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Controlling Insect Pests of the Forests

Defective Trees Usually Attacked. Proper Slash Disposal Reduces Loss

The bark-beetle constitutes the chief insect enemy of our coniferous forests. Forest fires are spectacular, and the results are immediately and strikingly noticeable, but competent authorities are of the opinion that the annual loss caused by the depredations of this and other forest insects which are widely distributed throughout the country is greater in the aggregate than the loss due to forest fires. The methods to be adopted to control the outbreaks of these serious enemies of our forests depend upon a knowledge of the species of bark-beetles concerned. Different species have different habits, and as control measures are based upon their habits it is necessary for the forester to be able to recognize the various species that are to be found affecting our timber and shade trees. In addition to the more evident outbreaks where large numbers of trees die each year in the infested area, there is a very large and often unrecognized annual loss due to the normal activities of forest insects. Everywhere throughout the forest, injured, unthrifty, and over-mature trees are attacked and killed by various species of bark-beetles and wood-borers; and, when large areas are considered, the normal loss from this cause is so very great that it demands serious consideration. When coniferous trees die without any apparent external injury, examination usually shows that their death has been caused or hastened by bark-beetles or other insects. When slashings are allowed to lie, the fresh bark and wood serve as a breeding ground for many destructive insects, and it is, therefore, only to be expected that the annual crop of scattered dying trees will be abnormally large in the neighbourhood of bodies of neglected recent slash.

In addition, nearly all these scattered dying trees are completely destroyed by "borers" (boring beetles) during the few years following their death, and they become an absolute loss, since, even though the limit is being logged, it is often considered unprofitable to collect the scattered dying trees. Properly conducted slash burning will almost invariably reduce the amount of this annual loss, and it must be regarded as a most valuable method of insect control.—*J. M. Swaine*, Dominion Entomological Branch.

More Than 2,000,000 H.P. Electric Energy Generated in Canada

Report to be Issued by the Commission of Conservation Gives Complete Analysis of Number of Plants, Sources of Energy and Ownership of Plants

That there is upwards of 2,000,000 horse-power of electrical energy generated in Canada is demonstrated in the report on *Electric Generation and Distribution in Canada* about to be issued by the Commission of Conservation. The investigation into this subject has extended over a number of years and has been a most comprehensive one. Two of the principal points to bring out are the large part water-power plays in the production of electricity and the fact that over three times as much power is produced by privately-owned plants as by those publicly owned.

Water Power Predominates

There are, according to the report, 565 electric generating plants in Canada, with an aggregate capacity of 2,107,743 h.p. These supply 752 distributing systems, which serve 973 localities. Classified according to the prime-movers used, these plants are divided as follows:

270 hydro-electric, aggregating	1,806,618 h.p.
201 steam plants, aggregating	288,202 h.p.
49 gas plants (nearly all producer-gas), aggregating	8,157 h.p.
45 oil or gasolene engine plants, aggregating	4,766 h.p.

These figures give a very fair idea of the power situation, and show the unquestionable predominance of water-power. In the Maritime Provinces, steam and water-power predominate with the former in the ascendancy. In Quebec, Ontario and eastern Manitoba, water-power is the dominating source of power, every large centre and most of the smaller ones being supplied by electricity produced from water-power. In the Middle West, large plants are steam operated, while the smaller ones use internal combustion engines. In British Columbia and western Alberta, water-power again predominates, but the generous coal supply in certain districts also permits considerable steam operation.

In the large hydro-electric installations, the report says, the type of plant is of the most up-to-date and substantial construction, but the same, unfortunately, cannot be said of many of the small plants, particularly the older ones. Old, leaky dams and inefficient types of water-wheels in bad repair are often the real causes of shut-downs attributed to lack of water. Likewise in the large steam plants, efficiency is shown but this is not generally true of the smaller ones. For the prairie provinces where fuel and the cost of generation are high in price, the report suggests that it would be more economical to generate electric power in large central steam plants and distribute it over transmission lines.

