

SEPT.
1921

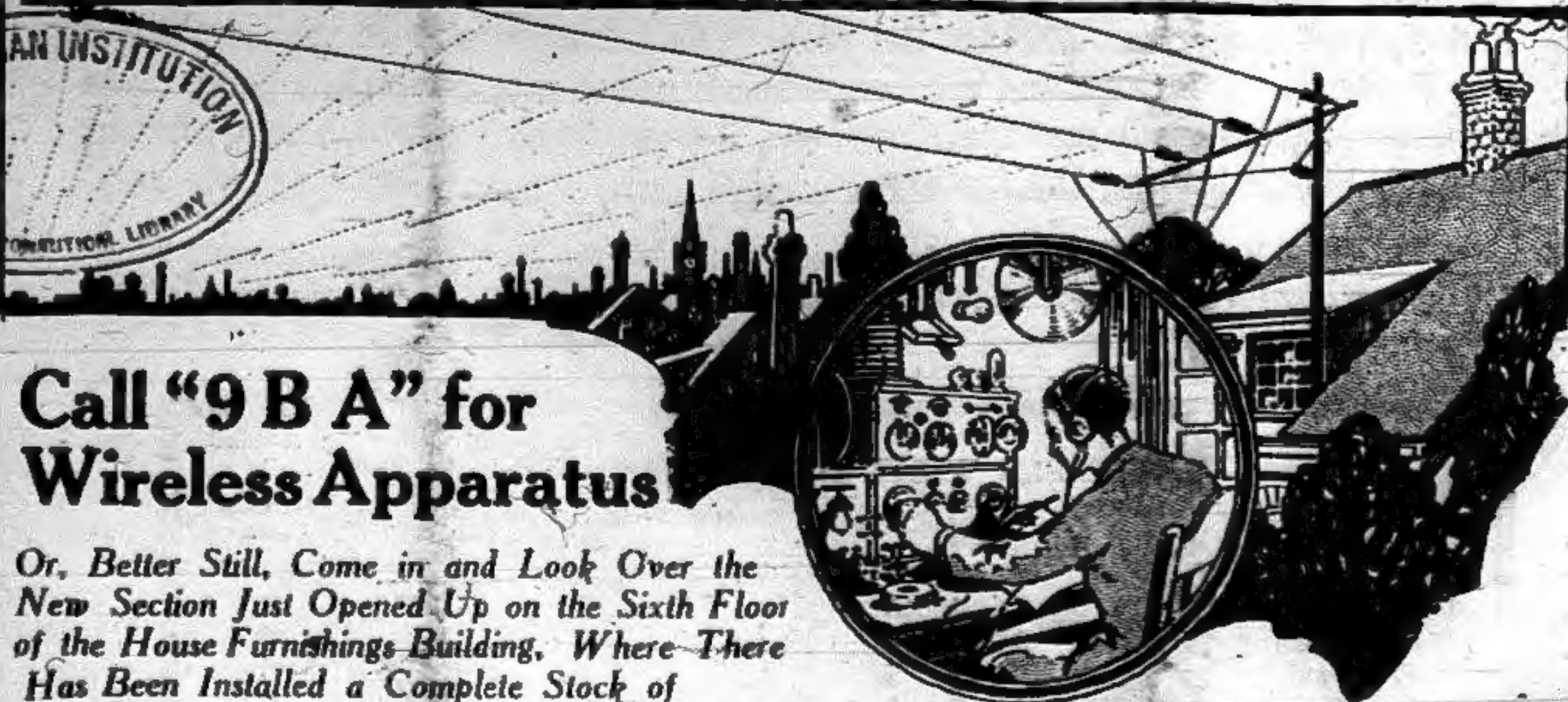
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Price
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OCT-5 1921

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AVIATION & WIRELESS NEWS



Call "9 B A" for Wireless Apparatus

Or, Better Still, Come in and Look Over the New Section Just Opened Up on the Sixth Floor of the House Furnishings Building. Where There Has Been Installed a Complete Stock of

Radio Supplies for Amateurs and Experimenters

The Radio Section is in charge of a licensed operator. He is at your service for the supplying of information and for helping you with any problems relating to wireless telegraphy and telephony.

Listen for **EATON** Concerts by Wireless, 4 to 4:30 p.m. daily, and 12 to 12:30 Saturdays

If you want to order radio supplies by wireless you may do so at any time from 4:30 to 5 p.m. daily. The call signal is "9 B A" — wave-lengths of 300 metres. Answered on continuous wave.

SOME OF THE EATON PRICES ON WIRELESS SUPPLIES

"Mignon" 2-stage Amplifier .. \$65.00	"Mignon" Damped-wave Receptor, can be used with either Crystal or Bulb Detector .. 25.00	"Mignon" V. T. Detector, type BD1-22 .. \$35.00
"Mignon" Damped-wave Receptor, 200 to 10,000 metres .. 65.00		"Mignon" Undamped Wave Tuner, type UW1-12 .. 36.50

DE FOREST DUO LATERAL COILS

No. turns	Price	No. turns	Price
25	\$1.65	300	\$2.50
35	1.75	600	3.15
50	1.85	750	3.25
75	1.95	1,000	3.65
100	2.00	1,250	4.00
200	2.25	1,500	4.35
250	2.40		

INSULATORS

	Price
Ball Insulator	\$0.45
4-inch Insulator65
10-inch Insulator	1.15

KNOB AND DIALS

2 1/2-in. White Dial and Knob ..	\$0.85
3 1/2-in. White Dial and Knob ..	1.15

	Price
Graphite Potentiometer	\$4.50
Antenna Switch	7.15
Variable Condenser	6.00
Audio Frequency Transformer	\$6.25
Coil Mounting	7.50
Filament Current Rheostat	11.50
De Forest Crystal Detector	6.25
"Brandes" Headsets	3.75
2,000 ohms, \$12.00; 3,000 ohms ..	21.00

KEYS AND PRACTICE SETS

	Price
Mesco Key	\$2.00
Bunnel Key	4.75
Mesco Wireless Practice Set	4.00
Practice Set with light	5.00

T. EATON CO LIMITED
TORONTO CANADA

House Furnishings Building,
Sixth Floor.





RELIABLE
TRADE MARK
Canadian Products



Wireless Batteries

The fascination of Wireless Telegraphy has brought to the Dominion Battery Co., Limited, numerous enquiries from all over Canada for **RELIABLE** high-voltage batteries. We are the pioneer manufacturers of all types of Wireless Batteries in Canada, and recommend their use on account of their being made from the highest grade materials only, and the thorough test which they are put through before leaving the factory.

RELIABLE Wireless Batteries are being used by the largest Wireless Companies, and in order that we may further assist them in taking care of their requirements, we have compiled the list shown below:

No.	Style	Size in inches			Approx. weight in lbs.	Taps	Voltage					No. of Cells	Retail Price	
		L.	W.	H.			22½	27	31½	36	40½			45
B-1	Plain	6½	4¼	3	4	0	22½					15	\$3.00	
B-1T	Variable	6½	4¼	3	4	5	7½	10½	13½	16½	19½	22½	15	3.25
B-2	Plain	5	4	3	3	0	45					30	3.25	
B-2T	Variable	5	4	3	3	5	22½	27	31½	36	40½	45	30	3.50
B-3	Plain	4	2¾	3	2	0	22½					15	1.85	
B-3T	Variable	4	2¾	3	2	5	7½	10½	13½	16½	19½	22½	15	2.10
B-4	Plain	3¾	2	2½	1	0	22½					15	1.50	
B-4T	Variable	3¾	2	2½	1	5	7½	10½	13½	16½	19½	22½	15	1.75
B-5	Plain	7¾	5¾	3	8	0	45					30	6.00	
B-5T	Variable	7¾	5¾	3	8	5	22½	27	31½	36	40½	45	30	6.25
B-6	Plain	7½	2¾	2¾	2	0	66					44	6.00	
B-6T	Variable	7½	2¾	2¾	2	4	15	30	45	60	66	44	6.25	
B-100	Plain	7¼	7¼	6¾	14	0	100					66	10.00	

The Batteries listed above are a selection only of a large range which we manufacture

Nos. B-2, B-3 and B-4 are the small cell type for use where light weight is essential. Nos. B-1 and B-5 are made from the larger size cells and have greater capacity and shelf sustaining life. We recommend the latter types in all cases where weight is not an important factor.

Manufactured only by

THE DOMINION BATTERY CO. LIMITED

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Use the highest type insulation made.

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Adaptable to every machining process and ready for every use—panels, plates, bases, rods, tubes, bushings, handles, cleats, etc.

To high resistivity and extreme water resistance CONDENSITE CELORON adds every other good quality demanded of an efficient insulator. It puts wireless insulation a step ahead. This Bureau of Standard test tells why:

Wave Length Meters	Approximate Frequency Cycles per second	Phase Difference Degrees	Dielectric Constant-K
373	804,000	2.0	4.7
1,295	231,500	1.8	4.8
3,067	97,800	1.8	4.9



CONDENSITE CELORON is regularly supplied in standard size sheets, rods and tubes ready for all machining purposes—for experts and amateurs. Sold by radio equipment dealers everywhere. If your dealer cannot supply you, write us.

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If you want service, order from us.
We carry a large stock of High Grade Wireless
Apparatus of our own and other manufacturers.

SPECIAL!!

Vacuum Tube Sockets	\$1.25
Rheostats	1.25
22½ Volt "B" Batteries	1.50
Rasco Dials60
Rubber Binding Posts20
Tested Galena40
Lateral Wound Coils. All sizes.	

Send 5c for our large illustrated catalogue.

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THE ELECTRICAL SHOP

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We Ship C.O.D.



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Catalogue
No. 21A



JUST THE THING FOR YOUR PANEL

6 Ohm filament rheostat for panel or flush mounting with knob and pointer - - - -	\$1.75
Standard 4 prong receptical - - - -	\$1.00

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57 MURRAY STREET, NEW YORK

Amateur Wireless Apparatus and Supplies

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leading manufacturers.

Have you tried the "ACE" "B" Battery? We are selling these at the
same price in Canada as in the U. S. A.

22-½ V Small ..	\$1.50	Topped	\$1.75
22-½ V Large ..	\$2.50	"	\$3.00

We cordially invite you to visit our store, and get our advice before purchasing.
It is our policy to supply an Amateur with apparatus suitable for his requirements, and
not to sell him apparatus totally unsuitable, merely to make a sale.

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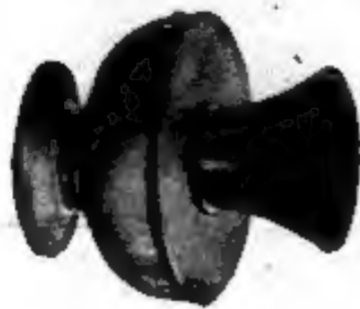
For Radiophone Use

Well, Here It Is—Built For Your EVERY PURPOSE
And It Will GIVE You RESULTS That Will SATISFY



No. 260-W

Hand Microphone
A handsome and very practical instrument.



No. 263-W

For panel mounting.
Full nickel plated.



No. 262-W

For panel mounting.
Adjustable pony arm.



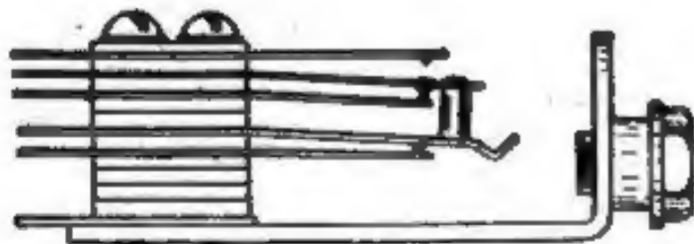
No. 261-W

Desk Microphone
An excellent instrument for desk use.

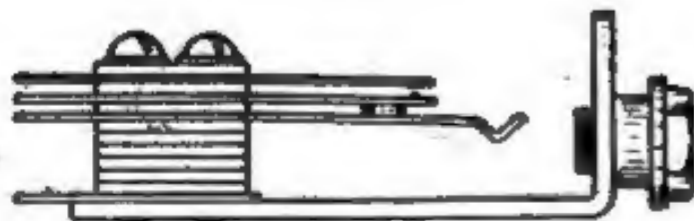
Write for Bulletin 103—W.B. describing latest Federal apparatus.

