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Water Supply of an Army Division in Palestine

Construction of Pipe Line from Ain Zerka and Wadi Reiya Springs—Chursa and Chaine-Helice Methods of "Pumping" from Wells—Experiences of a Canadian Engineer with Queen Victoria's Own Sappers and Miners

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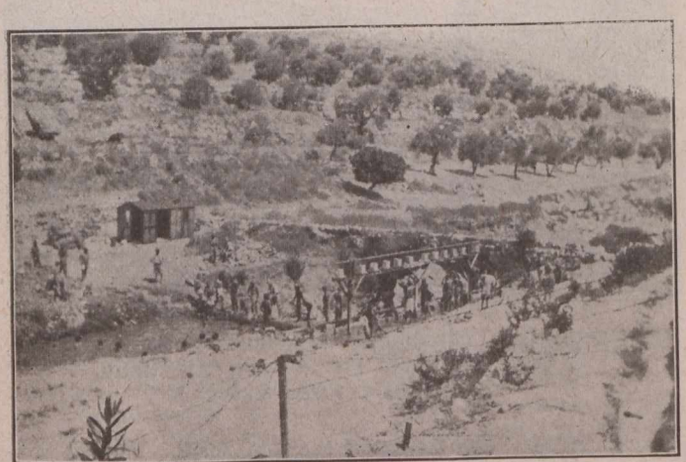
AFTER the capture of Jerusalem by General Allenby's forces, December 9th, 1917, a condition of stationary warfare was taken up in order to allow the lines of communication to be brought forward; moreover, the winter months in Palestine are unsuitable for active operations on account of the heavy rains, which, combined with the nature of the soil, make almost impossible the movement of troops and supplies. During these months, both the troops on the plain and the troops in the hills had a sufficient water supply. The deep wells of the villages of the plains then yielded a good supply, and in the hills there were innumerable cisterns in the rock in or near the villages and usually near the top of some weather-worn rocky hill.

As this article is to deal more with the history of the water supply of a division occupying a portion of the front line in the Judean Hills, we shall dismiss the problems of water supply on the plains by saying that it consisted mostly of improving existing wells and providing storage tanks, so that pumping could be as continuous as the yield of the well would permit.

One of the duties of the engineer field companies—when the line extending from the Mediterranean, a few miles north

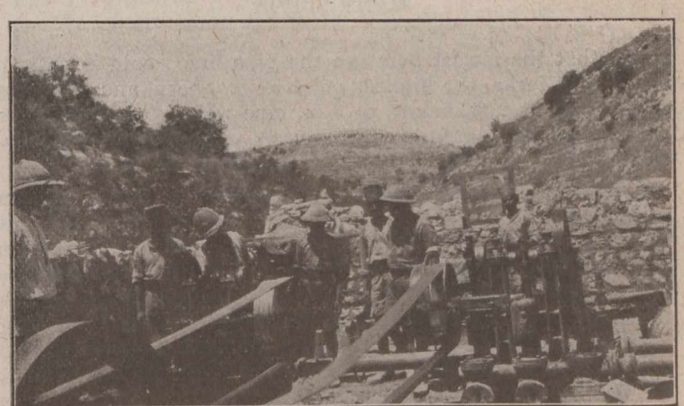


PLUNGE POOL AND SHOWER BATHS, WADI REIYA

of Jaffa, to north and east of Jerusalem, was taken up—was to search for, to measure the contents of, to give an identification number to and to report on all the cisterns from which the troops in the area could obtain water.

The water in these various cisterns would then be tested and, according to its suitability, would be alloted for troops, for animals or for washing. This cistern water was merely drainage off the rock surface near at hand, so its purity varied with the cleanliness of the area.

Pumps and troughs would be installed, the equipment being moved to another cistern when the one in use was emptied. Many of the villages depended on these cisterns for their supply, and of course, the presence of large numbers of soldiers did not enhance the villagers' chance of having water in the coming dry months. However, it was hoped that before the summer months the army would have advanced far beyond this region. According to maps and what information could be collected from natives, the water supply farther north was considerably better, occasional



PUMPS AT AIN ZERKA—WALL OF PUMP HOUSE PARTIALLY BUILT

large springs being shown on the old "one-inch-to-the-mile" maps made in 1878 by Lieut. C. R. Conder, R.E., and Lieut. H. H. Kitchener, R.E. (late Lord Kitchener). These maps were the ones in use by the force until the territory was captured, when new contoured maps were prepared by the survey companies of the Royal Engineers.

Two of these springs, Ain Zerka and a group in Wadi Reiya, were reconnoitered and measured by the writer, and each was found to yield about 30,000 gallons per hour, so it was important that we should at least secure these supplies.

In March, 1918, the division which was then on the right of the army corps on the coastal plain, commenced some forward movements which it was thought would later de-develop into something far more important than a mere straightening of the line. However, after a series of advances ending in two days' very severe fighting (April 9th and 10th) in which our objectives were denied to us by the enemy, orders were received to take up a defensive line.

These movements had given the division possession of several springs, the largest of which were Ain Zerka and the group of springs in Wadi Reiya. For a time all efforts were devoted to wiring in and strengthening a defensive line,

and during this time water was obtained mainly from cisterns, as before. But the animals were dependent on only one well, which was so crowded before we installed a petrol-driven pump and storage, that it required sometimes a whole day to make the trip to water the transport animals. Then the well very suddenly ceased to yield at its former rate, and it was foreseen that before long all these smaller supplies would be exhausted, so it was decided that we should turn to the large springs. Moreover, it was important that the cisterns should be sealed up to prevent the breeding of malarial mosquitoes.

Accordingly, it was decided to utilize Ain Zerka as a supply for practically the whole division, the water to be delivered to the high ground in the rear areas where the transport lines were situated. Levels were taken and it was

INTAKE, AIN ED DILBE AND WADI REIYA SPRINGS WATER SUPPLY

found that the lowest point on the pipe line would be 224 ft. below Ain Zerka, the highest point 57 ft. above, and the main delivery point 2 ft. below, so 4-in. pipe was ordered, also two pumps and two engines. The pumps were capable of delivering 3,000 gallons per hour to a height of 300 ft.

The pipe was delivered by motor lorry from railhead to suitable points as near as possible to the proposed line. It was then carried by infantry working parties to position and was laid by parties of sappers. In order to complete the work as rapidly as possible, pipe-laying was carried on simultaneously by several parties. When parties working towards each other met, in order to connect up an expansion joint would be put in. Allowance was made at the summit for the escape of air which might collect in the pipe, also provision was made at two points where it was thought branch lines might possibly be required later.

Yield of Springs Decreased

Measurements of the springs were taken from time to time, and the yield began to decrease at an alarming rate, though there still remained enough of the original 30,000 gallons per hour to supply the pumps, which delivered 3,410 gallons per hour to Lubban. However, levels and measurements of quantities of the springs in Wadi Reiya were taken, and it was found the main group of springs could be collected at a point 123 ft. above Ain Zerka, or 125 ft. above the Lubban water point. Theoretically, more water would be delivered by gravity from these springs than the 3,410 gallons per hour being delivered by the pumps. When, later, this was put in operation, it was found that 3,750 gallons per hour were supplied by gravity.

The Wadi Reiya springs were some distance from Ain Zerka; they also seemed at first sight very difficult to collect into a pipe line, as they consisted of a great number of small springs coming from a considerable length of the high bank of the wadi. They were, however, divisible into four main groups, called Ain El Liktan, Ain Ed Dilbe, Ain Alam and an unnamed group situated so much lower down that it was decided not to utilize same until necessary.

At considerable distances—in other wadis, etc.—there were fourteen other small springs of which weekly measurements were made so that data would be obtainable if it had been necessary to extend the pipe line at a later date.

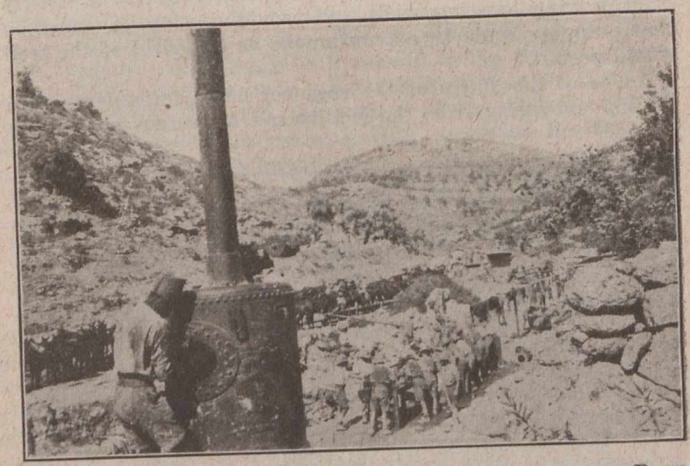
Ain El Liktan, a separate spring giving about 450 gallons per hour, was easily collected from the small cave in which it formed a pool, by damming up the outlet of the cave and installing a 2-in. pipe. This 2-in. pipe line supplied a fanati filling point and the camp of my half company of Indian sappers and miners; after the manner of all engineers I was not bashful about having the luxury of a tapped water supply in the camp. The 2-in. line then joined the end of the 4-in. main at the point where it took off at right angles from the wadi bottom up to Ain Ed Dilbe.

Ain Ed Dilbe was the collection of the water from hundreds of trickling springs from a high wall of rock. The water was collected by a long concrete trough built along the base of the rock wall, and was run by three pipes into a large intake in the form of a concrete tank about 4 ft. 6 ins. square and 3 ft. deep, which acted as a surge tank and was provided with an overflow.

Construction of Plunge Pool

Near at hand was Ain Alam, where the water was collected into a shallow V-shaped concrete basin. The overflow at Ain Ed Dilbe was made about 1 ft. lower than the pipe taking off from Ain Alam, and was also lower than Ain El Liktan, so that all the overflow of surplus water was at Ain Ed Dilbe. This overflow was used to fill to plunge pool in the wadi bottom. This pool was formed by building a stone and mud dam, faced with cement mortar, across the water course in the wadi bottom. At this point the water course was about 30 ft. wide, with vertical banks 9 ft. high. We thus had a splendid swimming pool, with about 7 ft. of water at the deep end, and 120 ft. long. The pool was provided with an overflow and could also be drained from the bottom into another pool, about 4 ft. deep, for non-swimmers.

Alongside the plunge pool was a row of twelve shower baths, having a concrete floor, the water being supplied



AIN ZERKA—IN FOREGROUND, DELOUSING BOILER; IN REAR, AT LEFT, TROUGHS FOR MULES; AT RIGHT, WASH TABLES FOR TROOPS

through a 2-in. pipe taken off the 4-in. main. For the concrete work, cement was brought up by mules. Good deposits of sand and gravel were found close at hand, further up the wadi bed. Bathing hours were alloted to units, certain days being set aside for British troops and certain days for Indian troops. Every man was required to hand in his soiled clothing and to bathe under the showers before using the plunge pool. After bathing he was issued clean clothing. The soiled clothes were sent to Ludd to be laundered by Arab washwomen.

