

October 20, 1925.

Brig.-General A.C.L. McNaughton, C.M.C., D.S.O.,  
Department of National Defence,  
Ottawa.

CONFIDENTIAL.

My dear Andy:-

I had a talk with Dean MacKay about Dwight and while the whole situation is still in the air, we feel much indebted to you for your interest and for the suggestion. I am telling you confidentially that there will be a vacancy in the place of King, so that we shall have one appointment to make almost at once.

It seems to me that the establishment of this new branch in Communication Engineering or Communication Physics or whatever it is called, involves a pretty close liaison with the Department of Physics, and that we must utilize the present opportunity for putting in someone who would be capable of working in the latter department for the time being, as well as in Electrical Engineering. Would Dwight be a possible man for the Chair of Engineering Physics with a view to his ultimately giving special attention to Communication work. The requisites for such a Chair would be a thorough knowledge of Higher Mathematics, a record for research, considerable attainments in Physics, and, of course, practical experience. You know that one of the great points about King was that he was a magnificent mathematician.

Yours faithfully,

Wilfrid Bovoy.

Measurement of Characteristics of Oscillating Circuits

3<sup>d</sup> year

Condensers

orders of value

Coils

of constant to

Standard Capacity Bridge

be low.

" Inductance "

Microhenrys

Decade Resistance Boxes

Low Resistance Thermo meters

General Radio Co Cambridge Mass.

Thermionic valve work

\$ 2500

Sound, Acoustics - Physics

Optics

Precision Measurements

4<sup>th</sup> year

Murray re Steels

Van Conference

High Precision Capacity & Inductance Bridges

Measurement of Radio

Frequency Resistance.

Low wave length valve driver (to be built)

High precision wave meter

Precision resistances.

Condenser with high precision equipment

\$ 2500

Telegraph & Telephone Work

\$4000

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Transmission problems.

Measurement of field strengths

\$1000

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# BELL TELEPHONE QUARTERLY

## A MEDIUM OF SUGGESTION AND A RECORD OF PROGRESS

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### The Place of the Bell Telephone Laboratories in the Bell System

IT is one of the functions of the American Telephone and Telegraph Company to work out for its Associated Companies engineering problems involving new developments. These problems as met by one company are, in large measure, common to all the companies, so that the solutions when once at hand are generally applicable and benefit all. The centralization of the study of such problems is almost imperative in order to unify the plant and the operating practices throughout the country, a prerequisite to the interconnection of subscribers on a nationwide basis.

Since the development problems encountered by the Associated Companies cover all branches of telephone engineering, there have arisen in the American Telephone and Telegraph Company or closely associated with it three organizational branches for participating in the solution of these problems, its Department of Operation and Engineering, its Department of Development and Research, and the Bell Telephone Laboratories.

The American Telephone and Telegraph Company undertakes, through constant association with the

operating organizations of the Associated Companies, to formulate the requirements, present and future, of the Bell System. Out of these requirements come the problems of the Department of Development and Research and the Bell Telephone Laboratories. Broadly speaking, the work of these departments may be grouped under one or the other of two classifications depending upon whether it has been initiated in response to some operating problem which is pressing for solution or initiated as a step in the American Company's broad fundamental programs of development. Work of the former character is necessarily carried on in much closer contact with the engineers in the operating field than work of the latter character. It follows that while some of the telephone research is specific, there is also another portion which is of the most fundamental character as regards the sciences upon which the telephone art is based.

After any research program has been satisfactorily concluded the proper standards in regard to systems, equipment and apparatus are established by the Department of Development and Research and these are then specified for their proper uses in the Associated Companies by the Department of Operation and Engineering.

Previous to 1907, three laboratories or departments of development and research were maintained in the Bell System, one by the American Company at Boston, one by the Western Electric Company at Chicago, and one by the Western Electric Company at New York. In 1907, in the interest of economy and efficiency these were consolidated so far as laboratory and experimental work was concerned into one unit in New York. It is this unit which has recently been given a corporate form and designated the Bell Telephone Laboratories, Incorporated. The Laboratories are owned jointly by the American Company and the Western Electric Company, the expense of operation being divided according to the nature of the work done.

### *The Place of the Laboratories in the Bell System*

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The recent incorporation of the Bell Telephone Laboratories as one of the group of companies forming the Bell System offers an appropriate occasion for describing in some detail this highly developed research organization. As indicated above, its functions, while distinct from those of the engineering and development departments of the parent company, articulate with them in all respects. The research problems handled in the Laboratories are primarily physical and chemical in nature but work in many other fields of science is constantly in progress and the charter of the company has been very broadly drawn to recognize both the present diverse nature of telephone research and its inevitable future ramifications.

The Laboratories comprise a technical personnel of about 2,000 persons,—highly trained scientists, engineers and their assistants. This number is exclusive of the large groups of scientists and technical specialists in the engineering and development departments of the American Company.

So large a laboratory staff, adequately supplied with the best equipment, provides an exceptionally powerful instrument of research. It is a contribution of our day, and especially of large industrial enterprises, to the advancement of science. It has been developed in response to the need for practical application of research, and is indispensable for carrying forward such concerted programs of investigation as the advancement of the telephone industry, for example, demands. The large laboratory, working to a single end, as contrasted with the individual worker, seems to present a definite stage in an evolutionary sequence. In it the many highly trained individual minds are fused into one composite mind. Some day it will be possible to state the gain in effectiveness which such a closely knit association provides, but in the meantime there can be no doubt that the gain exists. The purpose of all organization lies in the fact that the efforts of a group of people working together

in harmony toward a given end are much more effective than the same people dispersed and each laboring as a unit unrelated to the others. From this point of view the Bell Telephone Laboratories have in themselves the benefits of organization, but the gain is doubly marked, since they in turn are a working branch of a larger system, the whole of which is functioning toward a single end.

In America, the telephone is an institution of the people. Nowhere else is the service so nearly universal in the extent of territory covered, nowhere else is it so good, nowhere else is it so generally used and its use increasing so rapidly. The number of telephone calls completed last year was upward of twenty billions. Even at this, there is no sign that we are even approaching the point of saturation in the use of the telephone. The daily telephone traffic at present represents, on an average, one call by one out of every two persons in the country, and this use will increase steadily.

To care for the demands of the future, the size and complexity of the plant of the Bell System must grow steadily. Moreover, it is our ideal to work for constant improvement in apparatus, in methods, and therefore in service, until in the ultimate, any subscriber can reach any other subscriber, even if thousands of miles away, as readily and promptly as though he were in an adjoining room.

The future possibilities of the telephone appeal to the imagination. Growth will always bring new problems as it has in the past—problems as numerous and vital as at any period in our development. The multiple switchboard, the underground cable, the long overland toll cable, the carrier current systems, are our answers today to the demand for telephone service. We smile as we view a little fifty line switchboard of 1880 in the light of the 10,000 line board of today, but a steadily increasing demand means that we are even now in the midst of rapid progress. Increases in the size of the telephone plant

*The Place of the Laboratories in the Bell System*

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will always necessitate new ways of achieving old ends as well as warrant the introduction from time to time of new types of service. To meet these changing situations the one satisfactory course to pursue is that of development and research based on accurate studies and analyses of operating conditions.

The present-day complexity of the telephone plant is such that very few problems involve experts in but a single field. Improvement at one point usually opens up the possibility of improvement at other points and to take full advantage of such opportunities calls for centralized engineering and development groups who are at all times closely in touch with field conditions. Thus, transmitter and receiver tie to local and toll circuits, to central office switchboards, relays and signaling equipment, to telephone repeaters, to superposed telegraph and carrier facilities, until a single pair of wires with its associated equipment may represent the investment of more than a million dollars, and an improvement contemplated in one element may echo back and forth through the plant to such an extent that hundreds of experts in different departments are needed to decide the best procedure.

W. S. GIFFORD.



## Bell Telephone Laboratories, Incorporated

**T**HE Bell Telephone Laboratories is a new name for an essential organization in the Bell System. As the Laboratories become better known and better understood their function will be facilitated. In this brief exposition of the Laboratories some of the important features of their operation will be described.

### TWO BROAD PHYSICAL PROBLEMS OF COMMUNICATION

In broad classification the activities in the Laboratories are concerned with the two fundamental and inherent problems of electrical communication: namely, that of the electrical transmission of intelligence and that of switching and controlling the channels for such transmission. In the functionalized organization by the American Telephone and Telegraph Company of its continuous program of development and research there was instituted in the Laboratories activities which have resulted from time to time in important and now well-known developments in physical principles and in the apparatus or system embodiment of these principles. And all the activities of the technical staff of the Laboratories may be considered to have been undertaken in the solution of present or prospective phases of one or the other of these two main problems, or to have been either preliminary to their investigation or by-products thereof.

In the development of transmission systems the effective, and at times determining, contributions of the Laboratories have been evident in carrier current and radio systems, in telephone amplifier and repeater systems, in loading coils, in printing telegraphy and high-speed telegraphy, in duplex cable and in transoceanic submarine cable, in the transmission of pictures, and in many other instances which readily come to the mind of one skilled in the communication art.

As results of investigations basic to the problem of transmission there have been important contributions in the field of electronic physics, including not only thermionics which is basic to vacuum tube development, but also X-rays which are not so obviously important. New substances have been originated of which the iron dust material, for the cores of loading and repeating coils, and the magnetic substance, Permalloy, are well known illustrations. Fundamental studies, in the nature and characteristics of speech and the sensitivity of the human ear and its range of audition, have found application beyond the nominal limits of telephony and are today furnishing basic information to physiologists, aurists, psychologists, and students of phonetics. New vibrating systems and methods of actuating them have been devised and are finding use in loud speaking receivers or in horns where the vibrations of columns of air are controlled by proper design. Such developments have made possible also the public address system which is such a serviceable adjunct to wire or radio communication and meets a peculiar need in banquet halls and auditoriums. Results of transmission developments have been of recognized importance in the communication or signaling equipment of our Army and Navy. Other developments of these studies are illustrated by the power-line carrier-current system which permits the transmission over a high-voltage power line of telephone messages between substation operators.

In the field of switching and controlling transmission channels the contributions have been evident by thousands of refined devices and arrangements, familiar to those acquainted with inside telephone plant, by improved designs or circuits which result in smaller size, decreased annual charges, increased reliability, and greater speed and ease of operation or maintenance. From time to time the system studies have culminated in complete central-office systems, as most recently in that of the panel-type machine-switching system. Each advance in transmis-

sion, as well as the continuous increase in public patronage, has laid an increased burden on the designers of systems and of control equipment which has been met promptly, or even anticipated by suitable apparatus developments. If it had not been met the present extensive use, for example, of repeater stations and of carrier-current systems for multiplex telephony and telegraphy would undoubtedly have been delayed or uneconomical. Many of these investigations also have been of service in Army and Navy equipment. In the fields of transportation and of power transmission respectively, these developments have resulted in systems for train dispatching and for the remote indication of the operating conditions at distant substations.

Although it is possible to classify the activities of Bell Telephone Laboratories as has been done above, in terms of the two major technical problems of electrical communication, such classification obscures the peculiar research organization which has been evolved for the efficient coordination of its many-sided approach to these problems and may even tend to emphasize certain developments at the expense of others, equally fundamental and economically necessary, which proceed continuously and have a steady and continuous but less spectacular effect upon the communication art.

#### FUNCTIONAL ORGANIZATION

In its functional organization Bell Telephone Laboratories divides into two main groups, the first of far the larger size concerned with research, development and engineering investigations, and the second, with the commercial operations of the company and the rendering of service to the first mentioned group. In the second group fall those activities of the maintenance of the buildings, and the operation of its efficient and well equipped model shop; the purchase of supplies and equipment; all accounting and auditing; estimates and cost studies;

*Bell Telephone Laboratories, Incorporated*

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commercial relations with other units of the Bell System; an extensive library service with translators and bibliographers; the maintenance of correspondence files; transcription, photograph, photostat, and blue printing services; the assembling of technical information; the maintenance of the historical museum with its extensive and well ordered collections of apparatus covering almost fifty years; personnel activities, including education, employment, and medical service; and the bureau of publication.

The larger group of the Laboratories numbers some two thousand members of the technical staff. Excluding for the moment certain staff engineers, concerned with commercial developments and the exploitation of the electrical stethophone, the audiometer, the artificial larynx, and other by-products, the technical staff is divided into five main groups. One of these is concerned with patents and it is the function of this group to insure adequate patent protection for the ideas and developments of its associates.