AUTOMATIC FILAMENT CONTROL JACKS

(Patent applied for)

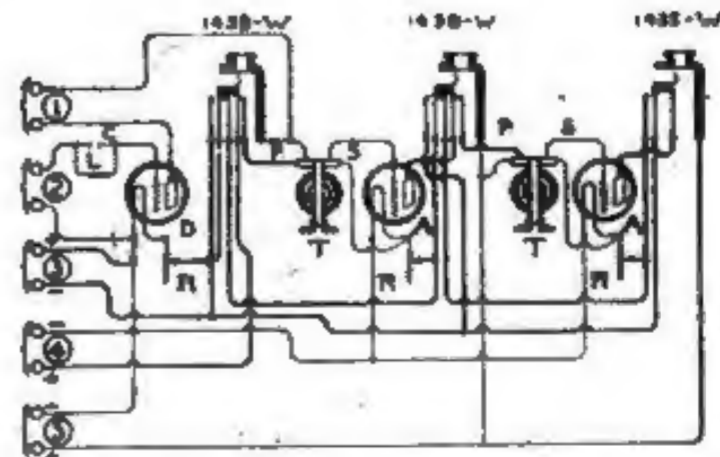


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ADVANCE**



DETECTOR & 2 STAGE AMPLIFIER USING FILAMENT CONTROL JACKS

NOTE
1—To TOWERS Ckt. C—250-w GND CONDENSER
2—To Secondary D—DETECTOR TUBE
3—To 7C BAY 6 VOLTS L—250-w 2 MED GND LEAD
4—To 6 BAY 18 TO 30 VOLTS A—AMPLIFIER TUBES
5—To 7 BAY 90 TO 60 VOLTS R—RESISTOR

3667

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No. UV-713 Radio Corporation	\$7.00
No. P-1 Amrad, mounted	4.50
No. P-3 Amrad, unmounted	3.75
No. QO Clapp-Eastham, semi-mounted	4.00

AMPLIFIERS

No. DA Westinghouse Detector and two-stage in beautiful cabinet	\$6.00
No. BORK Grebe two-step with automatic filament control, a beauty	\$5.00
No. BORD Grebe Det. and two-stage with automatic filament control	\$5.00
No. P-1 Amrad two-stage in 10x5 cabinet, splendid value	\$2.50

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No. BORB Grebe in cabinet, with tickler connections, hinged cover	17.00
No. BORA Grebe, in cabinet with hinged cover, special value at	9.75
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"Pittsco" No. 14 hard-drawn copper, 88 ft. per lb.—Per lb.	\$6.00
500 ft., special value at	2.25
"Pittsco" 7-strand No. 22 tinned copper, 65 ft. per lb.—Per lb.	.81
500 ft., special value at	4.00
"Pittsco" 7-strand No. 20 phos. bronze, per ft.	.32
500 ft., special value at	1.00

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No. P-1 100-amp. 600-volt ground switch, special value at	\$2.50
No. P-3 ground wire No. 4, weatherproof, per ft., special value at	.40
No. P-3 porcelain cleats with screws, for No. 4 wire, per pair	.10
No. P-4 "Pittsco" ground clamp	.20

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No. 7623 Standard, 22.5V, large	2.65
No. 7650 Standard, 22.5V, variable	3.50
No. 763 Eveready, 22.5V, small	2.25
No. 766 Eveready, variable 16½ to 22½ volts, large	3.00
No. 768 Eveready, 22.5V, large	3.00
No. P-1 "Boracinc," 22.5V, large and extra long life	4.00

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N 577 Dubilier, universal type, for transmission and reception, suitable capacities, .00025, .0005, .001, .0025, .005 or .01 MF, each 1,000 volts	2.00
No. ROCC Grebe .0002 MF	1.00
No. ROCD Grebe .0005 MF	1.20

GRID LEAKS

No. MW-1 Radio Corporation, ½, 1, 1.5, 2, 3, or 5 megohms, each complete	1.25
Grid leaks only	.75
Bases only	.20

HOT WIRE METERS

No. P-1 Roller Smith, 0-2.5 flush mounting. A real value for	\$4.75
No. 127 General Radio, .5, 1, 2.5, 5 or 10 amps, flush or front mtg., each	7.75

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No. B-3 Radio magnavox, latest model	\$45.00
No. P-1 Phonotron, just out	45.00
No. P-2 Vocaloud, station type	20.00
No. P-3 Vocaloud, laboratory type	25.00

PLUGS

No. 30 Patent Universal type	\$2.00
No. 1423-W Federal, brass	2.00
No. 1423-W Federal, silver-plated	2.50

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No. CR-2 Grebe, 175-300 meters. A special value at	\$30.95
No. CR-3 Grebe "Relay Special," 175-300 meters	25.00
No. CR-3A Grebe, 175-375 meters, with tube control, complete set, a special value at	25.95
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No. CR-8 Grebe "Relay Super-special," 150-1,000 meters, complete set. Just out	30.00
No. RA Westinghouse, 180-700 meters, very selective, beautiful cabinet	65.00
No. RC Westinghouse RA receiver and DA det. amplifier combined in one cabinet, a splendid unit, compact	125.00

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No. IT-541 Radio Corporation for UV-203 tube	2.50
No. 156 General Radio, new price	1.50
No. 530 Murdock, moulded	1.00
No. P-1 Amrad, new price	.75

RECTIFYING DEVICES

No. UV-216 Radio Corporation, 20-watt "Kenotron" rectifier, for UV-202 tubes	\$7.50
No. UV-217 Radio Corporation, 150-watt "Kenotron" rectifier, for UV-203 tubes	26.50
No. P-1 DeForest, 20-watt rectifying tube, for use with 5-watt tube	7.00

TELEPHONES

No. 56 Murdock, double, 2,000 ohms	\$5.00
No. 58 Murdock, double, 2,000 ohms	6.00
Brandes, Superiors, double	3.00
Brandes, Transatlantic, double	12.00
Brandes, Navy Type, double	14.00

POTENTIOMETERS

No. PR-536 Radio Corp. "A" bat. type	\$2.00
No. 98 Remler "A" battery type	.75

VACUUM TUBES

No. UV-300 Radiotron Detector	\$5.00
No. UV-201 Radiotron Amplifier	6.50
No. UV-202 Radiotron 5-watt transmitter	8.00
No. UV-203 Radiotron 50-watt transmitter	20.00

No. UV-204 Radiotron 250-watt transmitter 110.00
Note—All Radiotrons sent postage and insurance prepaid anywhere in U. S. A. Send us your orders for Radiotrons!

RADIOPHONE AND CW APPARATUS

Acme 50-watt, 250 volts, mounted	\$15.00
Acme 50-watt, 250 volts, unmounted	12.00
Acme 200-watt, 350-550 volts, mounted	20.00
Acme 200-watt, 350-550 volts, unmounted	15.00
Acme 500-watt, 1,000-1,500 volts, mounted	25.00
Acme 500-watt, 1,000-1,500 volts, unmounted	20.00

CHOKE COILS

Acme single coil, 1-3 hen., 150 MA	\$4.00
Acme double coil, 1-3 hen., 150 MA	6.00
Acme single coil, 1.5 hen., 500 MA	6.00
Acme double coil, 1.5 hen., 500 MA	8.00

CONDENSERS (Variable)

No. 182-G General Radio, .001 MF, unmounted, with dial	\$3.75
No. 3 Chelsea, .0011 MF, unmounted	4.75
No. 306-Int. Murdock, .001 MF, unmounted	4.25

FILAMENT HEATING TRANSFORMERS

Acme 75-watt, mounted	\$12.00
Acme 75-watt, unmounted	9.00
Acme 150-watt, mounted	16.00
Acme 150-watt, unmounted	12.00

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No. 170 Tusks, in cabinet	\$16.00
No. 21-AA West. Elec. 1,000-volt AC cond.	2.50

INDUCTANCES, CW.

No. 181 Tusks Cap. feed-back circuit	\$7.50
No. 182 Tusks split filament	10.00
No. 183 Tusks grid tickler	12.50

METERS

Model 301 Weston DC flush, 0-100, 0-150, 0-200, 0-300, 0-500 or 0-800 milliamperes, ea.	\$8.50
Model 301 Weston DC flush, 0-1, 0-2, 0-3, 0-5 or 0-10 amperes	6.50
Model 425 Weston, flush, thermo-ammeter, 0-1, 0-2.5 or 0-5, each	12.75
No. P-1 Jewel AC flush 0-15 volt-meter, ideal for power tubes	6.00

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No. 260-W Federal, hand type	7.00

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No. 231 General Radio, new type	5.00

RHEOSTATS

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No. 214 General Radio, 2.5 amp. type, just right for 1 UV-202 tube	2.50
No. 122 National Controller, 4.5 amp. type, just right for 1 UV-203 tube	4.50

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Type HS Ward Leonard 5,000 ohms	\$2.25
Type HS Ward Leonard 10,000 ohms	1.50

"Let 'PITTSO' products, super-service and delivery solve your Radio problems!"

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OBJECTS OF THE AERO CLUB

1. TO PROMOTE AND MAINTAIN A SOCIAL ORGANIZATION OR CLUB FOR THE ADVANCEMENT AND ENCOURAGEMENT OF VARIOUS FORMS OF AVIATION.
2. TO ADVANCE THE DEVELOPMENT OF THE SCIENCE OF AERONAUTICS AND ITS PRACTICAL APPLICATION.
3. TO ENCOURAGE AND ASSIST THOSE DESIROUS OF TAKING UP AVIATION WITH A VIEW OF RENDERING SERVICE TO KING AND COUNTRY.

OBJECT NO. 1

Club quarters are being maintained, including lounge, billiards, cardroom and lunchroom.

- * Until further notice the Clubrooms are open daily from 9 A.M. to 6 P.M. except Sundays and public holidays.
- * Meals are served daily to members and their guests.
- * THE DIRECTORS ARE NOW CONSIDERING PROPOSITIONS FOR MORE ADEQUATE QUARTERS IN WHICH IT IS HOPED TO PROVIDE BEDROOM ACCOMMODATION FOR VISITING MEMBERS.
- * As soon as deemed advisable and practicable, the Club will endeavour to maintain and operate an airharbor and suitable aircraft for the use of members, or to make suitable arrangements with an existing concern.
- * Out-of-town members are invited to write in to the club on any matters in which the Club can reasonably render personal service for members.

OBJECT NO. 2

Ways and means are being provided for making the Club a clearing house and information bureau on matters of aeronautical interest.

- * Members and others are invited to correspond with the Club—especially those who are engaged in commercial aviation, or are in a position to teach flying.
- * Owners of aircraft open for contract work are invited to register with the Club. Full information with regard to equipment and terms should be given.
- * It is desired to obtain costs of operation in order that reliable data may be compiled for the use of members and aviation interests.

OBJECT NO. 3

The Club is in favour of the Government maintaining an Air Force on adequate and economical lines consistent with the considered opinions, as to organization, of those competent to advise.

- * The Club will use its influence and organization in encouraging the youth of our country to engage in aeronautical work for the development of our commerce and natural resources, and for service to the Empire when necessary.

MEMBERSHIP

Membership is open to Officers of the Canadian Air Force, Officers and Cadets of the Royal Air Force, and other branches of the Canadian and Imperial United Services; also to civilians wishing to take up or become interested in aviation generally. Apply to the *Secretary* for terms of membership and application forms.

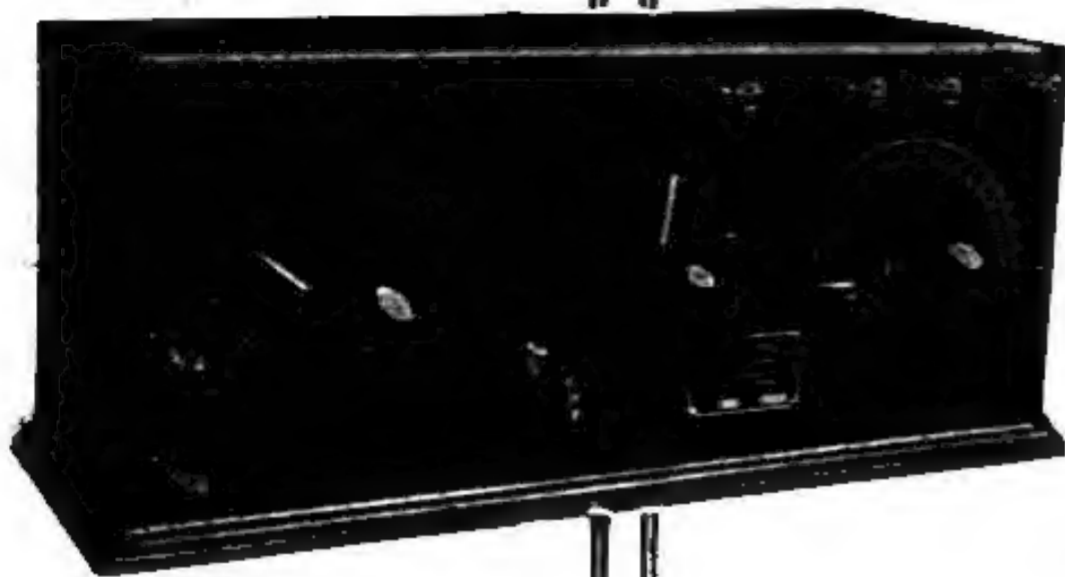
Membership carries privileges of visiting membership in all Aero Clubs throughout the world affiliated with the Federation Aeronautique Internationale.

The regular monthly issue of *Aviation News* is mailed free to all members.

AERONAUTICAL SPORTING EVENTS, RECORDS, ETC.

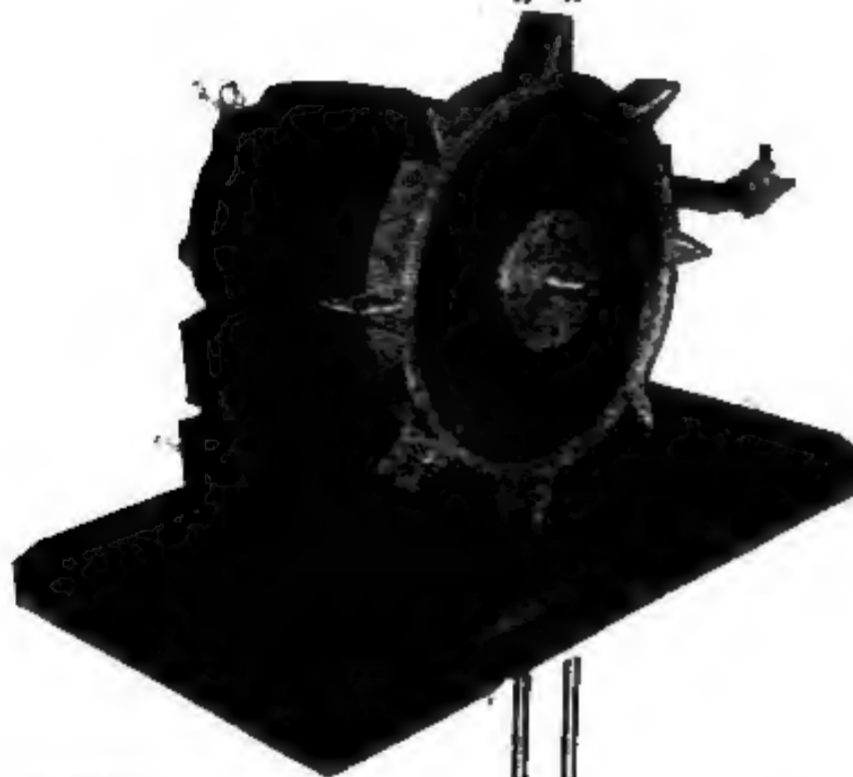
The Federation Aeronautique Internationale is recognized throughout the world as the dominant authority for the control of aeronautical sporting events and for the establishment of aeronautical records, and provides the necessary rules and regulations for the conduct of such. By agreement through the Royal Aero Club of the United Kingdom, authority has been vested in the Aero Club of Canada to represent and act for the F. A. I. in the Dominion of Canada.

