



Bulletin

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CANADA'S ATOMIC TECHNOLOGY FLOURISHES

Atomic Energy of Canada Limited is a Crown company incorporated in February 1952 under the Companies Act pursuant to the Atomic Energy Control Act. It is an agent for all purposes of the Crown and the shares of the company, with the exception of the qualifying shares of the directors, are held by a minister of the Crown in trust for Her Majesty.

The member of the Privy Council designated by the Governor in Council as the minister for the purposes of the Atomic Energy Control Act is the Minister of Energy, Mines and Resources.

In broad terms, AECL is responsible for research into and development of the peaceful uses of atomic energy, as a contribution to the general welfare and in the interest of scientific and technological progress in Canada. More specifically, the company has as its principal objective the development of nuclear-power systems that will meet short-term and long-term Canadian needs for low-cost energy and will be commercially attractive to other countries. A second major object is to widen and improve the applications of radioisotopes and radiation in medicine, industry, agriculture and research.

In the pursuit of its aims, AECL (a) operates laboratories for fundamental and applied research and engineering development; (b) designs and builds prototype nuclear-power stations, in co-operation with electric utilities and private industry; (c) provides nuclear consulting services as required; (d) offers to supply nuclear-power stations on the international market; (e) produces and markets radioisotopes; (f) designs, manufactures and markets equipment for the utilization of radioisotopes and radiation; (g) enters into co-operative research and development contracts with industry and universities; (h) makes available its special facilities and expertise to assist industry and utilities in putting nuclear energy to practical use and assist universities in nuclear studies.

AECL's main research and development centres are the Chalk River Nuclear Laboratories (CRNL), Chalk River, Ontario, and Whiteshell Nuclear Research Establishment (WNRE), Pinawa, Manitoba. Additional research and development work is carried out, on a contract basis, by private industry and universities.

The Power Projects group, with a design office and development laboratory at Sheridan Park, Ontario, and an engineering group at Peterborough, is responsible for nuclear-power system design, nuclear consulting services, development and testing of major equipment items for nuclear-power plants and the project management of the Douglas Point and Gentilly nuclear-power stations, the Bruce Heavy Water Plant and the Nelson River Transmission System.

The Commercial Products group, with its offices and manufacturing plant at South March, Ontario, and a laboratory in Ottawa, processes and markets radioisotopes and designs, and manufactures and sells related equipment and services. A research program in radiation and radioisotope applications is carried out in co-operation with other AECL laboratories, with universities and with industry.

CONTENTS

Canada's Atomic Technology Flourishes..	1
Sulphuric Acid Giant Plant	3
Repayment of Notes to Italy	3
Auto Trade Assistance	3
New Native Book	4
Oliver Mowat Stamp	4
Milk to Nigeria	4
Health-Care Costs	4
Old Buildings Inventoried	5
Teachers Briefed on Jobs Abroad.....	5
Institute of Guided Ground Transport	5
Monthly Index.....	7

Design and construction work for the nuclear-power program was sustained at a high level during the year. Nearly 6 million kilowatts of electrical generating capacity using CANDU reactors is under construction and close to 1 million kilowatts of this capacity will be in operation early in 1971.

CANDU is named from its use of heavy water (deuterium oxide) as the reactor moderator and natural uranium as the fuel. The principal feature of this system is the economical use of neutrons, the particles which sustain the atomic chain reaction. Neutron economy is achieved by design of the system, choice of structural materials in the reactor and the employment of heavy water. Such a system enables CANDU reactors to operate efficiently using natural uranium fuel, with a consequent low fuel cost.

The economical use of natural uranium makes the CANDU reactor attractive to a number of countries. Power stations employing reactors of this type are being built in India and Pakistan. In Pakistan the 125,000-kilowatt Karachi Nuclear Power Project (KANUPP) will go into operation late in 1970. The first of the CANDU power reactors in India will start operation in 1972. In Canada, 1971 will see the initial operation of the Gentilly nuclear-power station, a 250,000-kilowatt plant, and also the start-up of Units One and Two at Ontario Hydro's 2-million kilowatt Pickering generating station. By the end of 1971, more than 1.5 million kilowatts of CANDU power capacity will be on the line.