The remaining four groups are known by the terms: Research, Apparatus Development, Systems Development, and Engineering Inspection. The activities of these four groups are, however, so closely related and so harmoniously coordinated, involving as they do the informal exchange of considerable information between members of the various groups, that the contributions of the respective groups frequently overlap and represent cooperative rather than individual activities. Certain broad lines limiting the activities of the groups are, however, implied in the names mentioned above, and are adhered to in the organization and coordination of their activities. It is the general function of the research group to be concerned with the development of physical principles; of the apparatus group with the embodiment of these principles in commercially designed apparatus suitable to perform desired functions in complete systems; of the

systems group to devise new or improved systems and assemblies of equipment; and of the engineering inspection group to insure by studies and development of inspection methods that the manufactured embodiment of the work of the other three groups, as finally delivered or installed for the telephone customers of the Western Electric Company, shall not have lost between its conception and its commercial utilization any salient contribution of these other groups.

This grouping of the work of some two thousand engineers and scientists into the four divisions just mentioned and attaching a name to each can give but an imperfect idea of the varied scope and importance of the activities. To attempt much more would require a lengthy exposition. To attempt by illustration to explain more fully the work included under these four headings might give undue prominence to the types of work in which some scores of engineers were engaged at the expense of the hundreds engaged in related and equally important work. Illustrations may be ventured, but these should be considered for the point of view and method of attacking problems. In each only a single high point can be disclosed in the present condensed exposition.

#### ILLUSTRATIONS OF PROBLEMS AND METHODS

Consider, for example, the method of those members of the inspection engineering department who deal with such a piece of apparatus as the carbon button transmitter. Of this, some hundreds of thousands are manufactured each year. If the specifications, manufacturing tolerances and the like should be so placed as to admit to commercial service imperfect instruments even to a very small percentage of the total number manufactured, the damage to the telephone companies would be disproportionately large. On the other hand, if these limits are set too conservatively and result in the rejection of an appreciable percentage of the manufactured product,

then the cost and efficiency of manufacture are uneconomical. It is obviously impracticable to give to all of some two million transmitters a year a complete transmission laboratory investigation. A method of spot testing and checking must, therefore, be employed and a small part of the manufactured product intensively studied. What, however, are the relations between the part of the product so studied and the total part manufactured is a question of the mathematical theory of probabilities analogous to but as complicated as the problems met by life insurance actuaries. Fundamental studies of a theoretical character and careful and exhaustive analyses of large volumes of data are required in the consideration of these and related problems.

For a single example of the multiplicity of problems attacked by the research group consider the thermionic problem of the emission of electrons from a filament such as is utilized in a vacuum tube. In our modern theories the physical constants of filament materials are indications of the possible behaviors of the infinitesimal electrons of which the materials are composed. Such a study, therefore, as that of determining the relation between the total thermal emissive power of a metal and its electronic resistivity is one which is broadly fundamental to our Bell System applications of thermionics. The relation of such investigations to telephonic application are sometimes indirect and the investigations may serve merely to fill out a gap in existing scientific knowledge, on which broad knowledge, however, future developments must be based.

Of the work of the system group each development must fit with practical economy into the present highly coordinated telephone plant as well as anticipate the plant of the future. Manual and machine switching systems, local and long distance systems, circuits, power supply, and equipment, all present closely related or interdependent problems. Any development may later

contribute to some other desired advance. For example, when there was presented by the American Company the problem of automatically insuring that no two toll circuits, which needed an intervening repeater, should be connected by the intervening operator without a repeater, other recent developments were looked to for contributions. By utilizing some of the apparatus and methods recently developed for machine switching, suitable circuits and equipment were devised. Toll lines may now be equipped automatically to select, from a bank of repeaters, an idle repeater whenever they are connected to other toll lines of such transmission equivalents that a repeater is required.

In many of their problems the development groups of systems and apparatus are closely related. What a system will do is largely determined by the apparatus but the requirements imposed upon the apparatus are determined by the desired or projected system. Relays, for example, must operate for certain minimum or limiting currents which are dependent upon the circuits of which they are a part and upon the voltage range of the power supply at central offices.

When such limits are determined the problem of design becomes one for the apparatus development group. But such problems are continuous so that there is always going on a continuous program of fundamental investigations and designs. What is true of relays is also true of all the other pieces of equipment which enter into the telephone plant whether desk sets, plugs and jacks, repeating coils or condensers.

In each case fundamental studies are always in progress. Materials are investigated not only to determine new possibilities but to be informed of variations which may occur in materials already in use. New methods of measurement and investigation are developed and general relationships are established between such factors as: the operating power requirements, the size, the materials, the manufacturing conditions, factory adjustment and its

tolerances, and the annual cost figures. The latter, of course, are contributed by those engineers of the American Company who are expertly concerned with the plant utilization of the particular piece of apparatus. The steady development of the "E" type relay, of which some four million a year are manufactured, is but one example of the result of such continuous and fundamental investigations.

#### THE PERSONNEL OF THE LABORATORIES

The work of the Laboratories may be analyzed, as has been done, into the two main physical problems of telephony, or into those functional divisions which have just been illustrated. But neither the recognition of a problem nor the organization for its solution can be effective without a suitable working force, adequate executive leadership, and a group interested in a common field of work, with an *esprit de corps* which stimulates and rewards their best endeavors. For its peculiar problems there has been evolved not only the present functional organization, but also a remarkable corps of investigators whose individual interests and abilities are in part responsible for the formation of the organization itself.

The technical staff of the Laboratories has been broadly recruited over a long course of time. In the training, experience, and point of view of its individuals, it is adequately qualified for its large variety of tasks. Careful selection in employment and the further natural selection of experience have both been effective in producing an organization which is unique in the scientific productivity of its atmosphere. There is an atmosphere in which the technical interests of the various individuals are merged by constant diffusion like the different gases of our physical atmosphere. The outstanding characteristics of the individuals are their creative instinct and their capabilities for effective cooperation and helpful leadership.



To this scientific atmosphere there contribute men of widely different experiences. Some have grown up in the atmosphere of the Laboratories; others, fewer in number, have entered from other industrial work; and a large number directly upon completion of technical school or graduate school training. Some acquired their early telephone experience in the manufacturing organization of the Western Electric Company in the days before the formation of the Laboratories when engineering, manufacturing, and the field operations of installation were not so highly functionalized and separated. Others have come to the Laboratories with special experience in the operating telephone companies or the American Company, and have brought with them a practical familiarity with operating requirements and that resolve for a high character of public service which has always distinguished the operating departments of the Bell Companies. A considerable number has come from academic research laboratories and from teaching duties. Originally classified as physicists, chemists, mathematicians, or engineers, they have so broadened and profited by the ideas and technical experiences of each other that these more restricted terms no longer apply, but only the broad term, "member of the technical staff of Bell Telephone Laboratories."

JOHN MILLS.

NOTE—Mr. Mills is Director of Publication of the Bell Telephone Laboratories, Inc.—*Editor*.

*See Bridgman ratings*

P.A.M.

NOTES ON COLLEGE RECRUITING  
CAMPAIGN - 1924

In general the college recruiting campaign of 1924 was well organized and carried to a successful conclusion. For comparative purposes the following data for the Bell System is given -

		<u>Technical</u>	<u>Non-Technical</u>	<u>Total</u>
College Recruits	1924	627	462	1089
	1923	696	405	1101
	1922	542	150	692
% of Offers Accepted	1924	50.6%	60.4%	54.3% ✓
	1923	45.4%	61.1%	50.2%
	1922	X	X	51.0%
% of Quotas Filled	1924	72.6%	95.4%	80.8%
	1923	70.2%	108.5%	80.7%

The operating companies, exclusive of the headquarters organizations, make a better showing, for 1924, as follows:

	<u>Technical</u>	<u>Non-Technical</u>	<u>Total</u>
	431	344	775
% of Offers Accepted	54.4%	62.5%	57.8%

The quality of the college recruits obtained has been held to a satisfactory high average as indicated by the following table:

A+ Men	2.1%
A "	15.8%
B+ "	18.0%
<i>Satisfactory</i> B "	60.0%
C+ "	3.1%
C "	1.0%

While the classification for 1924 varied somewhat from 1923, the following table will permit of a comparison:

17.1% were straight A men  
 28.8% had A and B ratings  
 32.2% were straight B men  
 18.0% had B and C ratings  
 3.0% were straight C men

The effort of each future recruiting campaign should be directed toward securing an increasingly higher grade of men.

					Total	Supplying 10 or more recruits
No. of	Institutions	drawn from	1924		178	31
" "	" "	" "	" "	1923	152	34
" "	" "	" "	" "	1922	125	20

These figures indicate a healthy broadening of our field and consequent better relations with a larger number of educational institutions.

The attached table shows the distribution of college recruits by Organizations.

*Continue to improve quality;*

Refusals

acc.

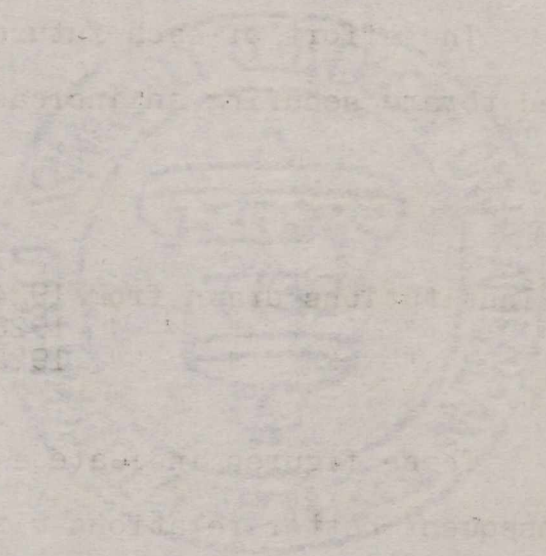
Refusals

1924

224 - 490

Refusals

- 1 Term of work 55
- 2 Salary 54
- 3 Location 54
- 4 Study 44
- 5 Wk. pos. 49
- 6 S. org. 17
- 7 Misc. 47



DISTRIBUTION OF 1924 COLLEGE RECRUITS BY ORGANIZATIONS

COMPANY:	Technical				:	Non-Technical				:	Total		
	Quo.	Of.	Ac.	% A/O		Quo.	Of.	Ac.	% A/O		Of.	Ac.	% A/O
Long Lines Plant	41	40	21	53	:	11	14	9	64	:	54	30	56
New England Tel. & Tel. Co.	34	27	15	56	:	36	53	33	62	:	80	48	60
Southern N. E. T. Co.	6	6	6	100	:	-	3	2	67	:	9	8	89
New York Telephone Co.	147	205	101	49	:	72	152	93	61	:	357	194	53
Bell Tel. Co. of Pa.	52	87	49	56	:	29	40	22	55	:	127	71	56
C. & P. Tel. Co.	27	50	27	54	:	18	36	17	47	:	86	44	51
Southern Bell T. & T. Co.	20	34	15	44	:	8	11	9	82	:	45	24	53
Ohio Bell Tel. Co.	16	29	20	69	:	19	20	13	65	:	49	33	67
Michigan Bell Tel. Co.	8	20	13	65	:	10	1	1	100	:	21	14	67
Indiana Bell Tel. Co.	4	4	2	50	:	6	-	-	-	:	4	2	50
Illinois Bell Tel. Co.	54	100	41	41	:	48	94	53	56	:	194	94	48
Wisconsin Telephone Co.	21	47	28	60	:	4	15	12	80	:	62	40	65
Northwestern Bell Tel. Co.	27	23	16	70	:	14	28	23	82	:	51	39	76
Southwestern Bell Tel. Co.	30	27	11	41	:	30	29	24	83	:	56	35	63
Mtn. States Tel. & Tel. Co.	3	29	13	45	:	10	28	13	46	:	57	26	46
Pacific Tel. & Tel. Co.	68	63	53	84	:	33	26	20	77	:	89	73	83
					:					:			
A. T. & T. Co. D. & R.	20	25	13	52	:	-	-	-	-	:	25	13	52
A. T. & T. Co. Other Gen'l	-	-	-	-	:	10	16	14	88	:	16	14	88
					:					:			
Western Electric Company					:					:			
Engineering Dept.	100	80	41	51	:	5	11	8	73	:	91	49	54
Manufacturing Dept.	124	279	114	41	:	50	106	55	52	:	385	169	44
Installation Dept.	34	29	12	41	:	9	-	-	-	:	29	12	41
Telephone Sales Dept.	23	31	16	52	:	39	60	28	47	:	91	44	48
Staff Dept.	-	-	-	-	:	18	13	6	50	:	12	6	50
Supply Dept.	4	4	0	0	:	8	9	7	77	:	13	7	54
					:					:			
Bell System	863	1239	627	50.6	:	484	764	462	60.4	:	2003	1089	54.3
Operating Companies	558	791	431	54.4	:	348	550	344	62.5	:	1341	775	57.8
A. T. & T. Headquarters	20	25	13	52.0	:	10	16	14	87.5	:	41	27	65.8
Western Electric Co.	285	423	183	43.2	:	126	198	104	52.5	:	621	287	46.2

Quo. - Quotas

Of. - Offers

Ac. - Acceptances

*to change an organization*

## COLLEGE RELATIONS AND METHODS OF RECRUITING

The present method of conducting a coordinated nationwide college recruiting campaign has given satisfactory results and is a great improvement over the independent method which was in operation in earlier years. This method should be continued and improved. The system of placing the responsibility on the Associated Company representative of conducting the recruiting campaign in his territory and under his chairmanship, has worked most satisfactorily. Their activities have covered not only the actual recruiting campaign in the spring of the year, but the broader field of college relations and contacts have been carried on quite generally throughout the whole calendar year. Among these activities are: offering temporary summer employment to faculty members and undergraduates; having company representatives present the Bell System problem in addresses before student bodies; the conduct of specific courses in the art of communication at several institutions; the early distribution of literature to the colleges; the arranging of visits by faculty members and students to points of interest in the telephone business; advising with faculty members on electrical engineering curricula and course content; and, in general, constantly keeping before the institutions and their student bodies the desirability of employment in the Bell System.