Canadian Amateur Radiomen==



Z-NITH
REGENERATOR

*A Super Short-wave
Receiver.*



Z-NITH
HY-RAD GAP

Meet us at the—
First A.R.R.L.
National Convention,
Chicago, Ill.,
Aug. 30-31, Sept. 1-2 & 3,
1921.

BECAUSE of the increasing number of Canadian Amateur Radiomen and their demand for a higher class of apparatus which will enable them to greatly improve their stations, we are entering this new field with an extensive advertising campaign through which we hope to acquaint you with the most perfect and highly efficient radio apparatus on the market today—the Z-Nith equipment.

We wish to impress upon you the reliability of every Z-Nith product, all of which are fully guaranteed.

No matter what your needs may be, there is a Z-Nith product that can't be beat. Anything, from the most minor piece of apparatus to a complete station equipment.

We want you to know of every detail concerning the Z-Nith apparatus. This is given in our new beautiful catalog which we will gladly send to you upon request. Write for it today.

Chicago Radio Laboratory,

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CHICAGO, ILL., U.S.A.

9 Z-NITH PRODUCTS

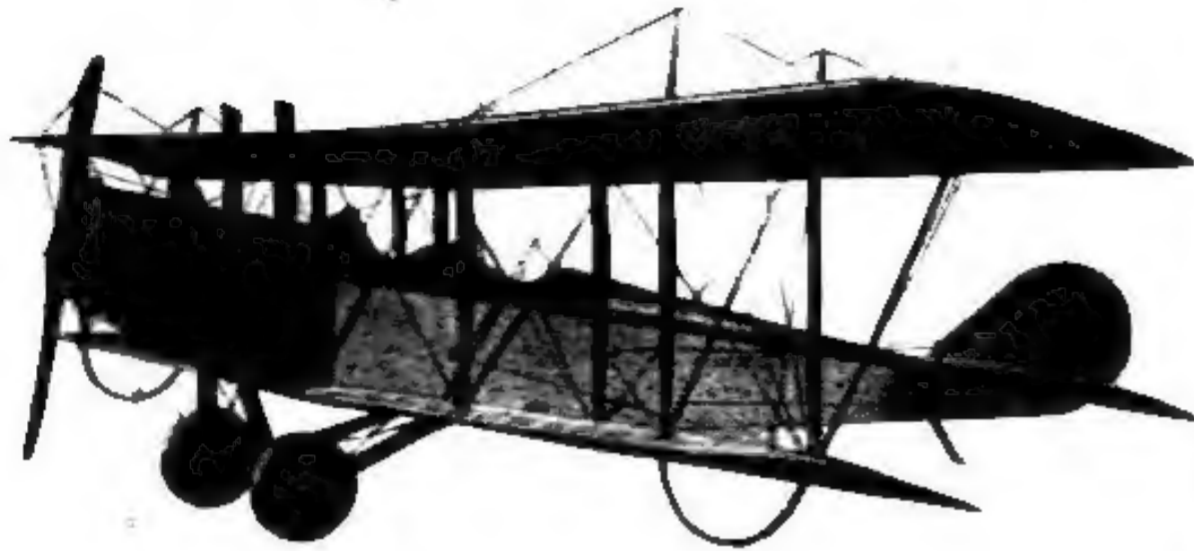
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AERIAL SWITCHES	OT'S	REGENERATORS	MICROPHONES
			GENERATORS

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The "CANUCK" has become the "Universal" plane.

The "CANUCK" has been used with success for every purpose where an aeroplane could be of service.

The foremost "Daredevils of the Air," amongst others Locklear, Elliott, Al. Wilson, Jennings and others, all use "Canucks."

Ericson Aircraft Limited

120 KING STREET EAST

TORONTO, Canada

LONG DISTANCE TELEPHONE MAIN 7180

Manufacturer & Designer of The "CANUCK" Plane



IMPORTANT— Watch our announcement re prices of Flying Boats in next month's issue.

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RADIO RESEARCH CLUB OF CANADA

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8 Strachan Ave., Toronto.

Committee

W. C. C. DUNCAN, E. J. BOWERS, CAPT. J. E. GENET

THE OBJECTS OF THE CLUB

- (1) To advance the art and science of radio communication by bringing together those who are interested in radio work, whether as scientists, professional radio engineers, manufacturers of radio apparatus, students, experimenters—in short—all those whose work or interest brings them in touch with the problems of radio.
- (2) To conduct and co-operate in radio research.

MEMBERSHIP

Membership is open to engineers, students and anyone else interested in the electrical side of Radio. Application for membership should be sent to the Secretary-Treasurer. They should state experience in Radio work and give as references names of three members of the Club.

MEETINGS

Meetings are held every third Thursday in Room 23, new Electrical Building, University of Toronto. A programme of papers by prominent Canadian Radio Engineers is being prepared for the coming season.

RADIO INQUIRY DEPARTMENT

As an assistance to those interested in Radio, a Radio Inquiry Department is being conducted in "Aviation and Wireless News," for particulars of which see announcement set out elsewhere in this issue.



AVIATION & WIRELESS NEWS

JOURNAL OF THE AERO CLUB OF CANADA
AND
COMMERCIAL AIR PILOTS ASSOCIATION

ADAM F. PENTON, Publisher.

C. E. WILLIAMS, EDITOR

C. LINCOLN MITCHELL, Publication Manager

Volume 4.

TORONTO, SEPTEMBER, 1921.

No. 7

Wireless Equipment at Dominion Observatory

Few people know that the Dominion Observatory at Ottawa is equipped with a wireless station. This is probably due to the fact that it does not possess a transmitting set, and therefore does not advertise itself. However, it can at least boast a very efficient receiving set.

At a place like the Dominion Observatory one would naturally expect to see a commercial installation, with all the apparatus in big cabinets. This, however, is not the case, and one is agreeably surprised to find a real honest-to-gosh amateur set, with which we "hams" are all so familiar. The long operating table is littered with a bewildering array of honeycomb coils, variable condensers, switches, bulbs, and amplifying transformers. Enormous quantities of flashlight batteries, all bound together with tape, supply the plate voltage, and the whole thing is promiscuously connected together with bits of wire. This style of installation is familiar to every amateur. And as every amateur knows, the results obtained with a set of this kind are far better than those obtained at commercial stations, where all the apparatus is boxed up in cabinets, and it is impossible to experiment with different hook-ups.

Mr. W. A. Dier is in charge of the station, under the supervision of Mr. R. M. Stewart. No transmitting set is used, because the needs of the Observatory call for a receiving set only. Honeycomb coils, giving a wavelength range of from 100 to 24,000 meters, are used for tuning. A valve detector and three-step audio frequency amplifier boosts the signals enormously and makes possible an efficient daylight reception of European stations. The head equipment consists of several pairs of Baldwin

mica diaphragm phones, and a loud speaker can also be connected in if desired.

The Observatory's wireless set is not used so much for the reception of accurate time signals as for the determination of longitudes. At present the Observatory has a field party out in the North-west, calculating the longitude of places in the Mackenzie district.

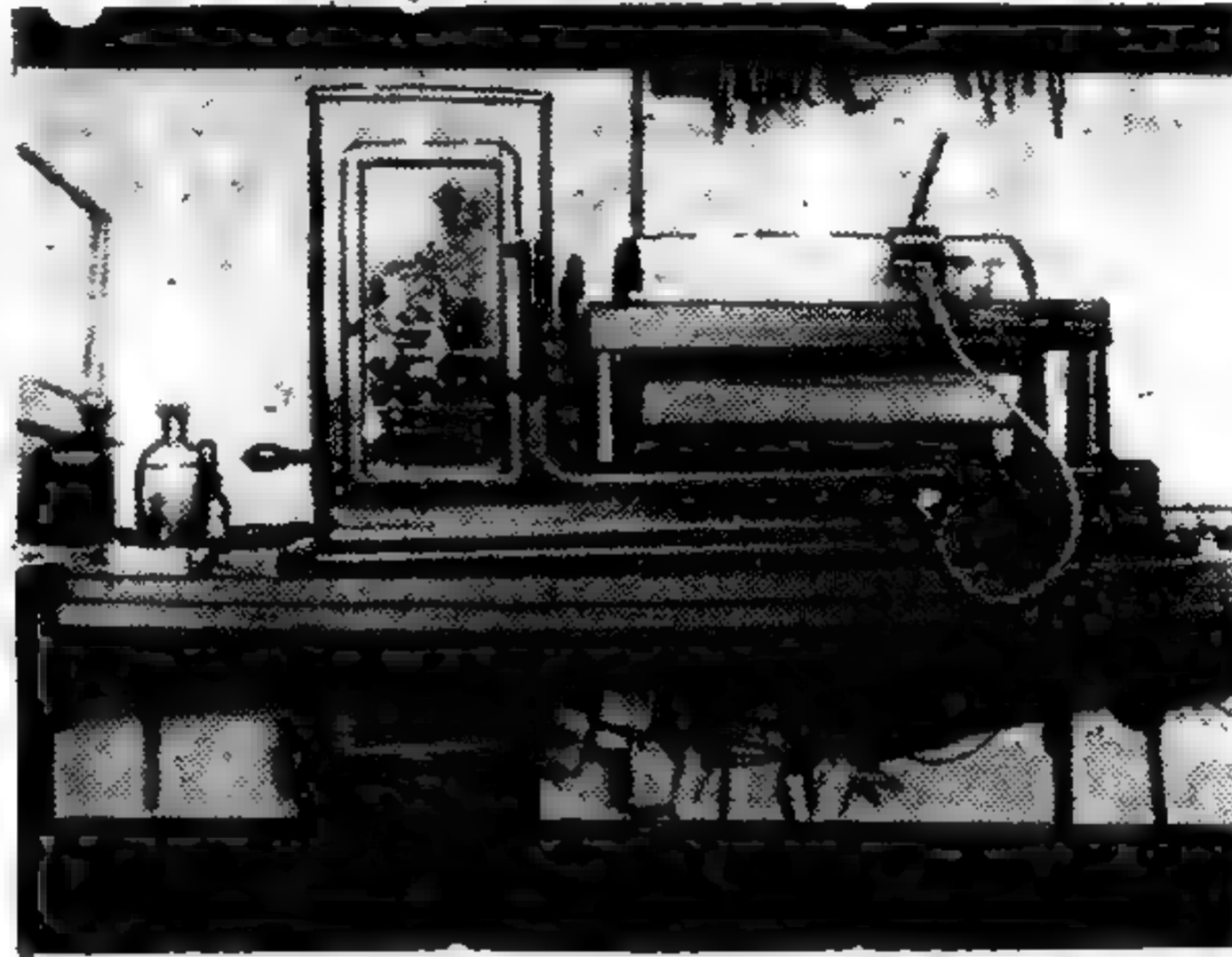
To find the longitude of a certain place it is only necessary to compare the local time of that place with the local time of some other place, in this case the Dominion Observatory, whose exact longitude is known. For this purpose the telegraph line is generally employed, but there are many places in the Mackenzie district where no telegraph line is available. Accordingly, wireless telegraphy is called into use.

When the field party comes to a spot whose longitude is to be calculated, they erect their portable aerial and connect up their receiving set. After setting their chronometer to the correct local time, by means of the stars, they are ready for business. They listen for the time signals of some powerful station which has previously been decided upon; let us say Arlington. By using a chronograph, or automatic recorder, the exact time that the signals are received is recorded on paper. Likewise the Dominion Observatory listens for these same signals, and the exact time they are heard at Ottawa is also recorded on paper. The next time the field party gets near a post-office they send in their chronograph record and it is compared with the one at Ottawa. Let us suppose the sheet at Ottawa shows that the time signal was heard there at 12 o'clock noon, while the sheet from the Mac-

kenzie district shows that the same signal was heard there at 3.40.32 p.m. Comparison of the two chronograph records reveals that there is a difference of 3 hours, 40 minutes and 32 seconds between the local time at the station in Ottawa and the local time at the station in the Mackenzie district. Now, as there is 15 degrees for every hour difference in time, and as the longitude of the Dominion Observatory is known, the task of deducing the longitude of the place in the Mackenzie district resolves itself into a simple problem in arithmetic.

as there is current flowing through the magnet the armature is held close to it, but as soon as the current is cut off a small spring jerks the armature, and with it the fountain pen, to one side. The pen-manipulating magnet is directly controlled by a radio operated relay. This can be more clearly understood by studying the diagram of connections.

The magnet which operates the pen is mounted on a slowly moving carriage. A threaded rod is geared to the revolving cylinder in such a manner that it causes



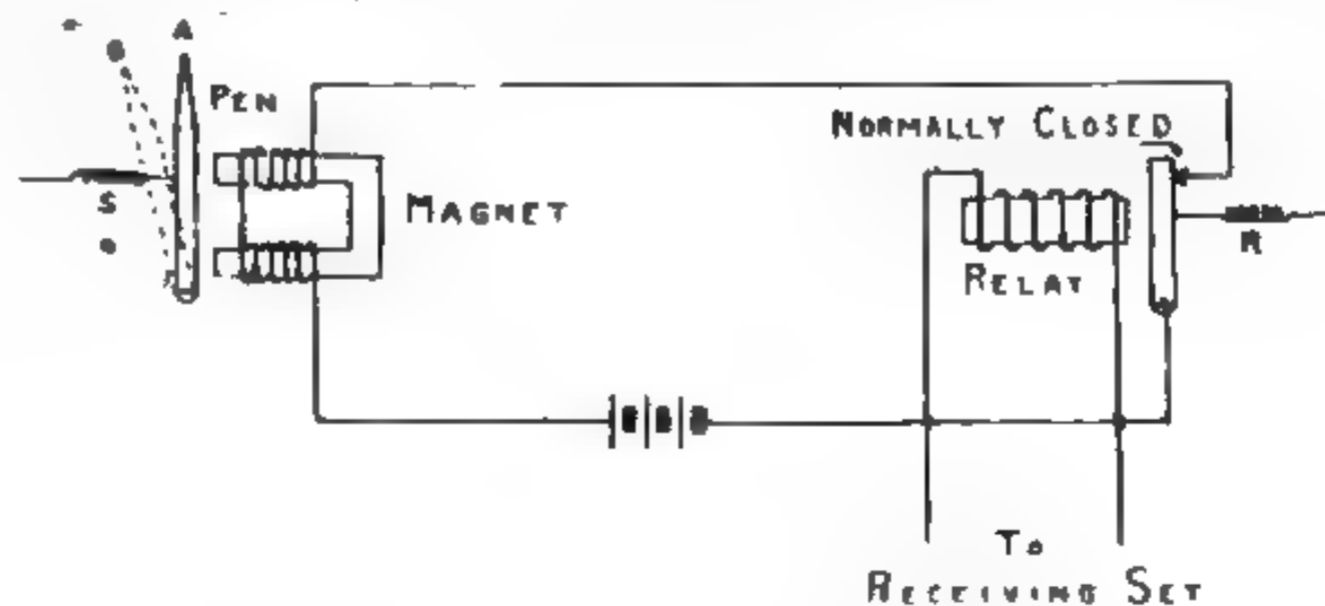
The Chronograph at the Dominion Observatory

Thus we see that wireless has proven itself of invaluable assistance in making maps of new districts. A transmitting set is not required at either observing station, nor is it essential that the time signals recorded should be accurate. As long as both stations listen for the same signal, it will be recorded simultaneously on both chronographs, and the rest is plain mathematics.