DOUGLAS POINT

Operation of the 200-megawatt Douglas Point station continues to provide experience that is being applied in the design and construction of Pickering and Bruce stations. Douglas Point has been in operation since 1967 and has produced more than 1.5 billion kilowatt hours of electricity. Besides serving as a prototype for the larger stations, it provides valuable training for the growing numbers of operating staff needed in the Ontario Hydro program.

One of the major achievements of the year was the successful commissioning of the "on-power" refuelling system. Refuelling of the reactor without shut-down is a basic feature of the CANDU design. The Douglas Point fuelling machines were used to carry out initial loading of the reactor and had also been used to refuel with the reactor shut down. The first on-power refuelling was attempted in December 1969, and the machines were in regular service by the end of March 1970. In the first month of operation, the machines demonstrated a capability in excess of that required for normal equilibrium fuelling.

Improvements in the conservation of heavy water occupied an important place in the program of modifications carried out during the year. More effective equipment for drying the air in the reactor boiler areas was installed and this has increased the efficiency of the heavy-water recovery system.

In the spring of 1969, the station was shut down for turbine inspection and overhaul. A common stage

in each of the three low-pressure sections exhibited rotor-blade failure or damage due to vibration. These were removed and will be replaced at the next overhaul. In the meantime the machine is being operated at slightly less than full output.

The shut-down for turbine overhaul coincided with the discovery of some fuel failures in the reactor. Twelve fuel bundles with cracked sheathing were identified. With the fuelling machines operating on-power, failed bundles can be removed from the reactor without interrupting the operation of the station, and so constitute little problem.

The station is being operated on a regular basis at high power. Reduction of radiation fields in the primary coolant system because of cobalt contamination, improvements to certain equipment and modifications to auxiliary circuits are now the main tasks to be done to attain the performance expected at maturity.

GENTILLY

Construction of this 250-megawatt prototype station reached its final stages and completed systems were turned over progressively to the Hydro-Quebec commissioning group. Operation is expected to begin in 1971, thus meeting the tight four-and-a-half-year schedule set when work on the project was started late in 1966.

Gentilly is the first natural-uranium, heavy-water power reactor to use ordinary water as a coolant. The reactor, known as CANDU-BLW (Canada Deuterium Uranium-Boiling Light Water), offers possible construction and operating advantages over power reactors using pressurized heavy water as a coolant. Gentilly is being built by AECL with the co-operation of Hydro-Quebec, which will operate and eventually purchase the station. It is on the south shore of the St. Lawrence river, near Trois-Rivières.

PICKERING

The 2,000-megawatt Pickering station is being built by Ontario Hydro. AECL is designing the nuclear steam supply and control system. The station is on Lake Ontario, some 20 miles east of the centre of Toronto.

All major reactor components of the first two units of this four-unit station have been installed and nearly all major equipment has been delivered. Fuel for the first charge of Unit One had been delivered and heavy-water delivery began early in April.

The present schedule calls for the Unit One reactor to go critical early in 1971 and that of Unit Two later in the year. Unit Three is expected to come into operation in 1972 and Unit Four a year later.

BRUCE NUCLEAR POWER DEVELOPMENT

This project will comprise a 3,000-megawatt nuclear generating station, an 800-ton-a-year heavy-water production plant, an oil-fired auxiliary steam plant to provide a stand-by steam supply for the heavy-water plant and the existing Douglas Point nuclear-power

SULPHURIC ACID GIANT PLANT

Plans are well advanced to build the largest metallurgical, gas-based, sulphuric-acid plant in the world in the heart of Canada's nickel belt, it was announced recently in a joint statement by The International Nickel Company of Canada, Limited, and Canadian Industries Limited.

The plant is to be entirely financed by INCO at a cost of almost \$20 million. It is being undertaken, coincidentally with expansion of the iron-ore-recovery plant and the construction of a new nickel refinery, to prevent the plant complex becoming a source of air pollution, not only from sulphur dioxide but also from dust. All dust must be removed as a prerequisite to sulphuric acid production.

