WSV	St. Joseph's College, Philadelphia, Pa.	360, 485 WHQ
Hurlburt-Still Electrical Co., Houston, Tex.	360, 485	WEV	St. Louis Chamber of Com., St. Louis, Mo.	360 KNJ
Interstate Electric Co., New Orleans, La.	360	WGV	St. Louis University, St. Louis, Mo.	360 WPJ
Iowa Radio Corporation, Des Moines, Iowa	360	WHX	St. Martin's College (Rev. S. Ruth), Lacey, Wash.	360 WAAE
J. & M. Electric Co., Utica, N.Y.	360	WSL	San Joaquin Light & Power Corporation, Fresno, Calif.	485 WEW
K. & L. Electric Co., McKeesport, Pa.	360	WIK	Seeley, Stuart W., East Lansing, Mich.	360 KGY
Kansas State Agricultural College, Manhat- tan, Kansas	485	WTG	Service Radio Equipment Co., Toledo, Ohio	360 KMJ
Karlows Radio Co., Rock Island, Ill.	360, 485	WOC	Ship Owners Radio Service, New York, N.Y.	485 WHW
Kennedy Co., Colin B., Los Altos, Calif.	360	KLP	Ship Owners Radio Service, Norfolk, Va.	360 WJK
Kierulff & Co., C. R., Los Angeles, Calif.	360	KHJ	Shotton Radio Mfg. Co., Albany, N.Y.	360 WDT
Kluge, Arno A., Los Angeles, Calif.	360	KQL	Southern Electrical Co., San Diego, Calif.	360 WSN
Kraft, Vincent I., Seattle, Wash.	360, 485	KJR	Southern Radio Corp., Charlotte, N.C.	360 WNJ
Lindsay, Weatherill & Co., Reedley, Calif.	360	KMC	Spokane Chronicle, Spokane, Wash.	360 KDPT
Los Angeles Examiner, Los Angeles, Calif.	360	KWH	Standard Radio Co., Los Angeles, Calif.	360 WBT
Love Electric Co., Tacoma, Wash.	360	KMO	Sterling Electric Co. & Journal Printing Co., Minneapolis, Minn.	360 KOE
Loyola University, New Orleans, La.	360	WWL	Stix-Baer-Fuller, St. Louis, Mo.	360 KJC
Marshall-Gerkin Co., Toledo, Ohio	360	WBA	Strawbridge & Clothier, Philadelphia, Pa.	360 WBAD
Maxwell Electric Co., Berkeley, Calif.	360	KRE	Stubbs Electric Co., Portland, Ore.	360 WCK
May (Inc.), D. W., Newark, N.J.	360	WBS	T. & H. Radio Co., Anthony, Kansas	360 WFI
McBride, George M., Bay City, Mich.	360	WTP	Tarrytown Radio Research Laboratory, Tarrytown, N.Y.	360 KOY
McCarthy Bros. & Ford, Buffalo, N.Y.	360	WWT	Taylor, Otto W., Wichita, Kansas	360 WBL
Metropolitan Utilities District, Omaha, Neb.	360, 485	WOU	Thearle Music Co., San Diego, Calif.	360 WRW
Meyberg Co., Leo J., Los Angeles, Calif.	360, 485	KYJ	Tulane University of Louisiana, New Or- leans, La.	360 WAAP
Meyberg Co., Leo J., San Francisco, Calif.	360, 485	KDN	Union College, Schenectady, N.Y.	360 KYF
Middleton, Fred M., Morestown, N.J.	360	WBAFG	Union Stock Yards & Transit Co., Chicago, Ill.	360, 485 WAAF
Midland Refining Co., El Dorado, Kansas.	485	WAH	United Equipment Co., Memphis, Tenn.	360 WPO
Midland Refining Co., Tulsa, Okla.	485	WEH	University of Illinois, Urbana, Ill.	360 WRM
Millikin University James, Decatur, Ill.	360	WBAO	University of Minnesota, Minneapolis, Min.	360, 485 WLB
Minnesota Tribune Co. & Anderson Beam- ish Co., Minneapolis, Minn.	360	WAAL	University of Missouri, Columbia, Mo.	360 WAAO
Missouri State Marketing Bureau, Jefferson City, Mo.	485	WOS	University of Texas, Austin, Texas	360, 485 WCM
Modesto Evening News, Modesto, Calif.	360	KDQ	University of Wisconsin, Madison, Wis.	360, 485 WHA
Montgomery Light & Power Co., Montgom- ery, Ala.	360, 485	WGH	Wanamaker, John, Philadelphia, Pa.	360 WOO
Mullins Elec. Co., Wm. A., Tacoma, Wash.	360	KGB	Wanamaker, John, New York, N.Y.	360 WWZ
Mulrony, Marion A., Honolulu, Hawaii	360	KGU	Warner Brothers, Oakland, Calif.	360 KLS
Nelson Co., I. R., Newark, N.J.	360	WAAM	Wasmer, Louis, Seattle, Wash.	360 KHQ
New England Motor Sales Co., Greenwich, Conn.	360	WAAQ	West Virginia University, Morgantown, W.Va.	360 WHD
New Mexico College of Agriculture and Mechanical Arts, State College, N. Mex.	360, 485	KOB	Western Radio Co., Kansas City, Mo.	360, 485 WOQ
Newspaper Printing Co., Pittsburgh, Pa.	360	WPB	Western Radio Electric Co., Los Angeles, Calif.	360 KOG
Noggle Electric Works, Monterey, Calif.	360	KLN	Westinghouse Elec. & Manufacturing Co., East Pittsburgh, Pa.	360 KDKA
North Coast Products Co., Aberdeen, Wash.	360	KNT	Westinghouse Elec. & Manufacturing Co., Chicago, Ill.	360, 485 KYW
Northern Radio & Electric Co., Seattle, Wash.	360	KFC	Westinghouse Elec. & Manufacturing Co., Newark, N.J.	360 WJZ
Northwestern Radio Manufacturing Co., Portland, Ore.	360	KGN	Westinghouse Elec. & Manufacturing Co., Springfield, Mass.	360 WBZ
Nushawg Poultry Farm, New Lebanon, O.	360	WPN	White & Boyer Co., Washington, D.C.	360 WJH
Oklahoma Radio Shop, Oklahoma City, Okla.	360, 485	WKY	Williams, Thomas J., Washington, D.C.	360 WPM
Oregonian Publishing Co., Portland, Ore.	360	KGW	Wireless Phone Corporation, Paterson, N.J.	360 WBAN
Palladium Printing Co., Richmond, Ind.	360, 485	WOZ	Wireless Telephone Co. of Hudson County, N.J., Jersey City, N.J.	360 WNO
Paris Radio Electric Co., Paris, Tex.	360	WTK	Yeiser, John O., Jr., Omaha, Neb.	360 WDV
Pennsylvania State Police, Harrisburg, Pa.	360	WBAX	Y. M. C. A., Denver, Colo.	485 KOA
Pine Bluff Co., Pine Bluff, Ark.	360	WOK	Zamoiski Co., Joseph M., Baltimore, Md.	360 WKC
Pomona Fixture & Wiring Co., Pomona, Calif.	360	KGF		
Portable Wireless Tel. Co., Stockton, Calif.	360	KWG		
Post Dispatch, St. Louis, Mo.	360	KSD		
Precision Equipment Co., Cincinnati, O.	360, 485	WMH		
Precision Shop, The, Gaidley, Calif.	360	KFU		
Prest & Dean Radio Research Laboratory, Long Beach, Calif.	360	KSS		
Public Market & Department Stores Co., Seattle, Wash.	360	KZC		
Purdue University, West Lafayette, Ind.	360	WBAA		

The radiophone to-day takes its place in the list of household conveniences along with the telephone, the gramophone, the electric iron and the vacuum cleaner.

U. S. Department of Agriculture, Weather Bureau

DISTRIBUTION OF WEATHER INFORMATION, FORECASTS, AND WARNINGS BY U. S. NAVAL RADIO FOR THE BENEFIT OF AVIATION AND MARINE INTERESTS

In co-operation with the Office of Communications of the Navy Department, the U. S. Weather Bureau will issue a special bulletin containing surface weather observations from regular Weather Bureau stations, upper air observations from aerological stations maintained by the Navy, Army, and Weather Bureau, and a summary of weather conditions, forecasts and warnings. The bulletin is for the benefit of marine and aviation interests, but is designed especially to meet the needs of the latter. The bulletin will begin June 1, 1921, and will be broadcast from the Naval radio station at Arlington, Va., each morning at 10:30 o'clock (75th meridian time), Sundays and holidays included. This service is in addition to the distribution now being made each night from the Naval radio stations at Arlington, Va., Key West, Fla., Point Isabel, Tex., Great Lakes, Ill., and San Juan, P.R.

Explanation of Bulletin

The bulletin is divided into two parts and invariably begins with the letters USWB (U. S. Weather Bureau). The first part consists of surface weather conditions based upon observations taken at 8 a.m., 75th meridian time, and of upper air observations begun at 7 a.m., 75th meridian time, of the date of distribution. The second part of the bulletin consists of synopsis of general atmospheric pressure distribution, including the locations of high and of low areas, and the barometer readings at their centres; wind and weather forecasts for Atlantic and east Gulf offshore areas; storm and hurricane warnings for these areas; and flying weather forecasts for each of six aviation zones (chart on page 4).

The bulletin will be broadcast from ARLINGTON, VA., at 10.30 a.m., 75th meridian time, each day, (Sundays and holidays included). Wave length, 5,950 meters, CW.

Key Letters and Stations

J —St. Johns, N.F.	AT —Atlanta, Ga.
S —Sydney, N.S.	TA —Tampa, Fla.
CK —Cochrane, Ont.	P —*Pensacola, Fla.
FP —Father Point, Que.	(Upper air Pensacola).
ML —Montreal, Que.	MG —Montgomery, Ala.
E —Eastport, Me.	VK —Vicksburg, Miss.
N —Northfield, Vt.	NO —New Orleans, La.
T —Nantucket, Mass.	LR —Little Rock, Ark.
NY —*New York, N.Y.	GV —Galveston, Tex.
(Upper air Rockaway).	NV —Nashville, Tenn.
AC —*Atlantic City, N.J.	CN —Cincinnati, Ohio.
(Upper air Lakehurst).	PB —Pittsburgh, Pa.
WA —*Washington, D.C.	F —Buffalo, N.Y.
(Upper air Washington).	D —Detroit, Mich.
NF —*Norfolk, Va.	L —Alpena, Mich.
(Up. air Hampton R'ds)	M —Marquette, Mich.
LB —Lynchburg, Va.	CH —Chicago, Ill.
AV —Asheville, N.C.	DU —Duluth, Minn.
H —Hatteras, N.C.	LC —La Crosse, Wis.
C —*Charleston, S.C.	SL —St. Louis, Mo.
(Up. air Parris Island).	KC —Kansas City, Mo.
B —Bermuda.	O —*Omaha, Nebr.
CO —*Columbia, S.C.	(Up. air Fort Omaha).
(Upper air Key West).	OK —Oklahoma City, Okla.
JA —Jacksonville, Fla.	DA —Dallas, Tex.
K —*Key West, Fla.	EP —El Paso, Tex.
(Upper air Key West).	

*Note.—Stations with which upper air observations are included.

The stations are indicated by one or more key-letters which are followed by two or more 5-unit groups of figures. The first two groups are always surface observations taken at the stations indicated by the key-letters. Additional groups containing upper air data are included only in the reports from stations marked with an asterisk (*), and invariably are represented in the third and succeeding 5-unit groups.

When upper air observations are not possible because of dense fog, the word FOGGY will be sent instead of the third group.

The names of the aerological stations are not included in the bulletin. Observations therefrom are made a part of the report of the nearest regular Weather Bureau station. The location of the aerological stations, the service that conducts them, and the surface stations with which the data are coded are as follows:

Aerological Stations.	Surface Stations.
Rockaway, N. Y.	New York, N. Y.
Lakehurst, N. J.	Atlantic City, N. J.
Washington, D. C.	Washington, D. C.
Hampton Roads, Va.	Norfolk, Va.
Parris Island, S. C.	Charleston, S. C.
Due West, S. C.	Columbia, S. C.
Pensacola, Fla.	Pensacola, Fla.
Key West, Fla.	Key West, Fla.
Omaha, Nebr.	Fort Omaha, Nebr.

When data for a portion of a group are missing the letter X will be substituted for each missing figure.

Second Part

The second part of the bulletin is in plain language and consists of; a synopsis of general pressure distribution; wind and weather forecasts for ocean zones for a period of 24 hours beginning at noon day of issue (see chart page 4); storm and hurricane warnings; and flying weather forecasts by zones for a period noon to midnight of day of issue (see chart page 4).

Explanation of Groups

First group (surface).—Barometric pressure reduced to sea-level and expressed in three figures; wind direction expressed in one figure; and wind force (Beaufort scale) expressed in one figure.

Second group (surface).—State of weather expressed in one figure; barometric tendency (rise or fall in hundredths of an inch during two hours immediately preceding the observation) expressed in one figure; and clouds expressed in three figures, indicating, in order, the amount of the clouds (tenths of sky that is covered), the kind of clouds, and the direction of cloud movement.

Third group (upper air).—Two levels are included in this group, 250 meters and 500 meters. The first figure identifies the group; the second figure indicates the wind direction at the lower elevation and the third figure the wind force at the lower elevation; the fourth and fifth figures represent, respectively, the wind direction and force at the higher elevation.

Fourth group (upper air).—Includes 1,000 and 1,500 meter elevations; same arrangement of the five significant figures as in the third group.

Fifth group (upper air).—Includes 2,000 and 3,000 meter elevations; same arrangement of the five significant figures as in the third group.

Sixth group (upper air).—Includes 4,000 and 5,000 meter elevations; same arrangement of the five significant figures as in the third group.

Last group (upper air).—Shows the highest elevation reached. The first figure (7) identifies the group as the one showing the maximum altitude, and it may be the fourth, fifth, sixth or seventh group, dependent upon the actual elevation reached; the second and third figures indicate the elevation in hundreds of meters; the fourth and fifth figures are wind direction and velocity, respectively, at the indicated elevation.

Key to Groups and Examples

First Group.

Barometric pressure (first three figures of group): Actual pressure in inches and hundredths used, except that first figure of full reading is omitted. Thus, if the actual corrected pressure is 29.98 inches, the figures 998 are sent, or if the reading is 30.14 inches, the figures 014 are sent.

