

Built \$60 Million Warsak Dam Angus Robertson Selected For York Central Hospital Structure

Construction of the York Central Hospital has now begun. Awarded the million and a half dollar contract was the Angus Robertson Company of Toronto and Montreal, one of the largest construction firms in Canada and known throughout the world for its building of the Warsak Hydro-Electric and Irrigation Project in West Pakistan as part of Canada's contribution to the Colombo plan.

The original foundations of the company can be traced back three generations, to a rugged young Scots immigrant who arrived in Canada in 1851. At the age of 22, this immigrant, A. Myles Robertson, began his career in the construction business, first as a stonemason at Bathurst, New Brunswick, then as foreman on the building of the second Welland Canal at Thorold, Ontario.

From there he went to Cleveland and Murray, American contractors, and took charge of the stone work on the Cardinal Canal. For the balance of his life he worked as masonry superintendent for the company. He died Feb. 10, 1893, following an accident while building a quarry.

At the age of 18, Angus W. Robertson, A. M. Robertson's son, took over the work of his father and in 1896 went into partnership with Hugh Quinlan, forming the forerunner of Angus Robertson Limited. The firm gradually expanded from masonry work to general contracting, the major part of this being the replacement of bridges, weirs, and development of a concrete lining placed under water to protect the banks of the Lachine and Soulanges Canals.

From 1900 to 1930, the company under various names, carried out important contract work in many different parts of Canada and took an active part in Canada's development following World War I.

After 1925, various subsidiary companies were formed, the principal of these being Rayner Construction Limited, a wholly owned subsidiary which built among other major construction projects, the five-mile water tunnel under the City of Toronto.

Angus Robertson Limited was incorporated in 1930 and is both a holding and operating company. Angus Robertson remained its president until his death in 1947, when his son, Donald V. Robertson, was elected to head the company.

The firm has built some of the largest bridges, harbor installations, industrial and office buildings, and defence projects in Canada. It is also the only Canadian company to have been awarded a major dam building

A Richmond Hill resident, Maurice J. Wicks, was general superintendent in charge of field operations on the multi-million dollar Warsak Dam project in West Pakistan.

At the peak of construction he had 10,000 Pakistanis tribesmen under his direction, working in temperatures that sometimes reached 130 degrees. It took five years to complete the giant power and irrigation dam, built as part of Canada's contribution to the Colombo Plan for underdeveloped countries.

History of the Company, description of the dam and construction problems encountered, along with the habits of the Pakistanis laborers are told in the first of two parts of this fabulous construction feat by Angus Robertson Limited.

contract overseas, when it built the Warsak Dam in Pakistan.

Besides the Warsak Dam, the company has built the Lord Simcoe Hotel in Toronto; Iroquois Lock on the St. Lawrence Seaway; St. Joseph's High School, Toronto; Confederation Life Building, Toronto; parts of the Yonge Street subway; Shand Control Dam; Postal Terminal Building, Ottawa; Humber River Bridge on Highway 401; Ashbridge's Bay Sewage Disposal Plant, Toronto; Pilkington Glass Ltd., plant, Toronto; head office of the Toronto Hydro-Electric System and airport facilities in many sections of Canada.

Largest Ever

The 60-million dollar Warsak Dam was the largest single project ever undertaken by the company and took almost six years to complete. General superintendent in charge of field operations was a Richmond Hill man, Maurice J. Wicks of 104 Laverock Road, who spent five years and eight months in Pakistan. At the peak period of construction he had 10,000 Pakistani laborers under his direction.

It all started when the federal government decided in 1955 that their major contribution to the Colombo Plan would be the Warsak multi-purpose development. Previous investigation had established the need for low cost electrical power in the area to aid in the setting up of industries and deep well pumping for land improvement, as well as for additional irrigation of the nearby plain.

The Warsak development could make a major contribution to these requirements, and in the course of construction a great many Pakistanis could be trained in modern construction methods and later continue to develop their own country. Negotiations were carried out between the governments of Pakistan and Canada to formulate the contribution that each would make.