The sulphuric acid plant is part of an environmental-control program, costing about \$40 million, that is being undertaken by International Nickel in the Sudbury area. In another phase of the program, a 1,250-foot stack, with associated precipitation equipment, is being built in Copper Cliff at a cost of \$15 million.

The plant, which will have a production capacity of 2,300 tons of acid a day, will be an adjunct to CIL's present sulphuric acid complex. The fourth plant in the complex, it will increase production of sulphuric acid from INCO smelter gases at Copper Cliff to a total of 5,000 tons a day.

CIL has started the engineering of the new project, but tenders have not yet been called and no contracts have been awarded. Completion is scheduled for the second half of 1972.

WORLD MARKETS

Markets for the output of the new plant will be largely overseas, and the operation will include a number of strategically-placed distribution depots to be built at additional cost. These will be serviced from Copper Cliff by unit trains. At least one of the depots will be on tide-water, giving year-round access by sea to world markets.

CIL inaugurated in 1967 the first unit-train shuttle service to transport sulphuric acid from the Copper Cliff works, and this service will also be used in connection with the new plant.

SULPHURIC ACID IN CANADA

A pioneer in Canada in the production of sulphuric acid and liquid sulphur dioxide from sulphur-bearing gases, CIL completed its first unit on the INCO site to manufacture acid from this raw material in 1930. Since that time, recovery of sulphur values from INCO's smelter gases has been expanded at an ever-increasing rate.

Manufacture of liquid sulphur dioxide began on the INCO site in 1952. Sulphuric acid operations there were expanded in 1957, 1963, and 1967. The plant that came into production in 1967 with a capacity of 1,400 tons a day was at that time the largest of its kind in the world. In contrast, the new plant will have a daily capacity of 2,300 tons. This steady expansion is the result of collaboration between INCO and CIL and a program of process development and marketing and distribution innovation.

REPAYMENT OF NOTES TO ITALY

Finance Minister E.J. Benson has announced the repayment of the last two blocks of Government of Canada notes issued to the Italian Exchange Office in May 1968, at a time when Canada's official international reserves were depleted. The repayment totals the Italian lira equivalent of approximately \$68.2 million (U.S.); the transaction took place on June 24, 1970. A previous repayment totalling the Italian lira equivalent of about \$32.2 million (U.S.) was made on May 15, when the first block of notes matured.

AUTO TRADE ASSISTANCE

The Automotive Manufacturing Assistance Regulations have been extended for one year to June 30, 1971, it was announced recently by Mr. Jean-Luc Pepin, Minister of Industry, Trade and Commerce.

Mr. Pepin said that the Regulations had established the basis for the Automotive Adjustment Assistance Program. The extension of the Regulations, which were announced in August 1965, was

necessary to the completion of the adjustment process resulting from the new market conditions created by the Canada-United States Agreement on Automotive Products.

The Regulations provide for repayable interest-bearing loans to auto parts and accessories manufacturers; to suppliers of materials, tools and dies; and to manufacturers of specified commercial vehicles and buses who have been affected by the auto agreement and who are unable to obtain financing on reasonable terms to restructure their operations. In addition, they provide for certification of the eligibility of workers laid off by eligible employers as a consequence of the auto agreement to apply for transitional assistance benefits.

The Adjustment Assistance Board, which administers the program, also considers applications for remission of custom duties paid by eligible manufacturers on certain production machinery and equipment which they are unable to obtain from Canadian production in time to meet their commitments for the year.

Since 1965, the Board has authorized 88 loans

amounting to some \$75 million. These are estimated to have increased annual production by \$150 million and to have provided about 3,800 new jobs. During the same period, the Board has recommended remission of custom duties of about \$10 million and has certified that 8,600 workers were eligible to apply for transitional assistance benefits.

Mr. Pepin explained that the adjustment-assistance loan program is not available to the manufacturers of passenger vehicles or to their wholly-owned or controlled subsidiaries.

NEW NATIVE BOOK

Trapping Is My Life, one of the most important books to come out of the North, by the late John Tetso, a Slavy Indian, has been presented to the National Library by Mr. Jean Chrétien, Minister of Indian Affairs and Northern Development.