Direction of surface wind (fourth figure of group).

- 0=calm or no movement.
- 1=north.
- 2=northeast.
- 3=east.
- 4=southeast.
- 5=south.
- 6=southwest.
- 7=west.
- 8=northwest.

Force of wind (fifth figure of group): Sent according to Beaufort scale values 0 to 9, inclusive.

Beaufort Scale

Scale number.	Designation.	Miles.	
		Statute.	Nautical.
0	—Calm	0-3	0-3
1	—Light air	3-8	3-7
2	—Light breeze	8-13	7-11
3	—Gentle breeze	13-18	11-16
4	—Moderate breeze	18-23	16-20
5	—Fresh breeze	23-28	20-24
6	—Strong breeze	28-34	24-30
7	—Moderate gale	34-40	30-35
8	—Fresh gale	40-48	35-42
9	—Strong gale	48-56	42-49
Ten	—Whole gale	56-65	49-56
Eleven	—Storm	65-75	56-65
Twelve	—Hurricane	75	—

†Note.—The code does not admit of force in excess of 9 being sent. Therefore, the figure 9 will be used for all wind forces 9 to twelve inclusive.

Example of first group as sent: 99852.

Translation: Barometric pressure, 29.98 inches, wind from south, wind force, 2 (8 to 13 statute miles per hr.).

Second group.

Present weather (first figure of group): State of weather at surface at 8 a.m., 75th meridian time.

- 1=clear (3 tenths or less).
- 2=partly cloudy (4 to 7 tenths).
- 3=cloudy (8 to 10 tenths).
- 4=raining.
- 5=snowing.
- 6=thunder-storm.
- 7=sleeting or hailing.
- 8=dense fog.

Pressure change (second figure of group) in hundredths of inch during two hours preceding observation.

- 0=change of less than .04 inch.
- 1=increase of .04.
- 2=decrease of .04.
- 3=increase of .06.
- 4=decrease of .06.
- 5=increase of .08.
- 6=decrease of .08.

- 7=increase of .10.
- 8=decrease of .10.
- 9=increase or decrease of .12 or more.

†Note.—Whether it is an increase or decrease can be determined by barometric tendency shown at surrounding stations.

Amount of clouds (third figure of group): Number of tenths of the sky obscured (10 tenths is total cloudiness).

- 0=1 tenth or less of sky covered.
- 2=2 to 3 tenths of sky covered.
- 4=4 to 5 tenths of sky covered.
- 6=6 to 7 tenths of sky covered.
- 8=8 to 10 tenths of sky covered.

Kinds of clouds (fourth figure of group).

- 0=1 tenth clouds or less (kind not indicated);
- 1=upper clouds (cirrus, cirro-stratus, cirro-cumulus, alto-cumulus, or alto-stratus), rapidly not indicated.
- 2=strato-cumulus moving slowly.
- 3=strato-cumulus moving rapidly.
- 4=cumulus moving slowly.
- 5=cumulus moving rapidly.
- 6=stratus moving slowly.
- 7=stratus moving rapidly.
- 8=nimbus or cumulo-nimbus moving slowly.
- 9=nimbus or cumulo-nimbus moving rapidly.

Direction of cloud movement (fifth figure of group).

- 0=no movement observable.
- 1=north.
- 2=northeast.
- 3=east.
- 4=southeast.
- 5=south.
- 6=southwest.
- 7=west.
- 8=northwest.

When both upper and lower clouds are observed, only the amount, kind, and direction of the lower clouds will be sent. In such cases the amount of the upper clouds, if any, can be determined approximately by taking the difference between the tenths of cloudiness interpreted from the figures showing "present weather" and "amount of clouds."

Example of second group as sent: 30855.

Translation: Cloudy weather; pressure change less than .04 inch during preceding two hours; 8 to 10 tenths clouds; cumulus clouds moving rapidly from the south.

The upper air observations are included in five groups and have identifying numbers 3 to 7, inclusive. The wind direction and force are indicated by the same numerals as for surface wind direction and force.

Third group.

(Five figures)*250 and 500 meter levels: The identifying figure for this group is 3, and is always the first figure of the group. The second figure is direction of wind at 250 meters and the third figure is wind force at 250 meters. The fourth figure is wind direction at 500 meters and the fifth figure is wind force at 500 meters.

Example: 35163.

Translation: Observations at 250 and 500 meter levels; wind blowing from south with force 1 (3 to 8 statute miles per hour) at 250 meters; wind blowing from southwest with force 3 (13 to 18 statute miles per hour) at 500 meters.

Fourth group (1,000 and 1,500 meters), Fifth (2,000 and 3,000 meters), and Sixth (4,000 and 5,000 meters) have the same arrangement as group three, the first figure, 4, 5, and 6, respectively, always identifying the groups.

Last group (highest elevation reached). The first figure (7) identifies the group; the second and third figures indicate the elevation in multiples of 100 meters; the

fourth and fifth figures show wind direction and force, respectively, at that elevation.

Examples: (a) 71785, (b) 71954, (c) 75879.

Translation:

(a) Highest elevation reached, 1,700 meters; wind blowing from northwest with force 5 (23 to 28 statute miles).

(b) Highest elevation reached, 1,900 meters; wind blowing from south with force 4 (18 to 23 statute miles).

(c) Highest elevation reached, 5,800 meters; wind blowing from west with force 9 (48 to 56 statute miles).

Distributing Stations

Following is a list of Naval Radio Stations from which distributions are made, and the composition of the bulletins distributed by them:

ARLINGTON, VA. Sending time, a few minutes after 10 p.m., 75th meridian time. Wave length, 2,500 meters.

Observation stations contained in first part and code letter.

St. Johns, N. F.	J
Sydney, N. S.	S
Father Point, Canada	FP
Montreal, Canada	ML
Nantucket, Mass.	T
New York, N. Y.	NY
Breakwater, Del.	DB
Lynchburg, Va.	LB
Cape Henry, Va.	CH
Hatteras, N. C.	H
Asheville, N. C.	AV
Charleston, S. C.	C
Bermuda	B
Atlanta, Ga.	AT
St. Louis, Mo.	SL
Little Rock, Ark.	LR
Nashville, Tenn.	NV
Duluth, Minn.	DU
Marquette, Mich.	M
Chicago, Ill.	CH
Detroit, Mich.	D
Buffalo, N. Y.	F
Cincinnati, Ohio	CN

Second part of bulletin.

- [1] Winds off Atlantic coast north of Sandy Hook.
 - [2] Winds off Atlantic coast, Sandy Hook to Hatteras.
 - [3] Winds off Atlantic coast, Hatteras to Florida Straits.
- Storm warnings, Eastport, Me., to Key West, Fla.
 Location and expected direction of movement of storm-centers affecting Atlantic coast.
 All hurricane warnings and advices.
 Figures in brackets correspond to zones shown on map page 4.
 Period covered by forecasts, 24 hours beginning at midnight.

This station broadcasts about noon, 75th meridian time, all storm warnings issued in the forenoon for the Atlantic coast and Great Lakes; also broadcasts at night (during the season of navigation on the Great Lakes) the same bulletin distributed by the Great Lakes station and at approximately the same hour.

KEY WEST, FLA. Sending time, a few minutes after 10 p.m., 75th meridian time. Wave length, 1,500 meters.

Observation stations contained in first part and code letter.

Hatteras, N. C.	H
Charleston, S. C.	C
Jacksonville, Fla.	JA

Miami, Fla.	MI
Key West, Fla.	K
Pensacola, Fla.	P
Burrwood, La.	BW
Galveston, Tex.	GV
Brownsville, Tex.	BV
Fort Worth, Tex.	FW
Kingston, Jamaica	KN
Turks Island	TI
Havana, Cuba	HA
Guantanamo Bay, Cuba	GO
Swan Island	SI
San Juan, P. R.	SJ

Second part of bulletin.

- [3] Winds off Atlantic coast, Hatteras to Key West.
 - [4] Winds over east Gulf of Mexico (east of longitude 90°).
 - [5] Winds over west Gulf of Mexico (west of longitude 90°).
 - [6] Winds over Caribbean Sea (west of longitude 73°) and Windward Passage.
- Storm warnings Hatteras to Key West and for Gulf of Mexico.
 Location and expected movement of storm-centers affecting Atlantic coast south of Hatteras and Gulf of Mexico.
 Storm warnings Gulf of Mexico, Key West to Brownsville.
 All hurricane warnings and advices.
 Figures in brackets correspond to zones shown on map page 4.
 Period covered by forecasts, 24 hours beginning at midnight.
 POINT ISABEL, TEX. Sending time, midnight, 75th meridian time. Wave length, 2,350 meters.
Observation stations contained in first part and code...

letter.

Key West, Fla.	K
Tampa, Fla.	TA
Pensacola, Fla.	P
Mobile, Ala.	MO
Burrwood, La.	BW
Galveston, Tex.	GV
Corpus Christi, Tex.	CC
Brownsville, Tex.	BV
Kingston, Jamaica	KN
Swan Island	SI

- [4] Winds over east Gulf of Mexico (east of longitude 90°).
 - [5] Winds over west Gulf of Mexico (west of longitude 90°).
 - [6] Winds over Caribbean Sea (west of longitude 73°) and Windward Passage.
- Storm warnings for Gulf of Mexico, Key West to Brownsville.
 Location and expected movement of storm-centers affecting Gulf of Mexico.
 All hurricane warnings and advices.
 Figures in brackets correspond to zones shown on map page 4.
 Period covered by forecasts, 24 hours beginning at midnight.

GREAT LAKES, ILL. Sending time, shortly after 10 p.m., 75th meridian time. Wave length, 1,500 meters.
 Distribution is made from this station only during season of navigation on the Great Lakes, approximately April 15 to December 20.

Observation stations contained in first part and code letter.

Duluth, Minn.	DU
Marquette, Mich.	M
Sault Ste. Marie, Mich.	U
Green Bay, Mich.	G
Chicago, Ill.	CH
Grand Haven, Mich.	GH
Alpena, Mich.	L
Detroit, Mich.	D
Cleveland, Ohio	V
Huffalo, N. Y.	F

Forecasts for upper Lakes (Superior, Michigan, and Huron).

Forecasts for lower Lakes (Erie and Ontario).

Storm warnings for upper and lower Lakes.

Location and expected movement of storm-centers affecting the Lakes.

Period covered by forecasts, 24 hours beginning at midnight.

All storm warnings issued in the forenoon for the Great Lakes also are distributed from this station about noon, 75th meridian time.

SAN JUAN, P. R. Sending time, 9 p.m., 75th meridian time. Wave length, 600 meters, damped oscillation first, followed immediately by 5,250 meters, continuous wave.

Distribution is made from this station only from June to November, inclusive.

Observation stations contained in first part and code letter.

San Juan, P. R.	SJ
St. Thomas, Virgin Islands	ST
Basseterre, St. Kitts	BT
Roseau, Dominica	RS
Bridgetown, Barbados	BB
Santo Domingo, S. D.	SD
Puerto Plata, S. D.	SL
Castries, St. Lucia	LU
Willemstadt, Curacao	W
Port of Spain, Trinidad	PS

All hurricane warnings.

In the absence of a tropical storm the following words will be sent each day "Weather Normal."

Hurricane warnings also will be broadcast from this station at 10 a.m., 75th meridian time, or as soon thereafter as possible.

Storm and hurricane warnings are displayed at over 200 points along the Atlantic and Gulf coasts, including every port and harbor of any considerable importance. Flags are used by day and lanterns by night. Illustrations and descriptions of these signals will be found on pilot charts. Explanatory cards will be furnished free on application.

A similar broadcasting service for the Pacific coast is being arranged.

NEW BROADCASTING STATION OPENED BY ATLANTA JOURNAL

On the night of Tuesday, June 13th, WSB of The Atlanta Journal began broadcasting over its new 500-watt Western Electric radiophone. The Journal inaugurated its new set with a two hour programme of vocal and instrumental numbers by the leading artists of the south; and even before its conclusion it was evident that a new era in radio broadcasting had begun in Dixie.

Local and long distance telephone messages, telegrams, post cards and letters have poured into The Journal office bringing the news that WSB's programmes are being heard clearly and distinctly over a wide territory. The well known slogan, "The Atlanta Journal covers Dixie like the Dew" would seem to apply with force and aptness to WSB's new broadcasting radiophone. Savannah, Augusta, Macon and numerous other points that formerly were supposed to be in a pocket and unable to hear WSB, are now reporting that the programmes are being heard regularly and satisfactorily every day. Points in Florida, Texas, Arkansas, Kentucky, Missouri, Ohio, Indiana, Mississippi, Louisiana, South Carolina, Tennessee, Michigan and Ontario have acknowledged satisfactory reception of WSB's signals and broadcastings. And the reports as a whole indicate that the quality of tone and voice and the modulation are excellent.

The Journal's new station is equipped with the Western Electric Company's latest No. 101-A broadcasting outfit, delivering 500 watts of radio frequency to the antenna system. It is the biggest and latest equipment built by the Western Electric and gives The Atlanta Journal equal power and range with the other big stations, such as KDKA at Pittsburg, WWJ at Detroit, and those recently installed by other newspapers. The Journal's plant is located on the fifth floor of The Journal Building in Atlanta, where a sound proof studio has been built to eliminate reverberation and echo. The Journal's radio auditorium, seating several hundred people, is open to the public, and by means of a Western Electric loud speaker the audience is able to hear the concerts as they are broadcasted from the sound-proof studio. Frequently the big auditorium is filled with interested spectators during the broadcasting of the principal programme from 7 to 8 p.m., Central time.

Another unique feature inaugurated by The Journal is the weekly demonstration of "How to Build a Crystal Detector Set," put on by George A. Her, The Journal's radio engineer, every Saturday morning. Several hundred boys and girls attend this demonstration each Saturday. The crystal set that is built during the demonstration, and a pair of head phones, are given away to one of the boys or girls attending the class.

A moving picture of WSB was made on the night of the formal dedication of the new set. This picture was shown at the Howard Theatre in Atlanta and will be released all over the South later. The film gives a complete picture of the broadcasting apparatus in operation and shows each artist as he or she appears before the

RADIO SUPPLIES

The JACK V. ELLIOT Company

Hamilton, Ont.

DEALERS and JOBBERS

Cleveland, Ohio.