More Privately-Owned Plants

The report shows that there are 207 municipal or publicly-owned plants of

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Immigrants Should Receive Assistance

What Intelligent Guidance of Intending Settlers Has Done in Wisconsin

If there is any one case in which the purchaser alone and unaided frequently is unable to pass judgment, it is in the case of the buyer of land. Very often, indeed, the purchaser is well qualified and neither asks nor requires any assistance in buying land. This would hold particularly with respect to old settled sections. But the cases where the purchaser cannot safely follow his own judgment are so numerous as to have great social significance. If land is not wisely selected, there is waste of labour power and of capital, and a serious public interest is involved. California affords conspicuous illustration of the difficulties of wise selection of land, and especially so in the case of land used for raising fruit. One piece of land may be highly productive and planted with citrus fruits, and another piece a few rods off, looking much like the first land, may be far inferior. Pieces of swamp lands in Wisconsin which superficially look alike differ widely in regard to present fertility and lasting qualities.

There is a public recognition of the needs of assistance in the selection and cultivation of lands in the soil surveys undertaken at the expense of the federal government and of the states, but these do not give the settler all the help he requires. Probably in north-

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Selecting Varieties For Spring Sowing

It Pays to Sow Varieties of Grain of Proved Excellence. Seed Should be Prepared in Good Time

Now is the time to prepare the supply of seed for the spring sowing. If known and suitable sorts are now being grown on the farm, it is a matter of thorough cleaning and grading the seed in readiness for the spring drive. This is a job which should be given attention now while you can wear a coat and not left until spring when there may not be time to do it properly or, as often happens, it may not be done at all.

Many farmers do not know what variety they are sowing. It makes an astonishing difference in farm profits whether you are sowing a variety suitable to your farm or not. If you do not know what you are sowing, you had better secure a few bushels of some variety that has proved its worth either at Guelph College, or at the Central Experimental Farm, Ottawa. It is a matter of indifference whether the same variety stands at the top at both places. In oats, the "O.A.C. 72" has given good results at Guelph, while the Banner is recommended at Ottawa. In barley, the "O.A.C. 21" is giving splendid satisfaction at Guelph and elsewhere. The leading variety at either place is likely to be much better for you than the unknown or mixed sort you may be sowing. If you have to buy, it might be well for you to consider a change which has been made in the regulations of C.S.G.A. to encourage purchasers of registered seed. The following paragraph is taken from a circular issued by the C.S.G.A.:

"Grain harvested from a crop grown from Registered Seed may in turn be registered providing it is up to standard, is not more than three generations removed from 'Elite Stock Seed' and that it has been properly inspected both while growing and while in the sack prior to shipping. Since registered seed brings more per bushel than does ordinary seed, the financial advantage which may be realized from sowing this kind of seed is obvious."

It is immensely worth while to you to sow clean and well graded seed of varieties of proved excellence. Act now, and know what you sow.

—*F. C. N.*

Canada collects a revenue of about $6,000,000 every year from her forests. Of this sum, the forests of British Columbia contribute one-third.

Airplanes As Aids To Forest Patrols

Improved Methods of Communication and of Transporting Fire-Fighters Important Factors in Checking Forest Fires

With the cessation of hostilities overseas, the development of peace-time uses of the airplane has become a live subject, which is receiving considerable attention. Among the uses under consideration is that of forest fire patrol. Experiments previously conducted in Wisconsin confirm the opinions expressed by returned aviators, that there is a large field of potential development in this direction.

The British Columbia Forest Service became convinced during the past year, of the feasibility of airplane patrol for forest fires, and leased a flying boat for use along the extensive coast line of that province. The machine was, however, accidentally wrecked before it had had an opportunity to demonstrate its value. It is understood that the experiment is to be continued during the season of 1919.

The co-operative forest protective associations of Quebec, under the leadership of the St. Maurice Association, are also undertaking to arrange for patrol by flying boat, or airplane, to discover fires in Association territory in that province.

Similarly, the matter has been brought to the attention of the Canadian Air Force, which is in a peculiarly favourable position to make experiments along these lines, to demonstrate the extent to which, and the conditions under which, the airplane may be used advantageously in forest protection work. The matter is one of such wide national interest that the co-operation of Dominion agencies in this direction would be fully justified.

It must be borne in mind, however, that such a patrol will involve considerable expense for maintenance of machines and salaries of staff, that patrol by men on the ground can still by no means be dispensed with, particularly in the settled districts, and that the mere discovery of fires, however prompt, loses much of its value unless adequate provision is made for getting men quickly to the scene, when a fire is discovered. This implies improvements in communication and transportation on a par with the improvement in the discovery of fires resulting from the use of aircraft. Presumably, it will be a matter of development of the more or less distant future, before ordinary gangs of fire-fighters will be transported to forest fires by airplane In the meantime, the opening up of the country by construction of roads, trails and portages, and the purchase of launches, automobiles, track motors and portable fire-fighting pumps, will be in order. Improved communication is also necessary, whether by wireless telegraph, or by ordinary or wireless telephone. Improved appliances along these lines, developed at the front, should prove of great value in forest fire protection.