The active campaign has usually been organized by sending well trained scouts, usually graduates of the institution concerned, in advance of the recruiting delegation to pave the way

## College Relations and Methods of Recruiting

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and arrange a time schedule for interviews with the members of the delegation for the desirable men in the senior class who may be interested in our work. In general the actual interviewing has been carried on excellently well as the results have shown, but this is a matter for constant study and improvement.

The gift of apparatus and the Bell System Educational Conference will undoubtedly contribute to better relations with those institutions which were represented, and will probably also result in making available students better trained for the communication engineering field.

In connection with this general subject, the problem of developing close relations with the secondary school system of the country is one worthy of careful study and development. Much valuable work in this direction is already going on.

Should be a  
provisional Estimate  
for 5 years; carefully  
prepared;

What are the  
jobs - list them  
up!

ESTIMATE OF FUTURE DEMANDS FOR COLLEGE  
GRADUATE EMPLOYEES

By July 1st the Bell System companies will have employed during the college recruiting campaigns of 1921, 1922, 1923 and 1924 about 3600 college graduates. 1100 of these were secured in the 1923 campaign and almost an equal number in 1924. The vigorous campaigns carried on during these years were made in the effort to overcome the shortage of trained young men among our supervisory and technical forces which had developed during the war and the years of industrial activity immediately thereafter. The Bell System now has about 1 college graduate for every 20 of its male employees and for every 50 of its total employees. Another interesting item of statistics is that in 1923 the Bell System, employing about 1 out of every 150 persons gainfully employed in the United States, employed 1 out of every 12 of the technical graduates completing courses in that year and 1 out of every 22 of those completing any college courses. Manifestly, we must justify on some scientific basis, our demand for such a large proportion of the college trained brains of the country. It would seem, if it is not already being done, that estimates as carefully considered as the provisional estimates for money and material should be made to determine the future demands for employees.

In a study made by the Operation and Engineering Department of the positions in the Bell System which could probably be held temporarily or permanently by college men in the Plant, Traffic, Commercial and Engineering Departments, the positions were classified under the following headings:



Estimate of Future Demands for College Graduate Employees

2

Principal Positions	Commercial Managers of Units
Large Division Corresponding Staff	Commercial Managers (Exch. under 5000 Sta.)
Medium Divisions Corresponding Staff	Supervising Foremen
Small Divisions Corresponding Staff	Traffic Chiefs
Districts	District Assistants
Engineers	Men in Training
Staff Men not included above	


In 1923 there were 8800 of these positions and it was estimated that this number would increase to 11,200 in 1928. On the basis of these figures it was estimated that the requirements for increase in number of positions each year for growth is 450 and for losses of men over two years' service 635, which would indicate annual requirements of 1085. After allowing for promotions from non-supervisory positions, in other words, from the regular forces, and taking into account the losses of college men during the first two years of their employment, the final estimate of the annual requirements totaled 1320.

These figures seem to indicate that in order to meet the demands for highly trained men for future positions of responsibility our rate of accession through college recruiting has not been excessive. However, these figures are given as an indication of the method which might be applied in each of the Associated Companies in preparing their estimates for future requirements.

Estimate of Future Demands for College Graduate Employees

3

Two factors, it would seem, should be kept uppermost in the consideration of this estimate: one, to insure that each company has a sufficient number of highly trained men coming up through the organization to fill the higher positions of responsibility; the other, to insure that sufficient number of jobs exist to absorb the college men we employ without detriment to the regular force.



## APPARATUS

The purpose of our undertaking to make gifts to the electrical engineering departments of educational institutions of a carefully selected list of apparatus was to encourage these departments to include in their fundamental engineering courses illustrations of general principles in the form of laboratory experiments and problems which are drawn from the art of communications. At the Educational Conference there was no doubt as to the appreciation of the visiting members of these gifts and it was proven that the selection of the list of apparatus was the most acceptable for their purposes that could have been chosen.

The institutions which have been designated to date to receive the apparatus are listed below:

- Alabama Polytechnic Institute
- University of California
- University of Cincinnati
- Columbia University
- Cornell University
- Harvard University
- University of Illinois
- Lehigh University
- Massachusetts Institute of Technology
- University of Michigan
- University of Minnesota
- Ohio State University
- Pennsylvania State University
- University of Pennsylvania
- Purdue University
- Rensselaer Polytechnic Institute
- Stanford University
- Stevens Institute of Technology
- University of Wisconsin
- Yale University

The list of the apparatus will be found appended.

The distribution of the apparatus is now under way and it should be completed and the apparatus in the laboratories of

Apparatus

2

all the institutions before the end of October.

The cost of the apparatus distributed to the institutions listed above is to be borne in equal shares by the American Telephone and Telegraph Company, the Western Electric Company and the Associated Company in whose territory the institution is located. Gift of apparatus to other institutions will be made only upon the initiation of the Associated Company, and if the company desires that the headquarters organization share in the cost, recommendation to that effect will be forwarded to Mr. Hall by the president of the company, and each case will be considered on its merits. Should an Associated Company desire to give apparatus to additional institutions independently and without reference to the A. T. & T. Company, it has been recommended that such transaction be reported to Mr. Hall in order that a complete record of the Bell System contribution to education may be preserved.

R. Bell,

Complete List of Apparatus Which  
it is Proposed to Furnish to  
Certain Educational Institutions

- 1 - Amplifier Voltmeter Milliammeter
- 1 - 8-A Oscillator
- 1 - 1-B Impedance Bridge
- 1 - Artificial Open Wire Line with Four Half Sections  
Consisting of the Following:
  - 48 - D-79158 Retardation Coils 14.6 millihenries each
  - 8 - D-79159 Retardation Coils 7.3 millihenries each
  - 25 - D-77263 Condensers - .064 mf. each
  - 24 - 19-A Resistances
  - 8 - 18-S Resistances
  - 24 - Double Pole Double Throw Switches
  - 8 - Single Pole Single Throw Switches
  - 20 - 629-B Mounting Plates
  
- 2 - No. 25-A Repeating Coils
- 1 - No. 25-R Repeating Coil
- 1 - No. 21-E Condenser (2 MF)
- 1 - No. 21-K Condenser (1 MF)
- 6 - No. 21-BP Condensers (.54 MF)
- 1 - 67-A Condenser
- 1 - No. 18-AJ Resistance (400 ohms)
- 1 - No. 18-G Resistance (200 ohms)
- 2 - No. 18-U Resistances (100 ohms)
- 1 - No. 18-DH Resistance (700 ohms)
- 3 - No. 18-AE Resistances (600 ohms)
- 1 - No. 18-BH Resistance (1000 ohms)
- 1 - No. 18-BJ Resistance (1200 ohms)
- 1 - BBL Blue Bell Dry Cells
- 7 - No. 766 Eveready "B" Batteries
- 1 - No. 771 Eveready "C" Battery
- 1 - 1002 - C Head Set
- 1 - No. 525 Receiver with Headband and Cord
- 4 - 101-D Vacuum Tubes
- 1 - 102-D Vacuum Tube
- 2 - 104-D Vacuum Tubes

## THE BELL SYSTEM EDUCATIONAL CONFERENCE

An educational conference of faculty members from the electrical engineering departments of nineteen of the leading technical institutions in the country meeting with representatives of the Bell System was held at 195 Broadway during the week of August 18-23, 1924. The purpose of the Conference was to determine ways and means whereby the Bell System could more closely cooperate with the engineering schools of the country and to bring about a common understanding of our mutual problems. The visiting members were invited to submit suggestions as to the manner in which the Bell System could contribute toward the development of electrical engineering education.

The program consisted of morning sessions devoted to papers and discussions, while the afternoons were spent in observation trips to the Bell System laboratories, local and long distance installations at the Walker Street building, and also in the demonstration of the telephone apparatus which is to be presented this fall to each of the institutions represented.

During the Conference the large problems of organization and operation of the Bell System were presented by Mr. W. S. Gifford and other officials of the System while the more technical aspects of the business were treated by representative specialists of the organization. Of great interest and value were the full and free discussions of the subjects presented, bringing about a mutual understanding of the best means of cooperation between this industry and the educational institutions. The two outstanding factors of importance whereby the

The Bell System Educational Conference

2

Bell System could contribute to the development of electrical engineering courses were the aid to the laboratories through the gift of apparatus and a distribution of technical data for instructional purposes, and every effort is now being made to meet these requirements.

The electrical engineering departments of the following named institutions were represented by faculty members:

University of Cincinnati  
University of California  
Columbia University  
Cornell University  
Harvard University  
University of Illinois  
Lehigh University  
Massachusetts Institute of Technology  
University of Michigan  
University of Minnesota  
Ohio State University  
Pennsylvania State University  
University of Pennsylvania  
Purdue University  
Rensselaer Polytechnic Institute  
Stanford University  
Stevens Institute of Technology  
University of Wisconsin  
Yale University

The limitations based on the invitations included only those institutions that were at that time on the list to receive apparatus.

*What can Bell System do to aid Institution*  
*Data for instructional purpose = Have started on this; will be available soon; Complete Bibliography"*  
*Apparatus;*  
*Be liberal =*  
*Call on New York*

Take special  
note of conference  
of what the Bell  
system wants!  
Do not want  
communication  
courses

Elec Eng. Student  
requires sufficient only  
appreciate fundamental  
of communication!

INDUCTION AND TRAINING OF COLLEGE  
GRADUATE EMPLOYEES

The problems of induction, training, assignment and follow-up of college graduate employees have a vital bearing on the building up of an efficient personnel and these problems also react directly upon the effectiveness of our annual recruiting campaign both as to the number and quality of recruits secured. Believing that the experiences of the several companies in dealing with these problems would be of interest to all of us, Mr. Hall has invited members of this Conference to open the discussion on these matters, and believes we would be benefited by learning the experiences of all the Associated Companies in dealing with these problems.

The training of college men on their entry into our employ is, after all, only one factor in the training, education and development of the whole body of our employee personnel, but closely related to it. Believing that this is also a subject of interest, Mr. Hall has asked several members of the Conference to lead in the discussion by giving the experience of their companies in this development.



## QUESTIONS FOR DISCUSSION

- (1) Are college relations and methods of recruiting satisfactory?  
How can they be improved?
- (2) What is the proper basis for estimate of future demands for college graduate employees?
- (3) Would it be desirable to hold conferences locally within the territory of the Associated Company along lines similar to that of the one held in New York during the past summer?
- (4) Discussion of induction, training, assignment and follow-up of college graduate employees along lines indicated in letter dated September 27th, which is appended hereto.
- (5) General discussion of methods relating to selection, training placement and promotion of employees.

Similar letters to all Personnel Men.

Sept. 27, 1924.

MR. W. D. STAPLES, Assistant to Director,  
Long Lines Department,  
American Telephone and Telegraph Company,  
195 Broadway, New York City.

My dear Mr. Staples:

Mr. Hall suggested and asked me to write you about one phase of the college graduate employment problem which he considered important, and to make it concrete I will put it in the form of a question.

What method is employed in following up the work of college graduate employees for the first year or more after their entry into our employ, (a) within the department, (b) for the Company as a whole?

Mr. Hall has already asked Mr. Fullerton to lead the discussion on this subject but thought it would be very valuable to find out what has been done in all of the Associated Companies. This particular subject is so closely connected with other matters pertaining to the entry of college men into the System that information with reference to the following questions if obtainable, we feel would be interesting to all of us. I will enumerate them.

1. Are new men given a course of instruction before being assigned to work?
2. Over what period does this course extend, including a very brief description of the course?

Mr. W. D. Staples

2

3. Are all students given the same course or are they given different courses depending upon their training or the department for which they are intended?
4. Where does the responsibility rest for the conduct of this training?

Mr. Koons at Mr. Hall's request will open the discussion on this question.

5. By what method are the graduates allocated finally to the different departments?
6. What steps are taken in their entry into our employ to prevent dissatisfaction and a sense of possible discrimination on the part of our regular employees?