A word as to the automatic recorder above mentioned may be of interest, and as it is possible to construct a fairly efficient home-made one with a little patience and skill, we shall consider it more carefully.

the pen carriage to move about a quarter of an inch to the left for every complete revolution of the cylinder. Thus the pen traces a spiral record and is always moving on fresh paper.

When no radio signals are being recorded the relay is closed and the magnet holds the pen at position A. The pen then traces an unbroken straight line on the revolving cylinder. This is called the datum line. But as soon as a dot or a dash is received in the radio set it opens the relay and cuts off the current flowing in the magnet. The spring S immediately jerks the pen to po-



Hook-up of Automatic Recorder

Essentially the recorder consists of a slowly revolving cylinder and a fountain pen actuated by an electro-magnet. A large sheet of blank paper is clipped around the cylinder. This cylinder is revolved by clockwork at the uniform rate of about one revolution per minute. On the surface of the paper there rests a light fountain pen supported by the armature of an electro-magnet. As long

as the pen is at position A, which causes a bump in the datum line. When the dot or dash is completed the spring R automatically closes the relay and the magnet pulls the pen back to position A. Thus a dot or a dash is recorded as a correspondingly long or short bump in the datum line.

The instrument shown in the photograph is not merely an automatic recorder, but a chronograph as well. That

is to say, in addition to its ability to record wireless signals it can also measure very short intervals of time. The pen-manipulating magnet is provided with another winding of wire besides the one shown in the diagram, and the current through this winding is controlled by an accurate clock. Every two seconds the clock automatically opens and closes the magnet, irrespective of the radio delay, and thus causes a slight hump on the datum line. In this manner the exact fraction of a second at which any time signal is received can be recorded on paper. This is a very important point when the set is being used for the accurate calculation of longitudes, as described last week.

At the Dominion Observatory, where this instrument is now in use, it is operated in conjunction with a three-step amplifier for recording radio time signals. A similar instrument of a size suitable for portable use is employed by the Observatory's field party, and at present these two sets are doing valuable work in the determination of longitudes in the Mackenzie district.

EATON'S NEW RADIO DEPARTMENT

It's a far cry from days not long gone by when the believer in wireless was looked upon in a spirit of kindly commiseration as a dreamer of dreams doomed to fade and die, to the present day when we find the largest departmental store in the British Empire opening, as a purely business proposition, a department for the sale of wireless apparatus.

The T. Eaton Company, Limited, as our readers have seen from our front cover, have opened such a department in their Toronto store. They are importing an especially good line of radio supplies from England which, with the addition of goods of Canadian and American manufacture, offer a wide range of choice not only to the hundreds of enthusiasts themselves, but to their friends and relatives as the Christmas gift-giving season approaches. For what better than to know that one's hobby is appreciated by one's intimate friends, and how better can such appreciation be shown than by a gift useful in the pursuit of such hobby.

There are in Canada many reliable retail dealers handling wireless apparatus, and the entry of the departmental store into the field will no doubt tend to stimulate the ever-growing interest in this fascinating field, and thus to increase sales for big and small dealers alike.

BRITISH FLIERS USE RADIO

The English wireless station at the Northolt Aerodrome experimented with receiving radio telegraph and radio telephone messages from a squadron of Bristol fighting planes. These experiments took place during the recent rehearsal for the air pageant, and the airplane pilots were also being given their instructions via radio from Group Captain Hereson, stage manager of the pageant.

The development of radiotelephony and telegraphy for use in communicating between airplanes as well as between airplanes and their ground stations, is being rapidly developed, and the American air force has been using the radiophone or wireless speech transmission apparatus for several years. The radio apparatus for transmitting as well as receiving on board airplanes owes much of its success, if not the major part of it, to the remarkable development and perfection in the past few years, particularly during the World War, of audion amplifiers and transmitting tubes. Vacuum tubes, for transmission of undamped radio telegraph signals as well

as for radiophonic messages, are now available for amateurs and experimenters, as well as for the regular radio companies, so that a wonderful impetus has been given to the application and development of radio.

We are only at the beginning of the road—the future will see more wonders year by year.

WINNERS OF CERTIFICATES IN RADIO TELEGRAPHY

The Department of Naval Service announces that 25 candidates were examined in radio telegraphy during August. The following Ontario candidates secured certificates of proficiency: First-class—A. E. Axsell, J. W. Graham, C. C. McAskill, P. A. J. Spearpoint, W. C. Wood, Toronto, and J. A. Murphy, Sault Ste. Marie. Second-class—J. R. Manghan and W. W. Morris, Sarnia; S. R. Wharin and W. A. Watson, Toronto.

FOUR-ELECTRODE VACUUM TUBE

In a recent paper by Prof. J. A. Flemming, read before the Wireless Society of London, there is described the new Flemming four-electrode tube which can be used as a detector of damped or continuous waves. In these tubes, instead of a grid intercepting the stream of electrons from the cathode, there are provided two "potential plates," one on each side, which deflect the stream when their potential is altered by a received oscillation. This causes a variation of the thermionic current which, in the case of damped trains of waves, is audible in a telephone. In the case of continuous waves, this reduction of current can be made to cause a delicate relay to drop off while the waves are being received.

THE RADIO RESEARCH CLUB OF CANADA

In connection with the above club, a notice of the organization of which was contained in one of our earlier issues, it is interesting to note the very interesting lectures which were held during the spring season. These were as follows:—

April 7th—Lecture on "Alternating Currents with Special Reference to High Frequency Phenomenon," by Professor T. R. Rosebrugh. April 28th—Second lecture on the above subject, by Professor Rosebrugh. May 19th—Election of officers for the year. Third lecture of the series by Professor Rosebrugh. June 9th—Fourth lecture, with special reference to "Filters," by Professor Rosebrugh. Exhibition of and discussion on values of various types by Dr. C. A. Culver and Mr. W. C. C. Duncan.

The following are the officers of the club, recently elected. Honorary President, Prof. T. R. Rosebrugh; President, C. A. Culver, Ph.D.; Secretary-Treasurer, F. K. Dalton; Executive Committee: W. C. C. Duncan, J. E. Genet, E. J. Bowers.

The club is desirous of including in its membership all of those whose work or interest brings them in touch with the problems of radio communication. Application for membership may be submitted in writing to the Board of Directors, through the Secretary, and must bear the written endorsement of at least three members of the club in good standing. Applicants should state their occupation and the extent of their experience in radio work. The Secretary's address is Hydro Electric Laboratories, 8 Strachan Ave., Toronto, Ont., Canada.

At the meeting on June 9th it was decided to postpone future meetings till after the holiday season. The next meeting is to be held Friday evening, September 16th, at the Canadian Independent Telephone Co., Ltd., Wallace Ave., Toronto.

Wonders of Wireless

Bring into the sitting room of your home a small electrical instrument and place it on the table. Don't bother even to open a window and, of course, don't trouble to connect up with any wire or any other machine.

Suddenly, somebody begins to sing a song, or you hear a piano playing, or a violinist renders a masterpiece. The instrument draws the music out of the air, over the streets and trees and through the walls into your home.

It's the wonderful wireless.

In several Canadian cities and hundreds of places all over America, thousands of amateur wireless enthusiasts enjoy these concerts weekly. They may take turns putting on the program, or they may arrange with music houses to hear the latest dances in this way.

Not long ago a Canadian amateur wrote to the New York Times telling how he had picked up a song one evening a week or so before. He gave the name of the song and the time he had heard it. He wanted to know if by any chance the singer would see his letter and declare his identity. Sure enough, an American amateur from the Middle West wrote to the paper, greatly excited over the fact that the song he had sung to his machine had been heard by a stranger away up in Ontario.

Of all American cities, Pittsburg is said to be best equipped with the wireless service. A church in the Pennsylvania smoke town for months has been ready to transmit sermons by wireless to parishioners who may be ill. The sermon, music and all, comes quite clearly. One of the advantages, also, is that the collection plate is not passed.

Just the other day a doctor at the Brooklyn Hospital directed an operation that was performed 200 miles at sea. One member of the crew operated on another, with results that are said to have been satisfactory. The doctor gave his directions to the wireless operator, who passed them on to the amateur surgeon.

The annihilation of distance by the wireless is being put to new uses every day. Scientists are already preparing to transmit photographs and written documents across the ocean by this unseen agency. From Annapolis, Maryland, last week, a photograph and a written document were sent by this means to Malmaison, the radio station in France. The first photograph forwarded by wireless was one of the Dempsey-Carpentier fight, which was flashed for reproduction in *Le Matin*, the Paris newspaper. While the picture went through the air very creditably, and appeared as scheduled, it was not as perfect as the experts expected. They next sent to the Paris newspaper a facsimile of a message written by a New York publisher and addressed to *Le Matin*. The verdict upon this reproduction when it duly appeared in Paris was that it was perfect. At the instance of the Inter-Allied Wireless Commission, now meeting in France, the American and French Governments are co-operating in these tests. Two French engineers are at Annapolis working with the American experts, and the system of sending photographs by wireless is said to be just about established as a practical process.

At the Pageant of Progress held in Chicago recently a demonstration of the wireless telephone was provided. Visitors were able to stop and listen to voices picked out of the air. They could hear, for instance, press association reporters sending in the results of speedboat races

which they were following in a sub-chaser. In sending by wireless telephone, the operator sits in front of a case which has little resemblance to a telephone switchboard. His transmitter is not a mouthpiece, but a flat perforated surface, into which he talks in a casual way with no forced nor anxious articulation. On the other side of his case is a dead wire with no current. This wire picks up the electric waves set in motion by a wireless telephone in a boat on the lake. Then the talk goes on. Visitors put on headpieces of the switchboard type to "listen in" on what the wild air waves are saying.

Operators of the wireless telephone do not call for numbers. They may say, "We are using seven hundred," which is notice to the other operators that they are transmitting on a wave length of 700 meters. Adjustment to wave length is done by the movement of numbered disks on the machine, like working a combination to open a safe.

RADIO CLUB AT SASKATOON

A few weeks ago an organization meeting was held in Saskatoon, Saskatchewan, of those in that city who were interested in wireless. The following officers were elected: President, Thos. Fyfe; Vice-President, Cecil Mather, and Secretary-Treasurer, Wm. Astin. Mr. G. H. Shippin, a former wireless operator overseas, consented to act as technical instructor.

Meetings are to be held every Wednesday night. While no permanent club rooms have yet been secured, it is expected that quarters will later be available in the local Y.M.C.A. Building.

The club is desirous of receiving correspondence from similar clubs. This can be done either through their Secretary, Mr. Wm. Astin, 1312 Avenue C, North, Saskatoon, or through the medium of "Aviation and Wireless."

CONCERT 500 MILES AWAY

A concert at San Jose, California, afforded enjoyment to a Victoria, B.C., audience of wireless operators at Gonzales Hill Station and amateurs throughout that city. The music was that of a radiophone concert in the California town, more than 500 miles away. It was sent out into the ether by wireless telephone, and was heard here as distinct and as free of interruption as though coming from the next room.

RADIOPHONES ON POLICE AUTOS

Wireless telephones recently installed on the automobiles of the anti burglar motor fleet of the Pasadena, California, Police Department, enable officers to communicate with headquarters while their machines are in motion. Every machine operated by the department has been so equipped.

The appliance enables officers to telephone for reinforcements, if necessary, while pursuing motor bandits. Installation of the phones on regular beats, to obviate the stringing of wires for enlargement of the old call-box system, also is contemplated.

AVIATION

—8—

WIRELESS NEWS

[Official Journal of the Aero Club of Canada]

PUBLISHED MONTHLY.

60-62 Adelaide Street East, Toronto, Ont.

ADAM F. PENTON, Publisher. C. LINCOLN-MITCHELL, Publication Manager.

Subscription price \$1.50 a year. Single copies 15 cents.

Advertising Rates upon request.

WIRELESS READERS

For the benefit of our many new readers who are chiefly interested in radio matters, we would say that this publication was commenced in March, 1918, under the title of "Aviation News" and as such has always enjoyed a large circulation among the many thousands of young Canadians interested in aviation.

Many former aviators have made their war-time training in wireless a basis for further experiment. Finally, after various requests, it was decided to cater to the requirements of these and the many other Canadian radio enthusiasts who were anxious to have some Canadian publication devoted to their interests.

With the foundation already established, this publication is in a peculiarly favorable position to meet such requirements. Co-operation is, however, required, and we invite club reports, descriptions of apparatus, short articles, suggestions and ideas.

EXAMINATION OF AIR ENGINEERS

August 26, 1921.

Editor Aviation News, Toronto.

Sir,—Your Aviation News being the only aeronautical paper of note in Canada, I wish to avail myself, if possible, of its limited space.