The book, which was released on June 23, the official one-hundredth birthday of the Northwest Territories, is a collection of short stories that Tetso contributed to the mission bulletin *Catholic Voice*. They were gathered into one volume by the Oblate Fathers, with whose assistance Mrs. Jane Tetso, widow of the author, presented them to Bud Orange, Member of Parliament for the Northwest Territories. With the help of Mrs. David Molson of Montreal, the book was published by Peter Martin of Toronto. It is illustrated by Lorne H. Bouchard, RCA.

OLIVER MOWAT STAMP

The Canada Post Office will honour Sir Oliver Mowat, one of the Fathers of Confederation, with the issue on August 12 of a six-cent commemorative stamp marking the one-hundred-and-fiftieth anniversary of his birth at Kingston, Ontario in 1820.



As a delegate from Upper Canada, Sir Oliver Mowat was one of the 33 Fathers of Confederation who attended the Quebec Conference of 1864 to discuss the feasibility of a political union of British North America. He began his career as a lawyer in Upper Canada (now Ontario) in 1841. Entering politics in 1857, he was elected as a Liberal member to the Legislative Assembly of Canada, where he served as provincial secretary in the Brown-Dorion administration of 1858 and as postmaster general in the

Macdonald-Dorion Government of 1863-1864 and in the Great Coalition of 1864. In November of that year, he was raised to the bench as vice-chancellor of Upper Canada.

In 1872, Mowat succeeded Edward Blake as leader of the Liberal Party and became Premier and Attorney-General of Ontario, an office he held for 24 years until his appointment in 1896 to the Senate, where he became the government leader. The following year, Mowat retired to accept the appointment as Lieutenant-Governor of Ontario, a position he held until his death in 1903.

The Sir Oliver Mowat issue, in red and black, was designed by Ernst Roch of Montreal. The stamp measures 40 mm. by 24 mm.

MILK TO NIGERIA

Canada recently sent 3,000 tons of skim-milk powder to Nigeria. The powder will be distributed by the National Rehabilitation Commission, which is assuming responsibility for relief and reconstruction work as the Nigerian Red Cross phases out its emergency services. The full cost of \$900,000, including transportation charges, will be met from food-aid allocations of the Development Agency.

Nigerians have benefited from medical services and food aid distributed throughout the war-affected areas during the past four months. Canadian Government aid for relief operations, from the beginning of the conflict to the present, totals about \$6,200,000, and includes four emergency hospitals, food, medications, medical supplies, trucks and cash contributions.

It is expected that future Canadian economic assistance will be directed towards projects connected with Nigeria's development program.

HEALTH-CARE COSTS

Four developments in a continuing program to implement cost-cutting recommendations contained in the report of the task forces on the cost of health services in Canada have been announced by National Health and Welfare Minister John Munro.

The developments are contained in a progress report prepared by the steering committee composed of members of the Secretariat that guided the efforts of the task force investigation.

The steering committee has recommended the establishment of a sub-committee, which should include representatives of the health professions and the consumer public. The sub-committee would advise the committee on the implementation of some of the recommendations concerning timing, economic impact and other factors.

In preparing the report, the steering committee studied a number of briefs and recommendations from interested parties and established a program that includes: setting up some 60 target areas to achieve impact within the health-care system; a time-schedule

for impact; benefits from impact; reports on areas where impact has taken place; starting development of specific reports on danger areas in costs; and federal allocation of resources to meet objectives.

The progress report also covers implementations and changes made to date. Some information has been obtained on the changes relative to health-care costs.

CHANGES ALREADY MADE

In reviewing the implementations and changes that have taken place, the committee has noted that the development of community health-planning is proceeding and the use of allied health professionals in the practice has been undertaken. Other observations of the committee include: increased development and use of incentive programs; meetings with the medical profession concerning the economic impact of their decisions; structured review by the provinces of utilization rates and lengths of stay; implementation of regional planning ideas; acceleration of group purchasing (drugs and supplies); increased use of patient-care classification in concert with other consultative services; the organization of regional groups to improve co-ordination and grouping of purchasing and services to reduce costs.

OLD BUILDINGS INVENTORIED

The Canadian Inventory of Historic Buildings, a ten-year, computer-based, screening program to survey, analyse and categorize 100,000 buildings built before 1880 in Eastern Canada and before 1914 in Western Canada will start this summer.