A short distance down the wadi, there were other springs, the largest of which was used as a supply for a 2-in. pipe line which delivered water to washtables and tubs for

the use of British troops in washing clothes. Further along a supply was tapped for an Indian dhobying place, and finally, there was a long trough for watering horses. The Indian dhobying place consisted of a row of stone and cement tubs made by building up four walls of stone and cement mortar on a flat sloping slab of rock, each tub being supplied with a very large table-like rock on which to beat the clothes. The tubs could be drained and filled very quickly. The Indian regimental dhoby had each day a very large washing, and he preferred to soak the clothes as long as possible. He then stood in the water, took up a suitably sized flail of clothes, and beat them upon the stone until all the dirt and buttons had disappeared.

The main pipe line followed the bottom of Wadi Reiya to the pump at Ain Zerka, situated at the junction of Wadi Reiya and Wadi Zerka. In the pump-house the arrangement of valves permitted of pumping from Wadi Reiya only, from Ain Zerka only or from Reiya and Zerka combined, or of a gravity supply from Wadi Reiya. At Ain Zerka was the large stone pump house, a fanati water filling point and a considerable length of horse troughs for watering camels, horses and donkeys. There were also shower baths, and clothes-washing tables and in addition we erected a vertical boiler in which to produce steam for a delousing station, in order that clothes could be deloused while the men were bathing.

Supply for Light Railway

The 4-in. pipe line from the pump-house followed Wadi Zerka to its junction with the Wadi Deir Ballut, where was situated an Arab water point, which was arranged for both fanati filling and animal watering. There was here storage for 18,000 gallons, the storage being filled from the pipe line only when emptied; as this was the lowest point in the pipe line, the tanks could be filled very quickly.

From the junction of Wadi Ballut and Wadi Zerka the line climbed a hill and over the crest back to the two main water points in the Lubban area; each water point was provided with 18,000 gallons storage, troughs for animal watering and fanati filling arrangements. From the storage at Lubban water point No. 2, a 2-in. pipe line about ⅓ mile in length ran to a steel water tank erected at the end of the narrow-gauge railway used for bringing up supplies. From this tank the railway secured its supply. It was found necessary to cover the pipe line in order to prevent inconvenient delays and difficult repairs, as before this was done the line was occasionally struck and burst by enemy shells.

A telephone system for control purposes was used to connect up the pump-house and various water points. It was found necessary to wire in the springs to prevent contamination. The pump-house was built of stone laid in mud mortar, pointed with cement mortar. Window frames were provided by the engineer corps. The roof consisted of panels covered with the metal from petrol tins, the whole being covered with felt roofing. The pipe line was kept in successful operation until after the final attack in September, 1918, when it was dismantled.

Operating Native Pumping Outfits

Just prior to the final operations in September, 1918, the field companies spent some time in outfitting and overhauling all water equipment, consisting of pumps, troughs, tanks, etc. The division, after having been moved to the edge of the plain and having spent a short time in training for plain warfare, was moved up to a position in the rear of the portion of the front line from which it was to attack, and was concealed in the orange and eucalyptus groves there for two days prior to the attack, so that the divisional engineers had the task of endeavoring to run the various and assorted pumping plants which had been operated by the Jews in this section for watering their orange groves. These people, by force of circumstances due to the war, had had to adopt all manner of repairs to keep their engines running, so we found that each engine had some peculiarity different to any other, and it was often a long puzzle to any one other than the owner. The groves were supplied with large concrete storage tanks from which they were irrigated. We filled these tanks and were able to supply abundant drinking water, and in addition, were able to set aside certain tanks as swimming pools.

In the advance after the rout of the Turks, many different types of watering-places were developed. Of course, we took over all the Turkish pumping plants, which were all equipped with a standard make of German engine and pump. We were forced to run these plants continuously, so that in cases we had breakdowns, owing to wearing out of the parts. However, so many engines of the same make were used, that we were able to interchange parts. Large engines in towns and orange groves were also used. Previous experience with the Turk taught us to be on the watch for "booby traps" in the engine houses, but this time the attack and advance were so swift and unexpected, that he had evidently no time to prepare anything of that nature.

Use of the Chursa

Where the depth of the well was not too great, we used lift and force pumps, but for deeper wells as a very temporary measure we employed a chursa. The chursa consists of a large conical-shaped leather bag about 2 ft. in diameter at the large end and about 8 ins. in diameter at the small end. It holds, when full, about 30 gallons of water. The small end is hooked up level with the iron ring which gives rigidity to the large end of the chursa bag. The bag is then ready to be lowered into the well by attaching it to the end of a long length of 2-in. cordage, which passes over a pulley suspended from a sheer-legs directly over the opening of the well, the pulley being at such height that the bag, when hoisted, will clear the opening. From this pulley the rope passes to another pulley on the ground, so that a horizontal pull is obtained. The chursa is operated usually by attaching a swingle tree and using two horses to pull it. When up clear of the well, the small end of the bag is released and the water spilled into a trough, usually leading directly into a drinking trough or storage tank. This chursa equipment, with trained men, can be set up very quickly, but of course, is not a good permanent arrangement.

The Chaine-Helice

The chaine-helice seemed to be the arrangement best suited for the work in Syria, where one had usually deep wells and wanted a continuous supply and wanted it generally in a great hurry after arrival at the well. The chaine-helice consisted simply of a continuous link chain surrounded by a helix of heavy wire. This continuous chain passed over a cupped wheel housed in a tin hood, which caught the water as it was thrown clear of the chain, and which led to a spout where the water was caught and led to the storage tanks or wherever desired. This hood and wheel were set over the well opening, and the chain lowered into the well. A heavy, deep-flanged wheel was set in the loop of the chain. This kept the chain taut and prevented it from twisting and tangling. The power was supplied by a petrol engine connected by a belt to a pulley on the shaft of the cupped wheel over which the chain passed. This outfit gave about 1,200 gallons per hour with wells 70 or 80 ft. deep. The length of the chain could be altered, split links being provided for this purpose.

In the fall of 1918 we were engaged mostly on road work and bridge building, but in spare time we made reconnaissance of the country for springs, which were measured and the map location given. For this class of work a small metal V-notch, which could be carried on the saddle, was useful; this, with a small rod about 18 ins. long, marked in inches and tenths of inches, comprised a simple device whereby one man could measure a small spring, it being necessary merely to make a small bend into which the V-notch was built, the inch scale firmly set up-stream and the reading noted at the time of first spill and again when the flow through the V-notch had become steady. For various heads of water on the notch, the yield in gallons per hour could be obtained from tables in a hand-book.

In the course of many rides over the plain of Sharon, I came across many small wells, or rather circular holes dug in the depression which marked the water-courses draining the land during the rainy season. These holes were dug by the shepherds for watering their flocks in the mud drinking troughs they made alongside the well openings. They found it necessary, even in November, which is the end of the dry season, to go to a depth of only 6 or 7 ft., or in all a depth of 12 or 15 ft. from the general ground level, to obtain water. The great number of these water-holes would lead one to believe that water exists all over this plain and at a slight depth from the surface; that pumping for irrigation water for orange groves, etc., should be comparatively cheap; and that this plain could be made rich and fertile.

Development of Saskatchewan's Highway System

Organization and Duties of the Department of Highways—Previous Methods of Provincial Aid—Difficulties in Arousing Interest in Maintenance—Paper Prepared for the Annual Meeting of the Association of Dominion Land Surveyors

By CHARLES W. DILL
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PREVIOUS to the year 1912, the improvement of roads, the building of bridges and the operation of ferries in Saskatchewan were all carried out through the Department of Public Works, under the direction of the assistant commissioner or deputy minister.

The rapid settlement on the land, the great extension of steam railroads and the consequent demands on the province for a more comprehensive road-building scheme, all combined to influence the provincial government, with the result that, in the spring of 1912, the importance of highway improvement work was given recognition, and a commission of three members was appointed to administer the work of the department. This commission took over the control of all roads, bridges, water supply and drainage works, the ferries being left under the Department of Public Works.

At that time the government voted a grant of $5,000,000 for the building and improvement of roads and the erection of capital bridges, which amount was to be spent in a three-years' program of work on defined road locations approved by the highway commission; and organized rural municipalities were to assist by expending an amount of their own money equal to the government grant for each separate location,—or what was called the "dollar-for-dollar basis." This work was handled by contracts with the interested rural municipalities, who agreed to maintain in good condition all roads improved under this program. In unorganized sections the roads were improved by government road crews under the supervision of district inspectors.

As early as 1910 it was felt that the best method of assisting the rural municipalities was by direct money grants to be expended by them, the selection of the locations to be improved and the disposal of the money grant to remain under the approval and supervision of the Department of Public Works; and, even prior to that time, the department adopted regulations stipulating that grants of provincial funds should be expended chiefly upon main roads, the subordinate roads to be cared for by locally collected funds.

Rural Municipalities Became Interested

It was also noticed, in the older settled districts, that the people were, year by year, becoming more alive to the great advantages to them of better roads which might be travelled with comfort at all seasons of the year. To meet this increasing demand, the government laid out a comprehensive program of highway improvements and organized additional road crews to handle the large amount of work to be done.

In the year 1913 it was found that many more rural municipalities took advantage of the offer of the highway board to reimburse them to the extent of half the amount which they expended upon approved main roads in accordance with the regulations of the board. This had two distinct beneficial effects: First, of stimulating the interest of each interested municipality in its own road-building problems; and second, in that each municipality organized its own road crews, purchased tools and equipment, and thus became a greater or lesser factor in the efficient organization for road improvement work.

At the close of the 1913 season, it was found that some of the rural municipalities, being anxious to have as large an amount as possible of government moneys expended within their municipality, expended heavily of their local funds to the extent that the burden of taxation was exceedingly great. Many municipalities proceeded with their work without having secured the written authorization of the board, and a great deal of difficulty was experienced with the auditing department because accounts were not submitted in a way that was acceptable to them. All these things combined to cause inconvenience and delays which were irritating, both to the department and the rural municipalities.

Contributions to Municipalities Stopped

It was further considered, that the "dollar-for-dollar" system of assistance had served a useful purpose in providing for board supervision and instruction in connection with the works carried out, and that the rural municipalities should now be prepared to continue the expenditure of their own moneys in an efficient manner. After careful consideration, the highway board at the end of the season resolved that such assistance should cease, and that in future all moneys placed at the disposal of the board should be expended directly by it, either by contract or by day labor.

This new policy was carried out during the season of 1914 and resulted in an increase in the number of road crews employed, and a large amount of work was satisfactorily carried out until the middle of August, when the financial depression caused by the breaking out of the Great War necessitated the closing down of practically all the road and bridge work.

Through the seasons of 1915 and 1916 this same policy was continued, although, on account of financial conditions due to the war, the work program was much restricted.

In the legislative session of 1916-7 the importance of the highway improvement work in the province was given further consideration, with the result that the Highways Act came into force on April 1st, 1917. By this act the board of highway commisisoners ceased to exist, and the work has since been carried out by an established Department of Highways as a regular department of public service, presided over by the minister of highways.

The work of the department as now established comprises the building and reconstruction of all roads designated as main roads throughout the province; the erection of all steel, concrete and timber bridges; the building and operation of all ferries; the supervision of surveys and townsites; the drainage works of the province; the reservoir and water supply construction necessary in districts requiring such attention; and the general supervision of all works, under-

taken in these branches, on which government money grants have been made.

