Conservation

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Northern Ontario Fires

Uncontrolled Settlers' Fires Undoubtedly the Cause. No Law to Restrict Them

The recent fires in the clay belt of Northern Ontario have, according to recent estimates, caused the loss of probably not less than 250 lives and the destruction of several million dollars worth of property.

This is the greatest catastrophe of the kind, from the point of view of lives lost, that has ever occurred in Canada. The nearest approach was the Porcupine fire, in 1911, in the same district, where 84 lives were lost. So far as records show, only two forest fires have ever occurred on this continent which caused the loss of more lives than the "clay belt" fire of 1916. One was the Peshtigo fire, Wisconsin, in 1871, when some 1,500 people perished. The Hinckley, Minnesota, fire of 1894 caused the loss of 418 lives.

All available evidence indicates that the recent disaster was the result of a large number of settlers' land-clearing fires, which spread rapidly and merged together into several all-consuming holocausts with the almost unprecedented hot, dry spell of the last half of July and the very heavy winds which occurred at that time.

Ontario has no law which restricts in any way the right of the settler to start clearing fires at any time he may see fit. The Act provides only that every reasonable care and precaution shall be exercised in the setting out or starting of clearing fires, and in the management of and care for such fires after they have been set out or started, in order to prevent such fires from spreading. There is no statement of what precautions shall be taken, nor any real provision for the enforcement of this wholly inadequate provision of the law.

In actual practice settlers are at liberty to set out clearing fires whenever they wish; and no fire ranger has any authority to prevent them. It, therefore, naturally follows that the more careless or reckless settlers select the driest times for such fires.

Unless a radical change is made in the forest protection laws, with adequate provision for enforcement, such disasters may be confidently expected in the "clay belt," at repeated intervals, and until the country in process of settlement is swept practically clear of timber.

It is evident that the primary need for the north country is a law regulating settlers' fires. In Quebec, British Columbia, Nova Scotia, the Dominion forest reserves of the west and in a portion of New Brunswick the setting out of such fires is prohibited except on permit signed by a forest officer. Similar laws should be passed by Ontario. The beneficial effects of such legislation are notable in every province or state where it has been made effective.

At the annual meeting of the Commission of Conservation, in January last, a resolution was adopted urging upon the Ontario government the thorough reorganization of its fire-ranging service.

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A part of the area near Kelso swept by the recent conflagration in the "clay belt" of Northern Ontario. Green timber killed but not consumed; ready for another fire. Culverts and corduroy destroyed. Roadway, usually covered with muck soil, partially burned out

Cut 138

What remains of a settler's home in the "clay belt" of Northern Ontario after the terrible fires of July 29 and 30. About 250 lives were lost in these fires and millions of dollars worth of property was detroyed. Such disasters need not be regarded as inevitable. They can and should be avoided, through adequate preventive measures

Fire Prevention in Schools

Early Attention of Teachers Required to Safeguard Pupils

The protection of pupils from fire and panic is the first duty of those in charge of schools. Schools will soon be re-opening for the autumn term and the institution of fire drills should be undertaken without delay. The first day of school is not too early for this purpose. Many scholars will be new to the school or, by promotion, will be unaccustomed to their surroundings and, in case of fire or of fire alarm, disastrous results might follow.

In an eastern city, within ten days after the opening of the last school term, two fires occurred, fortunately during the absence of the pupils. In these schools fire drill had been undertaken at the inception of the term. The occurrence of fires so early in the school term, however, demonstrates the necessity of giving first attention to this form of security to pupils.

The principal and teachers should also familiarize themselves with the school building, noting any dangerous conditions for immediate attention.

Accumulations of papers, disused furniture and school supplies are stored in basements and atties and, accentuated by deposits of dust, create serious fire-danger from spontaneous combustion. Chimneys or pipes passing through attics should be carefully inspected for any cracks or defects from which sparks could be emitted.

The care of waste paper is important. Metal waste paper baskets should be used and the contents burned as soon as the baskets are full; under no circumstances should they be allowed to accumulate. The burning should be done in a safe place, away from frame outbuildings or fences, and should be carried out by either the teacher personally or by some reliable senior pupil.

The heating apparatus, be it stove or furnace, should be carefully examined and placed in fire-safe condition.

Ashes should be kept in metal containers and should never be

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Labour on the Farm

Yearly Employment of Help Would be of Great Value to the Farmers

Farm labour conditions received careful attention in the agricultural survey conducted on 100 farms in each of four counties in Ontario during the summer of 1915 by the Commission of Conservation.