During the war the airplane has proved of incalculable value in the preparation of maps by photography. Similarly, it will also prove of great utility in mapping drainage and forest types in the vast unsurveyed and relatively unexplored areas of our northern forests. In this way, a much more accurate idea could be secured of the forest conditions and existing supplies of timber than will otherwise be feasible for many years to come. Such work must, of course, be supplemented by a certain amount of detailed investigation by men on the ground, to determine the specific composition and average stand of the various forest types. Work of this character might readily be carried on as a supplement to the fire patrol by airplane, or independently, according to the circumstances of the case.

In any event, present indications point to a distinct field of usefulness for aircraft in connection with various phases of forest work.—*C. L.*

Should Receive Assistance

(Continued from page 1)

ern Wisconsin not one settler in three knows how to make use of the soil surveys of Wisconsin, even if he is aware of their existence.

In Wisconsin we have gone somewhat further in our attempts to protect the purchaser of land through the activity of our State Department of Agriculture. We have connected with this department a director of immigration of a new type, Mr. B. J. Packer. His activities are far different and better than those of the old kind of state immigration agent. He thinks, first of all, of the settler and his well-being and endeavours to protect him against mistakes in buying land and then to help him after he has bought the land. Space is not adequate to do more now and here than to indicate briefly his methods, for it would take an article to describe fully Mr. Packer's work.

The principal doorway into Wisconsin is through Chicago, and Mr. Packer advertises in the Chicago papers that, on certain days, he will meet those who wish to buy Wisconsin lands at the United States Immigration station. He talks with each would-be settler in order to ascertain his intentions and his fitness for going on the land. One of the inquiries is this: "Does your wife want to go on a farm?" If the wife does not wish to go, he warns the man that he is not likely to be happy and successful, and tells him that he had better go back and talk it over with his wife. He discourages those who, for any reason, are not likely to be successful, and then attempts to direct the settler to desirable sections and to help him make a wise selection of land. Naturally he does not mention any real estate agents, but gives the settler the following letter:

To Whom It May Be of Interest:

The bearer,----------, is in touch with this department and is looking for a farm home in Wisconsin. It is our purpose to keep in communication with him to learn of his progress in farm development and to ascertain if he is satisfied with the treatment received by any person or firm selling him lands. Any complaint will be promptly investigated and any courtesies extended him by those with whom he may have business relations will be appreciated.

Director of Immigration for Wisconsin.

This letter is by no means of negligible significance to the settler, as may be seen from the fact that one Chicago agency refuses to sell land to men bringing the letter from Mr. Packer, being afraid of possible consequences. Another doorway into Wisconsin is through Minneapolis and St. Paul, and at these points an attempt is made to reach the immigrant into Wisconsin. Many are also reached through letters directed to the Director of Immigration, at Madison. In various ways, Mr. Packer gets hold of a considerable proportion of the immigrants into the state and warns them as well as he is able against the purchase of worthless lands, and, so far as he may, against land sharks. His idea is not to get a man into Wisconsin, but, to use his words, to get a man into Wisconsin who "will stick." Some have been inclined to criticize him for turning men away, but the results justify his methods. The writer recently made a tour of investigation with Mr. Packer to visit those whom he had placed on the land. He found one of these settlers who had brought into the state nine others, and another settler who had brought into the state five others.

The purpose in speaking of Mr. Packer's work is to indicate very briefly one line of activity followed by those who are pursuing modern methods of land settlement. It is hoped later on to describe more fully Mr. Packer's work and to give statistical details. It can be seen, then, that a public interest is at stake in the wise selection of land, and that the humble settler needs assistance.

—*R. T. Ely.*

Agriculture Must Be Made Profitable

Speculation Interferes With Production and Diminishes Wealth

The absence of a sound system of development for the economic use of land and all natural resources, and of human resource and energy as a raw material of wealth, has brought us face to face with acute financial and social problems which will not be solved in this generation unless we show ourselves more awake to the significance of present tendencies and conditions.