This is a well-meant criticism of the methods of examining and the status of air engineers in this country.

To begin with, the examining officer should be assisted if possible by an experienced man, himself an air engineer (Class I).

The present system, I believe, is to have the questions and answers already made out by the Air Board and the examiner minus any practical experience. This is bad. Any aeronautical or motor manual will give you the answers, etc., for \$5.

There are pointers on engines and machines which can only be discovered by practical experience on those machines and engines, which a man experienced on them has at his finger-tips. Also air engineers, in my opinion, should be classed in grades—three should suffice.

Grades of Air Engineers

Class I—Senior or foreman mechanics who have risen through having acquired an expert knowledge of aircraft work in shops and on the "drome." They have shown they have ability and can thoroughly inspect any job. They get engineers' pay and should have a minimum of four years' aircraft experience.

Class II—Mechanics of at least three years' experience in aircraft and should be expert in their own par-

ticular line of work, capable of reading blue prints and erecting any machine or engine thoroughly.

Class III—Junior mechanics or learners who have shown ability while in aircraft industry. Have the makings of good mechanics and should be trustworthy. Get mechanic pay of varying amounts.

I mention trustworthy, as it is to the writer's knowledge that there are men engaged in the aircraft industry in Canada who fail to realize that only the very best of workmanship is needed in aviation, and are content to finish jobs in a slipshod manner, and unfortunately get away with it in the majority of cases.

These grades of air engineers should be picked with care, a practical as well as a theoretical examination being undertaken, experience being taken into consideration.

Formal certificates of airworthiness should be signed by the senior air engineer (Class I), informal certificates on repairs being signed by the mechanic in care of machine or job.

The good air engineer (Class I) will rely on the engine mechanic for the running of the engine, and on the rigger for the condition of the machine, but should be able to show and assist either in the execution of their duties; general supervision.

The bad engineer (Class I) will leave practically the whole of his job to the mechanics and reserve the whole of his energies to "passing the buck" or shifting the responsibilities for accidents on to some one other than himself.

In the majority of cases he will make special favorites of those mechanics who are maintaining him in his position. In conclusion, practical experience always "has the edge" on theory. I know of a case of a man obtaining an air engineer's certificate when the first time he ever touched a machine, let alone work on one, was a fortnight before passing out as air engineer. He had speculated \$2 on Barnwell's "The Aeroplane Speaks." I apologize for length of letter.

(Signed) "AILERON."

AIR BOARD ANNOUNCEMENTS

The Air Board makes the following announcements for period July 31st to August 31st, 1921:—

Commercial Air Pilots' Certificates issued: C. R. Howsam, N. R. Anderson and A. H. Sandwell. Commercial Air Pilots' Certificates renewed: R. A. Logan, W. R. Maxwell, B. D. Hobbs and H. R. Hillick.

A new air harbor was established in August at Victoria Beach, Manitoba.

The Pacific Airways Limited, of Seattle, owners of an American machine, an H.S.2-L., was secondarily registered in Canada for the purpose of carrying passengers between Seattle, Victoria and Vancouver.

KONGO AIRPLANE SERVICE

It is reported that the directors of the Forminiere Diamond Mines Company have suggested the inauguration of an air service by seaplane, which would operate between the mines at Djoko Punda, on the Kasai (a tributary of the Kongo) and Kinchassa, on the Kongo—from which latter point the railroad runs to Matadinoki, a steamer port on the lower Kongo. The directors offer to defray the greater part of the initial cost of the scheme. In the meantime a survey of the route is being undertaken. The distance from Kinchassa to the mines is approximately 500 miles, which could be covered in two days, as contrasted with over a month by the existing river transport.

AERO CLUB OF CANADA

A special general meeting of the members was held on Thursday, Sept. 23rd, at which a very good representation of the membership was present.

In calling the meeting the directors desired to place before the members the general situation and to obtain the wishes of the members as to the action to be taken, and to arrange for increased activities.

The president, Lieut.-Col. Thomas Gibson, reviewed the operation of the Club during the year and the bearing which the general world-wide financial and industrial conditions had on the Club. Owing to strained financial conditions generally quite a number of old members had considered it necessary to retrace their ~~expenses~~ by discontinuing their membership. The board had under consideration the reduction of expenses to the lowest possible extent, and in this connection Col. Gibson announced that the secretary had also realized the necessity for economy and had voluntarily tendered his resignation, so that the Club might be relieved of that expense.

It was decided for the remainder of the year to remit the amount of the entrance fee to ex-service men and to accept new members at a fee of \$10 to cover the period for the balance of the year.

Some six or more propositions for new quarters had been considered by the board, but although one of these had reached the stage when there was every reason to expect that the quarters would have been secured, unfortunately conditions were added to the original offer which made it inadvisable to accept. The general feel-

ing of the members was that the Club should continue in the present quarters, but that every effort should be made to secure more adequate accommodation at the earliest opportunity.

It was unanimously decided to continue using Aviation and Wireless News as the Club's official journal, and that a special effort should be made to publish news of interest to the members. An associate editor is to be appointed for this purpose.

Another decision made that will be appreciated by all is to keep the Club quarters open in the evenings. As this would ordinarily entail adding considerably to the expense for staff, a number of members have volunteered to take tours of duty. This arrangement came into effect on Sept. 25th.

An annual Aero Club ball is to be instituted. This and other plans for social activity will be appreciated. A resolution of confidence in the directors was unanimously carried.

CLOUDS FORMED BY AIRPLANES

Meteorologists are beginning to believe that, under favorable conditions, the passage of an airplane through the atmosphere can result in the formation of a temporary cloud more or less surrounding the machine. Given the right degree of moisture in the air, there is every reason to conclude that the atmospheric water vapor will be condensed by the local changes of pressure produced. In the high-speed tunnel at Dayton the phenomenon has been noticed on a small scale.

The Canadian Clearing House will consider proposals from Manufacturers who require Distributors for Canada.

*We are always in the Market for good lines.
Canadian Managers for Foreign Houses.*

Address

CANADIAN CLEARING HOUSE

STAIR BUILDING, TORONTO

WINDSOR

MONTREAL

TORONTO

Canadian Air Force Activities at Camp Borden

SPORTS AND ENTERTAINMENT COMMITTEE AT CAMP BORDEN

The Entertainment Committee as at present constituted consists of: Captain R. A. Logan, President; Captain J. F. Tupper, Secretary; Lieut. A. Topping; Flight-Sergt. W. Burroughs, Flight-Sergt. Ward, and Sergt. R. M. Topping.

The Sports Committee has the same President and Secretary, together with the following members: Captain Fairweather, Sergt. Cronie, Sergt. McLaughlin, Sergt. Rolsten, 1st A.M. Alguire, 1st A.M. Rule and 2nd A.M. Markle.

FOOTBALL AT CAMP BORDEN

The Canadian Air Force Football Team at Camp Borden remains unbeaten this season. Sergt. Cronie is Captain.

Barrie Business Directory

For convenience of Members of C. A. F. at Camp Borden

We carry a full line of FOOT COMFORT APPLIANCES

And can give you FOOT EASE, at all times

Men's Black or Colored Calf Boots, Welged Soles, specially priced at \$7.50 a pair.

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Everything in Sheet Music
and Musical Instruments.

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Phone 243

Strings a specialty. Mail orders receive prompt attention.

A NIGHT AT CAMP BORDEN

"Lights Out" is usually more literal than that which it is intended to convey. Morpheus does not embrace us by clockwork, but rather by a form of natural inducement, and so a cross-fire of banter usually precedes the period of snoring, mild or pronounced.

Whether, however, the insect world had a grudge against the usurpers of the air or not, one never can tell, but that mosquitoes in dense masses, complete with well-tuned kazoos, invaded Borden Camp on the night of August 21st, is undoubted.

It mattered not whether the fire-alarm sounded or a train of autos returned late from a dance, sleep was impossible.

Several there were who dressed and went forth across the plains to greet the rising sun, but the sight of a mandolin player strumming with keen determination, followed by his hut-mates, sallying forth across the open parade grounds at the darkest hour of the night, turned one's thoughts with alacrity and mirth to one piper of many famous pipers, "The Pied Piper of Hamelin."

That the mosquitoes were drawn off by this melodious means the party later declared was beyond doubt.

DAILY PRAYERS FOR AIRMEN

There is a daily parade at 8.15 a.m. at Camp Borden, when a short service is conducted by the Chaplain.

WANTED, AND FOR SALE

Line advertisements under this heading 4 cents a word, minimum \$1.00.

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TO-MORROW'S AIRSHIPS

The present age is one of hustle in the endeavor to reconstruct prosperity after the devastating effects of what has been practically a world war. To the man of business, the saving of time means increased profits; and since most of such men spend a considerable portion of their working days in traveling, any means of reducing the hours occupied by their journeys, either over land or across the oceans, will be undoubtedly welcome.

It would appear that we have reached by now almost the maximum speed which can be accomplished over land by the express train, and across the sea by steamship. There is left only one other means of transport, and that is via air. The two forms of aircraft, the airship and the heavier-than-air machine, received an enormous impetus from the recognition of their value for war purposes, and reached a state of development in five years which would not have been achieved in twenty in times of peace. Undoubtedly a future exists for both types of aircraft in the realms of commerce, and it is anticipated that the time will come when the airship will usurp

the functions of the fast-going ocean steamers, while the airplane will take over the traffic now borne by express train and fast cross-channel boats. It will be seen, therefore, that the uses of the two types should not conflict, but that each will act as the complement of the other.

Until some entirely new design of airplane has been discovered, it seems fair to assume that no heavier-than-air machine is capable of undertaking non-stop flights over a distance exceeding 2,000 miles, carrying any commercial load. On the other hand, as will be shown later, the airship exists to-day which can be transformed into a paying commercial proposition, and in addition, the transatlantic flight of the British airship "R-34" has proved that such flights will present no difficulty to an improved model of an airship of this type. By arguing on these lines, we may assume that for long distance flights over the oceans or vast tracts of broken and unpopulated country, the airship will be found to be the more suitable.

Up to the present time, although nearly three years have elapsed since the signing of the armistice, it is disappointing to read that very little progress has been made. In England a commercial airship company seems to be regarded as a new and highly hazardous undertaking. Various proposals have been made by a combine of the several firms which built rigid airships to the orders of the Government, to certain steamship companies to exploit the airship. The Air Ministry has been approached and is understood to be willing to lease certain of the service airships for a series of experimental passenger flights.

The Germans, thanks to the genius of the late Count Zeppelin, have been from the beginning the pioneers as far as the rigid airship is concerned. In the year 1910 a company styled the Deutsche Luftfahrt Actien Gesellschaft was formed to run a commercial Zeppelin service and proved singularly successful. Four vessels were utilized, namely, "Schwaben," "Victoria Luise," "Hansa" and "Sachsen." During the period 1910 to 1914 over 17,000 passengers were carried a total distance of over 100,000 miles without incurring a single fatal accident.

At the conclusion of the war a small airship called the "Bodensee" was designed and built with quite remarkable rapidity and not so very long ago a service was inaugurated between the Swiss frontier and Berlin. This airship, in comparison with the war-time Zeppelins, is much smaller, being only some 650,000 cubic feet against the two million cubic feet capacity of the latter. In design, too, she differs quite considerably, being much greater in diameter as compared with her length, while all outside surfaces, such as fins, cars, etc., are more truly streamlined than was the practice in earlier ships.

Twenty-five passengers can be accommodated in the car and the journey is accomplished in comfort, hot meals being served en route. The scheduled time from Friedrichshafen to Berlin was fixed originally at seven hours, but the journey in favorable weather has been accomplished in half that time. This service was maintained throughout the autumn months when the airship returned to the constructional station in order that an extra section of hull might be added to increase her capacity. It was intended that the "Bodensee" and a sister ship of similar design carry out a service during the summer by

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means of which Stockholm would be brought within much easier access of the German capital.

It seems reasonable to assume that if such success has attended an airship of small proportions, then infinitely greater results will accrue by building an airship of size. In the case of the British rigid airship "R-34," when sufficient petrol has been taken to render the transatlantic flight a safe undertaking, the margin of disposable lift available for passengers or merchandise is not enough to make such a trip a commercial proposition.

Fortunately for the airship, in contradiction to the airplane, the percentage of disposable lift increases with the size of the ship and the weight to power ratio decreases. In the airship the capacity, and therefore the gross lift, increases as the cube of the dimensions; so that a comparatively small increase in size is accompanied by an enormous gain in lift, while the resulting increase in the weight of the structure is nothing like proportional.

To give an example, the airship of 10,000,000 cubic feet capacity has five times the lift of the present 2,000,000 cubic feet capacity airship, but the length of the former is only 1.7 times greater and therefore the weight of the structure only five times greater (1.7)³. Moreover, the proportion of useful lift, that is, lift available for fuel, crew, passengers and merchandise, is well over 50 per cent. when compared with gross lift.

A series of comparisons have been worked out from the performances of an airship of 2,000,000 cubic feet and those estimated for a vessel of 10,000,000 cubic feet.

From these figures it is to be seen that the endurance and weight-carrying capacity of the rigid airship is merely a question of size. For the 10,000,000 cubic feet airship of the future the range is to almost all intents and purposes unlimited and the weight-carrying capacity large. Some 200 tons lift will be available for fuel, passengers and freight and the endurance at cruising speed of 45 m.p.h. works out to approximately three weeks and the range to some 20,000 miles, or nearly once round the world.

For the present, however, an airship of this size exists only in the imagination and it will be of greater interest to consider the commercial prospects of an airship already building. Air Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F., the head of the British Airship Service, gave certain facts and figures in a lecture before the Royal Society of Arts in London a few months ago. These are particularly valuable as being the first which can be regarded in any way as official. The type of airship chosen for the occasion was "R-38" (now known as "ZR-2"), which has been purchased by the American Government and is nearing completion at her constructional station. Air Commodore Maitland chose an airship of this capacity since nobody could deny the possibility of building one of this size, although he had worked figures for a 4,000,000 cubic foot ship which gave still better results.