In general it was agreed that Canada would pay the cost of supervisors, technicians, material and equipment that had to be brought into the country.

Pakistan paid all rupee costs

of labor, for such materials as could be produced in the country, electrical power and fuel during construction, and for housing and accommodation. The latter costs were paid from counterpart funds from the sale of wheat donated by Canada.

Warsak is located 18 miles from Peshawar, near the famed Khyber Pass, where the Kabul River leaves a deep narrow gorge in the Hindu Kush range to flow across the plain to join the Indus River. The general ground level of the surrounding plain is 1,100 feet above sea level.

Climate of the region is subtropical, with temperatures ranging from the thirties in winter to as high as 130 degrees in summer. Rainfall is light, about 16 inches a year, and the immediate area is little affected by the Monsoons.

The Kabul River has its source in the mountains of Afghanistan, with little storage, and flow ranges from a recorded minimum of 4,180 CFS to a maximum of 225,000 CFS. Fortunately, the period of low flow corresponds to the best weather for working, and although the work was carried on throughout the year, it was possible to concentrate on the river bottom during the months of September to April.

Permanent work completed consists of a gravity type dam 650 feet long and 270 feet high, comprising an overflow section 440 feet long controlled by nine 40-foot-wide tainter gates between 10-foot-wide piers. A bulkhead extends into the sides of the gorge at each end.

Below the dam is a stilling basin designed to dissipate the energy of the water during periods of overflow. A power tunnel in the south bank of the river, 39 feet in diameter, concrete lined and 700 feet long, leads the water to a manifold from which six, 18-foot diameter steel lined penstock tunnels take the water to the turbines.

The power house is built into the wall of the gorge and the water discharges into a tailrace channel with an outlet just below the stilling basin. Six, 55,000 hp. units supply the power. Auxiliary power is supplied by two 750 KVA house units fed by one six foot in diameter penstock tunnel.

An irrigation tunnel three and a half miles long and 10 feet in diameter, inside the concrete lining leads water to a nearby portion of the arid plain to irrigate 100,000 acres of land.