We would appreciate it very much if in the discussion you will tell us of the experiences of your Company on these points with particular reference to the first.

Sincerely yours,

July 3, 1925.

Alec. Johnston, Esq.,  
Deputy Minister's Office, Department of Marine and Fisheries,  
Ottawa, Canada.

Dear Mr. Johnston:-

Your letter of the 30th June arrived after  
Sir Arthur had left for England and while I myself was on a  
holiday.

In accordance with your suggestion we  
sent copies of the correspondence to Dr. Tory and I will arrange  
to meet him in Ottawa when he returns, which I understand will be  
in July.

Yours faithfully,

Wilfred Bovey.

DEPARTMENT OF MARINE AND FISHERIES,  
DEPUTY MINISTER'S OFFICE,  
OTTAWA, CANADA.

30th June 1925.

Dear Sir Arthur:-

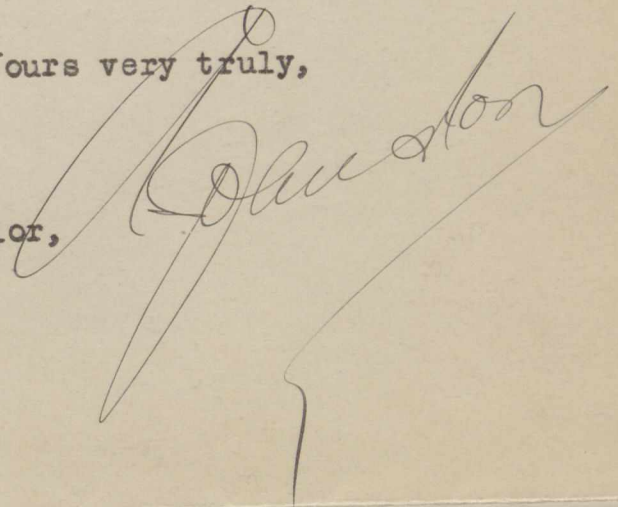
I beg to acknowledge receipt of your letter of the 24th inst., with regard to the institution of a course in communication engineering at McGill University.

The grant to Toronto University for an Aero-Dynamics Laboratory, to which you refer, was made under the auspices of the Research Council, and I accordingly think it advisable to postpone discussion of your suggestion until the return of Dr. Tory.

In the meantime I will arrange to have a talk with the Honourable the Minister of Defence in this reference.

Yours very truly,

Sir Arthur W. Currie, G.C.M.G.,  
Principal and Vice Chancellor,  
McGill University,  
Montreal.



PRESIDENT H. M. TORY, D.Sc., LL.D., F.R.S.C.,  
PRESIDENT

DEAN F. D. ADAMS, Sc.D., LL.D., F.R.S.  
CHAS. CAMSELL, B.Sc., LL.D., F.R.S.C.  
DEAN A. L. CLARK, B.Sc., Ph.D., F.R.S.C.  
HUME CRONYN, B.A., LL.B.  
DEAN A. FRIGON, B.Sc., D.Sc.  
SIR GEORGE GARNEAU, B.A.Sc., LL.D.  
J. H. GRIDDALE, B.Agr., D.Sc.A.



Canada

HONORARY ADVISORY COUNCIL

FOR

SCIENTIFIC AND INDUSTRIAL RESEARCH

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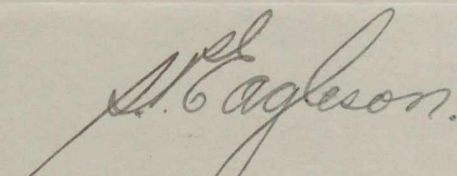
OTTAWA, 26th June, 1925.

Sir Arthur Currie, G.C.M.G., K.C.B.,  
Principal, McGill University,  
Montreal.

Dear Sir:

In the absence of Dr. Tory, I wish to acknowledge receipt of your letter of the 23rd instant, enclosing copies of two letters which you have written to the Departments of National Defence and of Marine and Fisheries. I expect that Dr. Tory will return to Ottawa within the next fortnight and your communication will then immediately be brought to his attention.

Yours very truly,

  
Secretary.



II  
OFFICE OF THE MINISTER  
OTTAWA

26th June, 1925.

My dear Sir Arthur:-

I have yours of the 24th of June, and, supplementing a conversation which I had with Colonel Bovey, just as soon as we get through with the rush of the Session, I shall confer with the Minister of Marine and Fisheries, who has the most to do with Radio matters, in connection with the Government, and will give your request every possible consideration.

Very glad that you came through your operation all right, and trust you are quite yourself again.

With very kindest regards, I am,

Yours faithfully,

*Erna Druel*

Sir Arthur W. Currie, G.C.M.G., K.C.B., LL.D.,  
Principal, McGill University,  
Montreal, P.Q.

L. A. HERDT, E.E., D.S.C.  
PROFESSOR,  
C. V. CHRISTIE, M.A., B.S.C.,  
ASSOCIATE PROFESSOR  
E. G. BURR, B.S.C.,  
ASSISTANT PROFESSOR  
G. A. WALLACE, M.S.C.,  
ASSISTANT PROFESSOR

DEPARTMENT OF ELECTRICAL ENGINEERING  
MCGILL UNIVERSITY  
MONTREAL

June 6th. 1925.

TEL. UPTOWN 5920

Colonel W. Bovey,  
Principal's Office,  
McGill University.

Dear Colonel Bovey,

Following our telephone conversation of June 4th, we beg to suggest the following points which might be brought to the attention of the Government when you make application for a grant of \$5000.00 for the equipment of our Communications Laboratory.

The communications laboratory will enable the University to send out men trained in the fundamentals of communication engineering and this will be particularly valuable in the case of those men who join the C.O.T.C. and later enter the signal services at Ottawa. With proper equipment in the laboratory such men can be trained for radio research.

There are two branches of research which are of very special importance in the communication field and which the University can carry out better than any other organization.

(1) The study of the interference of power circuits with neighbouring communication circuits, or as it is usually called "inductive interference." This problem is of ever increasing importance and the Railway Board when called upon to rule on questions of interference has in many cases to call in



the services of the Bell Telephone Company since this Company has done a great deal of work on this subject. There are many problems on which the Telephone Company has not the required information and they have repeatedly asked us to carry out research work along such lines, but up to the present time we have not had the required equipment. [ We now have a graduate student who has specialized in this subject, but his research work is held up for lack of equipment. This study of inductive interference is becoming of greater importance every year and it will only be solved through the active co-operation of all interested parties.]

(2) The second branch of research which we would carry out in the laboratory is the study of the interference with radio circuits and apparatus caused by faults in power and distribution systems.

You will probably be able to think of other points which will appeal to the authorities at Ottawa.

Yours truly,

C. V. Rouse

June 23, 1925.

Dr. H.M. Tory,  
President, National Council for Scientific and Industrial Research,  
Ottawa.

Dear Dr. Tory:-

I am enclosing herewith copies of two letters  
which I have written to the Department of National Defence and  
of Marine and Fisheries.

We feel that the proposed development is something  
that would be of a good deal of general value, and I know that  
we can count on your co-operation. Dean Mackay or Colonel Bovey  
will be only too pleased to give you any information which you might  
like to have or to discuss with you any method of co-operation which  
you feel would be advantageous.

Yours faithfully,

Principal.

June 24, 1925.

Alex Johnson, Esq.,  
Deputy Minister,  
Department of Marine and Fisheries,  
Ottawa.

Dear Mr. Johnson:-

As you are aware, this University has within the past year increased to a considerable extent its facilities for instruction in Electrical Engineering. We have erected a new wing of the Engineering Building which will be devoted entirely to the Department of Electrical Engineering, and we have been enabled to rearrange our entire laboratory equipment in such a way that it can be used to the best advantage.

As a part of the work, we propose to institute courses in Communication Engineering. There are many reasons for which we feel that this is desirable, indeed is even necessary. Canada is a country of great distances and small population, where speed and certainty of communication are essential not only to our material progress, but to efficient government. This is furthermore a branch of engineering in which the demand seems to be greater than the supply, an exceptional condition in that profession at the present time.

While, of course, we have made no definite decision as to the actual content of the course, it appears likely that it might consist of two branches - an undergraduate and a research side.

In the undergraduate part of the work our endeavour would be not so much to give technical instruction in the building up and use of communication equipment, as to furnish a thorough engineering background to equip the young engineer for employment in his profession.

Alex. Johnson, Esq.

The main lines of study would be the Measurement of the Characteristics of Oscillating Circuits, Precision Measurements, Telephone and Telegraph Work and Transmission problems.

On the research side we feel that there are two branches which are of very special importance in the communication field and which the University can carry out better than any other organization.

(1) The study of the interference of power circuits with neighbouring communication circuits, or as it is usually called "inductive interference." This problem is of ever increasing importance and the Railway Board when called upon to rule on questions of interference has in many cases to call in the services of the Bell Telephone Company since this Company has done a great deal of work on this subject. There are many problems on which the Telephone Company has not the required information and they have repeatedly asked us to carry out research work along such lines, but up to the present time we have not had the required equipment.

(2) The second branch of research which we would carry out in the laboratory is the study of the interference with radio circuits and apparatus caused by faults in power and distribution systems.

We are of course aware that Research work of this nature is being done in collaboration with the Department of Marine and Fisheries and the Research Council; nevertheless we think that there is ample room for further work and that it will be many years before all problems will have been solved.

We hope the erecting of this new department will enable us to initiate a definite plan of co-operation with the Government in these studies, somewhat as in the case of the Aero-Dynamics Laboratory which the University of Toronto was enabled to establish last year through arrangements made with your department. We shall, of course, be only too glad at all times to consult with the officials of your department or of any other department, regarding any particular problems, and we will do whatever we can to help in their solution.

In order to perform our task efficiently, it will be necessary for us to have a very thoroughly equipped laboratory. We are prepared to furnish the space and we propose asking the assistance of the principal employers of communication engineers in providing

Alex Johnson, Esq.

equipment. The total cost of equipping the laboratory would be about \$10,000. I would like to explain that this amount is a minimum and the cost can only be kept down to this figure by our assembling the greater part of the material ourselves. About one half of the sum would be devoted to that equipment necessary for the training of communication engineers in radio work.

As the British Government is interested in this problem to a greater degree than any other institution, and as it is so essential to the work now being carried on by the Government that the supply of competent communication engineers be maintained, we feel justified in asking for a grant to cover the equipment of the radio side of the laboratory, that is \$5,000.

I understand that Colonel Bovey saw you and Commander Edwards while he was in Ottawa, and that he explained that he had taken this matter with the Honorable Mr. MacDonald, who told Colonel Bovey that he would take it up with yourself.

I hope that it will be possible for your department to co-operate with the Department of National Defence, or otherwise to arrange for us to obtain the grant proposed.

Yours faithfully,

Principal.

March 5th, 1925.

Professor C. V. Christie,  
Engineering Building.

Dear Professor Christie:-

This is merely to  
acknowledge receipt of your letter of the 4th  
instant.

I shall give the matter  
immediate consideration.

Yours faithfully,

Principal.

October 14th, 1924.

C. F. Sise, Esq.,  
Vice-President & General Manager,  
The Bell Telephone Co. of Canada,  
Montreal.

Dear Mr. Sise:-

I beg to acknowledge and to thank you for your letter of October 13th, enclosing your Company's cheque for \$7,500 toward the improvement and extension of our Department of Electrical Engineering.

This is a very welcome contribution. Not only does it help us to grant further facilities in the Department mentioned, but it is an evidence of the interest your Company takes in the work of the University. Will you please convey to the Directors and accept for yourself the sincere thanks of the Governors of the University.

I read with much interest the article on "College Courses in Utilities" which you were good enough to send me.

Yours faithfully,

Principal.

SUBJECT

# THE BELL TELEPHONE COMPANY OF CANADA

VICE-PRESIDENT AND GENERAL MANAGER

MONTREAL. October 13, 1924.

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice-Chancellor,  
McGill University,  
Montreal.

Dear Sir Arthur:-

Referring to your letter of September 29th.

I have much pleasure in enclosing this Company's cheque for \$7,500.00, being our contribution toward the improvement and extension of your Electrical Engineering Department.

For your information I attach a marked copy of today's Boston News Bureau with an article on "College Courses in Utilities".

Yours truly,

Enclosure.

*C. F. Sise*  
Vice-Pres. & Gen. Mgr.



September 29th, 1924.

C. F. Sise, Esq.,  
Vice-President and General Manager,  
Bell Telephone Company of Canada,  
Montreal.

Dear Mr. Sise:-

I beg to acknowledge receipt of your letter of September 25th notifying me of the generous gift of your company in aid of the extension of our Electrical Engineering Department.