In the earlier years of the work of the highways board, it was determined that a main road system should be evolved, in the older settled districts, which could be gradually developed and extended as the settlement areas enlarged and the locations of market towns and elevator points were determined by future steam railroad lines being constructed, and the co-operation of the rural municipalities was sought in order to evolve this main road system in such a way as would meet, as far as possible, the wishes of the people themselves and thus avoid the criticism of being arbitrary in the selections of these main road locations or of neglecting to consult those who would be forced to use the roads; and it was even then felt that the government money grants should be used in developing this system, while the rural municipalities could look after the local feeder roads connecting into the accepted main market roads.

It was also considered that the municipalities should assume the responsibility and the cost of maintaining all such main roads on which government grants had been given, and all contracts carried such a provision. But it was soon discovered that the changing of municipal councils from year to year meant changing ideas of what were to be regarded as main roads in the various municipalities, and the highway board was besieged each year with deputations pressing for consideration of their various new locations, and it became impossible to permit all of the changes thus suggested.

Maintenance Difficulties

It was also found that, by the great majority of the municipalities, the principle in the contracts relating to maintenance of roads already built was not thoroughly understood, or to some extent not fully recognized. These difficulties were contended with by a continual pressure on the part of the department to improve conditions until the end of 1917, when it was decided to work out a definite approved main road scheme covering the total settled area of the province, and to have all provincial money grants used in developing this main road system. In this work the department sought co-operation with the local members of the legislature and the municipal councils, and other sources from which information might be obtained. The plan has been practically advanced to completion except in those sections where new railroad lines may be constructed and new towns located, or where it is impossible to determine what would be the future needs of these localities.

To stimulate interest in the maintenance of roads already improved, a road-drag competition was instituted in 1913, and all rural municipalities were encouraged to enter selected sections of roads in this competition. Suitable prizes were given in each of the five districts into which the organized municipalities were grouped; and all available data on the beneficial results of the systematic use of the road-drag sent out to all these municipalities. It was felt that the many miles of main and feeder roads already constructed at heavy expense were in danger of being destroyed, and of requiring, if neglect continued, additional large expenditures for reconstruction simply for want of maintenance, and this competition was instituted to encourage the municipalities to undertake this maintenance work, as well as to demonstrate the effectiveness and cheapness of the method of carrying it out.

Road-Drag Competition

In the seven years during which this competition has been held, 145 rural municipalities have, at one time or another, entered a section of road in this competition; 58 have been in for one year, 29 for two years, 19 for three years, 15 for four years, 12 for five years, 9 for six years, and 3 for the full seven years. Six municipalities have been in continuously for the past six years, and five others continuously for the last five years. These figures indicate, to some extent, a lack of sustained interest in road maintenance work, and it is apparent that some accentuated energy must be applied to keep the provincial main roads in shape.

This descriptive historical sketch of the attempts made in the past towards a comprehensive workable system of improved roads throughout the province has been written partially to show the great difficulties to be contended with in a province of the extent of Saskatchewan, with sparsely settled areas, with over 200,000 miles of road allowances, and with constantly changing road requirements due to railroad extensions and the establishment of new market towns or elevator points, and partly to indicate the sustained interest taken by the government of the province in the effort to improve conditions for the benefit and comfort of those settling on the prairies and in the more broken wooded areas in the north.

Department as Now Organized

The department, as now organized, is controlled by a deputy minister, who is responsible to the minister of highways, with a working staff as follows:—

1. A chief engineer and superintendent of highways, who has complete charge of the construction program of the department, and who controls the ten divisional superintendents, the engineering staffs of the bridges and roads branches and the road-drag competition inspectors.
2. A director of surveys and town planning engineer, who controls the district surveyors and the town-site engineer, and has charge of all surveys for town-sites, new railroad location plans and road diversions, and also has charge of all drainage works undertaken as local improvements under the Drainage Act of the province.
3. A chief clerk and superintendent of ferries, who has charge of the purchasing and handling of materials and supplies, the control of the correspondence and office staff. the accounting work of the department and supervision over the ferry inspector, who controls all the ferries operating in the province.

The legislature votes an appropriation for the Highways Department which is divided into amounts for salaries, superintendence and supplies, capital bridges, roads, revenue bridges and repairs. The capital bridge expenditure is handled entirely by the engineering staff of the bridge branch after the locations have been determined, and which generally are determined on the recommendation of the local divisional superintendent, confirmed by the superintendent of highways and the deputy minister. Plans and specifications are then prepared, and all such works are handled by contract under inspection of a resident inspector.

Division Based on Constituencies

The amount set apart for road work and revenue bridge construction and repairs is divided by the minister on the basis of the constituency unit, four factors being taken into consideration in making the division: First, and most important, the area of the constituency; second, the population of the constituency, as a well-settled district would be reasonably entitled to more grant than one sparsely settled; third, the railway facilities enjoyed by the district, as where these are plentiful, fewer roads are required; and fourth, the topography, difficulties of opening up the district and the consequent cost of construction. Perfection is not claimed for this method of considering the constituency as the unit of allotment of funds, but on the whole it has worked out satisfactorily.

The divisional superintendents of the department, after consulting with the interested local members of the legislature and the rural municipalities concerned, then make their recommendations of what new bridges are required and what sections of our approved main roads should receive attention during the current year.

These recommendations are carefully checked and considered, together with all other information which may come into the department, and, when approved, the bridges are placed on a construction schedule, to be built by special bridge crews working under the department's control. The road work is handled either by contract with the municipality, under which it performs the work and is paid the money grant after the work has been inspected and passed by the divisional superintendent, or is carried out by a government

road crew working under the personal direction of the divisional superintendent.

This system of operation keeps the control of the work and the payment of money grants entirely in the hands of the Highways Department, and we find that the municipal councils on the whole are co-operating very well in carrying out the work, both as to location and method of construction.

Motorists Report Road Defects

Saskatchewan has now some 55,000 automobile owners out of a population of about 827,000, and the greater percentage of these cars are owned by farmers. This ownership of an automobile has also lent an impetus to the improvement of our roads as well as to the maintenance of main arteries of travel. Motor clubs are very general throughout the province, and these have a system of reporting special defects on all roads to the Department of Highways through the secretary of their executive body, and it is encouraging to note this as a sign of the interest being developed in the direction of permanent good roads.

As time went by, the importance of maintaining roads upon which money had been expended for construction became more and more pronounced. To such an extent did this obtain that definite legislation was passed in an endeavor to cope with the problem. To this end a grant to each rural municipality of $500 (on the basis of a nine-township municipality) was provided for. Each municipality in the spring designates the sections of roads it wishes to maintain. These are check up, and, if found to be satisfactory, permission is given it to undertake this work. The sections undergoing improvement are inspected during the season, and the municipality makes its return of the actual extent of the roads maintained and the expenditures incurred. If the inspectors' reports are favorable, the amount is deemed to have been earned.

There are two difficulties which face the department in connection with this: First is the tendency, fortunately in only a few cases, to use the money in making good certain bad places on the roads, which improvement cannot properly be considered as maintenance work; and second, the dividing of the amount of the grant into a number of parts corresponding to the number of council divisions in each municipality, irrespective of the number of miles of main roads in each division or of the special claims of certain well-travelled roads to be considered. But so long as this council view prevails, just so long will the department be faced with this difficulty.

Unsatisfactory Road Locations

Whether by design of nature or the perversity of the Dominion land surveyors who gave the allowances, it is nevertheless a fact, that an undue proportion of sloughs, lakes, bad hills and awkward bridge locations occupy the road allowances, and, while it leaves more land for agricultural purposes, this serves to increase our difficulties and the cost of our road improvement work. To overcome many of these difficulties it is necessary to divert from the road allowances. To deal with these matters in a satisfactory manner, the department has provided a number of district surveyors, working under the direction of the director of surveys, who is responsible to the deputy minister and with him signs all plans of diversions, etc., before these become legal highways.

The proper location of these diversions demands a knowledge of road-building, as the question of drainage, gradients, side-hill work, suitable bridge and culvert locations and other features all enter into the determination of a well-selected diversion location.

The usual method followed is for the rural municipality to request a diversion survey, after having made an agreement with the owner for the purchase of the land required, which agreement is filed with the director of surveys. The survey is then made and the amount of land taken determined, and the construction of the improvement follows. In cases of improvements where the lands are not patented, the diversions are made on the recommendation of our divisional superintendents, the surveys are made and registered, and the diversions are made a part of the road allowances, to be deducted from the acreage of the section affected; while in unorganized municipalities, the same procedure is adopted with the exception that payment is made to the land-owner directly through the department.

In some cases where the topographical features make the selection of a diversion unusually difficult, it is found much better to make a preliminary arrangement with the land-owner for the land needed, to construct the needed improvement, and then to make the survey and payment for the land taken. This avoids a clash between the surveys branch and our construction department over the securing of the best possible location, and also avoids the need of a re-survey when the improvement cannot be confined to the limits of a survey already made.

In connection with the construction end of the work it is not necessary to say much, as this subject has been dealt with in so many papers, magazines and text books that no new matter of interest can be given, so that only a few general observations, relative to the handling of road problems as they are met, are required. First comes the question of the importance of the road to be improved, which determines the proper width of the road to be graded, the character of any bridges and culverts required and the maximum permissible grades for the traffic demands of that district.

General Requirements in Design

On main roads near the larger towns and cities, a width of 34 to 36 ft. between ditches is considered as necessary; for less important main roads, from 28 to 32 ft.; and for feeder roads and those more remote from towns, from 20 to 26 ft., according to the local conditions.

On important main roads it is aimed to provide permanent bridge structures of either steel or concrete, and either concrete or galvanized steel culverts; while on roads of lesser importance, timber bridges on either pile or frame-bent abutments are constructed, and the use of wooden box culverts are permitted where necessary.

The maximum permissible grade on a recognized main road is 7%, and an effort is made to keep it down to 5% wherever possible without incurring unwarranted expense in doing so. In many cases on less important roads the topographical features at times make it necessary to adopt grades as high as 10% to 12%, but these, fortunately, are the exception and only permitted where they cannot be avoided.

The amount of drainage is of greatest importance, as, with earth roads particularly, the removal of water from the road and side-ditches is very essential if the highway is to be of use at all seasons of the year.

In order to provide for effective drainage the ditches should have a continuous fall to certain points where the water can be led away from the road allowances, and where such cannot be provided by natural drainage it must be provided artificially where possible to do so.

The whole of the road drainage question may be summed up as follows: In order to have a good road the water must be got out, off and away; *out* of the road by under-drainage and by ditches of sufficient depth and gradual, continuous grades to off-take ditches or natural depressions; *off* the road by means of a properly crowned cross-section of the road; and *away* in the ditches as already described.

General Rules of Construction

Regarding the actual construction work, the organization of the working crew and the equipment required depends on the nature of the work to be done, and it is not possible to suggest a general outline which would fit all the varied conditions which might be met with.