The "R-34" had a total volume of 2¾ million cubic feet. She could carry 15 tons for 50 hours at a continuous air speed of 60 m.p.h. The assumption was made that she would fly about 2,500 hours in the year at an average ground speed of 45 m.p.h., although confidence was felt that the higher speed could be maintained. This would yield a yearly ground mileage of 112,000 miles and allowed the airship to be laid up for three months each year.

The cost of such a ship on war figures is £400,000 (about \$1,450,000, but it is agreed that with standardization the price should be reduced to £200,000 (about \$720,000).

The cost of a base station, consisting of sheds, gas plant, workshops and landing rights over surrounding ground, is £550,000 (about \$1,980,000) or with shed to house one ship, £400,000 (about \$1,440,000). A mooring base, equipped with mooring mast, gas plant and small stores, etc., would cost £45,000 (about \$162,000). Five houses will allow services to be maintained between all parts of the British Empire.

The route proposed for working out the cost per ton mile is England to India via Cairo. In England and Cairo double sheds would be erected and in India a mooring station. Four airships would be working on this route, each flying 2,500 hours, and with this arrangement a weekly service each way would be possible.

Each airship would carry 15 tons load for a journey of 50 hours. The flying time from England figures out as follows: To Egypt, 2 days; India, 4½ days; South Africa, 6 days; Australia, 9½ days.

Various figures have been given for the cost per ton-mile for an airplane service, and these seem to establish the fact that the airship is decidedly cheaper to exploit as a medium of transport. If the cost can be reduced, as Air Commodore Maitland asserts, to a much lower rate per ton-mile by building airships of 4,000,000 cubic feet capacity, passenger fares will be able to compete with steamship rates when the saving of time is taken into consideration.

A second scheme has been worked out in full detail for a proposed service between London and New York. In this case the figures are based on an airship of 3½ million cubic feet, which can be constructed in England without difficulty by a slight extension of the existing sheds. This ship is calculated to have a gross lift of 105 tons and a disposable lift of 68 tons. The estimated speed at full power is 75 m.p.h. and the endurance, carrying 15 tons of passengers and freight, 80 hours or 1,800 miles.

The proposed route to New York from London is via Portugal and the Azores, to take advantage of the better weather conditions, the distance being 3,600 miles and the time taken 60 hours. The return journey would be made by a direct crossing of some 3,000 miles and time taken would be 50 hours.

With four airships working it is anticipated from an examination of weather records that crossings would be practicable on 300 days in the year, and that 200 crossings could be maintained. Fifteen tons would admit of 140 passengers and their luggage to be carried, or 50 passengers and 10 tons of mails.—By Major George Whale, late R.A.F., in the "Scientific American."

REGAINS HIS SPEECH IN FLIGHT

A case parallel to that of the American soldier who regained his speech during an aeroplane flight has been brought to light in Indian Head, Saskatchewan.

Over a year ago Wilfred Verner lost his power of speech and on July 9 he was given an aeroplane ride at a high altitude. As a result of sharp loops and dives he was ill when he landed, but was able to talk.

RADIO INQUIRY DEPARTMENT

Commencing next issue there will be a Radio Inquiry Department conducted under the direction of The Radio Research Club of Canada. Canadian radio enthusiasts will then not only have an opportunity of having their various radio problems solved in Canada, but by men whom they already know as being among the leaders in radio work in Canada.

This department will be edited by the Secretary of the above club and the questions will be answered by the member considered to be most familiar with the particular field in question. Where the question is considered of sufficient importance it will form the basis for a discussion at a regular meeting of the club.

Answers will be given covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here, other queries being answered by mail.

The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions from one reader can be answered in the same issue. The club does not obligate itself to answer here any question entailing considerable research work, intricate calculations, patent research, etc. However, such an inquiry will be acknowledged and the writer advised as to the basis upon which the question can be answered.

U. S. AIR SERVICE USE RADIO

The use of radio telegraphy and telephony in the air service is becoming increasingly more important, as shown by the radio activities of the Engineering Division at McCook Field. Many types of radio apparatus are being tested and experimented with in the Radio Laboratory. In fact, there is probably no more completely equipped radio laboratory in the United States than the one at McCook Field.

Work at this time is being done on various types of apparatus, including a 5-kilowatt spark transmitting set which has a range of about 1,000 miles, a 2-kilowatt tube set which has a range of about 600 miles, a 1-kilowatt telephone set which has a range of several hundred miles, as well as various smaller radio telephone sets which have ranges of from 15 to 100 miles. In addition to this apparatus, tests are also being conducted with telegraph

and telephone apparatus which is used on aeroplanes and includes a telegraph set having a range, from aeroplane to ground, of 100 miles and various telephone sets having a range of from 15 to 100 miles. Thus in the course of tests it is possible to carry on conversation from the radio laboratory with an aeroplane which is flying at a distance of 50 miles from the field as easily as it is to carry on conversation over the ordinary wire telephone from the house to the office.

In addition to communication, radio is also being used in the air service to-day for the purpose of assisting in navigation, particularly in the case of "above the cloud" flying. By means of direction finding loop stations located on the ground, it is possible to ascertain the bearing and the location of any aeroplane that is flying in the vicinity. Thus, if an aeroplane is flying above the clouds and is in doubt as to its exact location, the radio operator in the aeroplane calls these ground direction finding stations and asks that he be informed as to his whereabouts. These ground direction finding stations immediately take bearings on the aeroplane, and by means of triangulation determine its location. This information is then transmitted to the aeroplane by either radio telephone or radio telegraph.

By means of special radio direction finding loops installed on an aeroplane, it is possible to fly directly towards any radio transmitting station. Thus it is possible for aeroplanes to rise above the clouds and to fly directly to another station without seeing the ground until its arrival and landing.

EVENING COURSE FOR AERO-MECHANICS

On October 2nd next, at the Central Technical School, Lippincott and Harbord Streets, Toronto, there will commence an evening course for mechanics and others who desire to become familiar with the working of an aeroplane engine and its various parts.

This course, which is given under the direction of Capt. M. B. Watson, assisted by other competent instructors, is a fitting preparation for enlistment in the C.A.F. or for work of such nature with a commercial organization. Last year the majority of those who took the course were taken on the strength of the Canadian Air Force. While the C.A.F. do not guarantee to take on all who take the course, yet this training is recognized to be of great value and those taking it may be assured that their standing in the course will operate greatly in their favor as regards their position with the officers of the C.A.F.

Pupils may register at the school during school hours or between 7.30 and 9.30 p.m. Tuition is free

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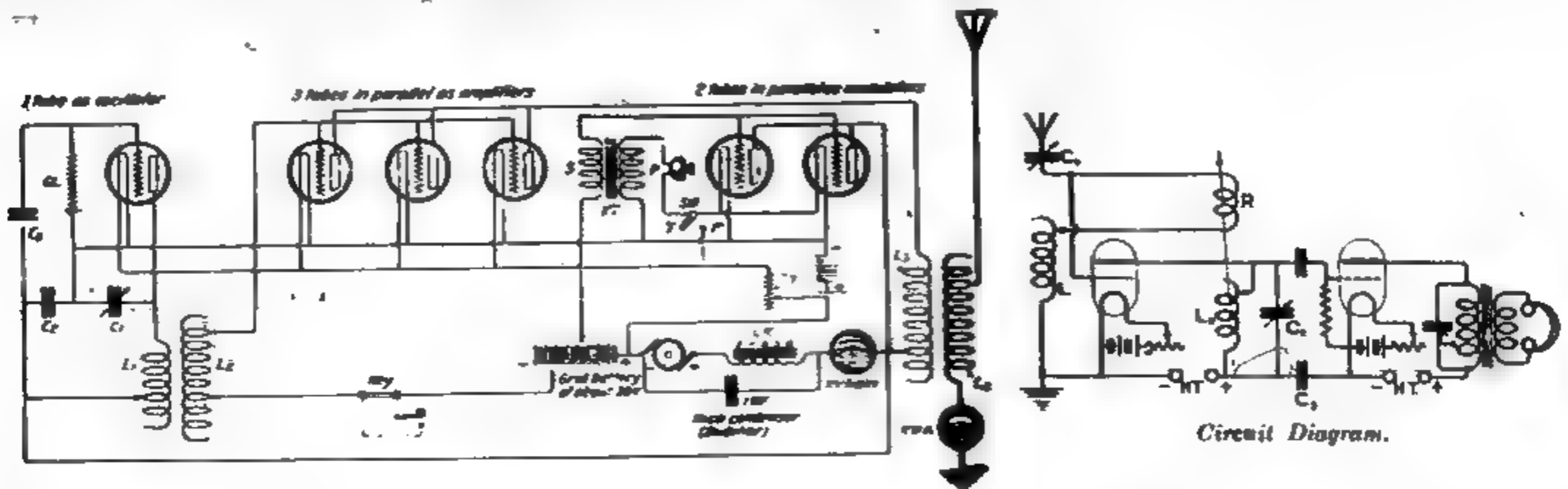
A Good Two-Valve Circuit for Telephony

In common with, I suppose, the majority of amateurs, it has long been my ambition to find a simple circuit giving good and reliable reception of the twice-weekly Hague concerts. With this end in view I have tried many circuits, always limiting myself to two valves. (Of course, it's easy enough to get them with four or five H.F. amplifiers, but I wanted a circuit suitable for the amateur of limited resources.) Until quite recently results were not such as to satisfy me. Always, it seemed, to get sufficiently loud signals (in Leeds) something had to be sacrificed, either clearness or selectivity (generally both!) if only two valves were to be used. Recently, however, I have devised a circuit that meets requirements very well.

The first valve (see diagram) functions as a high frequency amplifier, its anode circuit containing capacity and inductance, with reaction coupling into the aerial circuit. Across this tuned circuit is connected a leaky-condenser rectifier, the position of whose grid leak should be noted. The fixed condenser C_2 also is important; it should be of fairly large capacity, though the actual value

the circuit in oscillation. (To ascertain whether the set is oscillating, touch the aerial terminal with the finger—a sharp click should be heard.) The object of the preliminary tuning to 600 metres is to ensure that such an adjustment of reaction coupling is obtained as to make the set oscillate only when its two circuits are tuned to the same wavelength, thus providing an indication of correct tuning.

Having found the carrier wave, increase the amount of L_2 in circuit and correspondingly decrease C_2 as much as possible, leaving only such an amount of capacity in circuit as will serve for final fine adjustments. Now tune to the silent point of the howl and weaken the reaction until oscillation just ceases. The concert will then be heard and will be much improved by final correction of the adjustments of C_1 , C_2 and reaction coupling. These being somewhat critical, it is a great advantage to have long handles to C_1 and the reaction coil. (C_2 is not so critical.) For the same reason, and others, it is desirable to have the coil R spherical and to rotate within a cylindrical L_2 . This arrangement is vastly su-



is not at all critical. (I find a telephone condenser quite O.K.) C_4 , the telephone condenser is, I find, essential to good results.

Since I am addressing myself particularly to the newly-fledged amateur, it may be helpful to give some suitable capacities for the various condensers:—

- C_1 variable up to 0.001 mfd.
- C_2 variable up to 0.0003 mfd.
- C_3 fixed 0.001 to 0.01 mfd
- C_4 fixed 0.001 mfd

To tune in P.C.G.G. proceed as follows: First tune both circuits (i.e., aerial and plate) to 600 metres, which wavelength is chosen because there are always plenty of spark signals to be heard, and it may consequently be readily found, especially if the aerial circuit adjustments have been previously ascertained with a simpler circuit. Tune carefully to one particular station, and then tighten the reaction coupling until the set just oscillates and spark signals come in hoarsely. Now proceed to add inductance to both circuits, a little at a time, at each increase searching round with the condensers until the howl of P.C.G.G.'s carrier wave is heard. While doing this it may be necessary to tighten the reaction a little, to maintain

prior to a cylindrical coil to slide within L_2 .

As regards the possibility of causing interference by the preliminary adjustment of this circuit, I do not think the risk is serious, because, unless the coupling is far too tight, the amount of energy radiated is much less than in the case of the much abused autodyne circuit. Besides, with a little practice, the adjustment is over in a few seconds and the circuit is then operated non-oscillating, when it is, of course, impossible to cause any trouble at all.

In conclusion, I may add that this circuit is, in my experience, almost ideal for spark and telephony, though not very good for C.W. Its great feature is its quietness and freedom from jamming. X's are noticeably reduced, and my great enemy—humming from A.C. mains—is cut out entirely. Indeed, when no signals are coming in and X's are moderate, the circuit sounds positively "dead."

If three valves can be used the addition of the third as a note magnifier gives the finest three-valve circuit I have ever tried for the types of signals mentioned above. With it on my 100 ft. single wire aerial Budapest (HB) spark set is readable all round a good-sized room.—By G. P. Kendall, in "Wireless World."

Safety Tanks for Aircraft Competition

The Director of Research of the Air Ministry of Great Britain is arranging a competition the aim of which is to secure the design of a thoroughly safe and reliable fuel tank for service and commercial purposes.