It will give me great pleasure to transmit this information to our Board of Governors. Let me, in the meantime, offer to your Company the sincere thanks of the University and express the hope that in the training to be given we shall be able to render you a service of appreciable value.

As regards your last inquiry, may I say that if convenient to you we should prefer your subscription to be paid in cash.

Yours faithfully,

Principal.

SUBJECT

# THE BELL TELEPHONE COMPANY OF CANADA

VICE-PRESIDENT AND GENERAL MANAGER

CFS/W.

MONTREAL. September 25, 1924.

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice-Chancellor,  
McGill University,  
Montreal.

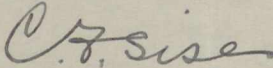
Dear Sir Arthur:-

With reference to your letter of September 11th, and our discussion re extension to the Electrical Engineering Department.

I am pleased to be able to advise you that our Executive Committee approved of the Company making a grant of \$7,500.00 in aid of this new extension of this work, in view of your statement that a course in Communication Engineering will be undertaken.

I shall be obliged if you will have your office notify me as to how you would like the payments to be made.

Yours truly,

  
Vice-Pres. & Gen. Mgr.

Electric

September 25th, 1924.

P. F. Sise, Esq.,  
President, Northern Electric Company,  
Montreal.

My dear Mr. Sise:-

I was delighted this morning to receive your letter of September 24th, in which you gave me the pleasing information that the Directors of the Northern Electric Company have contributed the sum of \$7,500. towards the construction of our new Electrical Engineering addition.

This is a very welcome contribution. Not only does it help us to grant further facilities in the Electrical Engineering Department but it is an evidence of the interest your Company takes in the work of the University.

Will you please convey to the Directors and accept for yourself the sincere thanks of the Governors of the University.

Yours faithfully,

Principal.

# Northern Electric Company

LIMITED

121 SHEARER STREET

MONTREAL, Que.

GENERAL OFFICES:  
121 SHEARER ST. MONTREAL

DISTRIBUTING HOUSES:

HALIFAX. QUEBEC.  
MONTREAL. OTTAWA.  
TORONTO. LONDON.  
HAMILTON. WINDSOR.  
WINNIPEG. REGINA.  
CALGARY. VANCOUVER.

September 24th, 1924.

IN REPLY  
REFER TO

\*

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal & Vice Chancellor,  
McGill University,  
Montreal.

My dear Sir Arthur:

I am pleased to be able to inform you that, at the Directors' Meeting which was held this morning, I was authorized to contribute, on behalf of this Company, the sum of \$7,500.00, toward the construction of a new building required to provide for the extension of the work of the Department of Electrical Engineering of McGill University.

Therefore, I am enclosing herewith the Company's cheque for that amount.

With kindest regards,

Yours very truly,

*A. J. Dick*

President.

PFS:CT  
Enclosure

# Northern Electric Company

LIMITED

GENERAL OFFICES:  
121 SHEARER ST. MONTREAL

121 SHEARER STREET  
MONTREAL, Que.

DISTRIBUTING HOUSES:  
HALIFAX. QUEBEC.  
MONTREAL. OTTAWA.  
TORONTO. LONDON.  
HAMILTON. WINDSOR.  
WINNIPEG. REGINA.  
CALGARY. VANCOUVER.

September 18th, 1924.

IN REPLY  
REFER TO

\*

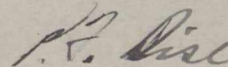
Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice-Chancellor,  
McGill University,  
Montreal.

My dear Sir Arthur:

I must apologize for my  
delay in answering your letter of September 11th  
but I have been away from the office for several  
days.

I shall be very glad to bring this  
matter up at our next Directors' Meeting which  
is to be held on September 24th and shall let  
you know what action the Board decide to take.

Yours truly,



President.

PFS:CT

September 11th, 1924.

C. F. Sise, Esq.,  
President, The Bell Telephone Company,  
118 Notre Dame Street West,  
Montreal.

Dear Mr. Sise:-

Some time ago the University came to the conclusion that it was necessary to provide for an extension of the work of the Electrical Engineering Department. The Montreal Light, Heat & Power Company and the Shawinigan Water & Power Company have undertaken to help us and have made a very substantial contribution towards this end. Although this was not actually sufficient to cover the cost of the new wing of the Engineering Building the Board of Governors authorized me to proceed on the understanding that I would endeavour to obtain some further contributions. I venture to suggest that it might be possible for your Company to give us some financial assistance towards the construction of the necessary new buildings.

A very important part of the work to be undertaken will be the institution of a course in Communication Engineering. The University recognizes that this branch of the profession has become such an important one, especially under Canadian conditions, that it well merits the provision of a special course of study. We feel, moreover, that by undertaking to provide young

G. F. Sise, Esq. - 2 -

engineers capable of doing useful service in this line we shall be able to do a real service for such companies as yours.

It is with this in mind that I would ask your Board to consider making a contribution towards the expenses of building and equipping the new wing of the Engineering Building in which these studies will be carried on.

Yours faithfully,

Principal.

September 11th, 1924.

Paul F. Sise, Esq.,  
President, Northern Electric Co.,  
Montreal.

My dear Mr. Sise:-

You will recollect that some time ago I told you that it was our intention to provide for an extension of the work of the Department of Electrical Engineering at this University and ventured to suggest that it might be possible for your Company to give us some financial assistance towards the construction of the necessary new buildings. Since that time the Montreal Light, Heat & Power Company and the Shawinigan Water & Power Company have undertaken to help us and have made a very substantial contribution. Although this was not actually sufficient to cover the cost of the new wing of the Engineering Building, the Governors authorized me to proceed on the understanding that I would endeavour to obtain some further contributions.

A very important part of the work to be undertaken will be the institution of a course in Communication Engineering. The University recognizes that this branch of the profession has become such an important one, especially under Canadian conditions, that it well merits the provision of a special course of study. We feel, moreover, that by undertaking to provide young



Paul F. Sise, Esq., - 2 -

engineers capable of doing useful service in this line we shall be able to do a real service for such companies as yours.

It is with this in mind that I would ask your Board to consider making a contribution towards the expenses of building and equipping the new wing of the Engineering Building in which these studies will be carried on.

Yours faithfully,

Principal.

September 11th, 1924.

J. B. Woodyatt, Esq.,  
Southern Canada Power Company, Limited,  
Coristine Building,  
Montreal.

Dear Mr. Woodyatt:-

You will doubtless recollect my calling upon you earlier in the year and informing you of the plans of the University regarding the extension of the Department of Electrical Engineering.

As a result of the various interviews I had with gentlemen interested in electrical work it was decided to proceed with the development and in view of certain substantial contributions received from the Montreal Light, Heat & Power Company and the Shawinigan Company I was authorized to arrange for the construction of a new wing of the Engineering Building. The premises thus becoming available will enable this University to install an electrical equipment equal, I hope, to any on the continent and the convenient proximity of the mechanical and hydraulic departments will ensure that the young engineers who leave McGill will be able to maintain the high traditions of the University.

I feel that in this extension of the Electrical Department we are making preparations to do still more effective service in training men for work with such companies as yours.

J. B. Woodyat, Esq. - 2 -

Indeed this has already been recognized by those who are assisting us. Although the funds received are not quite sufficient the Board of Governors has authorized me to proceed with the erection of the building on the understanding that I would endeavour to obtain some further contributions towards the cost of erection and equipment.

I hope that your Board will consider that we are making an important enough contribution to the cause of Electrical Engineering to feel themselves justified in giving the University some financial assistance for the object outlined above.

Yours faithfully,

Principal.

Civil Eng. Department.

Memorandum of Paper published since November, 1922.

"Strength of Steel I-Beams Haunched with concrete,  
(with P. Gillespie and C. Leluan), Engineering  
Journal August, 1923; Can. Engineer July 10th. 1923."

Researches carried out in Civil Engineering Laboratory:-

"Net Section of Rivetted Tension Members,"

L. S. McLennan, B.Sc.

Bond Stresses in I-Beams Haunched with Concrete,"

J. S. Trueman, B.Sc.

---

September 15th, 1924.

James. B. Woodyatt, Esq.,  
General Manager,  
Southern Canada Power Company,  
Montreal.

Dear Mr. Woodyatt--:

I very much appreciate your  
letter of September 13th and you undertaking to  
take up with your Board the question of a con-  
tribution to our Department of Electrical Engineering.

I may advise you confidentially  
for the information of you and your Board that the  
contribution of the Montreal Light, Heat & Power  
Company was \$25,000. and of the Shawinigan Wtare &  
Power Company, \$15,000.

Yours faithfully,

Principal.

CABLE ADDRESS:  
SOUTHERN

CODES { WESTERN UNION  
LIEBERS.

# SOUTHERN CANADA POWER COMPANY

LIMITED



HEAD OFFICE: CORISTINE BUILDING,

**MONTREAL.** September 13th, 1924.

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice-Chancellor, McGill University,  
Montreal, Que.

Dear Sir Arthur,

While we have not reached the age and prosperous condition of our neighbours in the power business, I hope that we will be able to make a contribution in proportion to our size and condition. You will remember that I suggested that we would try to do something like this when you first spoke to me.

The extension will undoubtedly increase the prestige and utility of the Electrical Engineering Department, and I am pleased that you have been able to go ahead with it. If you will let me know the amount of the contributions from the Montreal Light, Heat and Power Company and the Shawinigan Company, I will do all that I can to arrange for a proportional contribution from this Company.

Yours sincerely,

*James Woodruff*  
General Manager.

JBW-c.

SUBJECT

**THE BELL TELEPHONE COMPANY OF CANADA**

VICE-PRESIDENT AND GENERAL MANAGER

MONTREAL. September 13, 1924.

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice-Chancellor,  
McGill University,  
Montreal.

Dear Sir:-

In the absence of Mr. Sise, who is away from the office for a few days, I acknowledge receipt of your letter of September 11th. Immediately upon Mr. Sise's return your communication will be placed before him.

Yours truly,

*R. Wade*

September 8th, 1924.

Julian C. Smith, Esq.,  
General Manager,  
Shawinigan Water & Power Company,  
Montreal.

My dear Mr. Smith:-

Will you please allow me on behalf of the Board of Governors of McGill and of myself to express to the Shawinigan Water and Power Company our sincere appreciation of its help in enabling us to increase the facilities of our Electrical Engineering Department.

We are grateful for your recognition of the merit of the school and the part it is playing in electrical engineering development. I have every confidence that the school will continue to deserve your approval and support.

Yours faithfully,

Principal.



L. A. HERDT, E.E., D. Sc., F.R.S.C.  
FELL. A.I.E.E. MEMB. E.I.C.  
MEMB. INST. E.E.  
PROFESSOR

DEPARTMENT OF ELECTRICAL ENGINEERING  
MCGILL UNIVERSITY  
MONTREAL

August 4th, 1924.

TEL. UPTOWN 5920

General Sir Arthur Currie,  
Principal,  
McGill University,  
Montreal.

Re: Proposed Extension of the Engineering Building.

Dear General Currie,

On my return to the city on Thursday last after a week's absence, Professor E. Godfrey Burr advised me of the matters discussed at the conference held in your office with the architects of the proposed extension of the Engineering Building to take care of the Department of Electrical Engineering.

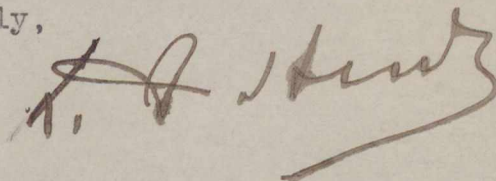
I need not tell you that I was delighted that this matter had been approved by the Board of Governors and that you had decided to proceed with the building extension.

I had a talk with Dean Mackay regarding the matter and it was agreed that a meeting should take place early next week with Professor E. Brown of the Department of Civil Engineering and Professor C.H. McKergow of the Department of Mechanical Engineering to discuss such details as may provide for the best arrangement of space of the Departments concerned under the new conditions thus established.

Sir Arthur Currie ----2.

This particularly has reference to the matter of access to the new wing and the possibility of providing such access through the Workman Building and avoid a bridge or an opening from the Engineering Building, and also reduce the cost of moving and installation.

Yours faithfully,

A handwritten signature in dark ink, appearing to read "A. A. Stewart". The signature is written in a cursive style with a long, sweeping underline that extends to the right.

DEPARTMENT OF MECHANICAL ENGINEERING

CHAS. M. MCKERGOW, M.Sc., PROFESSOR  
ARTHUR R. ROBERTS, M.Sc., ASSOCIATE PROFESSOR

MCGILL UNIVERSITY

MONTREAL

July 28th, 1924

Sir Arthur Currie,  
Principal,  
McGill University.

Dear Sir Arthur:-

At the conference held this morning on the proposed New Electrical Wing I made a tentative suggestion that the Foundry and Smithy might be removed from our course at the University. If this were done it would simplify the construction of the new building and leave vacant a very valuable floor space.