On ordinary grading work, with close borrow pits for fills, or on the ordinary steep side-hill grades, the use of slip or wheeled scrapers or fresnos are recommended. On fills of a sufficient length and height to warrant a bigger crew and equipment, the use of an elevating grader is recommended, and it will be found to be economical even with the added cost of discing the long grade and crowning the surface with an ordinary road-grader. On lighter fills, side-hill work where the side slope is not very steep, and turnpiking, the only

economical method of grading is by the use of a road-grader, the size and weight of which should be determined by the nature of the soil to be handled and by the quantity of earth to be moved. Except where old stumps, roots or boulder stones are encountered, it has been found that the modern type of road-grader, hauled by a farm tractor of suitable power, can do this work without any need of preliminary plowing of the earth, and the cost is much lower than was considered possible even a few years ago. But the nature of the equipment used must depend on the extent and magnitude of the work in question and can be determined only by a study of the actual conditions governing that special work.

Maintenance of Earth Roads

Every spring, before the ground becomes too hard, the road should be gone over with the road-grader to clean out the ditches, fill up the ruts and holes, plane off the undue elevations and shoulders on the road, improve the grade and crown of the road, and generally put the road in good condition.

Earth roads show an undue tendency to rut, and care should be taken in selecting material with which to fill these ruts; a point to be borne in mind is that the same material should be used as that composing the surface of a road. It is true that a clay road is often improved by the use of a sand or fine gravel surface coat, and a soft sand road by the use of a clay coating, but these are the only exceptions.

On clay or gumbo roads, any repairs should be made early in the season, as the dampness, together with the travel, will aid in compacting the surface. If repairs are made late in the season when the soil is dry, it pulverizes rather than packs, is very unsatisfactory, and will not result in a hard, waterproof, compact surface.

To maintain an earth road in good condition requires constant attention, and it will usually be found that this attention is necessary from the very day the road has been completed. The work cannot all be done at one time, as it will be found necessary that a little be done often and not too much at any one time.

Road Drag Very Useful

The best results generally are obtained by merely smoothing over the surface, covering up what small ruts there may be at the time, and doing this work when the surface of the road is moist or as wet as the soil will permit the work to be done, and this can best be done with a suitable road-drag. This road-drag, if properly handled, will keep the ditches clean and even, will keep the side-slopes and the ditches free from weeds, will preserve the uniformity and appearance of the side-slopes to the ditches and the crowned section of the road, will remove moderate ruts and unevenness of the surface, and will aid in securing a compact, even surface which, after faithful, continued treatment, will remain firm and compact, even under moderately heavy traffic.

With the object of showing the great possibilities of the district, the Niagara District Industrial Association has been formed. The association is planning for a big congress next summer, when representatives attending the meetings will be shown the power facilities of Niagara Falls, the fruit belt in the district, the Hydro station at Queenston, and also the Welland canal.

With a view to making the Toronto-Hamilton highway safer for pedestrians, a conference was recently held at the parliament buildings, Toronto, by members of the Ontario Railway Board, officials of the Toronto and York Radial railway, and members of the Ontario Motor League. The following suggestions were made: Establish safety zones or platforms where passengers of the radial cars may wait; adopt traffic laws requiring automobiles to halt behind cars that are discharging or taking on passengers; appoint traffic policemen in such busy centres as New Toronto and Mimico; change the doors on the radial cars so that passengers may board or leave the cars with less danger of being knocked down by passing automobiles.

SURVEYORS AND TOWN PLANNING*

AFTER considerable deliberation, this committee has decided that this report might be most useful if made in the form of suggestions to surveyors. The first suggestion is that all surveyors should develop or retain an interest in town planning. It is probably not necessary to remind the members that through the efforts of a committee of this association, the recently formed Town Planning Institute came into being. Many surveyors have joined this institute. To others we urge an interest in at least a local way. Take some thought of your home town, of its planning problems and how you can help as a leader in public opinion if not in a strictly professional way.

We wish to point out that though provincial land surveys can only be carried out by provincial land surveyors, surveys in the broad sense are in the province of the Dominion land surveyor as well as of the provincial land surveyor. If any surveyor is to restrict his interest in town planning to the mere staking out of lot and street lines, he will have passed up his opportunity for, and his obvious part in, development and planning for the future.

Thinking in Development Terms

The collection of maps and data as to distribution of population and buildings, transportation and industrial situations, assessment and taxation, public utilities, parks, schools, etc., and especially the preparation of topographical maps and the studying of such maps and data for the purpose of planning future development, are duties for which surveyors should be fitted by training and inclination, and are duties not limited to any one class by legal enactment.

From the foregoing it may be gathered that no longer should the surveyor think only in terms of land subdivision, but rather in terms of land development. The questions to be answered are not how much will it cost to make a survey of a lot or lots, but how much would it cost to develop a certain area with buildings and finished streets and other public utilities and with the necessary parks and open spaces. Some idea of this cost must be acquired by the surveyor to plan and carry out his part of the work intelligently. Costs of utilities and improvements may be desired in terms of acreage, per foot front, or per family.

To those Dominion land surveyors who spend most of their time in government surveys, and find their time and activities in their home town much limited on that account, we suggest that regional planning and development should be made a study. Land classification as now being carried out involves essentially the idea of development as opposed to mere subdivision carried out in the past. And so, too, is the idea of intelligent development involved in the making of topographical surveys. From the surveyor there should be expected, not stereotyped forms of rural development, but a scientific formulation of general underlying principles that could be applied to particular situations.

Regional Planning

As a general study for this association, we suggest the subject of regional planning, for which, of course, topographical maps are necessary. For any area, the data in regard to the following matters might be gathered:—

Area and population; railway transportation; highway transportation; nature of the soil and surface; use and development of the land; building development; industrial development; water supply and sewage disposal; and power development.

Where areas have been developed to any considerable extent, it is felt that the collection or mapping of such data will go far towards making possible the intelligent planning of the area.

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*Report of Committee on Town Planning, Association of Dominion Land Surveyors, presented February 5th, 1920, at annual meeting in Ottawa; A. H. Hawkins, chairman of committee.

SURVEYORS MAY FORM NATIONAL ASSOCIATION

Association of Dominion Land Surveyors Holds Annual Meeting in Ottawa and Discusses Available Means of Elevating Status of Its Members

INITIAL steps have been taken by the Association of Dominion Land Surveyors toward the formation of a national association of surveyors, to embrace all provincial and Dominion land surveyors in Canada. Resolutions strongly in favor of such an association were adopted at the thirteenth annual D.L.S. meeting, held February 4th-6th in Ottawa. A committee was appointed to discuss the project with the Ontario and other provincial associations. The idea has already been endorsed officially by the Alberta association. It was the unanimous opinion of those present at the meeting that some such action should be taken toward elevating the status of surveyors.

The meetings were held in the Carnegie Library, with J. R. Akins, president of the association, in the chair. A luncheon, attended by over 100 members, was held in

DOMINION LAND SURVEYORS AT OTTAWA

Chateau Laurier, and a public entertainment was given one evening in the auditorium of the Collegiate Institute, at which Mr. Akins showed lantern slides descriptive of surveyors' work, and Gen. Sir Arthur Currie lectured on the work of engineers in the war.

Among the papers presented at the meeting were: "Structural Geology of the Great Plains," by D. B. Dowling; "Highways of Saskatchewan," by C. W. Dill; "Place Names," by R. Douglas; "International Mapping," by D. H. Nelles; "Forestry Reconnaissance," by H. Claughton-Wallin; "Suggestions in Field Photography," by W. E. Morgan; "Early Explorations and Surveys," by F. E. Clarke; "Oblique Sun Dials," by Dr. Otto Klotz; "Clearing Land by Controlled Fires," by F. V. Seibert; "Aerial Photo-Topography," by H. F. Lambart; and "Field Survey Troops," by E. W. Berry.

At the luncheon, addresses were delivered by Hon. Arthur Meighen, Dr. W. J. Roche, Dr. E. Deville and C. A. Magrath. Dr. Roche promised consideration of the association's request for higher remuneration for surveyors in the civil service classification. Mr. Magrath spoke of the faithful work of the D.L.S. members, who often labor 12 or 14 hours a day in the wilderness, although entirely unsupervised and unchecked, and urged that this be taken into consideration by the Civil Service Commission.

The officers elected for the ensuing year are: President, F. V. Seibert, Edmonton; vice-president, G. H. Blanchet, Ottawa; secretary-treasurer, F. D. Henderson, Ottawa. A vote of thanks was tendered to Mr. Henderson for his able and devoted work as honorary secretary during the past year.

Councillors were elected as follows: For British Columbia—J. A. Calder, N. L. Stewart; Alberta—R. H. Knight, R. H. Montgomery; Saskatchewan—J. L. R. Parsons, E. H. Phillips; Manitoba—H. E. Beresford, A. R. Neelands; Ontario—A. L. Cumming, J. W. Pierce; Quebec and Maritime Provinces—H. L. Seymour; Ottawa—W. J. Boulton, F. H. Kitto, T. A. McElhenny, D. H. Nelles and B. W. Waugh.

ASKS ARCHITECTS' POSITION ON DEVELOPMENT OF CANADIAN RESOURCES

FOLLOWING is the text of a circular letter addressed to the members of the Ontario Association of Architects by Herbert E. Moore, president of that association:—

"During the war there was considerable comment and discussion amongst architects concerning the use of imported materials and the employing of professional talent from the United States in the erection of some of our principal buildings. Since that time, a great deal has happened to further accentuate conditions—namely:—

"1.—Rate of currency exchange with the United States, which shows at the present time something like 12% against our money.

"2.—Various warnings by our educational authorities urging the utilization of Canadian brains as well as Canadian material resources.

"3.—The effort of the Association of Canadian Building and Construction Industries for the use of Canadian goods, showing that the business interests are alive on this question.

"Time and again architects are asked: 'What are you doing in this matter?' and so far as one can see, very little has been attempted by way of systematic effort. In some cases, individual efforts have been passively looked upon as an outburst of some crank who either has an axe to grind or has some mistaken idea as to the possibilities of business in its relation to patriotism.

"It would seem that this question has reached a vital point; one where we, as architects, should state our position, and I would therefore ask you for your views, with any suggestions you might have concerning the advisability of placing our association on record before the government and the public, and an answer to the question: 'What are we doing in our practice to develop Canadian resources?'"

WAR MEMORIALS FOR BATTLEFIELDS

THE regular meeting of the council of the Royal Architectural Institute of Canada was held Saturday, February 7th, at the Chateau Laurier, Ottawa. In attendance were Messrs. Frank Wickson, president of the institute; H. E. Moore, president of the Ontario Association of Architects; C. S. Cobb, treasurer of the institute, Toronto; D. R. Brown and Alcide Chausse, Montreal; G. H. Macdonald, Calgary; and W. D. Cromarty, Edmonton.

Participation in the Rome scholarships examinations of the Royal Institute of British Architects was discussed and arrangements were perfected for special exemptions.

The question of war memorials was considered. In this connection the action of the government in instituting the coming competitions for the Canadian National memorials on the battlefields of Europe was heartily approved. Seven of these memorials are to be erected in the following battlefields:—

Passchendaele, St. Julien, Observatory Ridge, Drury Cross Roads, Courcelette, Bourlon Wood and Hospital Wood. The estimated cost of these is $100,000 each. A special monument will be erected at Vimy Ridge, the cost to be $500,000.

Appeal is to be made before the Board of Customs in Ottawa early in March for the revision of the basis of appraisal of building plans by non-Canadian architects and engineers. Confidence is felt that this will result in largely increased import duties in imported architectural service.