One of the signal facts revealed was the small number of farmers employing male help by the *year*. In Dundas 10 farmers, in Waterloo 9, in Northumberland 7, and, in Carleton 35, provide *yearly employment*; or a total of 61 out of the 400. Those employing help by the *month* included 13 in Dundas, 10 in Waterloo, 6 in Northumberland and 15 in Carleton, while those providing employment by the *day* only, were 41 in Dundas, 26 in Waterloo, 50 in Northumberland and 9 in Carleton. Farmers employing male help by mixed methods numbered 16 in Dundas, 42 in Waterloo, 19 in Northumberland and 9 in Carleton. Transient employment was thus provided for 256 men among the 400 farmers, as against 61 continually employed.

In view of the yearly complaints regarding the scarcity of farm help, the foregoing data indicate that much of the trouble is of the farmers' own making. It is too much to expect that a floating labour market can be maintained to supply this large demand at specific times. At what are these men to secure a livelihood during the balance of the year? True, there are on the great majority of farms periods of great pressure, when the crops must be cared for, and it is usually at these times that the additional help is employed.

The farmer is not alone in this situation, however; many of our largest factories and business houses have had the same conditions to meet. One of the largest clothing manufacturers of the United States recently stated that the keeping together of their staff of skilled workers had been one of their hardest problems. They had solved it, however, by utilizing their employees and plant in the manufacture of other lines for which it was adaptable during the off seasons in the clothing trade.

So with the farmer. He has at his command a wide range of production. By so operating his farm, he can increase his work at seasons when otherwise there would be no employment for his help. Competent help is as economical on the farm as in the factory; training help is an expensive undertaking. By providing continuous employment, the farmer not only overcomes this constant training of new men, but obtains the more valuable assistance of men familiar with his farm conditions.

One of the maxims of the Schools Division of the Experimental Union of the Ontario Agricultural College might be adopted with profit by the transient employers of labour, "Learn to look forward and plan your work." By doing this the slack seasons would be eliminated, the farm would greatly increase its production, the farmer would be better off financially and would also be relieved of the worry due to the help problem.

NORTHERN ONTARIO FIRES

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Closer supervision was shown to be needed, as well as an increased staff of fire-rangers to cover large areas at present unprotected.

The annual expenditure on forest fire protection in Ontario approximates $300,000. The province derives an annual revenue of more than $1,500,000 from its timber lands. For the perpetuation of this revenue and the safe-guarding of life and property, more adequate measures are required than have been in effect in the past.

The report of the Ontario Department of Lands, Forests and Mines for 1915 shows that 126 men were employed on fire patrol along the National Transcontinental and Timiskaming and Northern Ontario railways, at a cost of $56,326 These rangers patrolled only along the railways. They were not able to patrol the forested portions of the adjacent settlements, nor was any other provision made for such patrol. Even had the forested area in process of settlement been patrolled, the rangers would have had no authority under the law to prevent a careless or reckless settler from starting a clearing fire at any time he might wish, thus creating a most serious hazard to life and property.

That the province is justified in spending $56,326 annually on patrol along the two railways in question, is undeniable and the situation demands adequate provision, both legislative and administrative, in the adjoining forest areas in process of settlement, where the danger of fire is little, if any, less than along the railways. As a matter of fact, the one is of little value apart from the other.

Continued failure to provide efficient fire protection in the "clay belt" will inevitably mean that prospective settlers will refuse to undergo the unnecessary risk to life and property, and the whole development of that promising region will be retarded indefinitely. —C. L.

UTILIZING MILL WASTE

It is estimated that there is enough waste from the sawmills of the Southern States alone to produce 20,000 tons of paper per day. The waste from Canadian sawmills is undoubtedly in proportion. Investigations are being made by the Forest Products Laboratories, in both Canada and the United States, with a view to the development of methods for the commercial utilization of this waste. Considerable progress has already been made in sections where local markets are readily available.

Fresh Air a Necessity

Ventilation of Homes Essential to Health of Occupants

Many Canadians have returned from summer outings, of which the principal attraction and benefit were the enjoyment of the open air. Living in the open has health values superior to any artificial cures, and, during the warmer months, is fully enjoyed by Canadians. Today fresh air is a recognized remedy for tuberculosis and pneumonia and a preventive of disease generally.

It is regrettable that the interiors of the majority of homes in Canada are breeding places for disease, because of the difficulties in admitting fresh air. Foul air, containing exhalations from the lungs of the inmates, constitutes the atmosphere in many homes, and it cannot be otherwise when houses are built to exclude the external air.