Write for Particulars

Watch for our Display Advertisements in Succeeding Issues

sensitive microphone in the sound-proof studio, as well as the antenna system on top of the building.

In addition to its broadcasting station The Journal has equipped a radio truck, which is sent to the city parks and other public places where WSB's programmes are received for the entertainment of the public. Later this truck will be sent on a tour of the State.

The daily programme broadcasted by WSB follows:—

Noon.—Weather forecast.

2.30 p.m.—Close on markets.

4.00 p.m.—Overture of Howard Theatre Orchestra.

5.00 p.m.—Baseball scores, news flashes, bedtime story, ten minute talk and music.

7.00 to 8.00 p.m.—Concert by local and visiting artists.

The following is WSB'S Sunday broadcast programme:—

11.00 a.m.—Services from the First Presbyterian Church of Atlanta, Dr. J. Sprole Lyons, pastor; Charles A. Sheldon, Jr., organist.

5.00 p.m.—Sermon and sacred concert from The Journal radio studio.

LOCALIZED RADIO LANDING SIGNALS FOR AIRPLANES

Radio direction finders and other radio devices have been in use for some time to assist airplanes to land during the night, during fog, or at other time of poor visibility. The most usual method of using radio for this purpose is to transmit from an ordinary elevated antenna at the landing field radio signals which are received on a direction finder located on the airplane. On small planes the direction finder may be simply a coil of wire wound on the fuselage; in larger planes a small rotatable coil may be mounted vertically aft in the plane. This method gives the direction of the landing field, but does not give accurate information as to its distance when the plane is near the landing field.

Several years ago the Bureau of Standards was called upon to develop a method to assist airplanes to accurately locate the landing field when the airplane was quite near. It was desired to develop a method which would give a good signal which would be easily audible over a comparatively large area when the airplane was at comparatively high altitudes, but would be localized within a small area when the airplane was near the ground. The accurate location of the landing field is very important when near the ground.

A method of induction signaling was first tried, using 500-cycle alternating current. This current flowed through a large horizontal single-turn coil, 600 by 800 feet, at the landing field. The coil was tuned to 500 cycles, so that a large current flowed. For the induction signaling the reception on the airplane was made using horizontal coils wound on the lower wings of the airplane. It was found that this method gave a signal which was audible over a wide area when the airplane was near the ground, but was confined to a small area when the airplane was at an elevation of about a mile. This was not satisfactory.

The use of radio-frequency waves was therefore undertaken. Two horizontal coils were placed one above the other. The coils were identical in construction, and placed so that their axes coincided. The current in one coil flowed in a direction opposite to the current in the other coil. A fairly high radio frequency, suitable for direction-finding work, such as 300 kilocycles, was used.

A calculation was made which indicated that the signals

radiated from the two coils would be strongest for an airplane flying in a given horizontal plane, whenever the plane was inside a comparatively small ring-shaped area located above the landing field. After the coils had been constructed a careful experimental investigation was made under actual flying conditions, and the results of this calculation were verified. Signals were received on the airplane only when it was nearly above and in the immediate vicinity of the landing field. A Curtiss Type R plane was used for the experimental work for both the induction signaling and the radio signaling.

The Bureau of Standards has just published a paper giving the theory of the radiation from an antenna consisting of two horizontal coils, as used in this work. It is found that if a vertical coil antenna is used for reception on the airplane and if the airplane flies horizontally, the maximum signal is received when the line joining the airplane to the transmitting coils makes an angle of 30° with the vertical, assuming that the effect of the earth is negligible. The region of space within which the signal can be detected by receiving instruments of given sensibility has nearly the form of the space between two inverted coaxial vertical cones of finite length having their common apex at the transmitting station. The upper limit of the region within which the signal is audible depends on the sensitivity of the receiving apparatus and is not as clearly defined as the bounding conical surfaces. The signal vanishes when the airplane is directly over the transmitting station, and vanishes rather soon after the airplane passes over the region of maximum signal and flies away from the transmitting station.

The effect on the transmission of having a perfectly conducting earth directly under the transmitting coils has also been investigated, and it has been found that in this case a maximum signal is obtained when the line joining the airplane to the transmitting station makes an angle of $26^\circ 34'$ with the vertical. It is expected that these theoretical studies will be very useful in the design of radio transmitting stations for sending localized landing signals to airplanes.

The results of these investigations are given in Bureau of Standards Scientific Paper No. 431, "The Field Radiated from Two Horizontal Coils," by Gregory Breit. A copy may be purchased for 5 cents from the Superintendent of Documents, Government Printing Office, Washington, D.C.—Submitted by Bureau of Standards.

WHAT'S REQUIRED

In order to receive radio telegraph and radiophone signals, the following equipment is necessary.

- Antenna (Aerial).
- Ground connection.
- Antenna Grounding Switch.
- Tuner.
- Detector (with necessary batteries, etc.)
- Regenerative circuits.
- Head telephone receivers.
- The following may be used in addition:
 - Amplifiers, with necessary accessories.
 - Loud speaking horn.

The cost of a complete radio receiving outfit ranges from about \$20.00 for a simple set with mineral detector to \$200.00 or more for a highly sensitive installation of the best grade. For \$125.00 or less, a very satisfactory complete set may be installed, containing an electron tube detector; additional equipment may then be added at any time to reach the highest sensitivity.

Queer Little Instrument with Funny Name is Grid Leak of Million Ohm Resistance

The grid leaks, the smallest but most important part of the vacuum tube detector set is seldom given thought and attention. Without it the receiving set using a vacuum tube is about 50 per cent. efficient. When properly adjusted, the grid leak plays a very important part. The grid leak is either fixed or adjustable, and consists of a high resistance of a million ohms or more, shunted across the grid condenser. Grid condensers are often included in the grid leak, and remain fixed, some manufacturers claiming that a fixed grid leak of one megohm (one million ohms) will adjust to maximum efficiency any of the standard tubes on the market.

Before going further it may be better to explain the action of the grid leak and just what important part it plays in the circuit of the vacuum tube. When a radio oscillation or wave energy strikes the aerial and is tuned in on the receiving set the maximum alternating voltage of the radio frequency wave is directed to the grid of the tube through the grid condenser.

The grid receives many negative charges and these charges pile up on the grid so fast that the grid becomes overloaded with negative charges which cannot leak off fast enough through the grid condenser. This has the effect of choking the action of the plate voltage of the tube, and the tube becomes inoperative until these charges find a way to get off of the tube grid.

The purpose of the grid leak is to allow these small charges of negative electricity to leak off the grid so as to prevent the negative charges from piling up on the grid and obstructing the flow of electrons to the plate. The grid leak which is shunted across the grid condenser in this manner allows some of these extra negative charges to leak off through a resistance of one, two or three megohms.

Adjustable Grid Leak Preferred

When a set of receiving instruments comprising a regenerative receiver starts to howl or screech, or the receivers respond to a series of fast or slow clicks, the fault generally lies in the grid leak. It must be adjusted to suit the characteristics of the vacuum tube. Manufacturers of vacuum tubes have not yet been able to get every one of their vacuum tubes to a standard, that is, of like characteristics, so an adjustable grid leak is to be preferred over that of a fixed type.

By proper adjustment of the resistance of the grid leak the vacuum tube may often give far better results than if the tube was without a leak or with a poor one in circuit. Very often a set that receives very weak signals can be made to emit signals that are much stronger by adjusting the leak.

Grid leaks are simple to construct and with the aid of a soft pencil, an eraser and a piece of smooth cardboard and two small binding posts, a good grid leak that is adjustable can be made in a short time.

How to Make One

Cut a piece of cardboard about two inches long and about half an inch wide, or just the size of the grid condenser. If the grid condenser is used, make the cardboard just as long as the condenser so that the two binding posts will pass through the holes in the condenser and hold down the cardboard. Under each binding post rub off some of the pencil carbon so that when the binding

posts are tightened down some of the pencil marks will show around the edge of the post. Do this on both ends of the cardboard so that there will be contact enough for a pencil mark across the cardboard between the two binding posts.

Turn on the tube filament and adjust the set. If a point is reached where the adjustment will cause a loud howling, or the signal turned in is not clear, start rubbing the pencil back and forth between the binding posts until the howling just stops or the signal is made clear. If there is too much pencil carbon and the set appears dead, simply erase the marks and start all over again until the proper resistance is reached. The grid leak resistance need not be changed unless a different tube is inserted in the socket. Sometimes the grid leak made in this manner may be covered in hot paraffine so as to exclude moisture and it will remain in permanent adjustment.

Another method of making a grid leak is to soak a small piece of blotting paper in drawing ink and dry it thoroughly. Then pass two binding posts through the ends as with the other type mentioned above. A blotter inked in this manner cut down to 1/2-inch wide and 2 inches long will have a resistance of approximately one megohm, and is suited for the majority of tubes. However, the adjustable leak is to be preferred, for critical and efficient adjustment.

RADIOPHONE TO BRING "OUTSIDE WORLD" TO NORTH

Prospectors and mining men in Northern Ontario are alive to the possibilities of the radiophone, and many camps will this year be brought into touch with the "outside world." Some of those who are hunting for mines are including radio equipment in their outfits, and the far-off haunts of these men of the trail where the feet of women have never trod will ring this year with the finest voices of Broadway. Great stretches of trackless forest will no longer separate these pioneers from the news of the world.

Every Cabinet Member in Washington now has a radiophone at his desk or home, and some of them have an apparatus in both. In anticipation of still further development of radiophone possibilities, an arrangement is being made whereby President Harding and high Government officials may make addresses through a huge broadcasting apparatus being erected at Arlington. These speeches, made in the President's office, at the White House, can be heard simultaneously, in every home.

Get a Big Chunk of Genuine

GALENA

for real broadcasting results.

SEND 50 CENTS TO

GALENA SUPPLY CO.

P.O. Box 728

COBALT, ONT.

RADIO TRADE CATALOGUE

Now in the mails to Radio Dealers, the most comprehensive Canadian Trade Catalogue yet issued.

A complete guide for the radio store. Shows the code, key to symbols, diagrams and condensed description of radio communication.

Send your trade card or business letterhead when asking for catalogue.

STRICTLY WHOLESALE

JOHN MILLEN & SON, LIMITED

MONTREAL
321-323 St. James Street

QUEBEC
96 Crown Street

TORONTO
53-57 Adelaide St. West

RADIO NEWS

We are carrying a complete line of goods for the Radio Amateurs. We can supply the following for immediate delivery:—

Manhattan Phones, 2000 ohms	\$8.00
Manhattan Phones, 3000 ohms	9.25
Stromberg-Carlson, 2000 ohms	10.25
Everett, 3000 ohms	12.00
Brown, 8000 ohms	19.00
Variometers	4.00
Variocouplers	4.00
Condensite Celeron, per sq. inch .....	.02
Vacuum Tubes (Radiation U.V. 200)	7.25
Vacuum Tubes (Radiation U.V. 201)	9.00
Vacuum Tubes (Myers Audion)	8.75
Amplifying Transformers, Audio Frequency	5.00
Amplifying Transformers, Radio Frequency	6.00
Condensers, 11 plate	3.90
Condensers, 23 plate	4.50
Condensers, 43 plate	4.95
Rheostats	1.50
Grid Condensers, 00025 mfd .....	.20
Phone Condensers, 00025 mfd .....	.35

We can also supply and install complete Transmitting and Receiving Stations. Quotations and advice will be cheerfully furnished without any obligation.

SEMELHAACK-DICKSON, LIMITED

333-337 St. James Street, MONTREAL
Phone Main 2892

Dealers, Attention!

EVERETT PHONES

We carry a large stock of the new Everett Phones, ready for immediate delivery.

“ESCO” Motor Generators

We are distributors for the Electric Specialty Company's products.

IN STOCK:— Motor Generators, delivering 500 Volts and 1000 Volts direct current for use in broadcasting and other C.W. stations.

WE CARRY ALSO A

Full Line Radio Sets and
Miscellaneous Accessories

BROCK RADIO COMPANY

357 St. Catherine St. West, - MONTREAL, Que.

RADIO TRADE REVIEW

THE WORLD'S LARGEST RADIO HORN BUILT BY THE MAGNAVOX COMPANY IN CALIFORNIA

Idora Park, a public amusement resort in California, boasts possession of the world's largest horn. Measuring square, this horn was recently installed for broadcasting music received by radio, and is in successful daily operation at the present time.

Equipped with the Magnavox Radio reproducer and also the Magnavox Power Amplifier, the broadcasting capacity of this gigantic instrument is sufficient to carry radio music throughout an area of approximately twenty-nine square miles. One thousand feet of clear aeroplane spruce lumber went into its construction, which incidentally presented a number of interesting problems to the Magnavox engineers by whom it was designed and built.

Of absorbing interest first of all on account of its sheer size and amplifying range (so much greater than any previous horn), this instrument installed in Idora Park by the Magnavox Company also appeals to the imagination as being in all probability only the first of its kind. A spectacular "stunt" on the part of an enterprising amusement resort, the basic idea is capable of really impressive development. It is a further indication of the far-reaching influence of radio on the world's work and play which warrants attention.

To the radio expert, however, the most interesting aspect of the situation is the fact that the Magnavox Company through the use of its electro-dynamic reproducer have produced such true tones as to eliminate "distortion" even when employing this tremendous horn.

THE NEW R-E LINE

The demand for quality radio apparatus has brought to light many new and worthwhile improvements in the radio field. Foremost among these is the new R-E line, recently placed on the market by The Radio Electric Company of Pittsburgh.

The Type SA Vacuum Tube Socket, manufactured by this concern, represents the last word in tube receptacle construction. Electrically and mechanically it is claimed superior to any on the market at present.

The receptacle shell, made from the very best grade of heavy brass sheet, is guaranteed not to crack or chip under the most strenuous usage. Mounted on a special heat-proof composition base measuring $2\frac{1}{4}" \times 2\frac{7}{8}" \times 3\frac{3}{8}"$, possessing high insulating qualities, it presents a highly polished nickel finish, making it doubly attractive.

The contact springs are made of the very best spring phosphor bronze possible to obtain, and the shortest distance between any part of the spring and the shell is $\frac{3}{16}"$. This latter feature provides a minimum of energy leakage, and very small capacity losses. Whether mounted on the table or supporting shelf, the springs are always $\frac{1}{8}"$ clear, thus eliminating all chances of accidental short circuit.