NEED FOR ORGANIZATION OF THE CONSTRUCTION INDUSTRY IN CANADA*

By J. P. Anglin
President, Association of Canadian Building and Construction Industries

As I see it, the chief objects for having any Canadian association of construction industries are (1) to reduce the difficulties that surround those engaged in our industry,—contractors and supply men; (2) to improve the practices that are current between us; (3) to fix standards such as many can readily call to mind, and which can be fairly and uniformly applied throughout the country; (4) to facilitate the movement and employment of labor; and, finally, if possible, to work out some sort of a plan which will help in the production of building materials and bring it up to the great need which exists at the present time.

Why all these? It seems to me that we should bear in mind at all times that we are anxious to improve the position of our chosen industry in the business and financial world. Business, outside of our own industry, has in the past treated contractors more or less as a joke, and finance, as represented by the banks, has put us almost at the bottom of the ladder. These two conditions certainly are improving, but there is a great deal of room for further improvement. Contracting is something like stock gambling, —the few successful ones ultimately fail unless they retire at the opportune moment. That has been the history of the contractors of Canada and it is up to us to so improve conditions in order to ensure that that kind of thing shall not continue.

Eliminate "Cut-Throat" Practices

How can this be done? I have been talking of why, but now the question is: How can it be done? There is only one thing for it, as I see it. In the first place, it should be the duty of all of us engaged in the industry to help the honest, straightforward and legitimate contractor and material man and to make it difficult for the unsound firm, lacking either in experience or strong financial condition, to engage in the business. Make the industry, if possible, one that would be entered into by worthy men, and worthy men alone. Certainly we cannot accomplish this end by the usual underhand and so-called cut-throat practices of the past; certainly not by the free-for-all, or every-man-for-himself disorganized industry which has prevailed hitherto.

What is needed in order to attain the end desired? We need to increase efficiency, to lower costs and if possible to establish for our industry regular and steady earnings. After all, we must always look to that end if we are to be successful. We can no longer localize our organizations. The operations of all the larger general contractors, trade contractors, supply houses and building material manufacturing concerns cover many cities and towns, several provinces and, in some instances, the whole Dominion. Provincialism, therefore, is not the basis for our organization as I see it. Even the east and the west are disappearing, and Canada is our field. If organization has any value to the broadminded business man, it must be Dominion-wide, it must be centralized and efficient and it must be properly founded and sufficiently financed.

Employers Must Organize

Does our own employe, the worker in stone, marble, concrete, brick or tile, wood or metal, leave it to George, or does he get under his union? Does he centralize authority and does he obey its mandate and pay the price? The answer to this question is evident on all hands. If there was one thing that impressed me more than another at that National Industrial Conference in Ottawa, it was the fact that opposite those employers of labor were an equivalent number of employes, and every man who was on the other side of the house was a paid employe of organized labor. Gentlemen, that spoke volumes to me; it made me feel that any industry, or that which calls itself an industry, is not worthy of being held high in the esteem of the community that is not prepared to some extent to counteract that great movement and to pay the necessary price.

Is it worth while to endeavor to accomplish all this? What are some of the real benefits and what are some of the unseen advantages In the first place, I maintain that the fraternity that one has with his competitors is worth the price in itself; in fact, nothing has given me more satisfaction or pleasure than the acquaintanceship of men who are engaged in the same line of business, or the opportunity to discuss their problems, difficulties and troubles, and to compare results with those whose calling is the same as my own. To me it is worth the price in itself.

Fraternity Leads to Co-operation

This fraternity leads to the second point and that is co-operation of effort. There must be co-operation where there is the proper kind of fraternity. Co-operation in itself will lead, by the comparison of experience and notes, to increased efficiency in methods of doing business, and increased efficiency in methods will certainly lead in the direction of stabilizing our industry,—stabilizing our own particular business and stabilizing the business of those with whom we come in contact. As a result of that we will be in a position to render the service which the country really demands that we should render.

It sometimes bothers me a great deal, when I take time to dwell upon it, to reflect how little service this great industry really renders collectively to the community as a whole. We should bear in mind that, being the second largest industry in Canada, something is demanded of us. If we are able to render that service I think you will all agree with me that we will obtain something from our business,—the thing to which we give our life and our time. We will obtain a considerably greater amount of satisfaction and the net result will be a measure of success not obtainable in any other way. This can only be done by the best and busiest men being willing to give a little time and by all supporting their association. Shall we have it? What form shall it take? Shall it be a federation of separate bodies or an organized whole with autonomous sections and sub-sections Shall it be based on the organized district or shall it come up from the organized district, from the provincial organization and into the federal organization; or shall it come direct from the organized district to the federal, with a group of local districts in the provinces for provincial matters?

Will we support it with our time and our funds? Unless we are prepared to give it some time and consider it a part of our business, and unless we are prepared to support it financially, it can never be the success it should be and it can never render the service to us that we desire.

Financing Presents a Problem

My question, and I am sure the question that you put to each other, is: Are we prepared and are our confreres at home prepared and willing to back us if we organize this association on a sound basis We should bear in mind that this construction industry, no matter what part of it we are engaged in, after all is our chosen life-work and demands the very best we can put into it. If we do that, Canada will ultimately receive our help and support.

There is the question of the method of financing our organization and of whether we shall maintain a permanent office and secretary; the question of whether it is possible to establish standard wages in various parts of the country and the question of the length of time that our agreements with labor should be made, whether they should be short-terms agreements or long. We will all admit that trade agreements with unions must be based on equity. Are we ready to adopt the principle that these wage agreements shall be made upon the basis that the wages shall be variable with the cost of living? That is now the case in some localities. Is it possible to compete at the present time for contract work, and to what length would we recommend

*Excerpts from presidential address at Ottawa Conference, February 3rd, 1920.

our members to go in bidding for contracts without inserting in these contracts some fixed labor schedule?

Whn it comes to the question of labor, is it possible to establish a central bureau in Ottawa or elsewhere with a view to facilitating the movement of labor in co-operation with machinery already set up by the Department of Labor? When we are faced with the situation this season, as undoubtedly we will be, in which we are short of labor across Canada, is there any way we can obtain co-operation through the labor and immigration departments in supplying the need in the various districts throughout the country?

Apprenticeship and Technical Training

Would this association devise or work out a sound and attractive apprenticeship or scheme for technical training? The machinery is already set up for the establishment of technical training.

What is the attitude of this conference and of those whom you represent towards international unions and also towards other unions or labor organizations? Do we believe that the industrial council is the best method of determining agreements with labor, and if so, are we prepared to advise its extension to other localities? What has been the experience of those of us who have engaged in these industrial conferences? Is there any plan by which we can increase the output of our employes? Would it be possible to establish standards of day's work, or hour's work, in the building and construction industry, and if so, could we provide an increased incentive in the form of a collective bonus to our employes?

Propaganda Decreasing Production

The reason I refer to these things is simply this,—that it seems to me that all the talk that is going on about low production throughout the country is simply propaganda that is helping to decrease production. The more we talk about low production the less production we seem to get, and what I have in mind is that if we could start some talk about production that did not have in it so much of the element of criticism, we might be able to start something that would help production, and I am sure you will all admit that it is needed.

Another thing that we need in all localities is some prepared counter-demand on labor. I have felt the need of that every time I have met to discuss the agreements with the representatives of labor. They come and present their demands to us as employers. We never seem to have demands on them as employees, and it seems to me there are many demands we could make and which they would admit if we only had them gone into and standardized as they have on their side before they meet with us. The building trades have been the battleground for organized labor for years, and they are becoming still more the battleground in some localities. We cannot get away from it, and it seems to me that it would be better for us to try and solve the question now if possible.

Special Trade Discounts

Coming to materials, outside of labor at the present time our greatest need is for some better arrangement with respect to the supplying of material. I do not so much refer to the raw material, although, I think, we are very much concerned with that as well, as to the manufactured building material. We should have such respect for our membership and those who stand high in the industry, that we are always ready to support one another internally. Special trade discounts to contractors within our association is our right. We who are responsible men cannot be expected to go on paying big prices to make up the losses occasioned by our irresponsible competitors. In return, the supplier of material who supports the association should be given better consideration.

Then there is the question of the relation between the trade contractor, the architect and the engineer. I wonder sometimes if the trade contractor cannot see that by quoting the same price to the owner, the architect or the engineer, that he quotes to the general contractor, he is hastening his own doom, and that it really acts as a boomerang. We should have a fair and equitable standard of procedure and that is to see to it that the trade and sub-contractors also get a square deal.

There is need to improve conditions generally and to remove a lot of the difficulties which are ahead of us in the year 1920, by a more constructive type of propaganda. The truth is, that we are at least a full decade behind in the organization of this industry. There is an absolute need for some kind of a Canadian-wide centre and organization for our industry. The service that it could render is great.

GROWTH OF THE FEDERATION OF CONSTRUCTION INDUSTRIES IN THE UNITED STATES

John C. Frazee, Secretary of the Federation, Addresses Members of the Association of Building and Construction Industries—Co-operation Between Associations Inspired by War Work

AT a luncheon of the Association of Building and Construction Industries last week in Ottawa, John C. Frazee, secretary of the National Federation of Construction Industries, Washington, D.C., was the principal speaker. Mr. Frazee stated that the construction industry in nearly every country is the largest industry, excepting agriculture, in the country, and that it employs more labor and produces more wealth than does any other industry (again with the possible exception of agriculture). The effect of the distribution of wages in the building industry is more widely felt than in any other industry, and the conditions in the industry are reflected in all other lines of business.

As an example of the importance of the construction industry, he cited the fact that in the United States it furnishes 27% of all the railway tonnage. Its volume and wide and even spread makes it an industry which, if properly organized, can have the greatest power for good or evil of any national organization.

Mr. Frazee said that for many years there had been various associations of manufacturers in similar lines of industry in the United States, such as the Common Brick Manufacturers' Association, the Face Brick Manufacturers' Association, the Paving Brick Manufacturers' Association, the Hollow Tile Manufacturers' Association, etc. There were also national bodies of somewhat wider character, such as the National Lumbermen's Association, the Hardwood Manufacturers' Association, the National Wholesale Lumber Dealers' Association, the National Retail Lumber Dealers' Association, etc.

Subdivision of National Organizations

These national organizations were often subdivided in two ways: First, associations dealing with specific portions of the field, such as hardwood dealers who dealt only in hardwood flooring or in cyprus shingles, for example; secondly, subsidiary organizations restricted as to field of operation, such as the Lumber Dealers of Illinois.

Furthermore, there were purely local organizations, such as the Wholesale Lumber Dealers' Association of Chicago. Therefore, the various industries were well organized in national, regional or state, and local organizations, to the numbr of several hundreds of organizations in the United States dealing with one phase or another of the construction industries.

There still remained, however, the same lack of co-operation between the individual associations that there formerly was between individual firms. The cement and the brick industry, for example, were very antagonistic, and the brick and lumber interests believed that they were very serious competitors.

The next logical step, said Mr. Frazee, was to obtain co-operation between these associations through the agency of a central organization. There are many specialized interests, he said, which are strictly of interest to one group only, but there are other problems which are of interest

to the whole industry or to many different associations within the industry. The manufacturers of brick, plate glass and roofing, for example, have much in common.