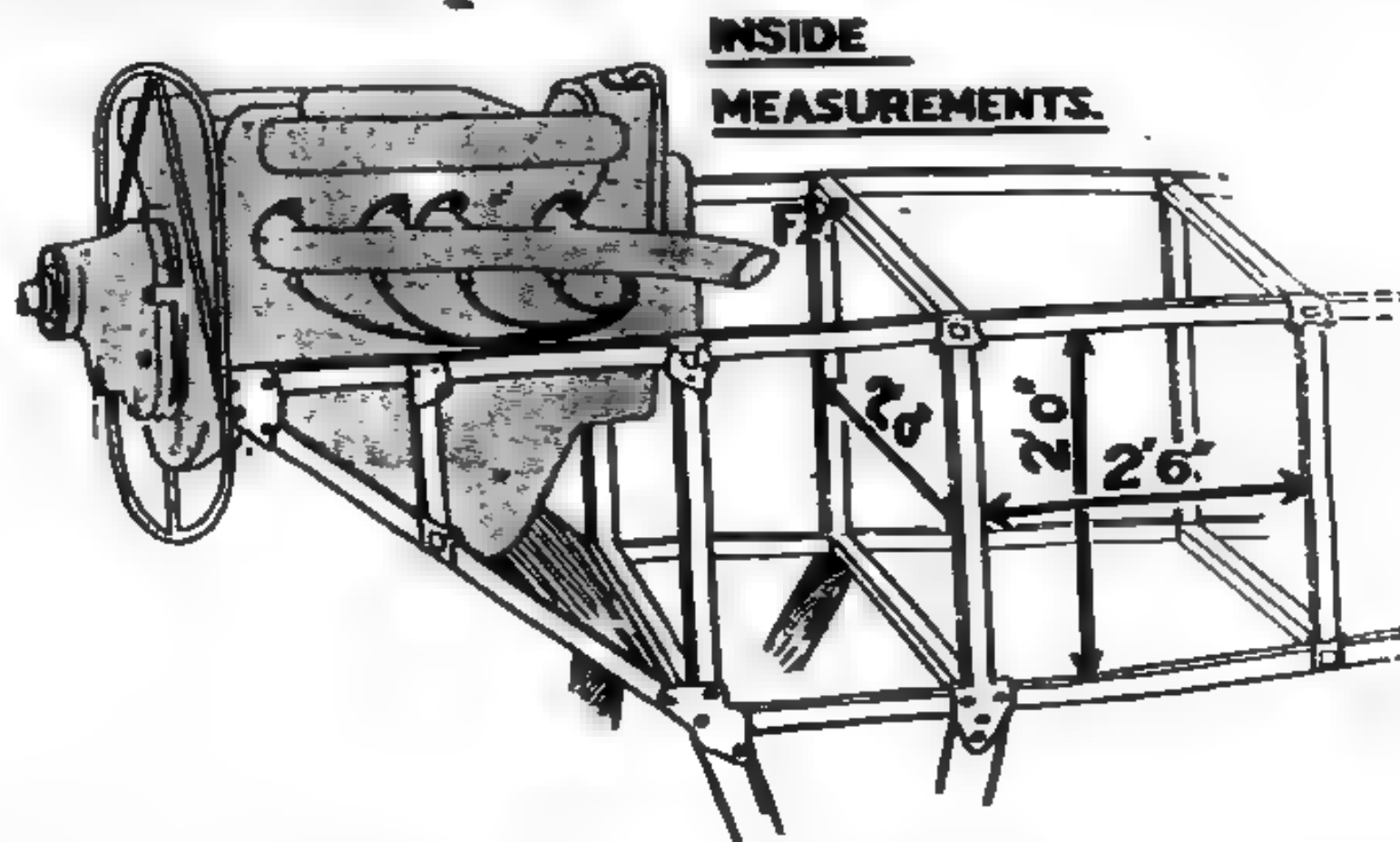
While the possibility of aircraft catching fire in the air has been almost entirely eliminated by care in design and inspection, such precautions are, as yet, not sufficient to protect in every case an aeroplane from the results of a crash.

One of the main objects still to be attained is to ensure that in a heavy landing or in a crash the fuel tanks on an aircraft, even though seriously damaged, will withstand the shock to which they may be subjected

be subjected to a crashing test of the following nature:

"Each tank will be mounted in a wooden structure and located behind a concrete body formed to represent an engine. The tank will be released down a wire ropeway approximately 100 feet high, so arranged that the structure will strike the ground at an angle of not less than 45° from the horizontal and will be free to turn over. This will ensure as far as possible the conditions prevailing in a typical aircraft crash. The tank will contain 22 gallons of petrol, which will be supplied by the Air Ministry.

"In the four tanks supplied for the final tests minor modifications of the original design may be made, pro-



without either bursting or leaking. At the same time it is desired to find a tank capable of withstanding the effects of enemy action by machine gun or shell fire.

Tests are to commence December 1st, 1921, and prizes to the extent of £2,000 are being awarded to the entrants of the tanks considered the best. The first prize is to be £1,400, the second £400, and the third £200. Entries for this competition close November 7th, 1921, and should be addressed to the Secretary (R.D. 1) Air Ministry, Kingsway, London W.C. 2, marked "Safety Fuel Tank Competition." Such entries should be made on forms procurable from above address.

Tanks should be constructed in accordance with particulars furnished with entry forms and all necessary fittings to enable the tank to be mounted in the structure shown in accompanying diagram are to be supplied by the competitor.

Further regulations as given in official Air Ministry Communique No. 709 are as follows: -

"All tanks will be submitted to preliminary trials. The three best types will be selected by the judges for a final trial.

"For the preliminary tests both tanks submitted will

provided the judges have previously decided that the modification is one of detail and not fundamental principle. The tanks will be required to undergo a similar crashing test as in the preliminary stages and also a firing test in which they will be subjected to machine-gun fire with ammunition capable of penetrating the ordinary type of mild steel fuel tank and leaving small entry and large exit holes when the tank is struck below fuel level, and exploding and igniting the fuel either on contact or after penetration.

"A series of bursts of five rounds each will be fired at a range of 50 yards, the tank being examined after each burst. The angle of fire will be at the discretion of the judges.

"At any time during the competition the judges may impose such other tests (e.g., to determine the resistance to acceleration, etc.) as they may desire in order to demonstrate the relative merits of competing tanks."

Capt. A. J. Hember, Secretary of the Aero Club of Canada, has written to London requesting forms and also an extension of time for entering the competition. Local interest is already spreading.

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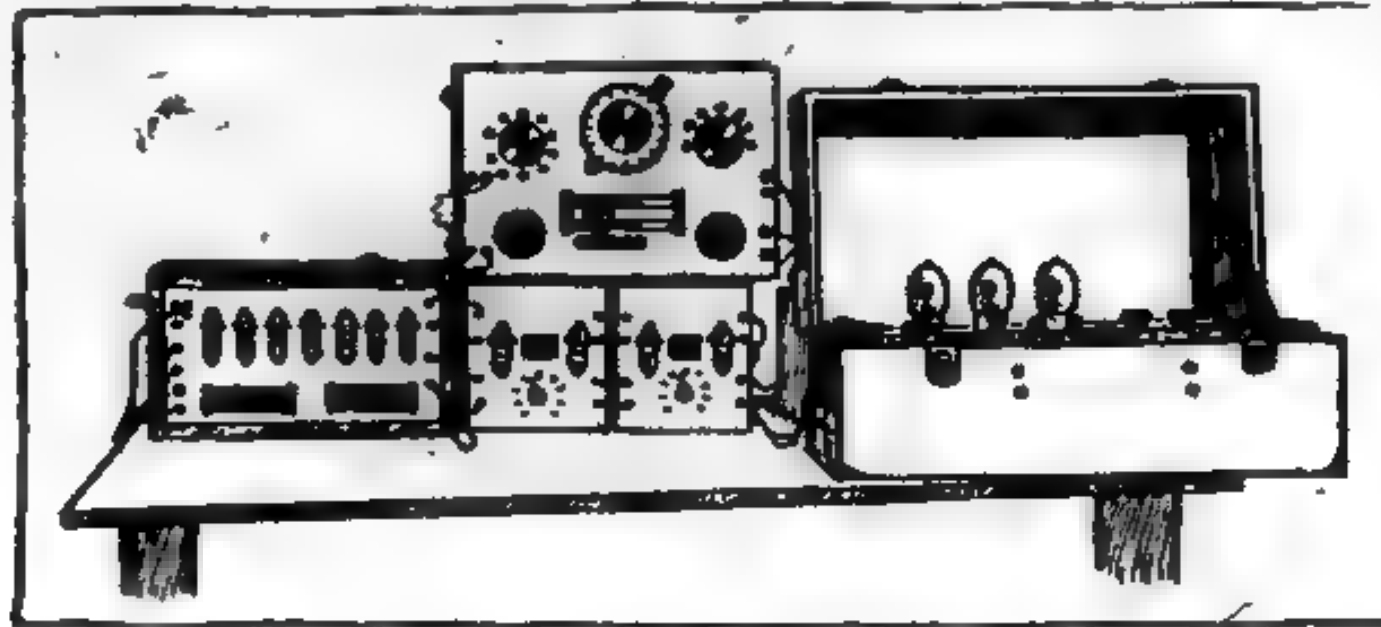
TORONTO, ONT.

Wireless Concerts at C. N. E.

One of the most unusual and interesting features of this year's Exhibition was the daily radiophone concert given by the Marconi Company from the main bandstand in the Exhibition Park. The music was transmitted from downtown every day between twelve noon and one o'clock and was picked up at the Exhibition, where it was broadcasted by means of loud speaking horns to the surrounding crowds.

of the power amplifier was fed directly to the five loud speakers on the roof, and as may be well imagined, the volume of sound issuing from the horns was something terrific.

On a wave length of 1,200 meters no interference from other stations was experienced, and the music was heard loudly and clearly by thousands of people, many of whom had never seen a wireless set before. The only

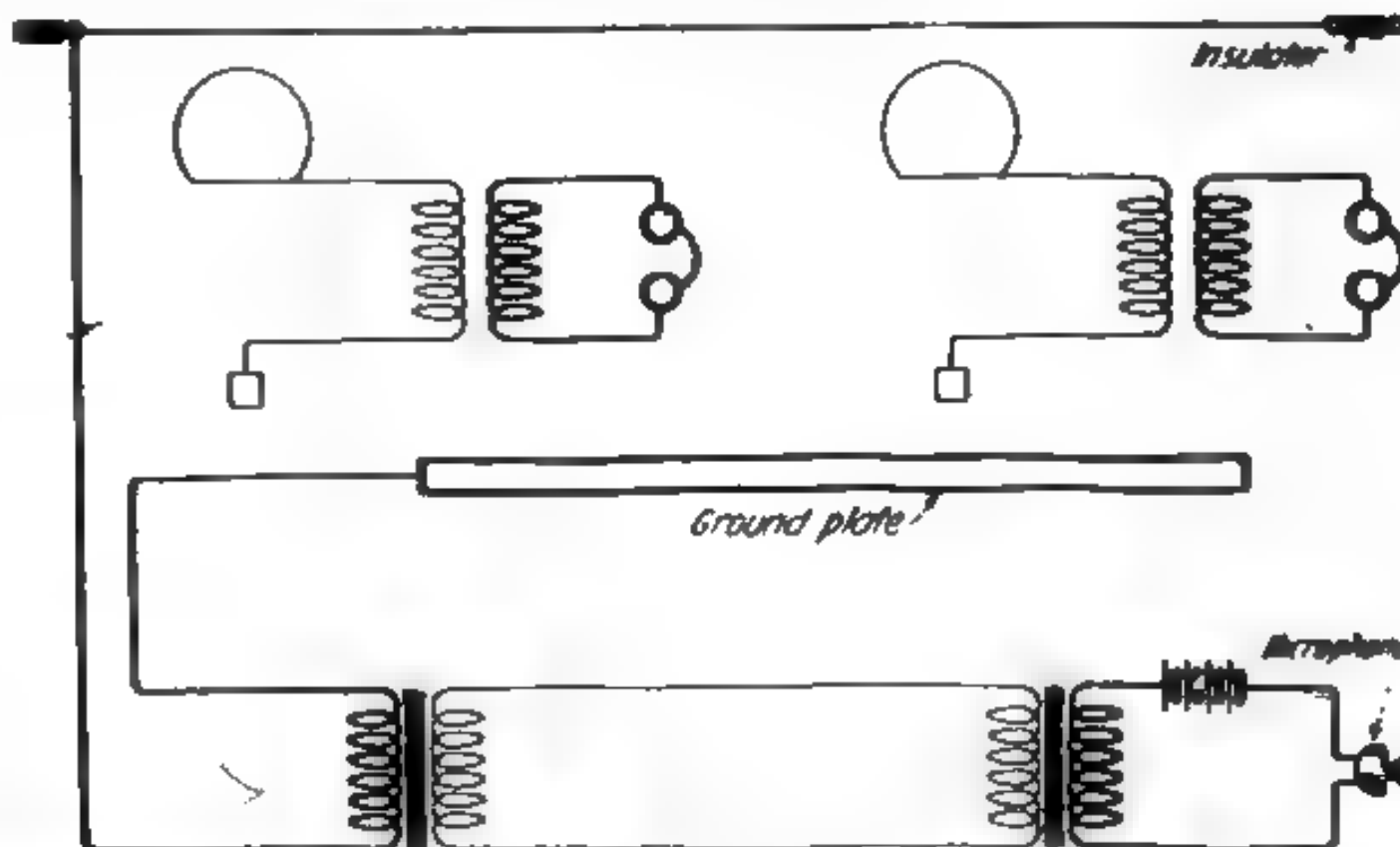


A single wire aerial about three hundred feet long and twenty-five feet high had been erected between the west end of the Manufacturers' Building and the main bandstand. This aerial was connected to a modern receiving set, including a thirteen-step amplifier. On the roof of the bandstand there were five Magnavox loud speakers, and it was due to these efficient instruments that the music was heard distinctly many hundred feet from the set.

difficulty that was experienced was on very hot days, when the static made itself noticeable. However, as Shakespeare has truly said, "Where ignorance is bliss, 'tis folly to be wise." Ninety per cent. of the people who heard the concerts didn't know any more about static than a South Sea Islander knows about higher mathematics, so they probably thought that the queer crackling noise which occasionally accompanied the music was part of the entertainment.

The illustration shows the arrangement of the receiving instruments. The lower-left hand cabinet, containing seven bulbs, is a detector and six-step resistance coupled radio frequency amplifier. The top centre cabinet is a standard C. W. receiver, while the two small cabinets on which it rests are both two-step audio frequency amplifiers. The large case on the extreme right is a Magnavox three-step power amplifier. This outfit does not use ordinary amplifying tubes, but requires five-watt transmitting bulbs. Dry cells were used to supply the five hundred volts plate potential required for the proper operation of these three tubes. The entire output

Although these concerts were primarily intended for the benefit of the crowds at the Exhibition, they were also heard and enjoyed by hundreds of amateurs at their own homes in Toronto and the surrounding country. Moreover, in several large offices and stores in Toronto's business district, complete receiving sets were installed, and the employes spent their noon hours listening to music by radiophone. Practical demonstrations of this kind do more to promote a general interest in the wonders of wireless than any amount of highly technical literature, and for this reason they are to be greatly commended.