There are certain parts of the work, especially in the Smithy, which are important and could not be eliminated. There is the question of the discarded apparatus. The question of the work done in the Shops for the University and also what is to be done for the instructors employed at present in the shops.

The important work referred to could be done in the new Laboratory I hope to have. The apparatus might have to be thrown away. I think we can get but little for it. The work done for the University is small outside of the materials required for the machine-shop and the care of the machine-shop tools. These would have to be done outside. The instructors might be given other congenial work in the University where they could earn as much as they do at present.

Oil is used very largely in the mechanical part of industry and engineering and I propose to make use of the space, should it become vacant, for a laboratory devoted to the teaching of Oil, its properties and applications.

This space could be fitted up as a 'show place' at a comparatively small cost and not only that but we have a laboratory where real scientific work in the study of oil could be performed. I know of no other University having exactly what I have in mind and I feel that it would fill a real need in Engineering and Industry.

I cannot at present lay a complete scheme before you nor would it be possible for me to prepare a course which could be put in operation the coming session. But if the idea commends itself to you, the room and floor could be prepared and the scheme gradually evolved.

Yours very truly.

*Chas. M. McKergow*

*The Shawinigan Water & Power Co.*  
*Power Building Craig St.*

OFFICE OF THE VICE PRESIDENT AND GENERAL MANAGER

*Montreal,* July 31st. 1924.  
*Canada*

Sir Arthur Currie, G.C.M.G., K.C.B.,  
Principal and Vice Chancellor,  
McHill University,  
Montreal.

Dear Sir Arthur Currie:-

Thanks for your letter of July 29th. Before giving you a formal answer on the \$3,000. a year for five years, I must have the approval of the Board of Directors of the Shawinigan Company. All contributions extending over such a term must, by the regulations of our Company, pass the Board of Directors. I have no doubt that at the next Board Meeting, the Board will approve this matter and at that time I will advise you concerning their action. I need hardly say that I will put this up to our Board with my personal approval.

Very truly yours,

*Julius C. Smith*

GENERAL MANAGER.

JCS/DH.

July 29th, 1924.

Julian C. Smith, Esq.,  
Shawinigan Water & Power Company,  
Montreal.

My dear Mr. Smith:-

With reference to our former conversations regarding an appeal to the Shawinigan Water & Power Company to help McGill University supply increased facilities to our Electrical Engineering Department, let me say that at yesterday's meeting of our Board of Governors I was given authority to proceed with the erection of the building contemplated. This authority was given on the assumption that we would receive some assistance from the Montreal, Light, Heat & Power and from your Company. I may say that Sir Herbert told me that we could count on a contribution from the Shawinigan of \$3,000 a year for five years.

Will you please let me know if this assumption is correct and in the meantime accept my sincere appreciation of the consideration you have given our request.

With all good wishes, I am,

Yours faithfully,

Principal.

July 29th, 1924.

Dr. L. A. Herdt, E.E.,  
Ritz-Carlton Hotel,  
Atlantic City, N. J.

Dear Dr. Herdt:-

Recently there have been certain developments in the matter of the building for the Electrical Engineering Department. Holt has promised \$5,000. a year for five years from the Montreal Light, Heat & Power, and \$3,000. a year for five years from Shawinigan. While one appreciates this help very much still it is a little less than we hoped for.

I began to despair of getting on with the building this year, but finally called in Ross of Ross & McDonald, Architects, and told him our trouble and asked him to make suggestions. He considers that a suitable building could be erected at a cost of \$55,000 or thereabouts. To this must be added architect's and engineering fees and Lawrence wants \$1,000 for connecting up his heating system, while I have added \$15,000 to cover the cost of moving. At a meeting of the Board of Governors yesterday I was given permission to go ahead, the amount at my disposal being limited to \$75,000 or \$80,000. Ross is busy on the detail plans and the Atlas Construction Company will have charge of the work.

I hope you will have returned before any work begins in order that we may have the benefit of your advice and, of course, your approval.

With all good wishes, I am,

Yours faithfully,

appt. Monday. Sir Herbert Holt.

*The Shawinigan Water & Power Co.*  
*Power Building Craig St.*

*Montreal,*  
*Canada*

June 10, 1924.

Sir Arthur Currie,  
Principal McGill University,  
Montreal.

Dear Sir Arthur:-

I enclose herewith copy of a letter which I have written to Dr. Herdt, relating to the subject of the new laboratory building at McGill University.

Upon receipt of the information requested I will talk the matter over again with Sir Herbert, and will then advise you what his ideas are.

Very truly yours,

*Jehon L. Smith*

March 6th. 1924.

Sir Arthur Currie, G.C.M.G., K.C.B., LL.D.,  
Principal,  
McGill University.

Dear Sir Arthur,

Re:- Communication Engineering.

We have realized for sometime that our Department should give courses in Communication and Telephone Engineering, with proper Laboratory Instruction.

This matter has become one of major importance following a conference at Ottawa with Brigadier General McNaughton of the Department of National Defence, and his request that students in the Department of Electrical Engineering be trained in the above subjects to enter the Militia Service as officers of the Signal Corps.

We have for some time also, with the approval of the Department of Physics, considered the advisability of taking over from the Physics Department the course in Electrical Measurements, now given to the Fourth Year Electrical Students.

This course would form the basis of the courses in Communication Engineering.

It is, however, impossible for this Department to do anything in this important matter until the Department is provided with additional laboratory space, either that provided in the proposed New Building at the Milton Street site or by extension of the Macdonald Workman Engineering Buildings.

( A preliminary scheme of the extension of the above buildings was prepared by the Department some years ago, and this information is still available. )

Yours very truly,

*Conrad A. ...*

*hudson*

*Complete  
on 10/2/24*

*Mr Nesdt*



*The Shawinigan Water & Power Co.*

*Power Building Craig St.*

*Montreal,*  
*Canada*

June 10, 1924.

OFFICE OF THE VICE PRESIDENT AND GENERAL MANAGER

Dr. Louis Herdt,  
Professor Electrical Engineering,  
McGill University,  
Montreal.

Dear Dr. Herdt:-

Some weeks ago Sir Arthur Currie spoke to me with reference to his desire to extend your Engineering Laboratories.

Sir Arthur had already spoken to Sir Herbert Holt, and he talked to me as to the methods by which the money could be obtained for this purpose. I told Sir Arthur that I would discuss the matter with Sir Herbert and would then take it up further with him. Sir Herbert has been away, but has returned and I talked to him yesterday on this subject.

Sir Herbert desired me to get from you some further details. Can you tell me approximately the size of the building which you propose to build? The approximate cost of this building? Have you the equipment necessary to equip this building? Are there any available funds to partially defray the expense?

I am sending a copy of this letter to Sir Arthur Currie, and if you will talk this matter over with him, and give me the information requested, I can take the matter up more intelligently with Sir Herbert.

Very truly yours.

JCS/l.

L. A. HERDT, E.E., DSC.,  
PROFESSOR,  
C. V. CHRISTIE, M.A., B.Sc.,  
ASSOCIATE PROFESSOR.  
E. G. BURR, B.Sc.,  
ASSISTANT PROFESSOR.

DEPARTMENT OF ELECTRICAL ENGINEERING  
MCGILL UNIVERSITY  
MONTREAL

March 15th. 1924.

TEL. UPTOWN 5920

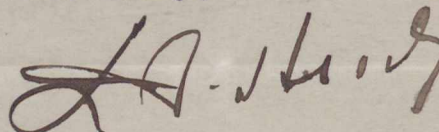
Colonel Wilfred Bovey,  
Assistant to the Principal,  
McGill University.

Re:- Royal Canadian Corps of Signals.

Dear Col. Bovey:-

You will find herewith copy of  
a letter to Brigadier-General McNaughton  
which is self explanatory.

Yours truly,



E.

March 15th. 1924.

Brig.-General Andrew McNaughton,  
Department of National Defence,  
OTTAWA, Ont.

Re:- Militia Service - Royal Canadian  
Corps of Signals.

Your file H.Q. 857-1-5.

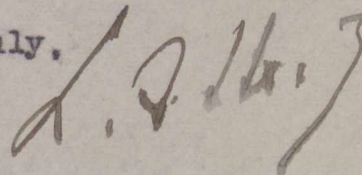
Dear Sir:-

Kindly refer to my letter of Feby.  
22nd. The four gentlemen named in this letter  
have each received a letter from Lieut. Col. D.  
McNiven, Asst. Director Personal Service, acknowl-  
edging receipt of their application dated Feby.  
21st. for appointment to a commission and stating  
that they will be further informed relative thereto  
at an early date.

Messrs. Wood and Howass were in my office  
to-day and they are somewhat uneasy regarding this  
matter (these two are amongst the best men of the  
year).

Positions have been offered to these and  
others of the graduating class and accepted by their  
classmates. The letter of the Department of National  
Defence is very vague as to when this further  
information is to be given.

Yours truly,



February 13th 1924.

Major M. Arthur Steel,  
For Deputy Chief of General Staff,  
Department of National Defence,  
Ottawa, Ont.

My dear Major Steel,

I beg to acknowledge receipt  
of your letter of February 12th. with enclosures.

I am passing these on to the  
Department of Electrical Engineering.

Yours faithfully,

Wilfrid Bovey.

DEPARTMENT OF NATIONAL DEFENCE

WAS:L

OTTAWA - February 12th 1924

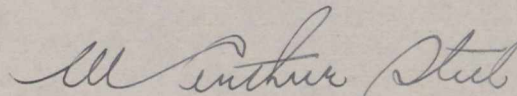
Dear Sir:-

In accordance with your request we are enclosing herewith the following publications from this Branch:

1. Lecture Notes - Volumes 1,2,3, - Elementary Electricity & Magnetism, Line Instruments & Testing.
2. General Report on Wireless Telegraphy Communication - Canadian Corps.
3. Draft of Militia Order - Provisional Schools of Instruction - Radiotelegraphy.
4. Map of Radio Communication Scheme, Department of National Defence - up to Stations proposed for 1925. (This is for your information only and not for republication).

If there is anything further that we can supply that would be of interest to you, we would only be <sup>too</sup> pleased to procure it if you let us know.

Yours sincerely,



Major R.C.C.S.  
for Deputy Chief of General Staff.

Colonel W. Bovey, O.B.E.  
McGill University,  
Montreal, P.Q.

February 13th 1924.

Professor L. V. Herdt,  
Department of Electrical Engineering,  
Engineering Building,  
McGill University.

Dear Prof. Herdt,

I enclose you herewith the following documents received from the Department of National Defence:-

- (1) Lecture Notes - Volumes 1,2,3, - Elementary Electricity & Magnetism, Line Instruments & Testing.
- (2) General Report on Wireless Telegraphy Communication - Canadian Corps.
- (3) Draft of Militia Order - Provisional Schools of Instruction - Radiotelegraphy.
- (4) Map of Radio Communication Scheme, Department of National Defence - up to Stations proposed for 1925. (This is for your information only and not for re-publication).

I will forward you later on a very important report on the Signal Communication in the Canadian Corps. I might remark that practically no copies of this report are left, and from the point of view of Army signallers, it is without doubt, one of the most valuable documents produced in the B.E.F.

Yours faithfully,

Wilfrid Bovey.

Thursday, February 21st, 1924.

I have just had a conversation with Professor Herdt re the requirements of the Electrical Department. He is to forward to me a memorandum setting forth the condition of his department,- its needs, its future possibilities, and, in his opinion, the best way in which these can be realized.

He points out that McGill has trained practically all the staffs of the large Power Companies in the Province of Quebec and he feels that these would respond to an appeal to bring the department up to date as regards space, equipment, etc. He also points out that his department is so closely associated with mechanical and hydraulic engineering that he feels it wisest to have all three in the same building, and that the electrical department should be left in the same building in which it is at present housed rather than go into a new building with the Departments of Geology and Mining with which it has so little in common. He shews that to put electrical engineering and mining engineering in the

same building means a waste of space, in as much as the mining department requires vertical space, while he requires nothing but horizontal space. He believes it would be much cheaper to increase the elevation of the rear of the present engineering building than to have space provided in a new building. It is possible, therefore, that the work suggested by him might be done much more cheaply in that way and so the cost of the new Geological and Mining Building might be considerably reduced. He also pointed out that Sir Herbert Holt is personally interested in this development.



CANADIAN PARTICIPATION  
WORLD POWER  
CONFERENCE



LONDON

JUNE 30 TO

JULY 12

1924

THE  
OFFICE  
OF THE  
SECRETARY  
OF THE  
TREASURY

OBJECTS

THE purpose of the Conference will be to consider by agreement the subjects mentioned in the following list, and to recommend the steps to be taken in connection with them.