The National Federation of Construction Industries was formed at the instance of the United States government during the war as a medium through which the government could deal with the construction industries. It was really a war service committee representing the industries as a whole, but after the war it was decided to continue it as a permanent organization to procure closer co-operation within the industry, to develop and preserve the relations between the industry and the public, to serve as a medium of exchange of ideas between various groups, and in all cases of common interest to take the initiative in questions of policy, propaganda, etc. In other words, the association was intended to mobolize the entire strength of the industry.

The United States had been divided into twelve districts by the Federal Reserve Board, and it was decided to adopt these districts for the purposes of the federation, one member being elected from each district to a board of directors, and thirteen directors being elected without regard to place of residence. There is one vice-president from each district, and he acts as chairman of his district.

Advisory Board Very Helpful

The advisory board of the federation is appointed by the various national associations comprising the federation. Each association may appoint two members at large, and one from each district. Each regional member of the federation, such as the Southern Pine Association or the Illinois Wholesale Lumber Dealers' Association, appoints one member at large and as many district members as there are districts over which its activities extend. A local association such as the Chicago Wholesale Lumber Dealers' Association, elects one district member. In addition, the board of directors may elect such other members as it deems advisable, and these are not confined to men in the construction industries. The board now consists of 147 members residing in all parts of the United States and includes several of the most prominent bankers, industrial leaders, railway presidents and many other men not directly concerned with construction activities.

Mr. Frazee said that whenever a matter is submitted to the board of directors, it is analysed and its principles are in turn submitted to the advisory board, each member of the board being asked to express his individual opinion and not his opinion as a representative of any group of interests. The work of this board had been found very helpful.

The federation is now organizing a staff council, said Mr. Frazee. This council is to comprise the paid executives of the various associations, whether they be secretaries, commissioners, statisticians or legal counsel. There will be a statistical division of this council, a legal division, and an advertising or publicity division. It is expected that the legal division, comprising the legal counsel of 200 or 300 associations, would result in a new type of legislation for the building industries.

Reform in Building Laws

There is urgent need for reform of building laws, said Mr. Frazee. There is no reason, for instance, why the radiators and heating equipment that are accepted in one state should be outlawed in another, or that one type of fire escape should be satisfactory in one part of the United States and forbidden in another part. It is impossible at the present time, said Mr. Frazee, for manufacturers of some lines of equipment to manufacture any article which will meet with approval all over the United States. If it passes the laws of one state, it is certain to transgress those of some other state. Sureiy, he said, it is possible to adopt universal heating codes and building by-laws that will enable manufacturers to serve their customers in every state.

Mr. Frazee outlined the benefits which he claimed had been received during the past year as a result of the federation. At the beginning of 1919, construction activities in the United States were only 10% of the the normal for that period of the year. The problem was how to get business started again. A "Division of Construction Works and Development" had been organized in the Department of Labor to encourage business projects delayed by the war and to get additional appropriations by states and municipalities as well as by the Federal government. By co-operation between this division and the federation, said Mr. Frazee, numerous road-building appropriations were secured totalling about $500,000,000. The directors of the federation also invited the co-operation of loaning organizations and real estate boards, and had organized the "Own Your Own Home" and the "Build Now" campaigns, which had been incorporated in the Department of Labor and had been carried on through government agencies. These campaigns were taken up by chambers of commerce, Y.M.C.A.'s and other organizations throughout the whole country. The country was divided into fifteen districts, with a director in each district, and within two months these campaigns were going in every city in the United States, with the result that by July the construction industries of the United States were from 100 to 150% normal for that period of the year.

Problem for Whole Industry

No one group could have gone into this work, said Mr. Frazee. The cement interests, for example, would not have done it because it would have been of equal value to the lumber and other interests. It was distinctly a problem for the whole industry.

Mr. Frazee also told how the association had secured the co-operation of the secretary of the treasury in instructing bankers to accommodate all legitimate construction activities despite the Victory loan campaign.

Many people were holding back construction work on account of prices, whereas the federation knew that on account of labor and other conditions, prices could not and would not be reduced for a long time. They approached Prof. Irving Fisher, of Yale, one of the leading economists of the country, in regard to this matter, and Prof. Fisher wrote an article on the new price level which was so logically presented that it did more than anything else to give confidence in the new price level and to revive business.

Other Services by Federation

Another service rendered by the federation, said Mr. Frazee, was to prevent an increase in the already heavy freight rates on building materials.

While the federation does not interfere in labor troubles excepting as a court of last resort, at one stroke the federation had eliminated 80% of the strikes in contracting work by securing the appointment of the Court of Jurisdictional Awards. It had been found that 80% of all strikes among employes and contractors was due to disputes as to which particular craft had jurisdiction over any certain kind of work. All such questions are now to be submitted to the Board of Jurisdictional Awards, whose finding is final, and there are to be no strikes on account of jurisdictional disputes.

"Big Stick, Velvet Covered"

The settlement of informal war contracts was another matter in which the federation proved of service to the industry, said Mr. Frazee. The Associated General Contractors of the United States had been working for three months to try to get a bill through congress to relieve the contractors who had large funds tied up in informal contracts, and who could not receive any payment in regard to same. Within thirty-six hours after the federation had received the call for help from the general contractors, the bill had passed the House of Representatives, and the following day it passed the Senate and was signed by the president. No one organization could have secured such quick work, said Mr. Frazee, but it was the organization of organizations that affected the result. It was the "big stick," said Mr. Frazee, although carefully covered with velvet.

The federation had also proven of service in drawing together various groups with similar interests. For instance, it has at present a request as a result of which it is trying to bring together the sash and door and glass interests so as to standardize sizes, etc.

Standardization is one of the most valuable phases of the federation's possibilities, he said. For instance, at present there are 26 manufacturers of freight elevators in the United States, each making about 30 types of elevators. The basic variations in an elevator are only three: Floor area, lifting capacity and speed. Probably five types could be designed, said Mr. Frazee, which would meet all conditions, if the co-operation of the engineers and architects could be secured, and then these five types could be produced upon a quantity basis, saving enormously in labor costs.

The federation had not been a medium for the raising of prices, but, to the contrary, had lent all its efforts to keeping prices within bounds. This was reflected in the fact that the advance in building materials has been 23% less than the advance in other lines.

Organized upon proper lines, said Mr. Frazee, a federation of construction industries is not a menace to labor, government or anyone. There are always some short-sighted people who want to do the wrong thing, but only a small percentage of business men are rascals and the tendency of the big organizations is to keep these few in line, and it is therefore a power for good instead of evil.

In regard to labor, if we are to avoid radicalism we must be just, said Mr. Frazee. There are just as basic fundamentals in labor as in freight rates or anything else.

Foreign Trade Division

Mr. Frazee referred to the foreign trade division which the federation has organized and which is sending scores of enquiries daily to its members throughout the United States. This trade division is fully organized upon a running basis, and has correspondents in all parts of the world.

Every phase of legislation is receiving the careful attention of the federation, as well as matters such as freight rates after the return of the railways to private ownership.

Emergency situations have also been met by the federation from time to time. For example, at the time of the coal strike, the common brick industry appealed to the federation, stating that its fire-protection systems were freezing for lack of coal. Within a few days the federation had secured an order from the fuel controller, authorizing shipments of coal to brick plants.

In conclusion, Mr. Frazee stated that there is undoubtedly a big place in Canada for an organization of construction industries, but to fill this place two essentials were needed: (1) Money; and (2) unselfish service on the part of all members, because for the first years comparatively few have to carry the load and are required to put more into the organization than they get out of it for the time being, but the big returns are sure to come in due time.

Charles P. Craig, of Duluth, vice-president-at-large and executive director of the Great Lakes-St. Lawrence Tidewater Association, states that the proposed inland waterways system should be completed within four years. "This project," Mr. Craig says, "has passed the diplomatic stage. The governments of Canada and the United States have come together on the proposition to the extent of granting the International Joint Commission power to prepare a plan of action. It is the intention of this commission to hold hearings in the larger cities of the fourteen states so far committed to the project. Much already has been done in clearing the way for this route, and when the last obstructions—the St. Lawrence river rapids—are converted into smooth water by a system of dams, making the river a series of lakes, the way will be opened to the sea. Inland mountains and plains will be brought 1,000 miles nearer to the world markets. Drowning out the rapids by means of dams will cost approximately $60,000,000 and provide water power as well as waterways. Rentals from water power rights will pay the expenses. This power is needed to relieve fuel shortage, while the water route is needed to relieve traffic congestion and bring down the most of commodities by increasing production and market facilities."

POWER POSSIBILITIES OF NOVA SCOTIA*

By K. H. Smith
Chief Engineer, Nova Scotia Power Commission

NOVA SCOTIA'S enormous coal resources of themselves place this province in an enviable position from the standpoint of electrical power. Great strides have been made during recent years in the improvement and perfection of steam power plant apparatus, and the art of electrical transmission is now in such a stage that large economies may be effected by generating power in large units strategically located as to fuel supply, water supply and distribution. In this connection it must not be forgotten that even steam power plants require large quantities of water for condenser and boiler purposes and it is frequently not possible to locate such plants immediately at coal mines, due to lack of sufficient water supply. The Acadia Coal Co. has a modern steam power plant at Stellarton, located at the pit mouth, while for some years a similar plant but now somewhat obsolescent has been operating at Chignecto mines.

In recent years internal combustion engines using oil fuels have come into increasing use and, under certain circumstances, they are unexcelled. This type of prime mover already fills an important field for comparatively small power demands in isolated districts where central station service is not or cannot be made commercially available. For intermediate power capacities, Diesel or semi-Diesel engines using crude oil or at least the heavier grades of oil are exceedingly economical and it is quite possible that the Diesel engine, which is being built in increasingly larger units both for stationary and marine service, may in time, partially at least, supplant the steam units. Now it appears that in Nova Scotia there are large areas of commercial oil shales so that in the oil engine field, also, Nova Scotia has possibilities.

Must Choose Power Source

In addition to these power resources, investigations during the last four or five years have shown that Nova Scotia unquestionably has considerable water power, and it is this that we wish to discuss here particularly. It should always be carefully remembered, however, that only by a careful co-ordination and combination of power resources of all kinds will the best interests of the province be served. Undoubtedly one of the greatest factors in the well-being and prosperity of any country is an adequate supply of electrical energy, but electricity is the same whether produced from wind, water, coal, oil, gas or any other source. It is the field of engineering and economics to decide which is the best possible source or combination of sources in any given set of circumstances. In certain places there are obviously no alternatives, as for example, Italy, Spain, and New Zealand, where there is no native coal but considerable water power.

Rainfall and Stream Conditions

Certain outstanding facts in regard to Nova Scotia indicate at the outset that there are likely to be commercial power possibilities.

In the first place there is an abundant rainfall, which is fairly well distributed over the various periods of the year, thus indicating not only a large flow of water in the streams but also a fairly constant flow. Generally speaking, with the exception of certain small sections of British Columbia, the rainfall in Nova Scotia is larger than in any other part of Canada and larger than that in most other countries. Taking Halifax as typical, the average yearly rainfall for 50 years is 56 inches, while for Montreal, Toronto, Winnipeg and Calgary, the average yearly rainfall is about 41, 34, 21, and 16 inches, respectively.