The receptacle may be back-mounted by reversing the connecting screws or the shell itself may be removed and used on a supporting panel where more than one socket is required. The contact designations are moulded in the base, and no opportunity is afforded for effacing them.

All metal parts have a high nickel finish, making the unit most attractive.

This company also manufactures a very high-grade inductance switch, known as the Type SC. This switch is of the most improved type and presents many features lacking in similar switches on the market to-day at the same price.

The knob, of special moulded composition, has a special tapered design, which affords a firm and easy grip. The contact arm is composed of three phosphor bronze laminations. Swinging over a radius of $1\frac{3}{8}"$, it affords a positive self-cleaning contact.

The panel bushings are so designed that it is possible to adapt the switch to any panel up to $\frac{3}{8}"$. These bushings are $\frac{7}{8}"$ in diameter and afford excellent bearing surface, and positive contact between stationary and moving parts. A brass terminal is provided, thus eliminating the necessity of making soldered connections to the shaft itself. All metal parts of the switch are also highly polished, making it not only efficient but extremely attractive.

A NEW RADIO JACK

A new Radio Jack has recently been placed on the market, which has features of remarkable merit.

From the accompanying illustration, it will be noticed that the jack is equipped with a hexagonal nut. This nut conceals the thread on the jack thimble, in such a manner that the jack can be readily mounted on any thickness of panel between $\frac{1}{8}"$ and $\frac{1}{4}"$ inches, without the use of "take up" washers and without either exposing the threads or changing the relationship of the jack springs, contact with the plug. The manufacturers lay particular stress on the latter feature, which guarantees a good contact between the plug and jack regardless of the panel's thickness, a condition which cannot be obtained when "take up" washers are employed.

The construction of the jack is such that quick mounting is facilitated with only reasonable care in getting the proper size of drilling in the panel for the jack thimble.

The jack frame is very rigid, so as to hold all parts in alignment, even though subjected to hard usage. The usual L type frame, it will be noticed, is reinforced by means of a side brace. The jack is made by the Stromberg-Carlson Telephone Manufacturing Company and is furnished with various spring combinations.

NEW COMPANY IN REGINA

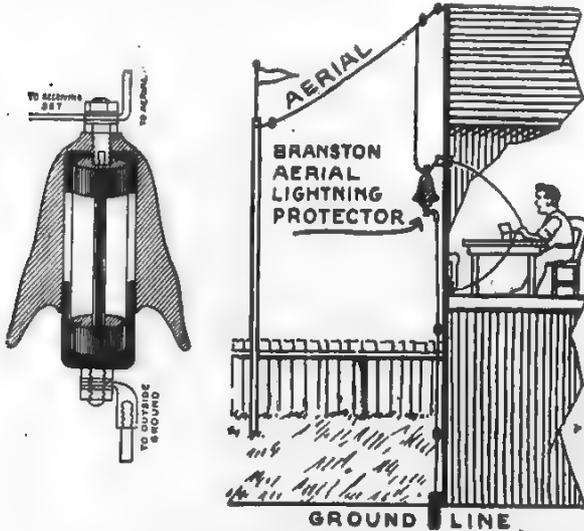
Notice has been received of the formation of the Radio Corporation of Regina, Limited, with a capital of \$125,000.00, divided into 250 preference shares and 1,000 ordinary. Head office, Regina, Sask.

"A" MINIMAX "B"
RADIO STORAGE BATTERIES
 POSITIVELY NOISELESS—RELIABLE and GUARANTEED
The MINIMAX STORAGE BATTERY Co.,
 323 THIRD AVE., MAISONNEUVE, . . . MONTREAL, QUE.
 DEALERS WANTED. Phone: La Salle 1797

NEW AERIAL LIGHTNING PROTECTOR

All dealers in radio apparatus will be interested in the Branston Aerial Lightning Protector. This is made by the Chas. A. Branston, Limited, 355 Yonge Street, Toronto, the well known manufacturers of Violet Ray High Frequency Generators, and is a well finished and properly constructed article.

The Branston Aerial Vacuum Gap Lightning Protector does not reduce the strength of incoming signals for the telephone or telegraph. Its use insures proper protection from lightning and heavy static and is absolutely approved.



It is scientifically constructed and is always ready to carry a lightning flash to the ground. The advantages are that the set is always connected, the static is drained from the antennae, thereby relieving interference, signals are more audible. It is absolutely automatic in its operation and requires no attention. It is designed for outdoor mounting and the petticoat-insulator prevents leaking in wet weather. The insulator is moulded from Phenolite Condensation material combining strength and insulating properties, as well as presenting a handsome appearance. The vacuum tube is entirely protected from breakage, moisture, dirt or insects, and not affected by snow, sleet or rain storms.

The satisfaction of knowing that your set is always grounded during a thunder storm and that you do not have to get up in the night, at the first sound of a thunder clap, and make sure that your switch is set for ground, is in itself worth several times the price of this protector. It is advertised to sell at \$4.00 retail, and dealers may procure deliveries from their jobbers in the usual way.

THE BRITISH MULLARD TUBES

"In the United States we think of radiotrons when we turn to vacuum tubes, not that there are no other tubes to be had, but because the Radiotrons are in such

general use. In England, on the other hand, the amateurs think of Mullard radio valves. The British amateur makes use of the Mullard tubes made for receiving purposes. These tubes, or valves, as they are called, are made in a variety of types. The most common type is the type R, which has an overall length, including pin contact members, of $4\frac{1}{2}$ inches and a bulb diameter of $2\frac{1}{4}$ inches. It works best on a filament voltage of 4, and 60 to 80 volts between the plate and the filament. In the K type, which is somewhat more compact, about $3\frac{1}{2}$ volts is required for the filament, and 20 to 30 volts for the plate circuit. This particular type is suitable for use in radio frequency amplifiers. The D type is a slightly soft tube designed for use in detecting or rectifying signals prior to audio-frequency amplification. It operates best at about 5 volts filament amplification. It operates 30 volts for the plate circuit. The electrodes of the Mullard tubes are made from sheet nickel, and molybdenum and tungsten wire. The Mullard valves or tubes for transmitting purposes have bulbs made with silica, which not only reduces the danger of breakage, but also permits of bringing the container nearer to the filament and grid so as to reduce the size of the tube."—Radio Broadcast.

DIAMOND STATE FIBRE ARE BROADCASTING

The Diamond State Fibre Co., at Bridgeport, Pa., are now operating two 250-watt radiotrons, power tubes operated by 200,000-volt 1,500-watt direct current generator, equipped with fan type antenna, 110 feet high, consisting of 5 wires with 80 feet spread at top.

Market reports are sent out daily from 11.45 to 12, daylight saving time, on wave length 485 meters. Concerts are sent out Thursday evenings, 7.30 to 8.30, on wave length 360 meters.

The company would appreciate hearing from anyone picking up either of the above. Their station call is WBAG. Any hearer get in touch with their Toronto office.

PITTSBURGH CONCERN EXHIBITS IN SAN FRANCISCO

The Radio Electric Company of Pittsburgh, pioneers in the manufacture and distribution of radio apparatus, shipped a wonderful radio display to The Emporium, San Francisco's largest department store, for exhibition in the recent Shriner's Radio Show. Travelling over a distance of 3,500 miles, this enterprising concern displayed enough apparatus to start a small store, in addition to distributing thousands of pamphlets and circulars of different representative lines of radio equipment.

CROSSLEY MANUFACTURING CO.

The above firm recently moved into their new building, which gives them 30,000 feet of floor space in addition to their wood-working plant of 30,000 feet and their former quarters at Blue Rock Street, Cincinnati, where formerly above 5,000 feet were devoted to radio. This progressive firm have several new lines on the market and are now in a position to make deliveries to dealers both in the United States and Canada.

HICKSON ELECTRIC Co., Inc., 11 Corinthian Street, Rochester, N.Y.

AGENTS for

Grebe, DeForest, J. Firth, Westinghouse and Hipo Batteries.

RADIO CLUB REPORTS

On this section the Editor will be pleased to publish reports of any of the various Radio Clubs. Such reports should be submitted in the exact form in which they are to appear, the Editor, however, reserving the right to edit and curtail the reports if necessary. Papers of special interest read before such Clubs will be also acceptable for publication.

LETTER TO EDITOR

Garden City Radio and Research Association,
St. Catharines, Ontario,
Merritton, Ont., May 17, '922.

Aviation and Wireless News,
Toronto, Ont.

Dear Sir,—The item in the March issue of your magazine concernig a Canadian Wireless or Relay Association, is a good idea and is worth being advertised, and I hope to see published the names of clubs who get behind and boost it.

We would like to have Canada leading in the art of wireless, or at least a good second. Hoping to hear and see more about this Association in the next issues.

Yours truly,

H. P. KENNEDY, Secretary.

Box 224, Merritton, Ont.

AERO CLUB OF REGINA

The following excerpts from the minutes of recent meetings of the above club, show the spirit of activity behind the it and the close connection between "Aviation" and "Radio."

Aero Club of Regina
6 Black Block, Regina,
June 6th, 1922.

Mr. C. E. Williams, Editor "Radio,"
60-62 Adelaide St. E., Toronto, Can.

Wireless Technical Committee, Regina Aero Club.

Dear Sir:

With reference to the above, enclosed please find copy of minutes of meetings held by this Committee of recent date.

This for your convenience and information, please.

Yours very truly,

T. H. SPENCE, Flight Lieutenant,
Provincial Secretary, C.A.F., Saskatchewan.

Wireless Technical Committee.

That seven members be elected on this Committee.

That the following members comprise this Committee: 1st A.M. Maloney, 1st A.M. Taylor, Lieut. Wade, Lieut. Temple, Lieut. Layton, Padre Whillans, Capt. Spence.

That this Committee shall hold its first meeting as soon as possible for the purpose of electing a Chairman, and for preparing a programme of work to be submitted for approval at the next meeting of this Club.

Authority for Purchasing Wireless Accessories.

Moved by Mr. Stephens, seconded by Lieut. Layton, That the Executive of this Club be empowered to purchase any necessary accessories for completing and installing wireless set A302, loaned by Provincial Air Board. Carried.

Boy Scout Radio Patrol (R.A.C.)

Moved by Mr. Balfour, seconded by Lieut. Campbell,

That the Wireless Technical Committee be empowered to arrange with Regina Scout Masters regarding the formation of this Patrol, or the attachment of twelve or more "Wireless and Aviation News," now "Radio."

Moved by Lieut. Jacobs, seconded by Mr. Ballantyne. That one year's subscription to this magazine shall be

The G-W Slider

Leader of a Quality Line

More Sold Than All
Other Sliders
Together

Imitated But Never
Equalled.

One Price Everywhere.



Better Electrical
Contact.

Slides Easily.

Cannot Cut or
Damage Coil.

Neater Appearance,
Better Wearing.

Every G-W Products—A Distinct Improvement

The trademark G-W on a product indicates that it has exclusive advantages. That is why G-W is always given the preference. The price is no greater, but the value can not be exceeded.

Sliders and Rods.
2 Slide Tuners.
Detectors.

G-W

Unmounted Coils.
Aerial Insulators.
Dials.

Canadian Agents:

CAM-FISH CO., Ltd.

70 King St. West, - TORONTO, ONT.

Manufactured by

Gehman & Weinert, 42 Walnut St., Newark, N.J.

Manufacturers of G-W Radio Products

In stock for immediate shipment, a quantity of Stromberg-Carlson 2-A Head Sets, No. 147 Jacks and No. 80 Plugs. We are distributors.

CLEAR RADIO SIGNALS

Complete Receiving Sets, ready for shipment. Marconi Model C, Amrad, DeForest.

Write for dealers' opportunity.

AUTOMATIC TELEPHONES and TIME RECORDERS LIMITED,

Main 3014 140 Victoria Street, - - TORONTO

given to each member of this Club who has paid the full year's fee of \$5.00 on or before July 1st, 1922.

Wireless Technical Committee Report.

Lieut. Layton read the minutes of a meeting held by this Committee, Monday, May 22nd; also reported that an aerial had been erected on the roof of the Black Block.

That the first Wireless Class was held last Monday evening, June 5th. These classes to be continued each Monday evening to the end of September.

Programme of classes for the coming winter would be submitted for approval during the latter part of the summer courses.

Wireless Set Accessories Required.

1 base piece, hardwood, 12x24 in.; 1 upright piece of hardwood, 24x24 in.; 1 pole (fir), 20 ft. x 6 in.; '80 ft. aerial wire, copper stranded; 100 ft. insulated lead (8 B. & S.); seven insulators in strain; porcelain tubes; eye bolts; iron wire, No. 12; one storage battery (second hand).

Erection.

(a) That Lieut. H. Wade, Lieut. J. Layton, Sergt. H. E. Taylor, have undertaken to commence erection of aerial on the roof of the Black Block on Saturday afternoon, May 27th.

(b) *Cost of erection and accessory parts.* That members of this Committee undertaking erection and construction of this set will report to the Treasurer, Lieut. T. Temple, as soon as possible, advising approximately the cost of such.

CHATHAM, ONT.

There's a live Radio Club in Chatham, Ont. The following new officers were recently out: F. J. Collins, President; E. Davey, Vice-President; A. Edwards, Radio Electrician; H. Jackson, Traffic Manager; C. Samage, Secretary-Treasurer.

CANDIDATES SUCCESSFUL IN EXAMINATIONS

The Department of the Naval Service announce that forty-four candidates were examined during the month of May, 1922, of which the following were successful and obtained Certificate of Proficiency in Radiotelegraphy:

1st Class (Commercial)

A. R. Anderson, Ottawa, Ont.; R. M. Brophy, Montreal, Que.; S. A. Galbraith, Victoria, B.C.; F. G. Godfrey, Toronto, Ont.; W. E. Hagar, Roseway, N.S.; H. Lake, Vancouver, B.C.; W. H. E. Mabe, Montreal, P.Q.; C. S. Miller, Montreal, P.Q.; O. L. Paquette, Nairn Centre, Ont.; T. Raddall, Halifax, N.S.; F. Reilly, Vancouver, B.C.; J. N. O. Roy, Montreal, P.Q.; C. C. Spring, Vancouver, B.C.; E. C. Weafer, Montreal, P.Q.; C. E. Williams, St. John's, Nfld.; W. D. Wood, Vancouver, B.C.

2nd Class (Commercial)

Andrew Anderson, Toronto, Ont.