# THE FIRST WORLD POWER CONFERENCE

JUNE 30 to JULY 12

1924

*Promoted by the Council of*

THE BRITISH ELECTRICAL AND ALLIED  
MANUFACTURERS' ASSOCIATION

(INCORPORATED)

*In Co-operation With*

TECHNICAL AND SCIENTIFIC INSTITUTIONS  
AND INDUSTRIAL ORGANIZATIONS  
IN GREAT BRITAIN AND  
OTHER COUNTRIES

† † †

† †

†

*To be held at*

THE BRITISH EMPIRE EXHIBITION

WEMBLEY, LONDON

## FOREWORD.

THE idea of a World Power Conference originated in England in the year following the declaration of war when the relationship of power to production was brought forth with vivid force. It remained, however, quiescent until the British Electrical and Allied Manufacturers Association evolved the scheme of holding such a conference at the time of the British Empire Exhibition. A British Committee was thereupon formed comprising the various technical and scientific institutions and industrial organizations in the British Isles and invitations were sent to various countries throughout the world to participate.

Upon the receipt of the invitation of the British Committee a provisional Canadian Committee was formed early in 1923 comprising sufficient Dominion, Provincial and Corporate interests to make it geographically representative of the whole Dominion. At the meetings of this committee it was unanimously decided to participate in the conference and arrangements were made to have as a commencement five papers prepared covering the most outstanding features of the power situation in Canada. Later a general advisory Canadian Committee was organized comprehensive of all power and allied interests in the Dominion. This committee met in December, endorsed the actions of the preliminary committee and formed a management committee to arrange for appropriate Canadian participation in the conference.

A preliminary meeting of representatives of national committees held in London in August 1923, was attended by a member of the Canadian Committee and an outline of programme and procedure agreed upon. It was also arranged that papers for submission at the conference will be printed and distributed by the British Committee to the members of the several national committees sufficiently early to allow examination and study prior to the opening of the conference. These papers will not be read but the sessions will be devoted to oral discussion of the subjects with which they deal.

The scope of the conference covering the power resources of all participating countries and the technical and economic problems of power development, transmission and utilization should prove of surpassing interest and value to those who are privileged to attend and to those countries which they represent. For Canada it will afford a unique opportunity to present before the world her magnificent power resources both hydro and fuel and the efficient and economic manner in which they have so far been utilized.

# OBJECTS

THE purpose of the World Power Conference will be to consider how the industrial and scientific sources of power may be adjusted nationally and internationally:

\*

By considering the potential resources of each country in hydro-electric power, oil and minerals.

\*

By comparing experiences in the development of scientific agriculture, irrigation and transportation by land, water and air.

\*

By conferences of civil, electrical, mechanical, marine and mining engineers, Technical Experts and authorities on Scientific and Industrial Research.

\*

By consultations of the Consumers of Power and the Manufacturers of the Instruments of Production.

\*

By conferences on Technical Education to review the educational methods in different countries, and to consider means by which existing facilities may be improved.

\*

By discussions on the financial and economic aspects of industry, nationally and internationally.

\*

By conferences on the possibility of establishing a Permanent World Bureau for the collection of data, the preparation of Inventories of the World's Resources, and the exchange of industrial and scientific information through appointed representatives in the various countries.

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Minister of the Interior

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Chairman, Quebec Streams Commission

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President, Canadian National Railways

H. M. TORY, M.A., D.Sc., F.R.S.C., LL.D., F.R.H.S.

Chairman, Research Council of Canada

# CANADIAN COMMITTEE

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Deputy Minister, Department of Mines, Ottawa

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Chief Hydraulic Engineer, Hydro-Electric Power Commission of Ontario, Niagara Falls, Ont.

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Director of the Hydraulic Service, Member of the Quebec Streams Commission, Parliament Buildings, Quebec.

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Consulting Electrical Engineer, Department of Railways and Canals; and Dominion Railway Commission, Ottawa, Ont.

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Consulting Engineer, Drummond Building, Montreal P.Q.

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Director, Dominion Water Power Branch and Dominion Reclamation Service, Dept. of the Interior, Ottawa, Ont

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Secretary, Canadian Engineering Standards Association, Ottawa, Ont.

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Manager, City of Winnipeg Hydro-Electric System, Winnipeg, Man.

## F. R. GLOVER

General Executive Assistant, British Columbia Electric Railway Company, Vancouver, B.C.

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President, Canadian Niagara Power Company, Toronto, Ont.

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Chief Engineer, Division of Fuel and Fuel Testing, Department of Mines, Ottawa, Ont.

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Director, Electrical and Gas Standards, Laboratories and Inspection Services, and of the Exportation of Electrical Energy, Department of Trade and Commerce, Ottawa.

## FRASER S. KEITH, B.Sc., M.E.I.C.

Secretary, Engineering Institute of Canada, Montreal, P.Q.

## O. O. LEFEBVRE, B.A.Sc., M.E.I.C.

Chief Engineer, Quebec Streams Commission, Montreal, P.Q.

## G. C. MACKENZIE, B.Sc., M.E.I.C.

Secretary, Canadian Institute of Mining and Metallurgy, Montreal, P.Q.

C. H. MITCHELL, C.B., C.M.G., C.E., LL.D., M.E.I.C., M. Inst. C.E.,  
M. Am. Soc. C.E.

Dean, Faculty of Applied Science and Engineering, University of Toronto, Toronto, Ont.

JULIAN C. SMITH, LL.D., M.E., M.E.I.C., M.I.E.E., M. Am. Soc. C.E.,  
F.A.I.E.E.

Vice-President and General Manager, Shawinigan Water and Power Co.; President, Quebec Power Co., etc.,  
Montreal, P.Q.

## K. H. SMITH, B.A., M.E.I.C.

Chief Engineer, The Nova Scotia Power Commission, Halifax, N.S.

*CVT  
Submitted June 18  
March 13 to  
March 24*

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# CLASSIFIED PROGRAMME

## DIVISION I: POWER RESOURCES

- Section A*: POWER RESOURCES, NATIONAL REVIEWS.  
General Survey, Power Resources, Available and Utilized, Administration, Power Requirements.

## DIVISION II: POWER PRODUCTION

- Section B*: WATER POWER PRODUCTION.  
*Section C*: PREPARATION OF FUELS.  
Distillation of Coal, Pulverized Coal, Distillation of Shales, Oil Refining, Lignites, Peat.  
*Section D1*: STEAM GENERATION.  
Boilers, Utilization of Fuels, Waste Heat.  
*Section D2*: STEAM TURBINES.  
*Section E1*: INTERNAL COMBUSTION ENGINES, CRUDE OIL.  
*Section E2*: INTERNAL COMBUSTION ENGINES, GAS, OIL AND SPIRIT.

## DIVISION III: POWER TRANSMISSION AND DISTRIBUTION

- Section G1*: A.C. TRANSMISSION AND DISTRIBUTION.  
Generators, Motors, Transformers and Switchgear, Transmission Lines, Underground Cables.  
*Section G2*: HIGH-VOLTAGE DIRECT-CURRENT GENERATION, TRANSMISSION AND DISTRIBUTION.

## DIVISION IV: POWER UTILIZATION

- Section H*: POWER IN INDUSTRY AND DOMESTIC USE.  
*Section J*: ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.  
*Section K1*: POWER FOR LAND TRANSPORT.  
*Section K2*: POWER FOR WATER TRANSPORT.  
*Section K3*: POWER FOR AIR TRANSPORT.  
*Section L*: ILLUMINATION.

## DIVISION V: GENERAL

- Section M*: ECONOMIC, FINANCIAL AND LEGAL ASPECTS OF POWER.  
*Section N2*: STANDARDIZATION.  
*Section N3*: EDUCATION.  
*Section N4*: HEALTH.  
*Section N5*: PUBLICITY.  
*Section N6*: BRITISH EMPIRE RESOURCES.

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To date (alphabetically arranged)

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HEER J. C. VAN STAVEREN, Vereeniging van Directeuren van Electriciteits-bedrijven in Nederland.

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*Secretary* : MR. WILLIAM M. STEUART, Director, Bureau of the Census, Dept. of Commerce.

## BRITISH COMMITTEE'S PRELIMINARY ANNOUNCEMENT AS TO CONDITIONS AND PRIVILEGES OF MEMBERSHIP

**ORDINARY MEMBERS.**—Any applicant, subject to the approval of the Executive Committee, is entitled to become a member of the World Power Conference on payment of the sum of £2, which will be used towards defraying the stenographic and other expenses incident to the conduct of the Conference.

Members will receive a Membership Ticket, which will entitle them to free admission to the British Empire Exhibition and the Conference Halls, during the period of the Conference. These tickets will be personal and not transferable.

Members, if they desire it, can purchase, at a nominal price, copies of papers in the Sections in which they are interested, the charges for which will be announced at a later date. These copies will be available for Members only. Papers will be on sale at the Hall, but Members who wish to take part in the discussions should apply in advance for such papers as they may require.

**OFFICIAL DELEGATES.**—The official delegates appointed by the participating National Committees are entitled to Free Membership.

Copies of the papers for presentation at the Conference will be sent free to official delegates in advance of the Conference, through their respective National Committees.

**ACCOMMODATION.**—The Organizers of the Conference, through their Official Travel Agents, will be glad to assist members in obtaining hotel accommodation in London, though they cannot guarantee to obtain such accommodation. Members are requested to make early application for such accommodation as they may require.

**OFFICES AND ENQUIRY BUREAU.**—The Organizers of the Conference are arranging for offices at the Conference Halls for the use of Members, full particulars of which will be announced later. An Enquiry Bureau and Postal Facilities for the use of Members will also be provided.

**OFFICIAL RECEPTIONS AND SOCIAL FUNCTIONS.**—A special Committee has been formed to arrange official receptions and social functions, and announcements will be made at a later date.

**OFFICIAL TOURS AFTER THE CONFERENCE.**—Official tours in which only delegates and Members of the Conference will be entitled to participate are being arranged to follow the Conference. The tours will be conducted with the co-operation of the National Committees in each country and in consultation with Messrs. Thos. Cook & Sons, the Official Travel Agents of the Conference. It is estimated that £60 should cover the cost of each of the tours but the final cost cannot be determined until the various National Committees concerned have completed their arrangements.

## PRELIMINARY ARRANGEMENTS REGARDING TOURS

### TOUR IN GREAT BRITAIN

(preliminary particulars, subject to alteration.)

- Monday, July 14:* Birmingham—Visits to Works—Excursion to Stratford and Warwick.
- Tuesday, July 15:* Sheffield—Visits to Works Colliery and Coke Oven Plant—Excursion to Baslow, Chatsworth and Haddon Hall.
- Wednesday, July 16:* Manchester—Visits to Ship Canal, Cotton Mill and Works.
- Thursday, July 17:* Excursion in Lake District, via Lakeside to Windermere.
- Friday, July 18:* Excursions in Lake District via Coniston and Grassmere.
- Saturday, July 19:* Glasgow—Visits to Shipyards—Excursions to Dunoon,  
*Sunday, July 20:* Loch Eck, Loch Fyne, Kyles of Bute; Oban, Staffa and  
*Monday, July 21:* Iona.  
*Tuesday, July 22:*
- Wednesday, July 23:* Edinburgh—Excursions to Edinburgh Castle and Forth Bridge.
- Thursday, July 24:* Newcastle—Visit to Shipyards, Colliery and Works.
- Friday, July 25:* York—Visits to York Minster and other places of interest.
- Saturday, July 26:* Return to London.

### SCANDINAVIAN TOUR

(preliminary particulars, subject to alteration)

#### TOUR IN NORWAY

- Tuesday, July 15:* From Newcastle per S.S. *Jupiter* at 5 p.m.
- Wednesday, July 16:* Arrive Bergen in the evening.
- Thursday, July 17:* Visits to Hydro-Electric Stations at Samnanger (23,000 H.P.) and at Bjolvo (36,000 H.P.) by boat.
- Friday, July 18:* Visit to Hydro-Electric Station at Tyssedal (140,000 H.P.) Excursion to Skjaeggardal waterfall and Haukelid Mountains, and then to Dalen.

- Saturday, July 19:* From Dalen to Kviteseid by boat, and then to Notodden. From Notodden by train to Rjukan (on the way passing Lienfos (20,000 H.P.) Tinnfos (24,000 H.P.) and Svaelgfos (45,000 H.P.).
- Sunday, July 20:* Rjukan. Visit two Hydro-Electric Stations (160,000 H.P. each.)
- Monday, July 21:* Kristiania.
- Tuesday, July 22:* Visit to Hydro-Electric Stations at Vamma (75,000 H.P.) and Morkfos-Solbergfos (150,000 H.P.).