NEW YORK STOCK EXCHANGE EQUIPMENT

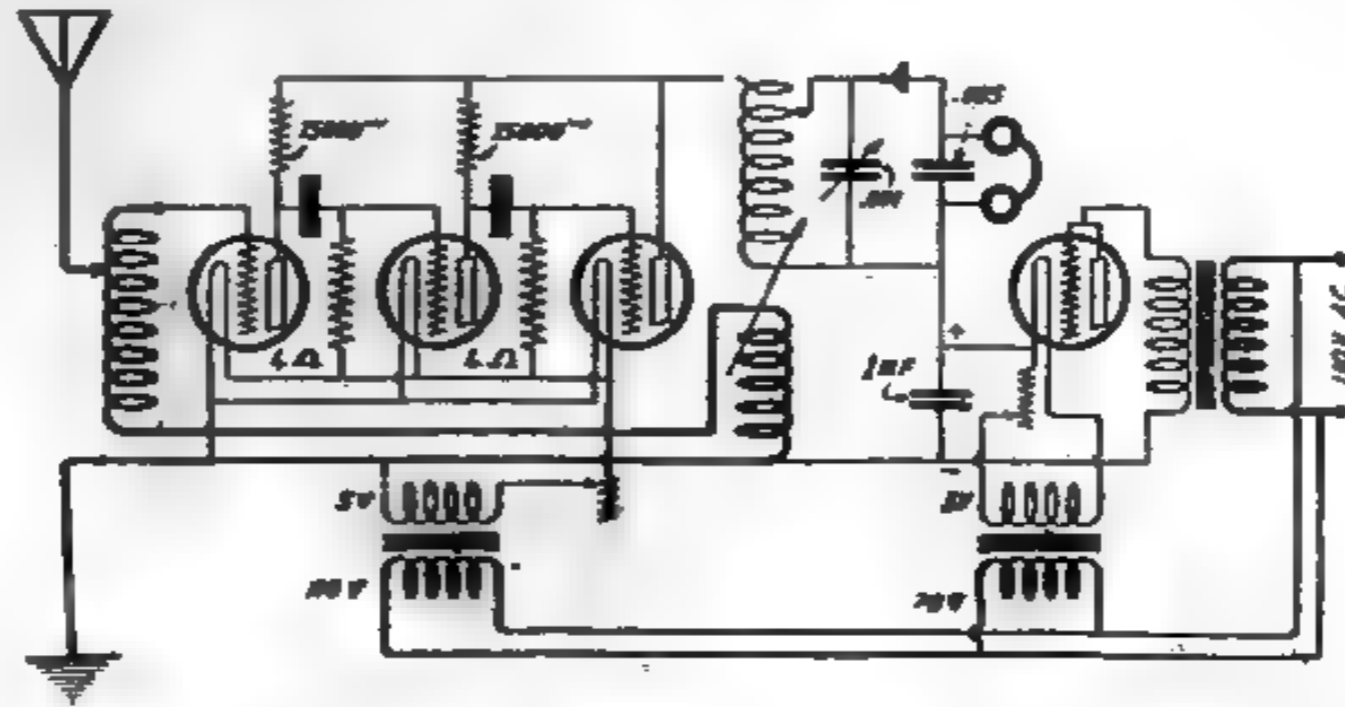
Reproduced from "Radio News" is a diagram showing the complete Audio Frequency Radiophone installation of the New York Consolidated Stock Exchange.

Two portable sets are shown. They consist of a cage aerial with ground made through the body of the man wearing the set. If high resistance telephones are used, the telephone transformer may be dispensed with.

"A" AND "B" BATTERIES REPLACED BY 110 VOLTS A.C.

At first sight, my receiving set looks like an ordinary three-step resistance-coupled amplifier with retroactive coupling, but its special and still unique feature, I believe, is its working without any cell or battery, all electrical energy being taken from the lighting main.

The heating of the filaments is obtained, quite easily, through the secondary of a bell-ringing transformer. The diagram is self-explanatory. For the high-voltage on the plates I devised a ready-made rectifying valve with an ordinary V.T. with grid and plate connected together as



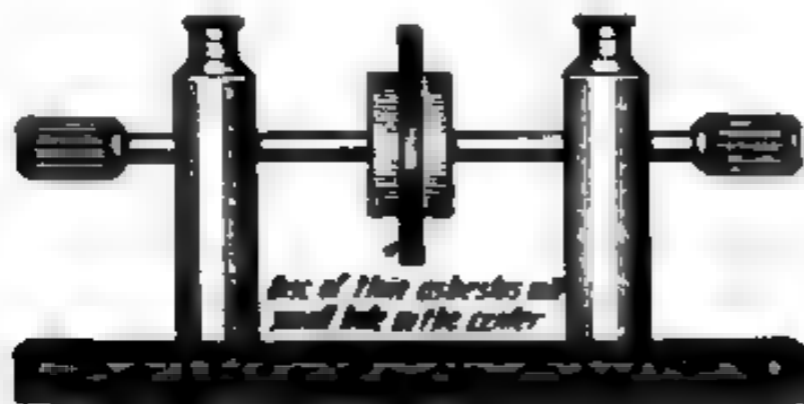
I shall not describe the amplifier, which is of a well-known pattern, but I may, perhaps, emphasize that a tuned circuit is rigged up on the plate side of the last V.T. with a detector and telephone in shunt. This circuit, tuned to the incoming signals, rejects them on the detector and phones, while it allows an easy path to the troublesome noises of very low frequency (50 cycles per second) drawn up by A.C. use. These noises, therefore, leave the phones undisturbed and you get signals exactly as by the time-honored method of accumulators or batteries.

indicated in the illustration. The rectifying valve is lighted by another bell-ringing transformer and the cold electrode is fed with A.C. from a one to one transformer of fairly high resistance (300 to 500 ohms). A connection from the filament goes to the plate side of the amplifier and delivers the required voltage. A condenser of 1 mfd. is put across the terminals of the rectifying apparatus and smooths out the fluctuations of the rectified current while allowing path for radio frequency oscillations. No choke coil is necessary.—By Prof. M. Moya, University of Montpellier, France.

IMPROVEMENT TO THE FORD COIL

No doubt many amateurs who use Ford spark coils for transmitting, do not know that it is possible to have a note as good as if a rotary gap were used, with far less trouble and no expense.

The accompanying sketch shows the vibrator of a Ford coil. "A" is a small spring behind the vibrator, upon which one of the platinum contacts is riveted. If a small splinter of wood is wedged behind this, to hold it stiff, a fine note is the result. The note may be changed



by forcing the wedge down further, or vice versa. When a good note is obtained the spring may be soldered down permanently, if desired.

After the vibrator is wedged as described above, a shorter spark is given from the secondary of the coil, but the coil will send practically as far, and the good note easily makes up for any slight decrease in the transmitting radius.

TRAIN DESPATCHING BY RADIO IN FRANCE

The Nord system of French railways will be the first in Europe to install wireless telephones for the control of train movements. Work has already commenced on receiving antenna to be attached to a statue surmounting the Gare du Nord, the principal Paris station, and a special registering apparatus has been designed by M. Branly, whom the French consider to be the real discoverer of the possibilities of the wireless, in his little laboratory on the outskirts of Paris.

For the present the system will only connect the Gare du Nord with individual stations as far as Creil with occasional intermediary sending posts attached to telegraph posts along the line, which will be useful in case of accident. As the efficiency of the system is proved, however, the company intends extending it as far as Dunkirk, with interstation service as well as long range despatching control.

Other French railways are watching the experiment with interest, as it is expected to make obsolete all block systems and to reduce the control costs by at least 75 per cent.

Meanwhile M. Branly is working quietly on various wireless inventions, which have been delayed by the war and through lack of funds. It is more than likely that the French Government will advance 100,000 francs this year to enable him to continue his labors to contest Great Britain's wireless supremacy.

In Ontario we have been told the Hydro authorities are beginning to make use of wireless in connection with the radials and that their plans include the erection of several elaborate stations.



AERIAL STAMPS FOR SALE

The Aero Club of Canada offers for sale a number of unissued stamps, authorized for use during 1918 and 1919, in connection with the First Aerial Mail between Toronto and Ottawa, and Toronto and New York.

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Loss of the Airship R-38

The rigid airship R-38, which was shortly to be incorporated in the U. S. Navy under the name ZR-2, was accidentally destroyed on Aug. 24 over Hull, England, with heavy loss of life. Of the forty-nine officers and men she carried, seventeen of whom were Americans, only one American and four Britishers were saved. Among those saved are Flight Lieut. A. H. Wann, R. A. F., commander of the airship, and four ratings, including Quartermaster N. O. Walker, U. S. N. Among those unaccounted for are Commander Louis H. Maxfield, U. S. N., who was to command the ZR-2 under the American flag; Lieut. Comdrs. Valentine N. Bieg and Emery Coil, U. S. N.; Lieuts. Marcus H. Esterly and Henry W. Hoyt, U. S. N.; Air Commodore E. M. Maitland, R. A. F., commanding the airship base at Howden; Flight Lieuts. G. M. Thomas, I. C. Little, R. S. Montague and J. E. M. Pritchard, R. A. F.

From statements by eye-witnesses it appears that the R-38 was flying over Hull when at about 5.45 p.m. the hull was seen to buckle amidships and break in two. There followed two violent explosions and the two sections of the airship broke into flames and fell into the River Humber. It is believed that most of those missing were killed by the explosions when the hydrogen and the gasoline tanks caught fire.

The cause of the accident had not yet been officially determined at the time of going to press, but according to the stories told by some of the survivors, the airship broke in two just when she was making high speed turning tests. Two turns were made without difficulty, but on making the third the strain may have been too great for the vessel, for it caused one of the longitudinal girders to buckle. In this connection it is recalled that during a 9-hour trial flight on July 17 some of the longitudinal girders and transverse frames amidships showed structural weakness and necessitated reinforcement. This was done at Howden, and it was then believed that the modification in her structure—to be anticipated in an experimental type such as the R-38—had overcome the initial defects.

Flying Officer Wicks, wireless officer of the R-38, stuck to his post to the last, attempting to communicate with the airship base at Howden. Signals were received at that place from the R-38 after the vessel had begun to buckle, but were undecipherable.

The R-38 was the largest airship ever built. She had a capacity of 2,720,000 cubic feet, being thus 300,000 cubic feet larger than the German L.71, the largest of the Zeppelin series, which was surrendered to Great Britain under the terms of the Peace Treaty. She was 695 ft. long, 85 ft. 4 in. in diameter, and was propelled by six 350 h.p. Sunbeam "Cossack" engines mounted in separate wing cars, placed in pairs side by side, each engine driving a pusher propeller. The designed maximum speed was 70 m.p.h. and this appears to have been exceeded on the full speed trials the R-38 made just before her collapse. Her disposable lift, that is, the useful load available for gasoline and oil, stores, armament, ballast, etc., as originally designed, was in excess of 50 tons, but this was subsequently reduced by the addition of a bow mooring gear and also by the reinforcement of the hull.

The hull structure was, in general principles, of standard type, such as was used in the Zeppelin airships, but a very considerable saving of structural weight had been effected by a large number of improvements in details. It was built of duralumin, and consisted of a number of longitudinal lattice girders connected transversely by other lattice girders which formed a series of rings, the longitudinals and rings being braced by wires. This structure contained fourteen compartments, in each of which was a gas bag made of fabric and goldbeaters-skin. Inside the bottom of the airship and running from end to end was a corridor containing the aluminum gasoline tanks, the fabric water ballast bags, accommodations for bombs and the sleeping and living quarters of the crew when off duty. This corridor was also the means of communication between the various cars and control stations, and of entry from a mooring mast.

The main control station of the airship was in a small car near the bows. This car was not suspended below the hull as in the case of the power cars, but projected from the underside of the hull structure, to which it was rigidly attached.

The crew was normally made up of a Captain, Executive Officer, Navigator, Engineer Officer, Radio Officer, Meteorological Officer, three Watch Officers, sixteen mechanics and ten riggers.

The design of the R-38 was decided upon by the British Admiralty in the spring of 1918. Construction was begun at Messrs. Short Brothers Works at Cardington in November, 1918. In April, 1920, the works at Cardington were taken over by the Air Ministry, and the greater part of the work of construction of the ZR-2 has been carried out since that date. The history of the airship up to date may, therefore, be summarized by saying that it was designed by the Admiralty, begun by Messrs. Short Brothers and completed by the Air Ministry.

LAYING MINES BY AIRCRAFT

A new method of planting mine fields, involving the use of aircraft and a special type mine equipped with a parachute, has been the subject of recent experiments conducted by the Navy in Chesapeake Bay, according to reports. The mine used is the invention of Charles Lee, a mechanical engineer of Portsmouth, Va. The mechanism, according to Aerial Age Weekly, consists of the mine, anchor, cable and silk parachute. Large numbers of airplanes, each carrying a supply of mines, can be sent over the area to be mined, and the devices dropped at regular intervals. The parachute eases the descent to the exact spot selected, and the instant the mine hits the water the parachute is detached and floats away to sink later.

AVIATION SCHOOL FOR BOLIVIA

There is a project on foot which has the approval of the Bolivian Government for the foundation in that country of an aviation school for the purpose of developing commercial flying and improving communication with adjoining countries. Included in the equipment of the proposed school will be hangars, mechanics' shops, photographic workshops, and other supplies.

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It is rumored that this fall may bring to those interested in wireless work information regarding certain improvements which mark a distinct step forward. Details are not available, but many are on the "qui vive" for the announcement.

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PLANS TO FLY OVER POLE

Philadelphia.—Capt. Robert A. Bartlett, who was master of the Roosevelt, Admiral Peary's ship on his expedition to the North Pole, has declared determination to cross the North Pole in an aeroplane. To finance the expedition, he says, will cost about \$300,000, and he is seeking to make arrangements with scientific bodies and wealthy men for the advance of this sum.

Capt. Bartlett is known among army, navy and scientific men as "The Polar Bear," and is a veteran of five polar expeditions. He arrived here recently to become port captain of the army transport service and is in charge of the transports being completed at Hog Island.

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