Amateur

W. M. Gray, Chatham, Ont.; G. W. Griggs, Brantford, Ont.; F. S. Howes, Windsor, Ont.; O. G. Mitchell, Brantford, Ont.; W. K. Mitchell, Brantford, Ont.; W. J.

Crystal Detector Receiving Set May Be Converted Into Efficient Vacuum Tube Unit

Radio amateurs will find it a comparatively simple matter to convert a crystal detector outfit into an efficient vacuum tube receiver and thereby obtain a three-fold increase in signal strength and a considerable expansion of receiving radius. In general, it will be found that the tuning basis for the crystal set, be it a simple tuning coil, a loose coupler or a variocoupler, can be used in connection with a vacuum tube set.

It will be necessary to purchase a small filament resistance of 6 ohms, a vacuum tube socket, one small B battery, a storage battery, grid condenser and leak, and one vacuum tube detector. All of these instruments can be mounted temporarily on a small board, with the exception of the storage battery.

If the tuning apparatus consists of a loose coupler and variable condensers it is only necessary to use the secondary terminals of the loose coupler for the input circuit of the vacuum tube. Disconnect all the wiring that was used for the crystal detector and start with the secondary terminals of the coupler.

In the first place, wire up the vacuum tube socket so that the storage battery and the resistance are in series with the contacts on the socket marked "F" or filament. In wiring the socket, connect one wire from the "F" terminal direct to the battery on the positive side. The negative terminal of the battery connects to the resistance and the remaining side of the resistance connects back to the tube socket marked "F." The bulb can be inserted and the resistance adjusted so that the lamp will either burn very low or by turning the resistance it will increase the brightness. This is a complete circuit, and will not connect to the rest of the circuit until everything else is connected.

One terminal of the secondary of the coupler connects to the grid leak condenser and the other terminal of the grid leak condenser connects to the post on the V T socket marked "G" or "grid." The terminal on the socket marked "P" or "plate" connects to the positive terminal of the B battery. The negative terminal of the B battery connects to the telephone receivers, and the telephone receivers connect back to the remaining terminal of the loose coupler.

When this much is wired, the plus or positive side of the storage battery connects to the same terminal as the telephones and the secondary. It is sometimes necessary to use the negative terminal of the storage battery in this connection instead of the positive terminal, and this all depends upon the particular tube in use.

With a complete set such as the Aeriola Jr., the Marvel or the DeForest, the terminals of the input circuit, such as with the loose coupler, are taken off of the detector supports, and the detector circuit opened. A short circuit must be placed across the old telephone terminals so as to allow the circuit to be completed.

The same connections apply to a single or double slide tuner. In this case the detector is disconnected and the terminals of the wires to the detector connect just as with the loose coupler. However, the telephone receivers are taken from the circuit and the wiring continued to the previous detector terminal.

In tuning the set it will be found that a variable condenser across loose coupler secondary and one across the primary or in series with the aerial and the primary slider, interference will be eliminated and the signal intensity increased.

TO MANY RADIO IS NOW ESSENTIAL

Radio telephony has been called a craze, and perhaps not inaptly. It is, however, something more than a passing fad, to be discarded when the enthusiasm has waned. The man or the woman who is free to leave his home to hear concert, lecture or sermon or to see play or moving picture, will listen-in only when a particular programme or lecture appeals to him.

Only a part of the great radio audience has a choice of entertainment. In remote and thinly-populated districts people are growing more and more to depend upon the broadcasting station for their entertainment. The farming communities alone will give permanency to radio broadcasting, even though the whole art of radio should never move beyond its present elemental state.

There is another and very large radio audience that will demand a continuance of radio programmes. Men and women who are prevented by illness or age from leaving their homes and who must depend upon friends and books for their relief from the monotony of the same room and the same daily routine, these have found radio a boon and blessing. The invalid who has been in the same room for weeks, months and even years, can put on a pair of head-phones and in a trice be carried on the magic carpet to distant places. He hears a station call that comes from Schenectady, N.Y., or Pittsburgh, Pa., or Detroit, Mich., Springfield, Mass. He hears delightful music, readings, instrumental and vocal music, readings, addresses by famous men, news, crops reports, and for a little time at least he is in a new world.

WGY, the radio broadcasting station of the General Electric Co., daily receives letters from appreciative listeners from almost every part of the United States, occasionally from distant Mexico, or the Islands of the Carribean, often from eastern Canada, and sometimes from radio operators aboard ships hundreds of miles off the Atlantic seacoast.

A woodsman, far back from civilization, writes that the nights are never lonely when he can pick up WGY and hear music and speech from Schenectady; an invalid who has lived in the same room for years tells how the dreaded night has been turned into the happiest time for her. A patient in a tuberculosis sanitarium relates how a new interest has been brought into many lives. While waiting for the sun, fresh air and good food to heal, these people sit and talk all day about the concert of the night before and anticipate the programme of the next evening.

Recently Warden Charles C. Clarke, of the New Hampshire State prison, wrote that he is getting WGY every night, and that the prisoners are enjoying the music. The superintendent of a county asylum and poor farm in Wisconsin adds his thanks and the thanks of the people in his charge for the programmes which are broadcasted by WGY.

None, however, is more appreciative of the boon of wireless than the blind. Many letters have come to the General Electric station at Schenectady, N.Y., from those who are sightless, some of them in that condition since birth.

Among the most striking of this type of letter is that from Lemont Hackett, field officer of the Maryland Association of Workers for the Blind, with headquarters at Baltimore, Maryland. In the course of his letter he says:

"I am myself without sight, and have for some time felt that this wonderful invention would come to mean a great deal to those who cannot see. I now know what

for so long I have imagined. This new phone will undoubtedly be the means of bringing to our blind people in the future, entertainment, and information, and will, in many ways, aid them in passing pleasantly many hours that would otherwise be lonesome and unprofitable.

"On this occasion (when Mr. Hackett heard WGY's programme) there was with me another blind man who was equally impressed by what he heard, Mr. J. Carroll Boone, a member of our board of directors.

"So impressed am I with the radio phone that I have taken up the subject with our superintendent, Mr. J. L. Beck, and he is writing you relative to the cost of installing a set at our workshop where our blind men and women may enjoy its possibilities."

THE PRINCIPLES UNDERLYING RADIO COMMUNICATION

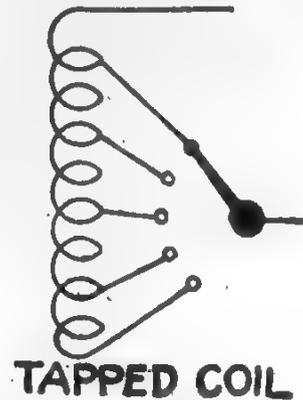
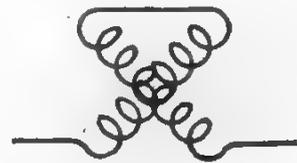
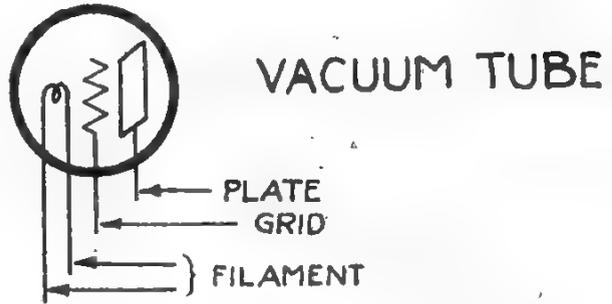
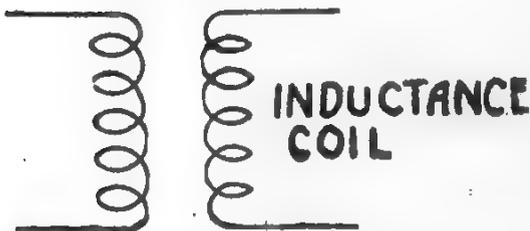
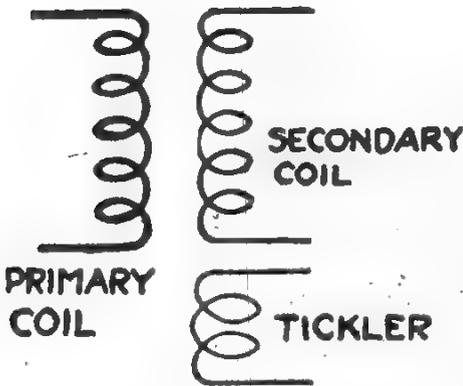
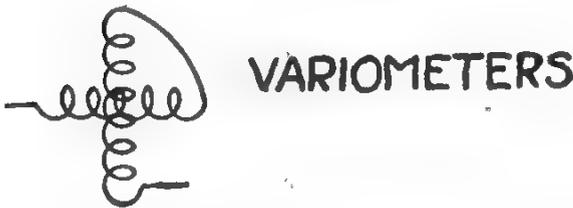
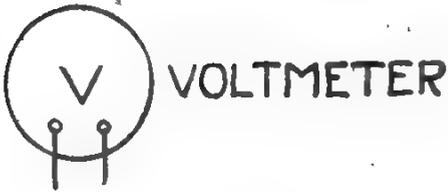
The Government Printing Office at Washington has just issued an elementary book on radio communication. This book is *The Principles Underlying Radio Communication Pamphlet No. 40*, second edition. The first edition was prepared during 1918 at the Bureau of Standards at the request of the Signal Corps for use as a textbook in training enlisted men of the Signal Corps for radio service. The revised edition has also been prepared at the Bureau of Standards, and has been considerably increased in size. Some obsolete material appearing in the first edition has been replaced, and considerable new material has been added. There is new material on batteries, ordinary wire telegraphy and telephony, line radio communication, transformers, antennas including coil antennas and direction finders, transmitting apparatus, particularly arc converters, electron tubes and electron tube apparatus, a. c. plate supply, and radio telephony. Numerous circuit diagrams are given. The construction of antennae and ground connections are described, and other useful practical information is given. The book also contains a table of dielectric constants, copper-wire tables, wave-length tables, and the International Code, safety precautions for radio stations, information regarding radio laws and regulations, and regarding radio publications, including Government publications. A complete index has been added. The revised edition contains over 600 pages and more than 300 illustrations, many of them photographs. The book is durably bound in fabricoid.

The first chapter deals with elementary electrical principles, the second chapter with dynamo-electric machinery, and four other chapters deal with radio principles and practice and discuss the construction and operation of the important types of radio transmitting and receiving apparatus. The book assumes that the reader has had at least the major part of a high-school course, but does not assume a knowledge of mathematics beyond algebra. By a study of this book a person having some general familiarity with electricity can acquire a good foundation in the principles of radio communication.

The first edition enjoyed a wide sale to many different classes of readers, and was used as a textbook by various schools and colleges as well as by the Signal Corps.

A copy of the revised edition can be purchased for \$1 from the Superintendent of Documents, Government Printing Office, Washington, D.C. This price includes postage in the United States and its possessions, and in Canada, Cuba, Mexico, and Panama. For other countries an extra allowance of 15 cents should be made for postage.—Submitted by Bureau of Standards.

KEY TO RADIO DRAWINGS



KEY TO RADIO DRAWINGS



AERIAL



LOOP AERIALS



CONNECTED WIRES



CROSSED WIRES NOT CONNECTED



"B" BATTERY 22½ VOLTS OR UP.



"A" BATTERY 6 VOLTS



GROUND



CAPACITY GROUND



BINDING POST OR CONNECTION



CONDENSER



VARIABLE CONDENSER



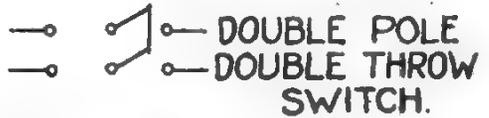
FUSE



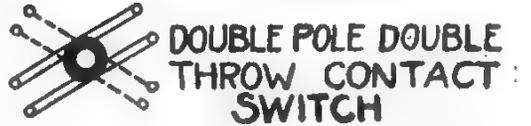
KEY



DOUBLE POLE SINGLE THROW SWITCH



DOUBLE POLE DOUBLE THROW SWITCH.



DOUBLE POLE DOUBLE THROW CONTACT SWITCH



BRIDGING CONTACT SWITCH (6 POINT)



TRANSMITTER



RECEIVER



LOUD SPEAKER



INDUCTIVE WOUND COIL



NON-INDUCTIVE WINDING



RESISTANCE WINDING



The Original Receiving Set

Drawn by "Radio" Staff Artist—Sherlock.



SINGLE POLE SINGLE THROW SWITCH



SINGLE POLE DOUBLE THROW SWITCH

BROADCASTING NEWS

CHIME MUSIC BY RADIO

A chime of sixteen bells played in Watervliet, N.Y., was heard 800 miles away in Athens, Ga. This distance achievement was made possible by radio.

Transmission of chime music was made for the first time by WGY, the General Electric Co. broadcasting station at Schenectady, N.Y. The bells were mounted on pine supports in the bell foundry at Watervliet and the music was carried over wire lines to the wireless transmitting station in Schenectady, at which place the music was put into the air. Letters received from people in Michigan, Georgia, North Carolina, the New England States and parts of Canada indicated that the music went through clearly in spite of the fact that the bells were played inside the foundry.

Until the advent of radio, bells were unrivalled as broadcasters of music. In the early days bells were the most effective means of sounding alarms. People from miles around could be summoned to meet a common enemy, or they might be warned of fire or flood. Even to-day the bell is depended upon to warn of fire or the escape of prisoners.

By means of radio the radius of a bell is increased many hundredfold. The chime recently broadcast by WGY has since been shipped to Washington, where it will be installed in the McKim Memorial Tower of the Church of the Epiphany. On the evening of the wireless concert the manager of the Hotel Raleigh in Washington tuned in the bells, to be installed in that city, and by means of a loud speaker, guests heard the bells clearly as they played "Swanee River" and "Old Black Joe." The largest of the bells, the tenor bell, weighs 4500 lbs., and the smallest, 225 lbs.

MONTREAL THEATRES INSTALL RADIO

That radio will play an important part in entertaining the public in the near future is shown by the fact that the Independent and United Amusements Limited, who own and operate the Strand, Regent, Papineau, Belmont, Plaza and Moulin Rouge Theatres have installed receiving sets in all their houses and will give a special radio concert every evening.

They have secured the services of a number of artists who will entertain the different audiences at the above mentioned theatres from the Marconi Company's large new broadcasting station which is situated on the roof of the Canada Cement Building, Phillips Square.