#### TOUR IN SWEDEN

- Wednesday, July 23* } Trollhattan—Visit to Hydro-Electric Station (170,000  
*Thursday, July 24* } H.P.). Sleeper to Vasteras.
- Friday, July 25:* Vasteras—Visit to Power Station (45,000 H.P. Steam) and works of Allmanna Svenska Elektriska Abtiebolaget.
- Saturday, July 26:* Upsala—Visit to Sub-Station and Excursion through typical rural distribution districts. Visits to Alvarleby Hydro-Electric Station (45,000 H.P.) and Untra Hydro-Electric Station (80,000 H.P.).
- Sunday, July 27:* Stockholm.
- Monday, July 28:* Stockholm—Visit to Vartan Power Station (47,000 H.P. Steam)—Excursions.
- Tuesday, July 29:* Malmo, and via Hamburg and Vlissingen.
- Wednesday, July 30:* London or Paris.

#### TOUR IN LAPLAND

- Tuesday, July 29:* Boden.
- Wednesday, July 30:* Via Gallivare to Porjus Hydro-Electric Station (75,000 H.P.)—Visit to Gallivare Ore Fields.
- Thursday, July 31:* Kiruna—Visit to Iron Mines and Electric Railway workshops and sub-stations. Evening excursion to see the midnight sun.
- Friday, August 1:* Narvik to Bergen by boat (a famous excursion trip, particularly on account of the midnight sun).
- Sunday, August 2:* Bergen—Boat to England or direct to America.

## TOUR IN FRANCE, ITALY AND SWITZERLAND

(preliminary particulars—subject to alteration)

### FRENCH TOUR

- 1st Day:* Comines, near Lille—Visit to Power Station.
- 2nd Day:* Gennevilliers, near Paris—Visit to Power Station (200,000 K.W.).
- 3rd Day:* Visit to Rheims and battlefields.
- 4th and 5th Days:* Visit Lyon to Hydro-Electric Stations at Beaumont-Montreaux (H. T. Transmission at 120,000 volts), Val-de-Fier, and ViClaire. Possibly an Excursion to the neighbourhood of Mont Blanc. Crossing into Switzerland, via Geneva.

### SWISS TOUR

- 6th Day:* Geneva—Visit to Hydro-Electric Stations at Chancy-Pougny (in construction, head 25 feet, capacity 43,000 H.P.) and Chevres (built 1893/1896, head 25 feet, capacity 18,500 H.P.).
- 7th Day:* Berne—Visit the Hydro-Electric Station at Muhleberg (built 1918/1921, head 60 feet, capacity 64,000 H.P., 330,000,000 cubic feet utilisable water reserve.) By rail to Interlaken (Monophase electric traction, 15,000 V.).
- 8th Day:* By rail (D.C. 1500 V.) to Wengernalp and Jungfrauoch (10,000 feet altitude, view on Aletsch glacier and Jungfrau). Visit to Hydro-Electric Station at Burglauenen, (built 1906/1908, head 550 feet, capacity 5,000 H.P.).
- 9th Day:* By rail to Brunig and Lucerne, Excursion by boat to Fluelen.
- 10th Day:* By rail (Gotthard railway monophase, 15,000 volts) to Airolo and Ambri-Piotta—Visit to Swiss Federal Railways Hydro-Electric Station at Ritom (built 1916/1920, head 2,700 feet, capacity 78,000 H.P.; water storage capacity in Ritom Lake, 300,000,000 cubic feet). By funicular to Ritom Lake, Crossing into Italy via Chiasso.

## ITALIAN TOUR

- 11th Day:** Venice.
- 12th Day:** Visit to Hydro-Electric Stations of the Societa Adriatica on the Piave.
- 13th and 14th Days:** Milan—Visit to Hydro-Electric Stations of the Societa Conti in Val d'Ossola.
- 15th Day:** Turin—Visit to Hydro-Electric Stations in Valle d'Aosta proceeding to Paris by night train.



*For*  
*Information Regarding*  
CANADIAN PARTICIPATION  
*in the*  
WORLD POWER CONFERENCE

†††

*Address Communications*  
*to*  
J. B. CHALLIES, General Secretary  
DOMINION WATER POWER BRANCH  
DEPARTMENT OF THE INTERIOR  
OTTAWA, ONT.,  
CANADA

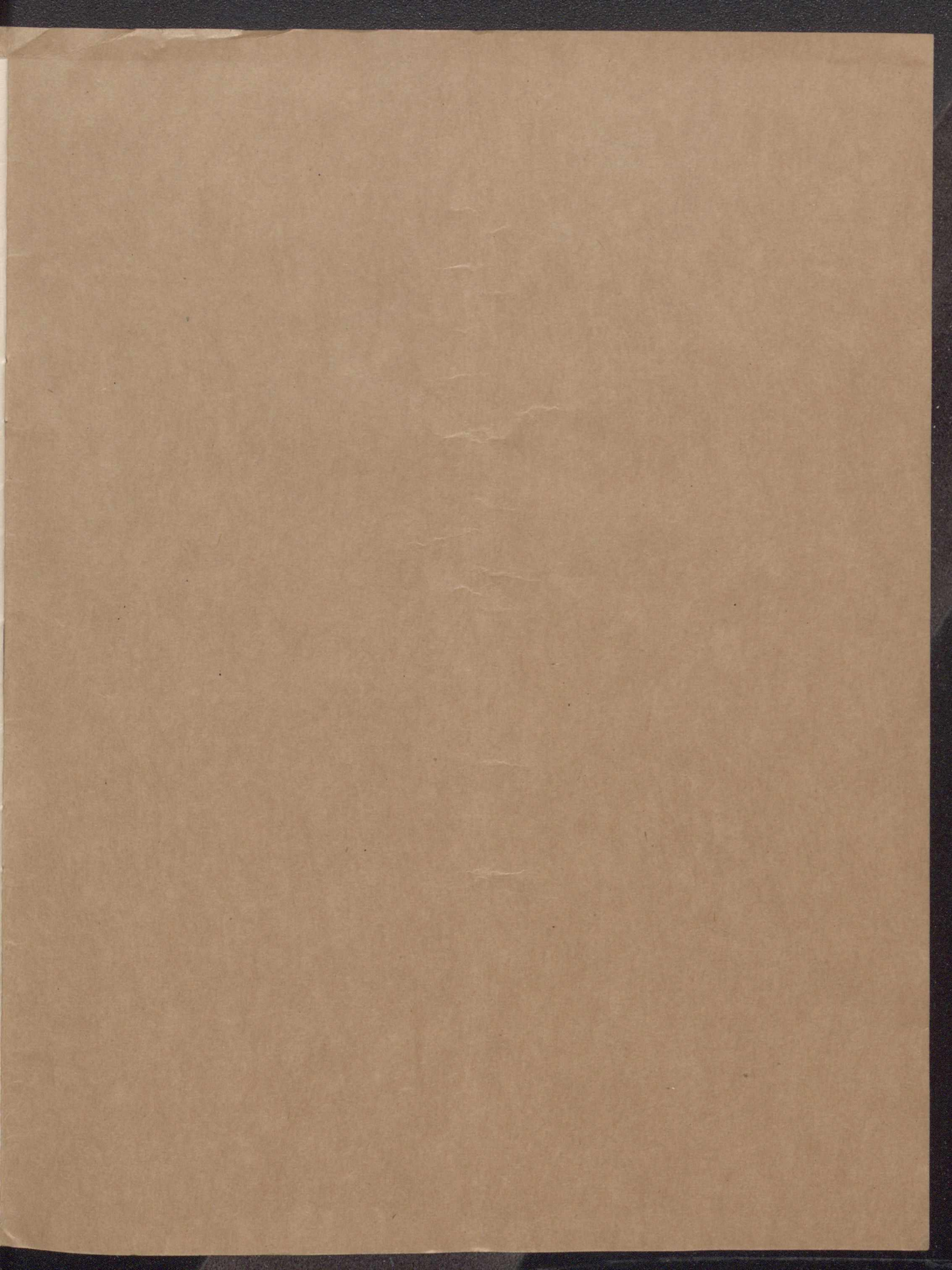
11th Day  
12th Day  
13th and 14th Days  
15th Day

Information regarding

CANADIAN PARTICIPATION  
in the  
WORLD POWER CONFERENCE

PRINTED AT  
THE GOVERNMENT PRINTING BUREAU  
OTTAWA, ONT. CANADA.

to  
J. B. CHALLIES, General Secretary  
DOMINION WATER POWER BRANCH  
DEPARTMENT OF THE INTERIOR  
OTTAWA, ONT.  
CANADA



February 22nd, 1924.

Professor C. V. Christie, B.Sc., M.A.,  
Engineering Building,  
McGill University.

My dear Professor Christie:-

I am sorry to have delayed action so long re your request to be permitted to participate in the World Power Conference to be held in London early in July next, but yesterday was our first Finance Committee meeting since you spoke to me.

The Board know that you would doubtless derive much benefit from that Conference and they are sympathetic towards helping the staff of McGill to take part in conferences where matters of interest to their department are discussed. They feel, however, that at the present time the University is not in a position to bear the expense necessary to enable you to go to London.

I hope the decision is not too disappointing to you.

Yours faithfully,

Principal.

February 15th 1924.

Professor L. V. Herdt,  
Department of Electrical Engineering,  
Engineering Building,  
McGill University.

Dear Prof. Herdt,

Enclosed you will find the Report on  
the Signal Communication in the Canadian Corps, of which  
I wrote you the other day. Accompanying this is a map  
of the Radio Communication Scheme. I think I have one  
in my own possession.

Yours faithfully,

• Wilfrid Bovey.

MEMORANDUM OF MEETING AT OTTAWA, September 1st, 1925.

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At this meeting were present all available members of the Professional Institute and myself. Mr. S.A. Cadmore of the Statistics Branch, Mr. Motherwell of the Observatory, President of the Professional Institute, were the principal ones interested. Mr. McLeish of the Mines Branch, Chairman of the Lecture Committee, is away in England for two months.

After some discussion it was decided that it would not be practical to put on the Financial and Economics Course this year. Mr. Unlace suggested that a course in Higher Mathematics would be very valuable. It was then pointed out that there were a good many very well qualified mathematicians at the Dominion Observatory, and a discussion arose as to the possibility of putting on co-operative courses, i.e. <sup>a</sup> courses which would be given partly by the staff of McGill University and partly by properly qualified members of the Civil Service. It was felt that this would relieve the strain on the University staff and would also reduce the cost to the Civil Servants and others taking the course, as the Ottawa lecturers would make no charge. The suggestion seemed worthy of consideration and it was agreed that Colonel Bovey was to take it up with Dr. Murray and Mr. Motherwell <sup>with</sup> and the other members of the Institute. The matter was to be taken up again at the time of the meeting of the Research Council in October. By then it was hoped that Colonel Bovey would have some information from Dr. Murray as to whether McGill could co-operate in a <sup>mathematical</sup> course of this nature and that Mr. Motherwell would have similar information from his Institute and the Observatory Staff.

MEMORANDUM OF MEETING AT OTTAWA? September 1st, 1925.

Mr. Gudmore stated that the Civil Servants were very interested in the Summer French School given at McGill University, as well as in other summer schools given by Queens and Toronto. He asked whether Colonel Bovey would undertake to discuss with the authorities of Queens and Toronto Universities the possibility of making a joint appeal to the Government to enact a regulation by which Civil Servants who gave up their three weeks' holiday to attend these courses would be given an extra three weeks on pay to complete the period of the course. Colonel Bovey agreed that he would do this as soon as the University session opened.

SUBJECT

Bell System Educational Conference.

*The Bell Telephone Company of Canada*  
*President's Office*

*Montreal*

November 27th, 1924.

Sir Arthur W. Currie, G.C.M.G., K.C.B.,  
Principal and Vice Chancellor,  
McGill University, Montreal.

My dear Sir Arthur:-

In accordance with the promise made to you, and because of the suggestion in your letter to Mr. Sise of the 11th of September that you had in mind the institution of a course in Communication Engineering, I forward by hand a report of the conference of members of the American Universities and representatives of the American Telephone and Telegraph and Western Electric Companies, held at New York last August. Among other subjects the discussions dealt with the Art of Communication and College graduates in the Communication Field.

The contents will, I trust, be of interest to you and Professor Herdt.

I also take the liberty of enclosing a copy of the Bell Telephone October Quarterly, containing on page 250 a marked item on Communication and Power Engineering Contrasted, which article, also, has a bearing on your proposed Course.

Yours very truly,

*L. D. McFarlane*

President.

Attachments.



December 3, 1924.

L.B. McFarlane, Esq.,  
President, Bell Telephone Co.,  
Montreal.

Dear Mr. McFarlane:-

I am very much obliged for the most interesting and valuable material forwarded with your letter of the 27th inst.

The discussion of which you have been so good as to let me have the record will be of very great value, not only when we have under consideration the question of courses in Communication Engineering, but in the consideration of the whole curriculum of the Faculty of Applied Science, to which much of the argument is equally applicable.

Yours faithfully,

Wilfrid Bovey.