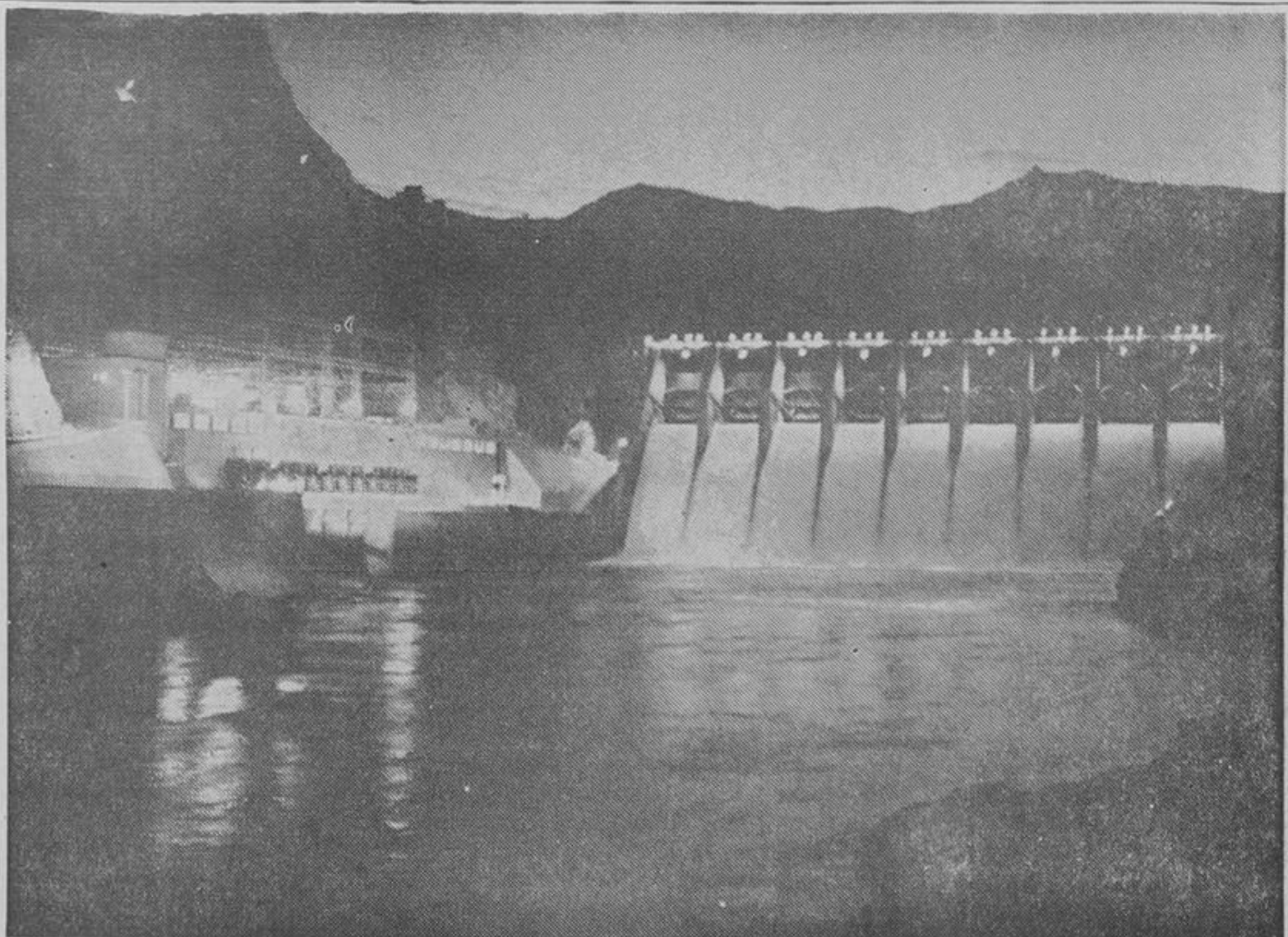
While building the permanent dam, temporary diversion was achieved by means of a 35-foot in diameter concrete lined tunnel, 1,700 feet long in the north bank of the river which bypasses the cofferdams. Capacity of this tunnel was approximately 30,000 CFS with water at the level of the upstream cofferdam, thereby providing diversion for about six to seven months each year.

Equipment and supplies for the giant project were brought in by rail about 1,000 miles from Karachi, the main seaport, to Jamrud Fort, the Pakistan entrance to the famous Khyber Pass. A 15-mile hard top road was built from there to the dam site, on which all equipment and material had to be trucked.

The nearest airport was 19 miles away at Peshawar, an ancient city with a population of nearly half a million. Pakistan Government Airlines flies from Karachi to Peshawar four or five times a week, via Lahore and Rawalpindi, carrying air freight and passengers.

Between Peshawar and Lahore the road is fairly good by our standards, but from Lahore to Karachi road travel is difficult and train service between Peshawar and Karachi is extremely poor. Telephone, telegraph and air mail services to Karachi are only fair.

Shipments of material or supplies from Montreal, New York



A night view of the Warsak Hydro-Electric Dam in West Pakistan, built by Angus Robertson Limited for the Canadian government. The plant, and the 750-foot-long, 27-foot-high, dam will generate 214,500 horsepower of electricity with an ultimate power output of 322,000 horsepower. It will provide water through a three and a half mile irrigation tunnel for more than 100,000 acres of parched land. Over three-quarter million cubic yards of concrete was used on the building of the dam.

or St. John took from 30 to 35 days to reach Karachi, with a ship leaving about once a month. Transfer at Karachi to railroad cars, passage through customs, and inland freight to Jamrud Fort averaged nearly three weeks.

From the time an article was requisitioned at the site until delivery could be expected took nearly three months, provided there was no particular delay by the manufacturer. Air freight was used very sparingly due to the cost involved and only careful planning by the company kept this expense down to about \$40,000 over a five-year period. Supplies by air took about six days from Canada.