It is believed that the inventory is the first of its kind in the world in that it is coded for computer-processing, and at the same time establishes objective criteria for style classification.

The inventory, consisting of three phases, will begin with a survey to produce a broad view of Canada's whole architectural heritage. The first phase will record the exteriors of 100,000 buildings over five years; by its completion seven million items of information will have been processed. The second phase will study the interiors and architectural details of 10,000 buildings chosen as a result of the first study and, by the end of the third phase, this number will be further reduced to a few thousand. Documentary research will verify the antiquity of these buildings.

This month, survey teams from a field staff will visit all provinces on the first phase of the inventory. Their attention will be on those areas threatened with demolition or neglect.

SIMPLIFIED SYSTEM

The basis of the Canadian Inventory of Historic Buildings is a new vocabulary of critical building elements on a simplified inventory recording form. With the new form, laymen working under team captains are able to do the field survey and team cap-

tains themselves require only routine training. The need for a large *cadre* of trained architects and architectural historians in the early stages is thus overcome; their knowledge will be used instead to evaluate the data obtained and interpret results.

When completed, relevant sections of the inventory will be sent to the provinces. As an information bank, the inventory will be a valuable resource for architectural historians, sociologists, urban renewal planners, geographers, economists, art students and other interested groups or individuals, and will be available through the Public Archives of Canada.

TEACHERS BRIEFED ON JOBS ABROAD

One hundred and fifty-six English-speaking secondary-school and post-secondary-school teachers met in Ottawa this month for a briefing to prepare them for assignments in the developing world.

These men and women have been chosen from communities across Canada by the Canadian International Development Agency with the co-operation of provincial departments of education. They will serve in the Caribbean, Asia and Africa as part of Canada's expanding program of technical assistance to developing countries.

The briefing course was to prepare the teachers for the problems awaiting them in countries whose social patterns, climates and living conditions differed from those of Canada. Representatives of various developing countries were present during the two-week course, providing an opportunity for the teachers to become acquainted with the views of persons from the countries to which they had been assigned. Canadians who had just returned from a CIDA assignment were also present to give the teachers the advantage of their experience. There were also briefings on subjects such as preventive tropical medicine and hygiene, domestic living conditions, care of children under tropical conditions and special problems faced by expatriate wives.

INSTITUTE OF GUIDED GROUND TRANSPORT

The Minister of Transport announced recently that the Federal Government was collaborating with Canadian National Railways, the Canadian Pacific Railway and Queen's University, Kingston, Ontario, to establish a Canadian Institute of Guided Ground Transport in Kingston. One of the principal purposes of the Institute will be to provide a focus for research studies that are relevant both to the railways and to new forms of guided ground transport, such as the tracked air-cushion vehicle.

The Institute will be established initially with the aid of three annual grants of \$100,000 — from the CN, the CP and the Federal Government. The University will make buildings and experimental facilities available, and will also release academic

staff to support the work of the Institute. Where appropriate, research emphasis will be on a multi-discipline approach to research problems, and it will, therefore, take advantage of the wide range of academic resources available at Queen's. These resources will be supplemented by the professional "know-how" available in government and railway laboratories and, where appropriate, professional staff will be seconded from these laboratories for periods of detached duty in Kingston.

The Minister drew attention to the fact that by establishing the Institute in collaboration with Queen's University it should be possible to attract young researchers and hence increase the flow of trained staff available for the transport industry. He emphasized that the research work to be undertaken by the Institute would be available and relevant to all sectors of the industry, both operating and manufacturing, and that, where appropriate, the Institute will be free to undertake contract research.

CANADA'S ATOMIC TECHNOLOGY FLOURISHES (Continued from P. 2)

station. Until the Bruce generating station is in operation, Douglas Point will serve as a steam supply for the heavy-water plant as well as for power generation.

Significant progress was made in the construction of the heavy-water plant and the design of the Bruce generating station.

Work on the heavy-water plant site started early in 1969 and by March 1970 the first-stage towers of Unit One had reached their full height. Tower construction for Unit Two and installation of piping will constitute a considerable part of the effort during 1970.