It is a common mistake to confuse heat and bad air or cold and good air. The atmosphere may be below freezing and still be bad, or it may be excessively warm and still be pure.

Buildings should be ventilated so that it will be impossible for the occupants to breathe air already used. A simple means of keeping the air of a room fresh is by a cross draft, secured through open windows on either side of a house. Where there are windows on one side of a room only, the upper sash should be lowered and the lower one raised. This allows the warm, foul air to escape through the opening above the upper sash as the pure cold air enters below the lower.

To utilize an opening above the upper sash of a window fully for ventilation and at the same time to lower the window shade, the latter may be attached to the roller by four or five pieces of tape, about five inches long. This leaves a space between the roller and shade through which the impure air may escape. The shade should also be shortened so that when drawn down to expose the opening at the top it leaves an opening also at the bottom. This will permit constant changing of the air of a room.

Canadians should be as fond of fresh air in winter as in summer. The benefit of the three or four warmer months with the open-air life is often offset by the shutting-in process adopted in the autumn, and the life and vigour displayed during the open-air months are frequently followed by lassitude and nervous depression, due entirely to the lack of proper ventilation.

FIRE PREVENTION IN SCHOOLS

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deposited near frame buildings or wooden fences. Wood should not be placed close to the stove or furnace to dry. This is a very dangerous practice, and has caused many fires.

All doors leading from classrooms, corridors and school buildings should open outward and should never be locked during school hours.

In the larger schools where a janitor is employed it should be a part of his duty to make a daily inspection of the school premises, from basement to attic. This should be imperative and not simply a matter of convenience.

The position of janitor or caretaker of a school is an important one. The custody of valuable property and the protection of many lives are in his keeping. Too often the only qualification for this position is the low salary at which a man may be secured. The position should be made one of ample salary and a reliable and qualified occupant employed; strict attention to duty should then be insisted upon.

There has been a material reduction in the number of school fires during the past few years. In 1913 there were 35 school fire losses, in 1914 there were 26, while in 1915 there were only 11. It is hoped that 1916 will show that, owing to the greater care exercised by those responsible, school fires have been entirely eliminated.

"Safety First" with Firearms

Each year the shooting season records a long list of accidents due to carelessness of hunters in the forest and in the use of firearms.

A gun going off accidentally and killing the owner, climbing fences with the gun loaded and cocked, or shooting at a companion in mistake for an animal are stereotyped causes. With the knowledge of the danger of handling firearms, it is surely incumbent upon hunters to exercise every precaution and keep continually before them the motto "safety first."

Stovepipe and Chimney Fires

With the approach of cooler weather, stoves and fireplaces will soon be put into commission. Before this is done care should be taken to see that chimneys and stovepipes are in good repair, thoroughly cleaned, and rendered safe from fire. Owing to the dampness of the early summer, many stovepipes will be found badly rusted, which an outer coating of enamel will not expbse. Examine these carefully and replace defective pipes. Fire prevention is one of the first considerations of the householder.

Commission of Conservation

CANADA

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Assistant to Chairman and Deputy Head

CONSERVATION is published the first of each month. Its object is the dissemination of information relative to the natural resources of Canada, their development and the proper conservation of the same, together with timely articles covering town-planning and public health.

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OTTAWA, SEPTEMBER, 1916

PROTECTION OF MIGRATORY BIRDS

The recent successful conclusion of a treaty providing for co-operation between Canada and the United States in protecting migratory birds constitutes a substantial advance toward the effectual conservation of North American wild life.

At the North American Conservation Conference, held in Washington, in 1909, and attended by representatives of Canada, Newfoundland, United States and Mexico, the international problems presented by the proper protection of natural resources were clearly recognized. With regard to migratory wild life the necessity for co-operative action is especially obvious. In Canada and the United States the protection of this invaluable resource is vested in the individual provinces and states, respectively. Protective laws were extremely diverse in both character and efficiency, with the result that the beneficial effects of adequate protection in one portion of the continent were largely nullified by the lack of similar measures in other sections. To secure stricter and more uniform protection negotiations between Canada and the United States were undertaken. The arrangement has now been satisfactorily concluded, the recent ratification by the United States Senate constituting the final step.

The treaty does not affect the administration of the provincial game laws, but insures in Canada, as in the United States, the minimum of protection regarded as essential to the permanent preservation of the wild life resources of North America.