At the conclusion of the local concert the operators in the different theatres will endeavor to pick up more distant points where concerts are in progress, such as New York, Pittsburgh, Springfield and other distant points where large broadcasting stations are situated. With favorable weather conditions the different audiences should hear quite distinctly band selections, vocal and instrumental numbers from points hundreds of miles distant. The tests, which have been conducted have proven highly successful, and the management of these theatres expect to give their patrons a real treat.

Every evening after the regular show is finished in the six theatres the operators in charge of the radio sets will give a special demonstration to those who wish to stay and view the different instruments at close range.

EIFFEL TOWER CENTRE OF FRENCH BROADCASTING

Stirred by the tremendous success of radio broadcasting in the United States, Gen. Ferris, head of the French Army Signal Corps, has organized a service for the benefit of the public within a radius of 1,500 miles of Paris.

A broadcasting outfit with a powerful amplifier has been installed in the Eiffel Tower, and now not only citizens sitting in their homes, but airplane travelers between Paris and London, enjoy the daily concerts. A party of 35 in North Africa, 1,450 miles away, recently enjoyed one of these Paris concerts, which they heard perfectly.

It is now planned to permit direct radio communication between a telephone subscriber in Paris and one in London or in an airplane or on a ship at sea, so that it will be possible soon to keep in touch with any person traveling between Paris and other European cities.

INTERFERENCE BY BROADCASTING STATIONS

Broadcasting stations should shut off transmitters when not in actual operation to prevent unnecessary interference from carrier wave.

Care should be taken not to extend schedules resulting in interference with the schedules of other stations.

Transmitters must be adjusted so as not to produce unnecessary interference.

THE K.D.K.A. KIDDIES

By D. M. Hope.

When the curtains of night are drawn o'er the land
And the stars take their place in the sky,
Before the fond mothers have put them to sleep,
By singing some sweet lullaby;
The kiddies delight to be listening in,
At the close of the long, weary day,
To hear Uncle Wiggily stories that cheer
Broadcast from K.D.K.A.

The sandman may beckon them earnest, but vain,
Until after the story is through.
Oh! the wonderful things Uncle Wiggily does,
And something each night that is new,
Exciting adventures, the well-meant advice
To squirrel boys and rabbit at play,
Beware of the weasel, the fox and the wolf—
'Tis wonderful K.D.K.A.

The rheumatiz painted red, white and blue,
Clover candy, now, scenting the air,
The soap that distracted the wicked old wolf,
And drove him away to his lair.
No matter the things that seem to start wrong,
There always will turn up some way
For Uncle's escape to his home and Nurse Jane—
They tell us from K.D.K.A.

When wrapped in sound slumber in lullaby land,
These tales, in their dreams, they must hear,
With no doubt, a smile on each chubby face
And Old Uncle Wiggily near.
'Tis well that this comes to the tired little tots,
And may it continue alway;
Their blessings you have, and each little heart
Is thankful to K.D.K.A.

S. Robertson, Brantford, Ont.



**Discriminating
Radio Operators
—USE—
The Bristol Loud Speaker
TRADE MARK
AUDIOPHONE**

PATENTS PENDING. DESIGN PATENT PENDING

ASK YOUR LOCAL DEALER FOR DEMONSTRATION

List Price \$56.50 f.o.b. Toronto, Ont.

DEALERS: Full Information On Request

A. H. WINTER JOYNER, Limited
62 Front St. W., Toronto New Birks Bldg., Montreal

Full Line of Radio Supplies

Immediate Delivery.

Write for Prices.

We are exclusive distributors for many well known lines. Dealers wanted. Some territory still open. Write for proposition.

SPECIAL

LOOSE COUPLER SET

CRYSTAL SET

- 100 ft. Aerial Wire
- 1 lb. 22 Gauge Enam. Wire
- 1 Ground Clamp
- ½ lb. C. covered 28 Gauge Wire.
- 4 Pr. Cleats
- 10 Contact Points
- 1 Slide and Rod
- 1 Switch Arm
- 1 4½ x 8 Paper Tube
- 1 3½ x 8 Paper Tube
- 2 Long Slide Rods for secondary coil
- 4 Binding Posts
- Galena
- Detector
- Federal 2,200 Ohms Phones—Double Condenser
- 1 6000V double throw single pole knife switch.

- 100 ft. Aerial Wire
- 4 pr. Cleats
- 1 600V double throw single pole knife switch.
- 1 Ground Clamp
- 1 3½ x 8 Paper Tube
- ½ lb. 22 Gauge Enam. Wire.
- 2 Slides and Rods
- 2 Wood Blocks
- 4 Binding Posts
- Detector
- Galena
- Federal 2,200 Ohms Phones—Double Condenser

PRICE \$22.50

PRICE \$19.75

The above prices include Blue Prints and full instructions.

DOMINION ELECTRIC SUPPLY CO. LTD.

Wholesale & Retail

110 Queen St., West., Toronto, Ont.

Now that "Radio" is the Magic Word

The Radio Station, Sixth Floor of the House Furnishings Building is the centre of the Store's attraction.

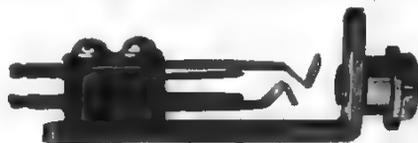
Call Signal "CJCD"—wave length 410 metres, continuous wave. This is something to know and note if you want to come in on Eaton Concerts by Wireless or to order Radio supplies. The Concerts are given daily 4 to 4:30 p.m., and Saturday at 12 o'clock to 12:30.

The Radio Station is in charge of a licensed operator who is at your service to supply you with any desired information, or to help you with any problems concerning wireless telephony or telegraphy.

Orders booked for Receiving sets. A full line of Crystal sets at various prices. Pay a visit to this department for your supplies.

T. EATON CO. LIMITED
TORONTO CANADA

"If a man write a better book, preach a better sermon, or make a better mouse-trap than his neighbor, though he build his home in the woods, the world will make a beaten path to his door."



SPECIAL ANNOUNCEMENT FIRCO JACKS

Single Circuit, open	\$.75
Single Circuit, closed .....	.85
Double Circuit closed	1.00
Three Spring Automatic Filament Control	1.25
Five Spring Automatic Filament Control	1.50

99% starting silver contacts-nickel-silver springs. Try them out against others and note particularly their resiliency and perfect contact. Designed by Fircoco engineers realizing the need for the perfect jack. IMMEDIATE DELIVERIES.

The famous KEIGHT Condensers, Capacity Meters, Frequency Meters and other Precision Instruments are now controlled absolutely by us. We have purchased the patent rights and will continue to be exclusive distributors.

JOHN FIRTH & CO., Inc.
18 BROADWAY NEW YORK

DEAL WITH THE MANUFACTURERS

Sole Distributors for all Radio Apparatus and Parts

GUARANTEED

Receivers—1500 ohms—\$7.50 per pair

Acme Special Radio Set—\$7.50

IMMEDIATE DELIVERY ON MAIL ORDERS

CONDENSERS, VARIOMETERS, VARICOUPLERS, DETECTORS, DIALS, TUBES, Etc.

ACME RADIO CO.

143 QUEEN ST., W., TORONTO, ONT.

DETROIT OFFICE—448 FIELD ST.

The GREWOL



Permanent crystal Detector. You don't have to find the sensitive spot with this Detector, it is always there. Price \$2.75.

Montreal Radio Supply Co.
283 Bleury St.,
Montreal.

Exclusive distributors for Canada. Write for our discounts on easy selling, profitable articles.

IMMEDIATE DELIVERY FROM STOCK

2000 Ohms Ellwood Double Head Sets	\$9.50
Antenna Wire, 7/22 Copper in 100 ft. lengths.....	.65
Vacuum Tube Sockets with Metal Holders .....	.90
23 Plate Condenser with new approved Dial	3.40
43 Plate Condenser with new approved Dial	4.95
3/16 inch Dials (Bakelite) .....	.85
1/4 inch Dials, (Bakelite) .....	.85
Mounted Crystal Detectors (Tested) .....	.25
1/4 Nickel Plated Binding Posts	each .08
No. B1 Hard Rubber Binding Posts	each .12c.
Deep Nickel Contact Posts	each .04c.
Ground Clamps	each .08c.
Deep Nickel Switch Stops	each .04c.
0001 Telephone Condensers	each .18c.
Rheostats, complete with Dial	1.35

ELECTRIC SUPPLY CO., 281 BLEURY STREET, MONTREAL, CANADA
Mail Orders Promptly Shipped.

PENTON PUBLICATIONS

Lead In Their Fields

	Subscription Price
Radio	\$ 1.50
Canadian Motor Boat	1.50
Canadian Exporter	1.00
Canadian Ford Owner	1.50
Canadian Trade Register	10.00
Canadian Export Trade Directory	10.00

Detailed information and advertising rates sent upon request.

A. F. Penton & Co.
Publishers
 60-62 Adelaide Street East
 Toronto, Ont.

Why Should I Use a

Weston

Filament Voltmeter

On My Receiving Set?



Model 301

Here's the Answer:

1. It simplifies tuning by eliminating guesswork as to tube adjustments.
2. Filament voltage control increases the life of the tube from two to three times.
3. The Weston Filament Voltmeter is accurate and can be relied upon for duplication of results.

All This Means

Better Reception!

Buy it from your dealer, or from us direct if he cannot supply you. Write for RADIO CIRCULAR J.

Weston Electrical Instrument Co.
 177 Weston Avenue, Waverly Park, Newark, N. J.

CANADIAN REPRESENTATIVES—
 A. H. Winter-Joyner, Ltd., Toronto, Ontario Agents; Northern Electric Co., Ltd., Montreal, Ottawa, Winnipeg, Halifax, Regina, Vancouver, Calgary, Edmonton.

Prompt Shipment

Radio Apparatus and Parts

Mail us your order from your Catalogs.

CANADIAN WIRELESS & ELECTRIC CO., LIMITED

36 PALACE HILL QUEBEC, QUE.

VALLEY BATTERY CHARGER

Simple

Safe



Will charge your "A" battery overnight from the lighting socket without any attention.

Approved by the National Board of Underwriters and the Hydro Electric Power Commission of Ontario.

It also has a 12-volt tap by means of which your storage "B" battery can also be charged by arranging the battery in parallel sections.

Type MC. 25 cycle.....\$38.00
 60 cycle.....\$32.00

F.O.B. Toronto or Winnipeg

Canadian Electrical Equipment Co.

199 HOWARD PARK AVE. TORONTO

SOLE CANADIAN DISTRIBUTORS

DEALERS AND JOBBERS WRITE FOR DISCOUNTS

"DICTOGRAPH" RADIO HEADSETS

DICTOGRAPH sound transmitting devices are recognized throughout the world as standard of efficiency.

Twenty-five years experience in the manufacture of DICTOGRAPH transmitters, receivers, Acousticons and loud speakers has combined to produce the DICTOGRAPH Radio Head Set for commercial, amateur and broadcasting service.

DICTOGRAPH Radio Head Sets will be found unequalled in distinctness, extreme sensitiveness and pure clear tonal qualities.

Send for pamphlet giving full description of same.

CANADIAN DISTRIBUTERS

SIGNAL SYSTEMS, LIMITED

11 WELLINGTON ST., EAST.

TORONTO, ONT.

IMMEDIATE DELIVERY On Super-sensitive Radio

**Receiving Instruments & Head Phones
NOT A TOY**

This Unit is the First of Four Units

(The balance to be announced at a later date) which constitute a modern Long Range Radio Outfit capable of bringing in Concerts hundreds of miles distant—Loud and Clear.

**But Each Unit is Complete in Itself
\$27 Complete, Ready to "Listen In" \$27**

HUGHES SALES CO., 304 Yonge Wholesale and Retail.

Radio Receiving Sets Complete for reception of RADIO CONCERTS

RADIO PARTS: FULL LINE for those who make their own.

We handle only the best quality apparatus.

Mail Orders receive prompt attention.

The J. D. FORD Radio Equipment Co.
974 BLOOR ST. WEST, TORONTO, ONT.

Main 5067

E. C. SYKES & Co., Inc.

We carry a complete line of

RADIO PRODUCTS AND PARTS

Catalogue upon request

12 FRONT STREET ROCHESTER, N.Y.

Canadian Amateurs Take Notice

We buy direct from the largest firms in the United States

Bakelite Dial \$1.00 Chelsea Rheostat \$1.35

Radio Corp. Sockets \$1.50

Radio Corp. Tube 200 \$7.00 — 201 \$9.00

Price List Free.

Immediate Delivery. Mail Orders sent Prepaid.

WINDSOR RADIO CO.

26 FERRY ST. WINDSOR, ONT.

MALCOLM and HILL

Limited

KITCHENER, ONT.

**Manufacturers of
Radio-Cabinets**

Special designs and prices on application

BUFFALO RADIOPHONE CO.,

SUCCESSORS TO: JATH WIRELESS COMPANY.

343 PARKDALE AVE., BUFFALO, N.Y.

We carry a complete stock of RADIO CORPORATION TUBES
UV-200-201

Immediate delivery. Mail orders sent prepaid

All Standard Makes of High-Grade Wireless Equipment.

NOVO "B" BATTERIES FOR WIRELESS SETS

All Standard Sizes—22½ to 105 Volts. Send for Catalogue

HALE BROS. 318 St. Paul St. W., Montreal

When You Amplify use Acme Apparatus

Acme Amplifying Transformers



*The Heart of the
Amplifier is the
Transformer.*

Acme Transformers are for sale separately, and are also incorporated in complete Acme Detector and Amplifier instruments designed to connect to your present receiving equipment.

Radio has been moved to the living room, and Acme units are constructed to harmonize with the furniture.

Acme Transformers

have been brought to a high degree of efficiency through years of specialization on this one product.

ACME APPARATUS COMPANY, 200 Massachusetts Ave., Cambridge 39, Mass.

New York Sales Office—1270 BROADWAY

TRANSFORMER AND RADIO ENGINEERS AND MANUFACTURERS

Federal Junior



The Federal Jr. Broadcast Receiving Set is a most efficient instrument for receiving radio telephone broadcasting within a radius of 15 to 30 miles. It is substantially constructed, beautifully finished and exceedingly simple in operation.

Demand Federal Jr. from your dealer.

Century Telephone and Construction Co.,
BRIDGEBURG, Ont.