Another feature is that most of the streams are short and rapid with frequent rock outcrops in their beds and along their banks. While the shortness of the streams presupposes small tributary drainage areas and consequent small amounts of water in the streams, still their rapidity and

*Abstracted from article published in the Halifax Chronicle.

character indicate that such water as they do contain may be controlled and utilized at reasonable expense, so that a comparatively small amount of water may, by falling a long distance, do the same amount of work as a large quantity of water with a shorter fall, and at relatively less expense due to the smaller structures involved.

A third feature is the abundance of lakes and ponds, which even in their native state very materially aid in maintaining a regular flow of water in the various rivers on which they exist, and most of which may at small expense be utilized to a much larger extent for this purpose.

The efficacy of these artificial reservoirs has been questioned by some in this province. This is the most remarkable in that artificial control of water supply has universally been used in this province for many years to a greater or less extent in lumbering and milling operations; to say nothing of municipal water supply systems. The practical effect of artificial pondage either for seasonal or daily purposes may be seen at any time in the hundreds of small mills and log driving dams throughout this country. To go further afield, it is a fact that with few exceptions such as those on the Great Lakes waterways, which lakes are themselves the largest natural storage reservoirs in the world, all larger water power plants depend to a greater or less degree on artificial reservoirs for a dependable water supply. For example, the government of the province of Quebec has just recently completed the second largest artificial storage reservoir in the world at a cost of about $2,000,000. The capacity of this reservoir exceeds that of the great Assouan reservoir in Egypt, used for irrigation purposes, and is only exceeded in capacity by the great lake above the Gatun dam, forming part of the Panama Canal. This Quebec reservoir is near the head of the St. Maurice River at La Loutre, and is used in connection with the large power plants at Shawinigan and Grand Mere.

Opportunities Investigated

Investigations of the nature indicated were undertaken early in 1915 by the Water Power Branch of the Interior Department, Ottawa, at the request of and in co-operation with the Nova Scotia Water Power Commission. These investigations are still under way and so far as measurement of water supply is concerned will be continued for some time.

Therefore, with over four years' actual measurements of water supply in various streams throughout the province, including a period in which rainfall records, extending over a much longer period, indicate to have been almost if not quite the driest experience in some fifty years, and in instances where sufficient surveys and investigations regarding head or fall and storage capacity have been made, we are in a position to make estimates of dependable power capacity which may be accepted with considerable confidence.

The basis for such estimates may need some explanation, that is to say, the estimated quantity of a site will vary in accordance with the use to be made of the power derived therefrom. Pulp mills and some other industries utilize power at practically a constant rate over the whole twenty-four hours of the day; some other industries use power for only eight hours in the day and that at varying rates. A reasonable assumption is that the average power demand for diversified industries will be 40 per cent. of the maximum demand, and machinery must be installed correspondingly if the full benefit is to be derived from a given site. Any estimates that follow are therefore given on that basis, that is to say, the commercial capacity of the site is taken to be 2½ times the average continuous capacity, since practically all the sites discussed have ample pondage capacity to store water at periods of low load for use at periods of heavy demand.

Considering in detail the water-power resources of the province we find four natural divisions based on typical characteristic rivers and general topography.

Atlantic Drainage Area

Another natural division of the province may be termed the Atlantic Drainage, covering roughly the counties of Guysborough, Halifax, Lunenburg, Queens, Shelburne, Yarmouth and Digby, and embracing the largest rivers of the province such as the Tusket, Liverpool, Medway, Lahave, Sheet Harbor and St. Mary rivers. This division forms by far the largest part of the province, and by reason of the fact that it is studded with lakes and rivers of considerable size, has large power resources. The possible power developments are of much the same type, being of low or medium head, ranging from 30 to 70 feet, with a few exceptions up to 160 feet head.

Capacity of Large Rivers

The estimated capacity of a few of the larger rivers may be mentioned briefly.

East River, Sheet Harbor, has a capacity in two developments of 15,000 horse-power, or if the West River, immediately adjoining, be included, a capacity of 17,500 horse-power. The heads utilized on these rivers would be 60 to 100 feet.

Two rivers flowing into St. Margaret's Bay, the Indian and Northeast, present exceptions to the general type of power rivers in the Atlantic drainage area in that they are comparatively small rivers. They have large storage facilities, however, and by a special development wherein a total head of 250 feet is utilized, the two together have a capacity of about 10,000 h.p. on the basis indicated above.

The Lahave, Medway and Liverpool rivers are all of the same type and when completely developed will supply 26,600, 35,000 and 85,000 horse-power respectively. There will be a number of power houses on each river, all of the same general type and operating under heads from 20 to 50 feet. The different power houses on the same river will, however, be so intimately connected electrically that they may be considered as a single unit. The Liverpool river is already developed to the extent of 6,500 horsepower, mostly for pulp and paper purposes.

The Tusket and Sissiboo rivers also have large power capacities, and while field surveys and investigations of these rivers have been completed, the necessary office computations have not yet been made.

Bear river, both branches, which is somewhat similar to the Indian and Northeast rivers already mentioned, will furnish about 5,000 h.p.

Valley District

The "Valley" district is so well known as to need no further description. Its power capacities lie mainly in the small but very rapid and precipitous streams which tumble from the high plateau known as the South Mountain into the Annapolis river. It presents unique opportunities for comparatively large developments immediately adjacent to thickly populated agricultural country.

Of the rivers in this particular class, falling from the South Mountain, the most important are the Lequille, Paradise and Nictaux, with power capacities of 6,500, 7,250 and 8,200 horse-power respectively. All of these developments would be cheap, that of the Paradise with a head of over 50 feet, remarkably so. The Gaspereau and St. Croix rivers are also included in this district, although the St. Croix, which is a particularly interesting stream from a power standpoint, is somewhat in a class by itself. The estimated capacity of the Gaspereau is 18,600 h.p., and of the St. Croix 8,200 h.p. on the basis already mentioned.

The Midlands

The remainder of the province which may be conveniently designated as the Midland district, embracing Hants, Colchester, Cumberland, Pictou and Antigonish counties, has no water power sites of great magnitude, although there are a large number of small sites well suited for local or private use. As in the case of Cape Breton, however, we have large coal areas in Cumberland and Pictou county upon which to fall back, and undoubtedly steam power plants in this district will ultimately be interconnected with some or all of the water-power sites mentioned.

It is an interesting fact, that in this province, as in so many other parts of the world, where we find large coal resources, we do not find large hydro-electric resources, but

between the two sources of power, nature has done very well by mankind and we generally find either one or the other.

Commission to Develop Sites

Having come to a point where there could be no doubt as to the fact that this province has considerable hydro-electric resources as well as large power resources from other sources, the provincial authorities have taken steps to put these natural resources at the disposal of the people. In the first place, everything possible is being done to supply to those interested adequate and reliable data, and at the same time to remove any restrictions of a legal or proprietary character tending to retard development. In addition, the Nova Scotia Power Commission has been organized to carry out as a public measure such developments as may be in the interest of the public. There seems to be little doubt but that the province is now on a fair way to be adequately supplied with electrical energy for domestic and industrial purposes. Of course there will always be certain outlying districts which in the very nature of things cannot be supplied with such energy as a commercial undertaking.

As an earnest of what is proposed in this connection, the Nova Scotia Power Commission is already proceeding as rapidly as possible to develop a water-power site in the vicinity of Halifax. This will form one of the nuclei for a network of transmission lines, eventually serving all the more populous and industrial centres of the province and possibly with some of its ramifications extending into the province of New Brunswick, where similar projects are under way. This network of transmission lines may be likened to a large reservoir of electrical energy, with energy being pumped into it from various generating stations, both steam and hydro-electric, and which may be tapped at any point. It may be noted here that this arrangement is no dream of the future, but is an accomplished fact in many places even so near at hand as the upper part of New Brunswick, the State of Maine, the New England States and a large area of the other states.

Some Probable Plants

It is probable that the next undertaking of the Nova Scotia Power Commission, and that at an early date, will be a water-power development at Sheet Harbor to supply the industrial section of Pictou County, possibly interconnected with a steam plant in the vicinity of New Glasgow. A third development may well be one on the St. Croix river to supply Windsor, where there is already in existence a considerable industrial community which would be greatly stimulated by a supply of reasonably-priced electrical energy. A line could extend down the valley from this development to supply existing demands there and ultimately, as demands grow, link up some of the possible developments in that section. A fourth development might well be a steam plant located in the vicinity of Springhill, with a trunk transmission line following the railway and connecting at Truro with a line from the St. Margaret's Bay developments and the St. Croix development to New Glasgow via Truro.

May Electrify C. N. R.

With various plants thus interconnected there can be no question of dependability of supply, and advantage can be taken of the great diversity in the character of the power loads at various places to secure a maximum use of the generating equipment and consequent minimum costs for energy. It is quite probable that the availability of such a dependable source of supply would hasten the electrification of the C.N.R. from Moncton to Halifax, something which must be carried out sooner or later if the fullest possibilities of the port of Halifax in the interests of the country at large are to be realized. The existence of such a dependable source of power was a considerable factor in one of the largest railway electrifications now in existence, that of the Chicago, Milwaukee and St. Paul Railway, which is fed by a power system embracing some 13 hydro-electric power stations and three steam stations.

While the specific developments mentioned may be considered as commercially feasible now or in the immediate future, it is well to bear in mind that a proper balance must always be maintained between capital expenditure and market. There can be no question, however, but that a certain amount of electrical energy immediately available, with the certainty that more will be made available as demands arise, will prove a powerful stimulus to industrial and even agricultural development. Probably no person can better realize the benefits of electrical energy than the farmer, and all industrial and commercial development must rest on a substantial and satisfactory agricultural foundation.

MOVING PICTURES OF FRAZIL FORMATION

MOVING pictures showing the formation of frazil were shown to members of the Montreal branch of the Engineering Institute of Canada last Thursday evening, during the course of a lecture by John Murphy, electrical engineer of the Department of Railways and Canals, Ottawa.

The pictures showed practically the same experiments that were made in February, 1919, at the general professional meeting of the institute at Ottawa, and which were described in the February 20th, 1919 issue of *The Canadian Engineer* (pages 241-2). They showed bottles of water just at the freezing point or slightly below it, the water in the bottles being agitated by steel rods, the temperature of the rods in some cases being a fraction of a degree below the freezing point, and in other cases a fraction of a degree above.

The experiments showed that perhaps one-thousandth of a degree in temperature may determine the formation of frazil; that is, if the runner, casing, etc., of a hydraulic turbine be one-thousandth of a degree below the freezing point of water, frazil will be attracted, and, said Mr. Murphy, will often clog the machine in an incredibly short time. If the metal parts are one-thousandth part of a degree above the freezing point, frazil then will not cling to the metal.

To avert this danger from frazil, which, said Mr. Murphy, is the "bogey" of Canadian water powers, the easiest and cheapest method is to raise the temperature of the machinery or of the water to slightly above freezing point. He told of an instance where a small steam boiler kept a very large hydro-electric plant from freezing. "The simple fact is," he said, "that moving metal machinery below freezing point is an ice-making machine, and the only remedy is either to bring the machinery above freezing point by steam or electric energy, or to raise the temperature of the water."