Regulation of Settlers' Fires

Legislation Under which the Forest Provinces Protect their Timber

A comparison of the following extracts from provincial legislation will show that Quebec, British Columbia and Nova Scotia have much more adequate provision for the regulation of settlers' land-clearing fires than has Ontario. It is claimed by many that the recent disaster in the "clay belt" could hardly have occurred if Ontario had had in effect a provision for regulating settlers' fires, similar to that of the other provinces. On the Dominion Forest reserves of the west, as well as in a part of New Brunswick, there are provisions similar to those quoted for Nova Scotia, British Columbia and Quebec.

THE NOVA SCOTIA LAW

"No person shall make, kindle or start a fire for the purpose of clearing land, or other like purposes, nor set up nor operate a portable steam engine within sixty rods of any woods, between the fifteenth day of April and the first day of December next following in any year, without first having obtained leave in writing from the chief ranger or sub-ranger. It shall be the duty of such chief ranger or sub-ranger on being requested to grant leave to start such fire, or to set up or operate such portable steam engine, to examine the place at which it is intended to start the fire, or to set up or operate the steam engine, and the adjoining lands, and the timber, trees and other property thereon, and to refuse such request and decline to grant leave, or to grant it only on conditions to be performed by said persons, if in his opinion it would not be safe by reason of the danger of fire spreading thereon or otherwise."

BRITISH COLUMBIA

"During the close season (between May 1 and October 1) no person, firm or corporation shall set out, or cause to be set out, fires in or near slashings or forest debris, standing or fallen timber, or bush land for the purpose of burning slashings, brush, grass, or other inflammable material, or for any industrial purpose, without first obtaining a permit therefor: Provided that no person shall be convicted who shall have set, in good faith and with reasonable care, a back-fire for the purpose of stopping the progress of a fire then actually burning."

QUEBEC

"No person shall, in the forest or less than a mile from a forest, set fire to, or burn, any pile of wood, branches or brushwood, or any tree, shrub or other plant, or any black loam or light soil, or any tree trunk or tree that has been felled, at any time, except for clearing purposes between the 16th of November and the 31st of March of the following year, but between the 1st of April and the 15th of November, it is necessary to first obtain the written permission of the Minister, or of any other officer of the Department thereto authorized by the Minister, or of the fire ranger."

ONTARIO

"Every person who, between the 1st day of April and the 1st day of November, sets out or starts a fire within a fire district for the purpose of clearing land, shall exercise and observe every reasonable care and precaution in the setting out or starting of such fire and in managing of and caring for it after it has been set out or started, in order to prevent the fire from spreading."

From the foregoing, it will be seen that, in every forest province of Canada, except in Ontario, the governmental fire-protective agency on the ground assumes some degree of responsibility for protecting the general public against the careless or reckless settler, by preventing him from setting out clearing fires at an unsafe time. Ontario assumes no such responsibility.—C. L.

Co-operative Threshing

Electric Power Utilized on Farms and Cost Materially Reduced

The benefits from modern methods of utilizing waterpowers are not confined to cities and towns or industrial centres. A recent undertaking in a Kansas rural district illustrates the manner in which the progressive farmer may secure the advantages of hydro-electric service.

Nine farmers along the transmission lines of a hydro-electric plant formed a co-operative Electric Threshing Association, purchased equipment, and are doing their threshing with electric power. The service is reported to be very satisfactory, and the cost to the farmers is about one-half of that charged for steam threshing, despite the fact that the rate paid for electrical energy is 5 cents per kilowatt-hour, or about double the charge that would be made in many localities in Canada. The energy required is approximately a quarter of a kilowatt - hour per bushel, varying with the nature of the grain threshed. The power company, as well as the farmer, benefits from this undertaking, deriving a handsome revenue from energy which might otherwise go unutilized. It is expected that the same electrical equipment will be used for filling silos and will produce an equal additional revenue from that source.

The farmers have also utilized the equipment for baling hay, and for threshing for neighbours who are near the company's transmission lines.—L. G. D.

Selection of Seed Potatoes

Greater Production and Improved Quality Results from Care with Seed

Thousands of farmers have suffered heavy losses at various times from fungus diseases attacking potato crops. Weak, spindly hills make breeding places for the diseases which would never get started otherwise. These spindly hills are often caused by planting weak seed, the result of carelessness in selecting the tubers for seed. Like begets like and the sooner persons planting small or diseased potatoes realize this the better it will be for their crop yields.