Most of the ordinary materials required for construction were in short supply in Pakistan and local purchases were of small volume. Although most foodstuffs were available, a lot of them were of indifferent quality by Canadian standards, and a considerable quantity of the food was imported. Approximately half of the diet of Canadian personnel was from local sources.

Sand and gravel deposits for concrete were found within a few miles of the dam, close to the Kabul River. Processing plants were designed to suit conditions, and all aggregates were obtained from crushing, screening and washing.

Cement was obtained from a plant at Wah, some 90 miles away by rail. A consistently good grade of Portland cement was maintained, and during the busy period as much as 19,000 tons per month was delivered, mostly in bulk, in specially built freight cars.

Earlier Project

Production from the Maple Leaf Cement plant at Daud Kehl, an earlier Canadian Colombo Plan project, made it possible for the Wah plant to deliver Warsak's requirements without seriously disrupting supplies to other users.

Local accommodations had to be constructed for Pakistanis as well as Canadians. Married quarters were built for Canadians who brought their families and for the senior Pakistani staff. Bachelor quarters and single men's mess were also constructed and Pakistanis were quartered in multiple unit barracks.

As timber was in short supply in the country, all buildings were constructed of masonry bricklaying being a well-known trade among local inhabitants. Mud bricks or Kacha bricks are widely used in Pakistan, but require some maintenance in the wet weather. Burnt bricks were also available, though much more expensive and were mostly used for permanent homes.

Temporary accommodation was a difficult problem, very little being available, and resulted in the build-up of the Canadian staff being considerably delayed during the first eight months. The company discarded the idea of erecting imported prefabricated houses due to the excessive costs.

Following considerable study by the company, it decided to supply air-conditioning for the offices, hospital and quarters occupied by the Canadian staff. The houses and bachelor quarters had one unit for each bedroom. Without air-conditioning, sleep was almost impossible during the summer months due to the high temperatures.

Hospital and medical facilities were generally lacking in the country, and it was necessary to establish them based on Canadian standards. A 50-bed

hospital was built, and staffed by two Canadian doctors and three nurses, as well as a number of Pakistani doctors, nurses and orderlies.

It was fully equipped, and its main purpose was to treat job accidents and sickness among the employees and their families. Actually, many patients from other than the Warsak job were treated, which was greatly appreciated by the Pakistanis.

A good deal of trouble was experienced in making up the construction schedule, with little knowledge of conditions to be encountered. The Canadian government was anxious to make a quick start once the decision to proceed had been taken. Likewise, the Pakistani authorities seemed to want to get ahead rapidly, though understandably without full knowledge of what was involved.

Preliminary visits to the site revealed sufficient power was not available from the local network; construction of accommodation was proceeding slowly; the supply of skilled or semi-skilled men was very limited; and very few foremen could be found.

Although it had been hoped the work could be carried out with only about 40 Canadians, it was soon realized that more than double that number would be required. At peak of construction, 150 company engineers and skilled construction personnel made up the Canadian contingent.

All of these factors made planning difficult, and cost estimating particularly so. Another factor about which little was known was the output of labor, and here some rather vague assumptions had to be made. Knowledge of labor costs or the number of men required to do a certain job on similar work in Canada was of little value.

Although the company was not expected to make a very close estimate of Pakistani costs, which as previously stated covered all labor costs except supervision, it was important to estimate the output and operating efficiency of construction equipment, all of which is closely linked with labor efficiency.

The important requirement of training as many Pakistanis as possible also affected labor costs considerably. It meant that there would always be a rather high percentage of only partially productive apprentices, a condition that persisted throughout the entire job.

This had considerable bearing on equipment output, as it resulted in excessive mechanical breakdowns due to continual operation by inexperienced men. The rate of progress eventually attained in the diversion tunnel is an example of the company's training program. During the last month of this work, the tunnel advanced 18 feet a day, in rock that required continual arch support. This was a very creditable performance from a labor force that had never worked on a project requiring this type of work.