The Barwick Radio Co.

Manufacturers, Importers and
Distributors of

High Grade Radio Apparatus

Canadian Distributors for Remler,
Clapp-Eastham General Apparatus Co., etc.

- Barwick VT Socket\$1.00 each
- " Panel Rheostat\$1.00 "
- " Fine adj. Rheostat...\$1.00 "
- 600 Metre Receiving Set\$7.50 "
- Audion Receiving Set with
Coils and Tube.....\$37.50

We specialize in supplies and parts for the
man who "Makes His Own",

A POSTAL CARD will BRING OUR PRICE LIST to YOU

If in doubt about Radio Apparatus, ask our advice

THE BARWICK RADIO CO.

89 Britannia Ave., Hamilton, Ont.
Retail Store at 35 Mary Street.



Electricity at your finger ends

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set to-day to look over.

HAWKINS GUIDES

3500 PAGES \$1 A VOLUME
4700 PICTURES \$1 A MONTH

These books tell you all about —
Magnetism — Induction — Experiments — Dynamos — Electric Machinery — Motors — Armatures — Armature Windings — Installing of Dynamos — Electrical Instrument Testing — Practical Management of Dynamos and Motors — Distribution Systems — Wiring — Wiring Diagrams — Sign Flashers — Storage Batteries — Principles of Alternating Currents and Alternators — Alternating Current Motors — Transformers — Converters — Rectifiers — Alternating Current Systems — Circuit Breakers — Measuring Instruments — Switch Boards — Wiring — Power Stations — Installing — Telephone — Telegraph — Wireless — Bells — Lighting — Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index.

SHIPPED TO YOU FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth \$100 to you—pay \$1.00 a month for ten months or return it.

THEO. AUDEL & CO., Publishers, 72 FIFTH AVENUE, NEW YORK.
Please submit for FREE EXAMINATION Hawkins' Electrical Guides—10 numbers at \$1 each. If satisfactory I agree to remit \$1 a month until paid.

Employed by

Business

Occupation

A. W. 200

RADIO WORKERS

—USE—

"Imperial" Rosin Core Solder

CLEAN AND QUICK for all Fine Work

Ask Your Jobber And Specify "Imperial"

The Canada Metal Co. Limited
TORONTO

IN STOCK

- Murdock, No. 56, 2000 ohms, double phones \$8.50
- Murdock, No. 56, 3000 ohms, double phones 8.00
- Stromberg-Carlson, 2200 ohms, double phones 10.25
- Federal, 2200 ohms, double phones 10.80
- UV 200 Detector Valves 7.00
- UV 201 Amplifying Valves 9.00
- UV 202 Power Valves, 5 watt 11.50
- Arkey Amplifying Horn 6.50
- King Amplifying Horn 14.00
- Magnavox E3 Amplifiers, comp. 14 in. Horn 62.50
- Grebe, CR5, Intermediate-wave Regenerative Receiver and Vacuum Tube Unit (150 to 3000 metres), \$115.00
- Grebe, CR9, Intermediate-wave Regenerative Receiver, Detector and Two-stage Amplifier (150 to 30000 metres), including two special Plugs \$180.00

14-Page Catalogue Free. Dealers Wanted
Orders Shipped in 24 Hours for Grebe Sets

WINDSOR RADIO CO., 26 FERRY STREET,
WINDSOR, ONTARIO

"B" SATISFIED

FACTS ABOUT KICO STORAGE "B" BATTERIES —

1. Not an ACID "B" Battery.
2. They eliminate noises caused from "B's" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical adjustment is essential on your detector bulb for Radiophone and C.W. reception.)
4. Rechargeable from your 110 volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge, while in the detector plate circuit.
6. NOT an experiment. All batteries are sold with the privilege of receiving your money back within a ninety day trial, if unsatisfied.
7. Neat, efficient and compact.
8. Unlimited life.

Drop a line for information
Distributors in Toronto: THE VIMY SUPPLY CO.

KIMLEY ELECTRIC CO.

290 Winslow Ave. Buffalo, N. Y.

THE NAME
IS



Guarantee



No. 56.

Murdock Head Receivers
Murdock Variable Condensers

Are sold by Progressive Canadian Dealers.

WM. J. MURDOCK CO.

100 CARTER STREET - CHELSEA, MASS, U. S. A.



KENNEDY

Universal Regenerative

RECEIVER

Type 110

is designed to meet the requirements of those who wish to cover the entire field of Radio. It permits of reception on all wave lengths in use today by Government, commercial, amateur, special and all broadcasting stations. Coupled with Kennedy Amplifier Type 525 it affords the user access to every field of Radio.

Type 110 Receiver can be made to detect, regenerate, or oscillate at will, with high efficiency, over its entire range of 175 to 25,000 meters

KENNEDY RADIO EQUIPMENT IS LICENSED UNDER ARMSTRONG U. S. PATENT NO. 1,113,149 AND IS SOLD BY GOOD DEALERS EVERYWHERE

Write for Latest Bulletin C-3



THE COLIN B. KENNEDY COMPANY

INCORPORATED

RIALTO BUILDING

SAN FRANCISCO

The most progressive family has a

MAGNAVOX Radio

ATTACHED to any commercial receiving set, the Magnavox Radio reproduces every sound in volume and marvelous clarity.

Family and friends all enjoy the Radio Programs—thanks to Magnavox Radio.

With Magnavox Radio—the reproducer supreme—the hookup is simple and no extras or attachments are required.



No receiving set is complete without a Magnavox Radio.

Radio brings it

MAGNAVOX tells it

R-3 Magnavox Radio with 14-inch horn (here illustrated), is ideal for use in homes, offices, etc.

R-2 Magnavox Radio with 18-inch horn for those who wish the utmost in amplifying power; for large audiences, dance halls, etc.

Model "C" Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. Made in 2 and 3 stage.

Any dealer will demonstrate for you, or write us for descriptive booklet and name of nearest dealer.



The Magnavox Co.
Oakland, California

N.Y. Office: 370 Seventh Avenue



Our Super-Sensitive Detectograph Transmitter No. 2
Price, \$8.00 Complete



Adjusted Model No. 80 Horn, High Grade Loud Talking Receiver, Cord Plug and Desk Stand Base.
Price, \$15.00 Complete

Low Resistance
SUPER-SENSITIVE
Detectograph
MICROPHONE DEVICES

Practical Instruments for Commercial and Scientific Purposes

AMPLIFY YOUR RADIO SIGNALS

With the new DETECTOGRAPH-TRANSMITTER, the amateur can amplify radio signals to such an intensity that he can hear the signals about his station without the need of the telephone head set.
The manner in which the amplifying process is attained is by attaching with tape the DETECTOGRAPH-TRANSMITTER to the regular wireless receiver.
By the addition of a loud talking telephone he is able to hear the messages many feet away from the instrument.
The super-sensitive DETECTOGRAPH-TRANSMITTER herewith shown is two and

three-eighths inches in diameter, five-eighths of an inch thick and weighs less than three ounces. It is the most sensitive sound-detecting device ever brought before the public.

Not only is this instrument applicable for amplifying radio signals, but it can be used with equal satisfaction for amplifying other sounds. Phonograph music, can be transmitted from one place to another by means of this instrument, and those who are afflicted with deafness will find enormous benefit by using this transmitter.
Can be used for any purpose where a sensitive detecting instrument is required.



Our New Special Loud Talking Receiver No. 25
Price \$7.50



Detectograph Rheostat, especially made for amplifying circuits. Price, \$2.00 Complete



Detectograph, \$18.00
This detecting instrument of marvelous sensitivity can be used for detecting secret conversations. Outfit consists of Sensitive Transmitter, 22-ft. Black Cord, Receiver, Headband, Case and Battery.



Our Special Loud Talking Telephone Transmitter No. 5, Price \$12.00

This model is especially made for Loud Talking Telephone reproduction. This transmitter can be used to advantage in connection with our Loud Talking Receivers or Horn Apparatus by wireless operators, window demonstrators, and in fact by every one desiring to build up their own loud talking telephone apparatus.



The Detectograph Junior Desk-Phone, \$18.00

Equal to any \$35 instrument made. Outfit consists of Super-Sensitive Transmitter with cord connector; Super-Sensitive Ear Piece with small black cord, Black Single Headband; Black Case and Two Batteries.

High Resistance

WIRELESS RECEIVERS

SUPER SENSITIVE
Superphone
TELEPHONE DEVICES

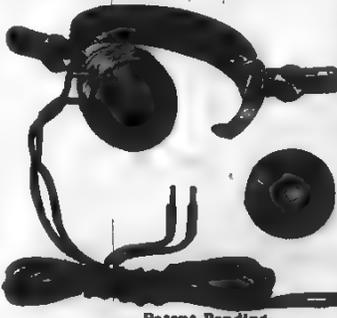
MAGNIFYING APPARATUS

A Set of Receivers offering a Combination of a silent and loud reproduction of Wireless Signals
Efficiency of the Superphone Receivers

Sound is transmitted from one medium to another in vibrating waves. These waves travel in every direction unless they are forced into one particular direction. Attached to the second cap close to the diaphragm is a small round tube, this tube is made so that it fits snugly into the operator's ears. The sound waves are now forced into one direction—the operator's ears. This attachment makes the loss of sound impossible, giving the maximum reproduction. The feature that aids the clear reproduction is the resonant chamber directly below the diaphragm and above the magnet and coils.

THIS CUT ILLUSTRATES THE RECEIVERS WITH HORN ATTACHED

The high tension metal used as a spring forces the receivers close to the ears. The receivers are so attached to the head band that they rest against the ears in a vertical position. This makes it comfortable for the operator.



Patent Pending



Superiority of the Superphone Receivers

The features that are enjoyed by only the SUPERPHONE receivers, that of the LOUD TALKING HORN attachment and the attachment that fits into the operator's ears, make them superior to any set of receivers on the market at present. The construction and arrangement, not to say anything of the matched tones of the two receivers, place them far above the ordinary receivers.

Superphone Receiving Set with Cord and Headband

2000 Ohms.....	\$12.00
3000 Ohms.....	15.00
4000 Ohms.....	20.00
With Horn Attachments as above.....	\$ 5.00 Extra

High Resistance Loud Talking Horn Apparatus for Use on Wireless Instruments

Direct



Model No. 50, 12 in. Long
Price \$12.00

Order direct from ad. Or write for free descriptive new catalogue
G. BOISSONNAULT COMPANY, Inc. 26 CORTLANDT STREET
NEW YORK CITY

Comes Summer— and Trouble!

SOON will come summer and "static" and other troubles for amateur Radio fans. Then will be the true test of worthwhile wireless equipment and apparatus.



Signal Variable Condenser

"SIGNAL" quality has long endured strenuous service by government, professional and commercial users, as well as beginners.

Sell your customers "SIGNAL"—for SERVICE.

SIGNAL ELECTRIC MFG. CO.
MENOMINEE, MICHIGAN

COUPON

Send me the new Signal Wireless Bulletin W.

Name

Company

City

State W.A.N.

Dependability

"Lambda-Built Products"

Look for our Trade Mark on

CONDENSERS,
RHEOSTATS,
BINDING POSTS,
VALVE HOLDERS,
PANELS,
CABINETS,
COILS,
COIL HOLDERS,

Lambda-Built Receivers and Transmitters

Manufactured by

RADIO DEVICES Limited
GANANOQUE, Ont.

Service !!!

Distributors for

Lambda-Built Products,
Dictograph Head Sets,
Brown's English Receivers,
Mullard Radio Valves,
Mullard Power Valves with
Renewable Filament Features,
Mullard Grid Condensers,
Mullard Grid Leaks,
Bristol Loud Speakers,
Edison Storage Batteries.

POWLEY & MOODY, LIMITED

GOAD BLDG. 103 BOND ST.
TORONTO, CANADA

RADIO APPARATUS

*Distributors of Reliable Radio Apparatus to Schools,
Colleges, Radio Clubs and Experimenters
All Over the World!*

"PITTSICO"

Specializing on "RADIO
CORPORATION'S" Products.



"PITTSICO"

NOW HAS THREE STORES!
SEND US YOUR ORDERS.

The present tremendous demand for Radio Apparatus has practically made it impossible for us to render our usual SERVICE. Reasonably prompt delivery however can be made on the items listed.

AMPLIFYING TRANSFORMERS		CRYSTAL RECEIVING SETS	
No. P-1 General Radio, semi-mounted	\$5.00	Aeriola, Jr., Westinghouse, complete with tele- phones	25.00
No. 50 Chelsea, semi-mounted	4.50	Every-man's DeForest, complete with telephones	25.00
No. A-2 Acme, semi-mounted	5.00	CONDENSERS (Variable)	
ANTENNA WIRE		No. 1 Chelsea, fully mounted, .001 Mf.	5.00
"Pittsco" No. 14 hard drawn copper (80 ft. per lb.), per lb.	.40	No. 2 Chelsea, fully mounted, .0025 Mf.	4.50
500 ft. (special value)	2.25	No. 3 Chelsea, unmounted with dial, .001 Mf.	4.75
"Pittsco" 7 strand No. 22 tinned copper, per ft.	.01	No. 4 Chelsea, unmounted with dial, .0005 Mf.	4.25
500 ft.	4.00	No. 387 Murdock, fully mounted, .001 Mf.	4.50
1000 ft.	7.50	No. 388 Murdock, fully mounted, .0005 Mf.	4.00
"Pittsco" 7 strand No. 20 phosphor bronze, per ft.	.02	No. 3860 Murdock, unmounted without knob and dial, .001 Mf.	4.00
500 ft.	7.50	No. 3880 Murdock, unmounted without knob and dial, .0005 Mf.	3.25
ANTENNA INSULATORS		JACKS (Radio Type)	
No. P-1 Electrose ball insulator	.35	No. P-1 Open circuit	.70
No. P-2 Electrose 4 inch strain insulator	.45	No. P-2 Closed circuit	.85
No. P-3 Electrose 10 inch strain insulator	.75	No. P-3 Two circuit	1.00
"A" BATTERIES (Storage Batteries)		LOUD SPEAKERS	
Yale 6 volt, 60 ampere-hour	18.00	Arkey, horn only, satin finish	5.00
Yale 6 volt, 80 ampere-hour	21.00	Federal Pleiophone, complete with phone	14.00
Yale 6 volt, 100 ampere-hour	25.00	PLUGS	
Note.—These batteries are shipped carefully crated and fully charged ready for use.		No. 84-B Fireco, round type	2.50
"A" BATTERY RECTIFIERS		No. P-1 Western Electric	1.10
No. P-1 Tungar, 5 ampere type, complete with bulb	28.00	SOCKETS	
No. P-2 Tungar, 2 ampere type, complete with bulb	18.00	No. 156 General Radio, improved model	1.50
No. P-3 FF Battery Booster, 5 ampere type	15.00	No. P-1 Chelsea	1.00
"B" BATTERIES		No. P-2 Clapp-Eastham, bakelite type	1.00
No. 763 Eveready, 22.5 volt, small size	1.75	No. UR-542 Radio Corporation	1.00
No. 766 Eveready, 22.5 volt, large size, 16 1/2 to 22 1/2 volts	3.00	TELEPHONES	
No. 774 Eveready, 43 volt, large size, variable	5.00	No. 56 Murdock, 2000 ohms	5.00
		No. 56 Murdock, 3000 ohms	6.00
		No. 2A Stromberg Carlson, 2000 ohms	7.50
		No. P-1 Holtzer-Cabot, 2200 ohms	8.00

Let "PITTSICO" fill your orders for any of the above items.
Our SERVICE on these at the present time will please you.