The moving pictures were very clear. They were produced in Ottawa under the direction of B. E. Norrish and J. M. Alexander, of the Bureau of Publicity and Exhibits, Department of Trade and Commerce, with the co-operation of the Chateau Laurier, the bottles of water being brought to the desired temperature in the refrigerating plant of the hotel. The pictures were taken with the aid of powerful electric lights and microscopic lens.

Other branches of the Engineering Institute of Canada, or other technical societies, who might be interested in securing a showing of these pictures, should address Mr. Murphy, who is a government official and is interested in the matter merely from the standpoint of education and of increasing the value of Canadian water powers during severe winter weather.

Officers for the newly formed Vancouver branch of the British Columbia Technical Association were elected at a recent meeting. They are as follows: President, A. S. Wooton; secretary, R. Snodgrass. Executive: Naval architects, T. Halliday; mining engineers, Dr. E. T. Hodge, A. E. Hepburn; civil engineers, A. Lighthall, P. Philip, W. B. Young, F. O. Mills; mining engineers, W. Reith, A. D. Robertson; chemical engineers, Dr. J. G. Davidson, G. S. Eldridge; architects, S. M. Eveleigh, A. L. Mercer; electrical engineers, J. Muirhead, T. H. Crosby.

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PRINCIPAL CONTENTS

HYDRO-ELECTRIC ICE TROUBLES

At an informal breakfast party in Montreal during the recent annual meeting of the Engineering Institute of Canada, several engineers interested in hydro-electric problems were gathered around the table. One of the engineers was John Murphy, electrical engineer of the Department of Railways and Canals, Ottawa, who has devoted considerable time during the past twenty years to the subject of ice troubles in hydro-electric plants.

The talk turned to the canalization of the St. Lawrence river, and the possible means of obviating ice difficulties in connection with the proposed large power developments.

"Why not heat the river?" asked Mr. Murphy, and naturally everyone laughed; but Mr. Murphy explained that he was perfectly serious, and that there is some possibility of being able economically to heat a stream of water even as large as the St. Lawrence river to an extent sufficient to obviate frazil troubles in the development of hydro-electric power. Mr. Murphy declared that he had demonstrated in experiments that an astonishingly small quantity of heat, properly applied, would keep flowing water from freezing, and that a thousandth of a degree in temperature will in some cases have an enormous influence on the formation of frazil.

If the water be not heated, the only other remedy for ice troubles, declared Mr. Murphy, is to heat the turbines, racks, etc. Mr. Murphy has had practical experience in the efficiency of the latter method, as he has kept a large hydro-electric plant near Ottawa running continuously throughout several winters by the aid of a comparatively small boiler, whereas, previous to the installation of the boiler, this plant was always shut down during unusually cold weather. Frazil will not stick to metal, said Mr. Murphy, if the temperature of the metal be one-thousandth of a degree higher than the freezing point of the water; but if the metal be of lower temperature, frazil will cling and build up rapidly, preventing the operation of the entire plant.

In the reference to the International Joint Commission regarding development of St. Lawrence power, the governments of the United States and Canada have included certain instructions to the engineers in charge of the investigation for the commission. One paragraph of these instructions relates to the handling and disposal of ice as a fundamental difficulty on the St. Lawrence river. It states that the necessary arrangements for this purpose should be discussed, as well as those recommended for ice disposal during the construction period. No doubt the engineers in charge will take into serious consideration the suggestions made by Mr. Murphy and the data that he has collected on the subject, however fanciful the idea of heating a river may seem, and however little it may seem to solve the problems presented by cake ice, which is generally more troublesome than frazil.

The entire subject of ice troubles in hydro-electric plants is a very important one in this country in view of our great dependence on water powers and the large extent to which they will undoubtedly be developed during the next few years. It is to be hoped that the Research Council or some university will carry on the investigations that Mr. Murphy has begun, in order to determine whether some simple and inexpensive solution can be found for the entire problem.

Letters to the Editor

MUNICIPALLY OWNED ASPHALT PLANTS

Sir,—In the last issue of *The Canadian Engineer*, page 179, I see that Mr. Mullen, of the Milton Hersey Co., gives a list of municipally owned asphalt paving plants in Canada. He has, however, omitted to mention London, which has owned and operated a municipal plant, 1917 to date, inclusive, and which is, I believe, one of the most successfully operated plants in Canada.

H. A. BRAZIER,
City Engineer.

London, Ont., February 2nd, 1920.

ANOTHER ONE OVERLOOKED

Sir,—I notice in your edition of *The Canadian Engineer*, under date of January 29th, 1920, an article on page 179, under the heading of "Municipally Owned Asphalt Plants," in which article is given a list of cities on the North American continent owning their own asphalt plants, and in which list I do not find Winnipeg mentioned. Winnipeg is the owner of three asphalt plants—one stationary and two portable—and I believe that this city was the first in Canada or the United States to own its asphalt plant. The stationary plant was put into operation first in the year 1899, so that you will readily agree with me that the city of Winnipeg should at least be included in the list.

W. P. BRERETON,
City Engineer.

Winnipeg, Man., February 5th, 1920.

DRIFTING SAND FILTERS AT TORONTO

Sir,—We have noticed with interest a descriptive article in your issue of October 2nd, 1919, entitled, "Operation of Drifting Sand Filters at Toronto." We have read through the details, and find no reference to any of the firms interested in the supply and construction of this equipment, and we think, under the circumstances, we may look to you to insert in an early issue information based upon the following details:—

The drifting sand filter plant installed at Toronto was carried out in the form of a joint contract by the John verMehr Engineering Co., Ltd., of Toronto, and William

Cowlin and Sons, Ltd., the latter firm being responsible for all constructional work, and the former firm for all mechanical equipment and satisfactory operation of the plant installed.

The John verMehr Engineering Co., of Toronto, is an associated firm of ours, the firm here in London being in the position of parent company, and as a matter of fact engaged in the supply and installation of drifting sand filters in various parts of the world. It will doubtless interest your readers to know that during the recent hostilities the Ransome drifting sand filters have been extensively supplied for use of the troops on active service, numerous plants having been ordered by the British, French and United States Governments for this purpose.

Naturally, the individual capacity of any of these filter plants was nothing like so much as in the case of the Toronto installation, but are nevertheless of interest as embodying three distinct types: Firstly, the small, mobile unit, self-contained with pump, engine, coagulent plant and filter, mounted on a standard three-ton army lorry; secondly, floating filtration plants, erected in steel barges, and arranged to pump and filter water from the canal or river in which the craft was floating, these floating equipments being used not only in the canals and rivers in France and Belgium, but also notably on the Tigres and Euphrates rivers in Mesopotamia; thirdly, the normal stationary type of filter, such as would be supplied to any municipality.

With regard to these plants in general, they were in every instance of the pressure type, although the drifting sand principle, which is so advantageous from both a chemical and bacteriological point of view, was in every case adopted.

RANSOME-VERMEHR MACHINERY CO., LTD.,
Per J. E. Hobbs, Chief Engineer.

London, Eng., January 22nd, 1920.

PERSONALS

JOHN B. CARSWELL, who has been elected as president of the newly formed Canadian General Contractors' Association, and who was also recently elected first vice-president of the Association of Canadian Building and Construction Industries, was born April 9th, 1888, in Paisley, Scotland, and was educated at Glasgow University in civil and mechanical engineering, graduating in 1909 with the degree of B.Sc. Immediately after graduation, Mr. Carswell came to Canada and spent the summer in the head office of the Grand Trunk Railway at Montreal, as assistant engineer in the maintenance-of-way department. At the end of the summer he returned to Scotland and spent the winter in the James Watt Laboratories, Glasgow University, in mechanical research work. In 1910 he again came to Canada and became superintendent of construction for the John Stewart Co., of Montreal, in charge of the erection of the New Birks Building, a ten-story reinforced concrete structure. The following year he entered the office of Ross & Macdonald, architects, Montreal, as business manager, and two years later he opened an office at Toronto as that firm's Ontario representative, in which capacity he remained for over three years, during which time he was the architect's representative on the construction of the Royal Bank Building, the Toronto Union Station and the Central Technical School. While acting in 1917 as resident architect at the Union Station, he was requested by the Director of Aviation to supervise the construction of the plant of Canadian Aeroplanes, Ltd., and soon afterwards he was appointed chief engineer of the Aviation Department, Imperial Munitions Board. In 1917 and the following year, Mr. Carswell had charge of the design and construction of all of the Ontario barracks and camps of the Royal Air Force. He organized a construction force which numbered at times over 2,000 men, and directed expenditures of more than $400,000 per month. His construction force included departments covering road construction, electrical work, plumbing, heating, telephone line construction, building construction, commissary, etc. After the armistice, Mr. Carswell and two of his former associates, incorporated the Carswell Construction Co., which concern has secured the general contracts for new buildings for Gunns, Ltd., Toronto; H. B. Johnston & Co., Toronto; Consolidated Rubber Co., Kitchener; Chase Tractor Co., Toronto; Wm. Davies Co., Toronto; Beaver Board Co., Thorold; and Canadian Allis-Chalmers, Ltd., Toronto.

ROBERT WEIGHTS has been appointed superintendent of works, Mimico, Ont.

SERAPHIN OUIMET and ROYAL LESAGE, who have been in partnership as consulting engineers under the firm name of Ouimet & Lesage, Montreal, have dissolved partnership.

JOSEPH HALL, superintendent of outside construction of the Water Board, Windsor, Ont., has resigned. Mr. Hall is 80 years of age, and has been in the service of Windsor's water works for the past 45 years.

L. LEON THERIAULT has been appointed town manager of Edmundston, N.B. Mr. Theriault has been in the service of the department of public works of the province of New Brunswick for the past three years, as a district road engineer. He graduated from the University of New Brunswick in 1909.

LT.-COL. H. L. TROTTER, D.S.O., has resigned from the Henry Holgate consulting engineering firm, Montreal, to become engineer in charge of the construction of the extension to the Abitibi Power & Paper Co.'s hydro-electric plant at Iroquois Falls, Ont., for which Morrow & Beatty, of Peterborough, have the contract.

W. T. RANDALL has joined the sales engineering staff of the Neptune Meter Co., Ltd., Toronto, having just returned to Canada after a seven months' course of instruction in the factory of the Neptune Meter Co., Long Island City, N.Y. Mr. Randall went overseas in 1916 with the 180th Battalion, but was transferred to the 4th Battalion. He was invalided home in 1918 on account of shell shock. He is a son of W. H. Randall, the well-known managing director of the Neptune Meter Co., Ltd.

F. M. CLARKE has been appointed assistant chief engineer of the Nova Scotia Highways Commission. Mr. Clarke has had twenty years' experience in road construction in the United States and Canada, and is a graduate of Dartmouth College, N.H. He was formerly assistant engineer of the New York State Highway Department, and was at one time assistant engineer of the Virginia State Highway Department. Latterly he has been with the Barrett Co., Ltd., in charge of the construction of the road between St. John and Rothesay, N.B.

OBITUARY

PAUL PARADIS, civil engineer of the Montreal Tramways Commission, died last week at his residence in Montreal. Mr. Paradis was a graduate of McGill University, and before his appointment by the Montreal commission he held various government appointments in Calgary and other western cities.