The Bruce generating station, to be built by Ontario Hydro, will be one of the world's largest nuclear-power plants. AECL is designing the nuclear steam-supply system and its central controls for Ontario Hydro. This work is being done both at Sheridan Park and Peterborough.

NUCLEAR POWER DEMONSTRATION

The NPD reactor continued to operate in the boiling heavy-water mode and has now achieved all the major objectives of the conversion from pressurized heavy-water coolant.

A boiler-tube failure in June was detected, located and repaired and has provided valuable experience for future maintenance of CANDU reactors.

A contract to supply replacement fuelling machines for NPD was completed by a private company. The machines are computer-controlled to simplify fuel handling. They also are equipped with positive mechanical drives to all components; exact positions of moving components can be easily detected and machine maintenance is reduced. The first fuelling with the new machines with the reactor at power was carried out in November; they performed well both then and in subsequent operations. From November

1963, when on-power refuelling was first accomplished, to the end of March 1970, 1,184 channels had been fuelled with the NPD reactor at power.

While its main functions were to serve as an engineering test reactor for AECL and a training facility for Ontario Hydro, NPD also produced a sizable amount of power - 94,977,000 kilowatt hours - during the year.

After preparation at CRNL, two shipments of irradiated NPD fuel, totalling 719 bundles, were shipped to Mol, Belgium, for recovery of plutonium for the French Commissariat à l'Énergie Atomique.

RAJASTHAN ATOMIC POWER PROJECT

The schedule for India's first CANDU station calls for operation of Unit One in 1972, with the second unit starting up in 1974. A second station, known as the Madras Atomic Power Project, has been committed by the Indian Department of Atomic Energy. This will employ the CANDU idea, but will be designed in India.

The Rajasthan project is being financed partly by standard-type loans from Canada's Export Development Corporation. These loans, totalling \$83 million, cover non-Indian content of the project and carry the requirement that 80 per cent be spent in Canada. The Indian Department of Atomic Energy is building the plant, with Montreal Engineering Company Limited as consultant for the conventional part of the station. AECL is designing the nuclear portion, which is based on the Douglas Point station.

Installation of equipment for the first RAPP unit is virtually complete. The team from Ontario Hydro that will assist the DAE in commissioning Unit One has begun to arrive on site. The team is being supplied under a sub-contract with AECL.

Training of the Indian staff in Canada, which was an important part of the project, has been completed. The six-year program, carried out under the auspices of the Canadian International Development Agency, involved the training of more than 110 Indians in power-plant design and operation, as well as industrial techniques.

MARKETING OF NUCLEAR POWER

The past year was AECL's first complete year in the nuclear-power marketing field. It was an active one, highlighted by the signing of a contract with the Republic of China for a research reactor to be built in Taiwan. The value of the Canadian content of this \$35-million project is approximately \$28 million.

Negotiations continued with Romania for the sale of a nuclear steam-supply system and a decision is expected soon.

Requests for preliminary tendering information were received from Brazil, Chile, Mexico, Australia and Thailand. By both Mexico and Australia AECL was invited to submit firm-price tenders for the nuclear steam-supply system. A bid has been submitted to Mexico for a 600-megawatt nuclear plant and a bid to Australia for a 500-megawatt unit is being prepared.

MONTHLY INDEX

(July 1970, Volume 25)