Remarkable results have been obtained by investigators in seed selection work with potatoes. Intricate methods are not necessary to obtain marked improvement in the ordinary field crops. It is a good plan to go over the field when the tops are about half ripened off and mark with a stake or twig the hills which show exceptional vigour and resistance to disease, to drought or to heat. At digging time these hills can be kept apart for seed. Any of the marked hills not yielding smooth or superior potatoes should be discarded. Farmers may think it too much trouble to save all their seed in this way but enough can easily be selected to plant a special seed plot each year from which seed for the main crop the following year may be obtained. If the farmer neglects to mark the vigorous hills he should, at least, note and keep apart the high yielding hills of smooth, uniform tubers for a seed plot next year.

Potato growers will find that it is highly profitable to select their potatoes for seed carefully and intelligently as it will mean greater productiveness, vigour and uniformity in shape and size.—F.C.N.

Study of Water Powers in Chile

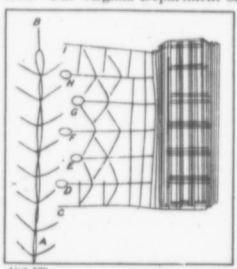
Chile has appointed a Commission to make a study of the water powers of that country available for the purpose of hydro-electric development. Prof. Don Arturo E. Salazar, of the University of Chile, estimates that proper development would reduce the cost of electricity to the small consumer for commercial purposes from 25½c to 1c.

Canada, through the Commission of Conservation, has already taken steps to have an inventory made of our hydro-electric resources. *Water Powers of Canada* was published in 1911. A new work, entitled *Water Powers of Manitoba, Saskatchewan and Alberta* is now in press and this will be succeeded by a report on the water powers of British Columbia.

Selection of Seed Corn

Field Conditions Provide Best Indication of Quality for Reproduction

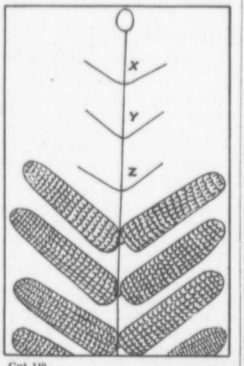
If a good crop of corn is expected good corn must be planted. The crop depends so largely upon the seed that no farmer can afford to plant anything but the best. Those who save their own seed are urged to carefully select it from the field crop and to give it the best of care. Those who have to buy should purchase only carefully selected seed. The Virginia Department of



Cut 139

Showing process of making six wire racks out of a piece of 2-foot fencing for Drying and Storing Seed Corn

Agriculture has conducted tests in connection with field selection and crib selection and has found that ears selected from good yielding stalks in the field (field selection), produced 16 bushels more per acre, or 20 per cent more than good ears of the same variety selected from the crib. Selection in the field enables one to see under what conditions the ear was produced and to note the character of the stalk and leaves of the parent plant, earliness of maturity, size, weight and strength. Where husking is done while the crop is standing a box can be attached to the back of the wagon and the best ears from the most suitable stalks can be plucked and placed in this box. If, however, the corn is to be cut and shocked before husking, enough for seed can be quickly gathered just previous to cutting by going into the best portion of the field and pulling the best ears from the desirable stalks. This should be carefully handled and thoroughly dried before the severe frosts. More than enough should be selected as outlined above and the poorest of the ears should be discarded.—F.C.N.



Cut 140

Completed wire rack made from fencing, for holding Seed Corn, with ears in place on all but three pairs of holders

Advantages in General Delivery

There has been a growing tendency among merchants in Ontario during recent years to favor the general delivery system. This method of delivering goods possesses advantages, and is particularly applicable to the smaller cities and towns. One firm makes deliveries for all the merchants of a town. From two to four trips a day are made, with an additional one on Saturdays and days preceding holidays. In Sarnia, Ont., the waggons collect packages and take them to a central building, where they are sorted, and each waggon covers a particular district. The method employed is similar in principle to the city mail delivery.

This practice eliminates the expense of maintaining separate horses and waggons by individual merchants. The development is in line with modern methods for the elimination of waste. One merchant stated recently that where the average merchant paid $20 a week to the general delivery, it would cost twice that amount to maintain a separate delivery. Another advantage was that the general delivery was more satisfactory and systematically covered the whole city. So far as known it has also given satisfaction to the public. It has induced housewives to send in their orders with greater regularity, knowing that they must be given by a certain time to be filled by a certain delivery.

LUMBER OVER THE COUNTER

The recent reference to a department store in Portland, Ore., in which lumber is sold in "short lengths for odd jobs," has been followed by the establishment of similar departments in a dozen big American cities, where bits of board are sold for 2, 3 or 5 cents. The idea has spread so rapidly that a company has been formed at Portland, Ore., under the name of the Miniature Lumber Company, to supply department stores with cabinets for the display of such lumber.