First Overseas

Angus Robertson had not previously worked abroad. Very few of the men sent to Warsak had ever been in the East, and most of them had not been off the North American continent. The government requirement that all employees from Canada should be Canadians was adhered to, and care was taken when approving men to choose only those who might be expected to make a favorable impression.

In addition, in the case of married men, whenever possible

their wives were also interviewed to ascertain whether they were really willing to go, and if they could be expected to fit in well to their new environment.

Every effort was made to explain the living and working conditions to be expected. By the nature of its work, the company had a small proportion of permanent employees available, and it was necessary to recruit a number of men not in the employ of the firm, though many of them had previously worked for it at one time or another.

Excellent results were achieved by the careful checking as mentioned above. It is interesting to note that of the total number of Canadians who returned home, approximately half was during the first year of operations when living conditions left much to be desired; and when the company was gaining experience in the type of men who could be expected to fit in and work well on a foreign job and in the climatic and other conditions prevailing at Warsak.

An early decision was made to establish working conditions for Canadians reasonably similar to those which they were accustomed to at home, and to take married men and their families when experience and suitability indicated. The results showed that this decision was justified.

A school was established with Canadian teachers to take pupils up to and including Grade 8, on the general standard of Ontario public schools. Special arrangements had to be made by the parents for children above eighth grade.

Full attention was given to recreation facilities. A building was constructed for movies and dances; swimming pool, tennis courts, bowling alleys and billiard tables followed. A commissary was established to sell Canadian staple foods.

According to Mr. Wicks, the Pakistani staff were encouraged to partake in all of these activities, and some of them became quite proficient in bowl-

ing and tennis.

All Canadian employees were engaged under contract for a two-year period, plus or minus three months at the discretion of the company. Basic salary was approximately one-third higher than an equivalent salary in Canada. A further sum of 15 per cent of the basic salary was set aside as an incentive bonus, payable only after successful completion of the employment contract.

Three weeks annual leave was granted the Canadian personnel, as well as one day for every 15 days of completed contract was allowed for home leave. Transportation both ways was paid by the company for the employee and his family on the basis of first class fare.

The company felt that these terms were sufficient to attract good men, though at times certain classifications were difficult to find, particularly during 1957.

During 1955-56-57, there was relatively full employment in the construction industry in Canada, and the Canadians who went to Warsak all left good jobs, friends, homes and associations, to travel almost half way round the world to live and work with people of a different race, language, and culture. And with whom, superficially, they had little in common.

Furthermore, they were subjected to a climate which for five months of the year is excessively hot compared to Canada.

The tribesmen, from whom the great bulk of the labor force was drawn are Pathans, people who have never really known law and order as we know it. They live in what we would describe as almost abject poverty, and their very livelihood depends on the small amount of moisture which falls to yield a crop sufficient for themselves and their animals. A slight reduction in precipitation results in a poor crop and means near starvation for many.