- Arts (*see also* Grants and Awards)
 - Eskimo art exhibition, No. 27, P. 4
 - Music pavilion at Man and His World, No. 29, P. 4
 - New native book, No. 30, P. 4
- Aviation
 - Airfields in the Arctic, No. 28, P. 4
- Births *see* Vital Statistics
- Commerce *see* Trade
- Communications
 - Multicom service, No. 27, P. 5
- Construction
 - Canadian housing in France, No. 28, P. 3
 - External Affairs' new building, No. 29, P. 5
 - Inventory of historical buildings, No. 30, P. 5
- Cost of Living
 - Retail monitoring system, No. 29, P. 1
- Culture (*see also* Arts)
 - France-Canada Joint Commission, No. 29, P. 2
- Czechoslovakia *see* Health and Welfare
- Deaths *see* Vital Statistics
- Economy *see* Cost of Living *and* Trade
- Education (*see also* External Aid)
 - Flying professors, No. 26, P. 5
 - International conference, No. 28, P. 3
 - University salaries, No. 26, P. 6
- Eskimos *see* Arts *and* Indians and Eskimos
- Exhibitions (*see also* Arts)
 - Overpopulation pavilion at Man and His World, No. 26, P. 4
 - Sports at Man and His World, No. 28, P. 6
- External Affairs (*see also* Construction, North Atlantic Treaty Organization *and* Tunisia)
 - Diplomatic appointments, No. 29, P. 6
 - Foreign policy papers tabled by Mr. Sharp, No. 27, P. 1
- External Aid
 - Fiji university, No. 26, P. 4
 - Milk to Nigeria, No. 30, P. 4
 - Peru earthquake victims, No. 27, P. 3
 - Teachers briefed for overseas jobs, No. 30, P. 5
 - Water supply in Jamaica, No. 28, P. 6
- Finance
 - Repayment of notes to Italy, No. 30, P. 3
- Forestry
 - April forest fires, No. 28, P. 2
- France *see* Construction *and* Culture
- Germany *see* Trade
- Grants and Awards
 - Inventors' pins, No. 26, P. 3
 - Labour film wins prize, No. 27, P. 6
 - Machine maintenance award, No. 29, P. 2
- Health and Welfare
 - Czechoslovak dentists, No. 29, P. 6
 - Health-care costs, No. 30, P. 4
- History *see* Construction
- Housing *see* Construction
- Indians and Eskimos (*see also* Arts)
 - Aid to Indian business, No. 27, P. 3
- Industry (*see also* Indians and Eskimos)
 - Assistance to auto industry, No. 30, P. 3
 - New "perma-stamp", No. 26, P. 5
 - Sulphuric acid plant, No. 30, P. 3
- Italy *see* Finance
- Labour *see* Grants and Awards
- Marriages *see* Vital Statistics
- Museums
 - Famous old helicopter to, No. 27, P. 6
- National Defence (*see also* Science)
 - Famed regiments disbanded, No. 28, P. 5
- Natural Resources *see* Wildlife
- Northern Affairs *see* Aviation
- North Atlantic Treaty Organization
 - Mr. Sharp reports on ministerial meeting, meeting, No. 26, P. 1
- Nuclear Energy
 - Canada's atomic technology, No. 30, P. 1
 - New reactor, No. 26, P. 3
- Pollution
 - Canada-U.S. ministerial meeting on Great Lakes pollution, No. 28, P. 4
- Post Office
 - Oliver Mowat Stamp, No. 30, P. 4
- Publications *see* Arts
- Puerto Rico *see* Trade
- Science
 - Four-nation TNT test, No. 29, P. 3
- Sharp, Mitchell *see* External Affairs *and* North Atlantic Treaty Organization

Shipping see Transportation

Trade

- Hogs to Germany, No. 28, P. 2
- New car sales, No. 26, P. 6
- Prairie distribution centre, No. 28, P. 3
- Protection for exporters, No. 26, P. 2
- Puerto Rico telecommunications sale, No. 27, P. 6
- Trade balance, No. 26, P. 6

Transportation (see also Aviation and Museums)

- Canada-U.S. study, No. 29, P. 4
- Institute of Guided Ground Transport, No. 30, P. 5
- Mr. Trudeau opens Vancouver port extension, No. 27, P. 3

Trudeau, Pierre Elliott see Transportation

Tunisia

Canada-Tunisia Joint Commission, No. 26, P. 5

Unemployment Insurance

Changes in Act, No. 28, P. 1

United States see Pollution

Visits and Visitors

Prince Charles in Ottawa, No. 29, P. 3

Vital Statistics

Births, marriages, deaths, No. 27, P. 6

Wildlife

New Ontario centre, No. 28, P. 2

Corrigendum

Please amend the figure "1,080" to read "1,080,000" in the second paragraph of the article entitled "External Affairs' New Home", which appeared in CWB, Vol. 25, No. 29, dated July 22, 1970, P. 5.