F. D. PITTS CO., Inc.

12 PARK SQUARE

BOSTON, MASS., U. S. A.

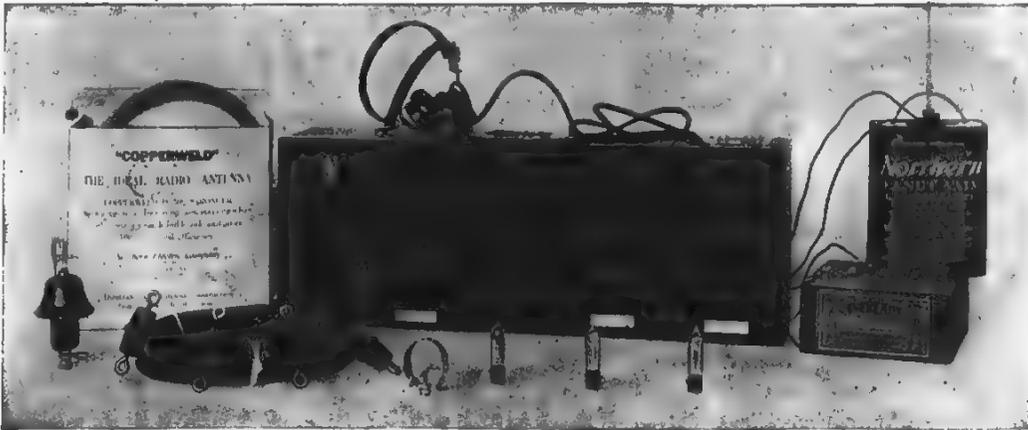
Woolworth Building,
Providence, R. I.

3 STORES

276 Worthington Street,
Springfield, Mass.

ORDER THIS NEW SET EARLY

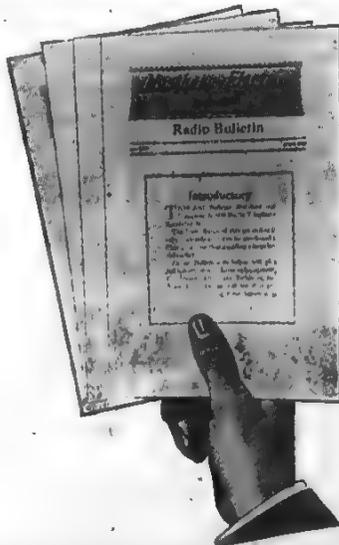
R1000 Radio Telephone Receiving Set



This set, which can be purchased complete or Unit by Unit, has the famous R 215-A "Peanut" Vacuum Tube, Copperweld Antenna Wire and many other new and desirable features.

Its wave length, from 200 to 600 metres, covers the full range of local or distant Canadian and American Broadcasting, Shipping, Stock and Weather Reports, Official Time, etc.

Full description and prices are in our Bulletin No. 1000. Ask your dealer for a copy. If he hasn't one, phone or write our nearest House.



The R 1000 Radio Telephone Receiving Set consists of—

- 1 No. R1 Short Wave Tuner and Detector Unit.
- 2 No. R5 Amplifier Units.
- 1 No. R6 Double Head Set, 2500 ohms.
- 1 No. R650 Aerial System.
- 3 No. R215-A "Peanut" Valves.
- 1 No. R180 Northern Peanut Valve Filament Battery.
- 1 No. R90 45 Volt Plate Battery.

Northern Electric Company

LIMITED

MONTREAL TORONTO WINDSOR CALGARY
 HALIFAX HAMILTON WINNIPEG EDMONTON
 QUEBEC LONDON REGINA VANCOUVER

Makers of the Nation's Telephones

MANUFACTURING

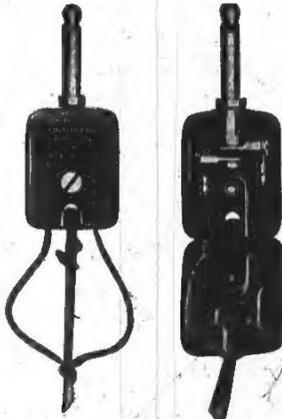
Manual Telephones
 Automatic Telephones
 Wires & Cables
 Fire Alarm Systems
 Radio Sending and-receiving Equipment

DISTRIBUTING

Construction Material
 Illuminating Material
 Power Apparatus
 Household Appliances
 Electrical Supplies
 Power & Light Plants
 Marine Fittings



No. 2A—Radio Head Set
Price \$10.25



No. 60—Universal Plug
Price \$1.70



No. 147—Radio Jack
Price \$1.15



No. 148—Radio Jack
Price \$1.35



Radio Comfort

The thrills of wireless entertainment in the home are enjoyed only where high-grade receiving apparatus is installed.

You can insure the maximum of radio pleasure and comfort by insisting upon having your receiving outfit equipped with—

Stromberg-Carlson Radio Parts

There is the Stromberg-Carlson "Radio Head Set" with—its pleasing fit, its quick adjustment, its fine tonal qualities and its ability to faithfully reproduce even the faintest long distance signals.

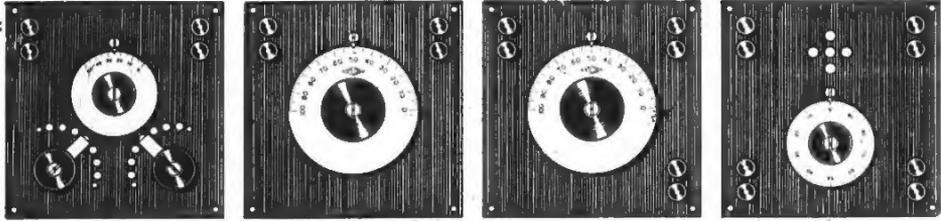
There is the Stromberg-Carlson "Universal Radio Plug" which should be attached to every Head Set. It fits any standard jack, takes any type or size of conductor; takes wire loops, tinsel loops, pin tips or spade tips.

And there are the Stromberg-Carlson "Radio Jacks" which are adapted to all standard radio plugs and which are designed to mount neatly, without washers, on panels that are of varying thicknesses between $\frac{1}{8}$ and $\frac{1}{4}$ inches.

Stromberg-Carlson Radio Products are backed by a firm that has had twenty-eight years experience in the design and manufacture of radio and telephone apparatus.

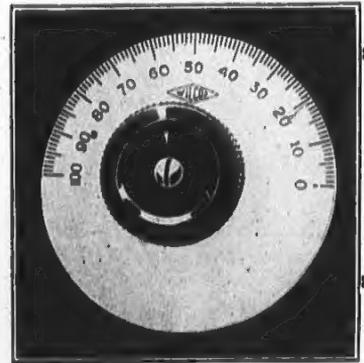
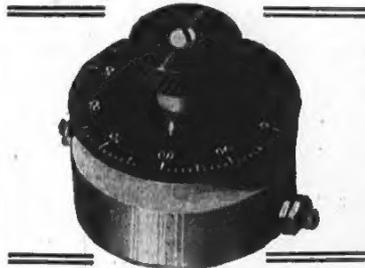
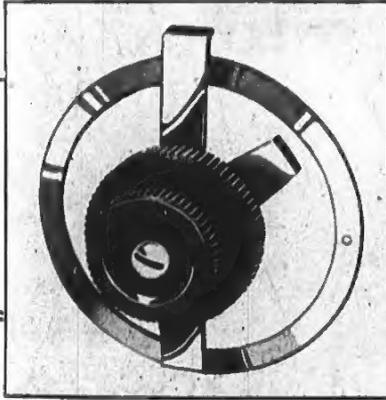
Order Stromberg-Carlson Radio apparatus through your dealer in electrical merchandising or write for free Bulletin No. 1088-A.

**Stromberg-Carlson Telephone Mfg. Co.,
35 McCaul St., Toronto, Ont.**



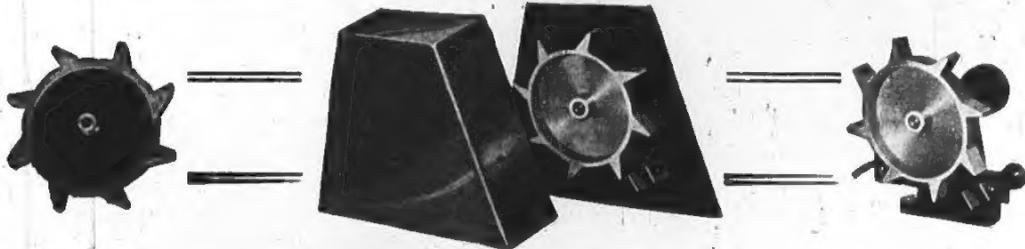
WILCOX Standardized Unit Panels—

form the cheapest, best and most versatile receiver. When coupled together the four instruments shown form a high grade, efficient short wave receiver complete with audion control for only thirty-one dollars. On the left is shown the variocoupler, with fine and coarse primary tuning switches and variable secondary coupling. Next is the grid variometer which controls the wave length from 175 to 450 meters, a range which may be increased if desired by a small fixed condenser. The third instrument is the plate variometer and last is the audion panel with grid condenser, leak, socket, rheostat, etc. The variocoupler and variometers are priced at \$8.00 each and the audion control at \$7.00, all postpaid.



WILCOX Standardized Parts—

make home construction easy. By building your own apparatus from WILCOX parts you can save money, learn more about radio and have instruments as fine as any. They are as great an improvement over "hit or miss" parts as the audion is better than the coherer. No need now to buy a rheostat with one style knob, a switch with another and a dial with a third; neither is there any need of buying parts that are hard to mount, poorly constructed, inefficient or not just what you need. Instead—Standardize On WILCOX Standardized Parts.



WILCOX Rotary Gaps—

have made themselves famous. Known the world over because of their many long distance records.

Send five cents (Canadian coin accepted) for our new interesting loose leaf catalog describing these and other WILCOX products.

THE WILCOX LABORATORIES, LANSING, MICH., U.S.A.

When writing to Advertisers please mention RADIO

Western Canada

MORE BROADCASTING IN CANADA

Radio fans are much interested in the news from Winnipeg which states that both the Winnipeg Tribune, CJNC, and the Manitoba Free Press, CJCG, have begun broadcasting daily. They have put on a very good program of music, business reports, etc. These schedules will be found in "Radio Broadcasting Program" issued at Toronto by the publishers of "Radio."

It is also reported from Montreal that the Northern Electric Company is now putting on a nice program daily, and the Montreal La Presse is now ready with its new studio and will probably be broadcasting before this issue appears.

WESTERN CANADA RADIO CO. OF WINNIPEG

The Western Canada Radio Company of Winnipeg, with general offices in the Somerset Block and factory at 61 Heaton Avenue, when seen by the representative of "Radio," stated:—

"We believe the possibilities of radio practically unlimited. Radio is so new that predictions as to its future development, in order to be conservative, must, we believe, be qualified.

"When we went into this business we first endeavored to secure the services of experienced and at the

same time conservative technical experts and workmen. We have completed and tested three models: Our Junior Canadian Crystal Receiving Set, our Audion Tube Receiving Set, and our Loud-Speaker Concert Machine, the Ampliola, which is, we believe, the first radio-phonograph manufactured in the Dominion of Canada. These machines will be ready for delivery in limited quantities early in September.

"It is also the plan of this company to own and operate its own broadcasting station throughout the West; so as to give the public radio service without the necessity of buying very expensive and necessarily complicated receiving sets. We should have our Winnipeg broadcasting station and possibly our Brandon station in operation within thirty days and intend to follow these with stations in Saskatchewan and Alberta.

"We are now represented by exclusive agents in 86 of the principal cities in Manitoba, Saskatchewan and Alberta."

MANITOBA GOVERNMENT RADIO WILL SPAN LONG STRETCH

When the Manitoba Government Telephone Commission installs the radiophone to connect The Pas with Dauphin or Swan River, the Province will have the distinction of spanning by wireless the longest stretch of country in North America having no other means of communication, John Lowry, Telephone Commissioner, said to our correspondent.

The distance of air between The Pas and Dauphin is about 260 miles, but to Swan River it is only about 160 miles. It has not yet been decided whether the station will be established at Dauphin or Swan River. A service similar to that which it is proposed to establish in Manitoba is carried on between Los Angeles and the Santa Catalina Islands, but the distance across the water is only 35 miles.

A delay has occurred in the manufacture of the apparatus ordered by the Manitoba Government, he stated, and the transmission apparatus, which was to have been delivered first, consequently will not be received until September. Delivery was to have been made early this month.

Although communication will not be of the type known as "directional"—direct communication between parties without the possibility of aerial eavesdropping—Mr. Lowry said that a method will be worked out whereby conversations practically will be private. This, he said, will be in addition to controlling legislation which will probably be sought at the next session of the Legislature.

WHEN RADIO TURNS WHEELS OF INDUSTRY

Dr. Chas. Steinmetz, of the General Electric Co., says there may be a time when power to turn the wheels of industry will be supplied by radio.

Western Canada Radio Headquarters

Before purchasing your
Radio Supplies or Sets
Write us a Line and get
Our Quotations

We are agents for
Marconi Equipment.

RADIO Co. of Canada Ltd.
Tribune Bldg.,
WINNIPEG, MAN.