We cannot separate town and country, or province and municipality, or manufacturing and agriculture. Their interdependence must be recognized. We must establish confidence in government organization under our federal system unless we desire to revert to autocracy; we must impose more confidence on the base of government organization, which rests in the municipality.

To promote industry in town and country we must recognize that production alone makes or increases wealth, and that speculation diminishes production, and therefore diminishes wealth. Urgent as are our urban problems, our chief attention needs to be directed to our rural problems. In connection with the rural problems we need (1) To plan and develop land for economic use; (2) To promote closer settlement and closer connection between manufacture and agriculture, and (3) To provide facilities for co-operation, rural credit, education and social intercourse.

There is no simple solution of these problems; planning and development will only provide the foundation on which to build. We must plan to promote values and methods of production as well as to guide physical development. It is folly to force increased production from agriculture without making agriculture a better paying business; it is equal folly to use government money to increase production and not make it easier and cheaper to produce, nor to take into account the probable increase in production in other countries.

In new countries, self-interest is apt to be so strong that it prevents people from realizing the truth that whatever artificial condition is injurious to social well-being, whatever impairs health and lowers vitality, is destructive of productive capacity and proportionately lessens our wealth. We know that natural resources in themselves are not a source of wealth, and that the real source comes from the human energy and skill we apply to whatever resources are available. Instances are numerous where crowded populations live in poverty with ample natural resources at their call, and of others, where an energetic and skilful people have founded great wealth on comparatively small natural resources. Some people seem to think that increase of population and of capital only are needed in Canada to develop our resources, whereas these things may neither increase wealth nor production per capita unless we apply more science and organization to develop our resources.—*T. A.*

APPRECIATION OF FIRE PREVENTION CAMPAIGN

The Maritime Branch of the Canadian Manufacturers' Association at a recent meeting in Amherst, N.S. passed a resolution recording their appreciation of the work being carried on by the Commission of Conservation in attempting to arouse public opinion to the seriousness of Canada's fire losses and in assisting municipalities and other bodies by means of technical advice respecting fire-prevention measures.

The Association also memorialized the Governments of Nova Scotia, New Brunswick and Prince Edward Island to appoint provincial fire marshals to investigate fires, prosecute incendiaries and inspect properties for the removal of fire-breeding conditions.

The sugar beet crop in Southwestern Ontario was good last year, the yield running from 15 to 18 tons per acre. About $10.50 per ton is being paid for them.

Two out of every three fires occur in residences, says the Ontario Fire Marshal.

Handling The Furnace to Conserve Coal

Points that Every Householder Should Know and Observe in Operating His Furnace

Consumption of coal in the average household may be decreased by:

1. The economical consumption of the coal itself.

2. The conservation of the heat thus generated.

3. The saving effected by the use of moist fresh air, and heat-forming foods.

Of the foregoing, the first and second deal with the physical properties of the coal itself, and represent a direct saving in dollars and cents. The third, while also saving indirectly, carries with it increased hygienic benefits that greatly outweigh the monetary advantages of the first and second.

Economical Consumption of Coal

To achieve the maximum of efficiency in using coal, it should be borne in mind that:

(1) In a given quantity of it there is only a given quantity of heat.

(2) To maintain our houses at a reasonable temperature during the winter months, it is necessary to burn a certain minimum quantity of fuel.

(3) This minimum amount of fuel is most economically utilized when all the carbon and volatile combustible matter is consumed in the fire-box, only the incombustible matter (ash) remaining.

This efficiency has been obtained by the writer in various types of furnaces and heating stoves, but, owing to the style of grates used and the small fire-boxes, such complete combustion is not possible in cook stoves; but, with careful manipulation, there will be no clinkers, and only a very small quantity of cinders (unburnt carbon).

The four points to be considered in the operation of a furnace, hot-water heater or stove are as follows:

1. The size of furnace in relation to the size of the house.
2. The size of coal used.
3. The operation of the furnace or stove.
4. The disposal of the ashes.

In this article, hard (anthracite) coal only, is considered.

SIZE OF FURNACE IN RELATION TO THE SIZE OF THE HOUSE.—No hard and fast rule can be laid down respecting the size of furnace required for a house of a given size, as the amount of radiation required depends upon many variant factors, such as type of walls, area of openings, and weather exposure. It is a good plan, however, to install a furnace which errs on the large size. The increased economy effected in the coal consumption more than offsets the difference in the first cost, for the following reason: it is not economical to force a hard coal fire, i.e., to leave all the drafts open until a white heat is obtained; firstly, because clinkers are thus formed, and, secondly, because, when the fire passes a certain critical state, it will rapidly go out. When clinkers are formed, it is necessary to use a slice bar for their removal, and the extra shaking causes hot coals to fall into the ash-pit. Thus, in addition to the loss of heat from the hot coal, there is a loss of the cinders, if the ashes are not sifted, or, if they are sifted, there is the extra labour.