Experiments with jack pine have shown that it is well suited for making kraft paper. On some of the national forests in the United States, this tree is used to plant land which is too poor to grow other timber.

Whale Fishing Industry

International Regulation Necessary to Secure its Continuance

Whale fishing, like every other industry, has felt the far-reaching economic effects of the war. Glycerine, which is useful in the manufacture of explosives, is obtainable from the oil of the "humpback," "finback" and "sulphur bottom" whales. As Pacific whale oil averages 6 to 10 per cent of glycerine content, with a maximum 14 per cent, a rise of 10c to 20c per gallon since the outbreak of war has given a pronounced impetus to whale-fishing in Pacific waters.

The pursuit of whales for oil and bone has declined very seriously from the high water mark reached in the middle of last century. While the "right" whale has become so scarce that the price of baleen or "whalebone" has risen from $1,250 per ton in 1835 to about $12,500 to-day, the price of oil, despite the upward trend caused by the war, has seriously declined from the level of former years. Sperm oil had declined from upward of $1.00 per gallon, in the fifties, to less than 50c in 1913 and ordinary whale oil was sold for 35c. These low prices, together with the increased cost of fitting out ships—$65,000 in 1853, as compared with $150,000 to-day—have made the industry unattractive to American capital. The decline in the New England whaling industry may thus be explained on economic grounds.

There is a tendency to scout the idea that whales are becoming scarce but the fact that the whalers are going further and further afield demonstrates that the old grounds are becoming depleted.

A very flourishing fishery has grown up in the Antartic. South Georgia, previously uninhabited, now has a large industrial village with three slips for cutting up whales, two guano factories, and large reservoirs for oil. In 1911, the catch was 7,000 whales, which produced 34,000 metric tons (about 310,000 barrels) of whale oil, enough to fill a basin in which a 100-ton steamer could manœuvre. One company, with a capital of $182,000, has, in two years, distributed an annual dividend of 130 per cent, besides adding a portion of the profit to various reserve funds and increasing its resources 60 per cent.

Although whaling is still a flourishing industry in certain quarters of the globe, these enormous profits spell the doom of the whales unless an international agreement can be arrived at to regulate the killing. Of course, an increasing scarcity of whales may make the business unprofitable and, as in New England, the majority of the hunters may be driven from the field. Then the whales may get sufficient respite to enable them to re-establish themselves. But, leaving the conservation of natural resources to the blind play of economic forces is both dangerous and unsatisfactory. Not only may it lead to the utter destruction of an irreplaceable resource—as an animal species—but it builds up a huge industry in the boom days—when the principal as well as the interest is being greedily consumed—only to be followed by a wretched decline when large numbers of men lose their livelihood and expensive plants rot through lack of use. Proper regulation would minimize this expansion and contraction and would ensure a steady supply and a more stable condition of industry.

Conservation in Electric Traction

In view of Canada's wealth in water-powers, so generously distributed throughout the various provinces, the progress of electric traction on railways is of particular significance to the Dominion. An incentive to railway electrification has recently been supplied by the utilization of electric locomotives on 220 miles of the mountain section of the Chicago, Milwaukee & St. Paul railway. The railway officials report the complete success of the electrically operated line, and, by November, 1916, electric traction will be in operation over the whole of the mountain section—about 440 miles. The power is supplied from several hydro-electric plants situated along the railway, thus reducing the cost to a minimum.

In connection with this development, the, so-called, "regenerative" braking has been installed. In "regenerative" braking, which is particularly useful on long downgrades, the retarding force, instead of wearing out the brake-shoes, is utilized to drive the motors, producing electric energy. This energy is returned to the line, and usually serves to help an ascending train moving in the opposite direction on the same grade. The operation may be compared to the well-known mechanical appliance, consisting of two cars, one fastened at each end of a rope which passes over a pulley, and in which the weight of the descending car helps to raise the other.

The electric regenerative-braking apparatus automatically controls the speed by regulating the amount of energy put back into the line. Should there be no other trains to absorb the power thus returned to the line, this power passes through the sub-station and is utilized for lighting or power purposes. A 2,500-ton train, running at 17 miles per hour down a 2 per cent grade, returns about 4,700 h. p. In addition to the elimination of air brakes and the prevention of brake-shoe and wheel wear, there has been a saving of about 15 per cent in power.—L. G. D.