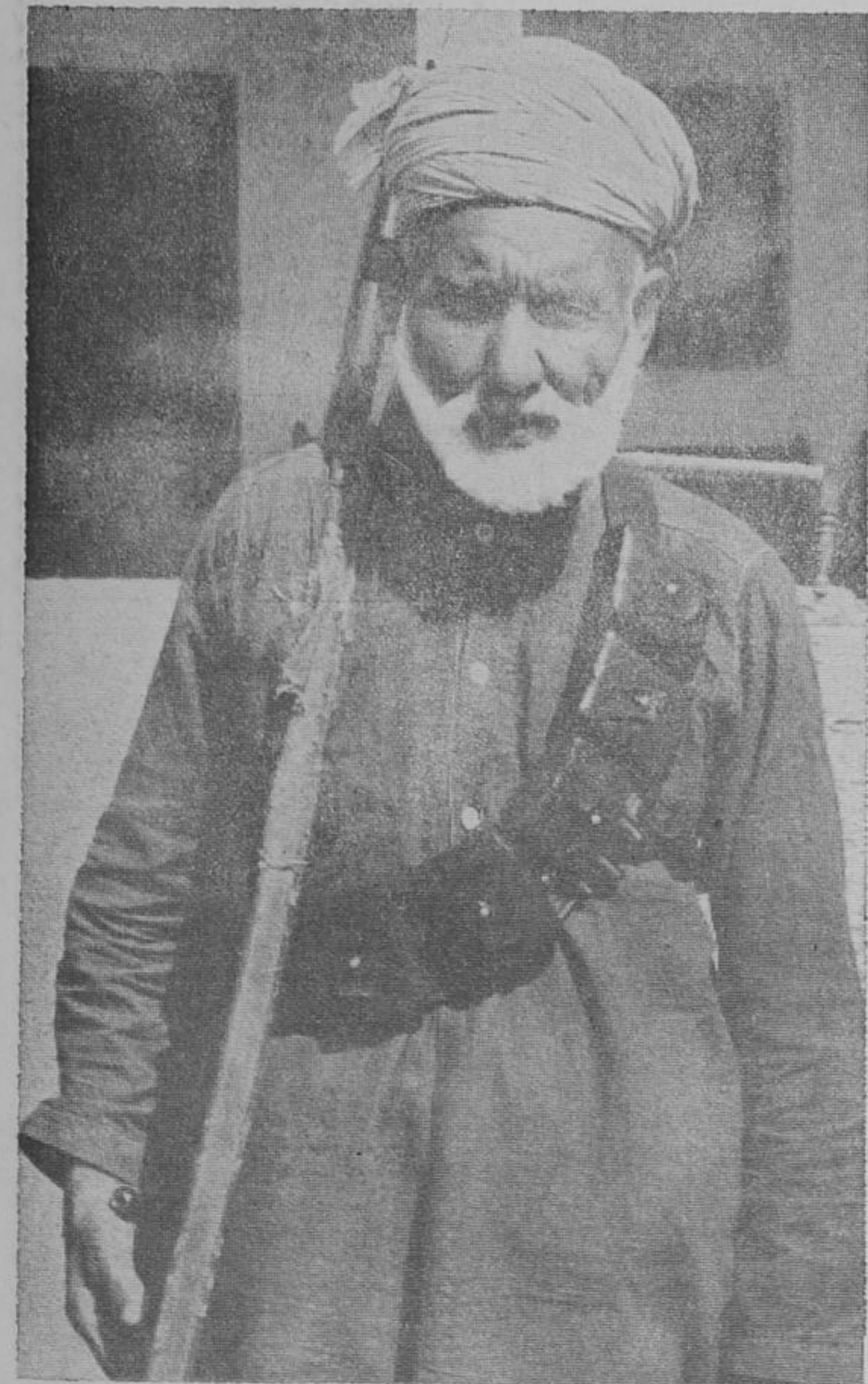
Their Benefit

Patient explanation by the Pakistanis in authority gradually convinced the tribesmen in the vicinity that the completion of the Warsak Dam would bring permanent benefit to them, and an opportunity for gainful employment as well as the acquisition of a trade in the meantime. But this took time, and many frustrations were encountered, particularly during the first six months when the Canadians sometimes wondered if they would ever be able to build up an efficient working force. As will be seen later, such a working force was achieved.

The method of labor recruitment was worked through the Malik, who is the political chief of a village. He is the one who receives and dispenses the government grant, and who administers justice of a kind. The laborer pays a small portion of his wages, either directly or through the company to the Malik.

There was seldom any lack of numbers, but, especially at first, it was difficult to know how many of any particular gang might turn up for work on a given day. Gradually, however, as the tribesmen seemed to achieve a certain sense of responsibility towards their work, they became aware of the opportunities for advancement, and the percentage of absentees declined to less than eight per cent.

(Continued on Page 9)



AN ARMED TRIBESMAN EMPLOYED AS A GUARD



MR. WICKS (left) WITH HEAD TRIBAL CHIEF