SIZE OF COAL.—The most economical size of coal depends upon the volume of the coal-box, and the size of the openings in the grates. In a small fire-box, a large-sized coal will not burn very well, and, in a large fire-box, small coal will fall through the grates. With regard to the coal itself, it may be said that the smaller the coal, the slower will be the fire, with a corresponding decrease in the amount of coal burned, and also in the amount of heat given out; but such a fire can be kept burning for hours with very little fuel. On the other hand, a large coal gives a hotter fire, but it requires plenty of draft or it will not burn, and does not keep alight except with a large amount of coal. Should difficulty be experienced in keeping large coal, such as egg or furnace, from going out over night, it is a good plan to cover the top of the fire the last thing before retiring, with some chestnut coal or cinders, which fill up the openings between the larger pieces of coal.

THE OPERATION OF THE FURNACE.—Many people who have operated furnaces for years, are inclined to make light of any hints that will save time and coal, but how many people sift their ashes and thus save the cinders? One of the main points of this paper is to demonstrate that a furnace or heating stove can be run with a minimum amount of trouble and expense.

All furnaces of a certain pattern are similar, but, owing to their different positions in different houses, and the differences that will occur in the size and shape of flues, it is obvious that each furnace needs to be regulated according to circumstances. The important parts of a furnace that are in daily use are as follows:

The furnace door with its damper
The draught opening (generally in the ash-pit door)
The damper opening (generally in the flue)
The direct draught lever.

There is sometimes a separate opening for a slice bar, but this is a matter of convenience.

First, the fire-box should be clean, as an accumulation of ashes will absorb the moisture in the summer and, thus, rust the interior. Close the damper, open the door draft, and the draft in the ash-pit; place some paper and kindling on the grates; as soon as it is well lighted fill the box about half-full with coal; when this coal is lighted, shut off the direct draft, then, close the draft in the ash-pit door—the only time this door should be tightly closed, but, as soon as the fire is giving off the full amount of heat, open the damper slightly. The chains connecting the damper and the draft should be so adjusted that, when the damper is open, there will be a small opening in the draft door. This is necessary, because as long as a small amount of air is passing through the grates, there is no danger of their burning out, and, at the same time, the continual supply of air ensures complete combustion of all cinders at the bottom of the fire-box.

A good clean fire made for the first time should last for 12 to 18 hours without attention, and, at the end of that time, it will be necessary to shake the grates and add more coal. Open the direct draft, and shake the grates until small coals about the size of a pea commence to come down, then stop, put on a fresh supply of coal, and close the direct draft in a few minutes, depending upon how quickly the coal ignites. Some ashes should be left in the fire-box to check the supply of air; thus, the draft door can be left partly open continually, and, at the same time, the partially consumed coal is retained in the fire-box.

The first essential in firing a furnace efficiently is to be sure that the direct draft is open no longer than is necessary to ensure the ignition of the fresh coal; the second, is keeping the ash-pit draft slightly open all the time; the third is making sure that no live coals are shaken down into the ash-pit. As already stated, the best results are obtained when the fire is maintained at a uniform temperature; in fact, the very first step in the operation of any furnace or stove, is to see that one person, and one person only, has charge of the fires, and that no other person interferes with any drafts or dampers, unless, under exceptional circumstances; for the steadier the fire, the greater satisfaction will it give, and the less coal will it consume.

When anyone and everyone is allowed to meddle with a furnace, the following is what usually takes place: Someone feels a little cold, and opens the draft, forgetting it until he finds the house unbearably hot, then he shuts off the draft and opens the damper, killing the fire. What happens is as follows: When the draft was opened, the fire burned briskly, and each lump of coal slowly turned to ash, commencing on the outside; then, when the fire was suddenly dampened off these half-burnt coals became dead, and as each was surrounded with an incombustible covering of ash, it became necessary to shake them down into the ash-pit before the fire could be brightened up again, whereas, if the drafts had been correctly adjusted, a slow but complete combustion would have been taking place all the time.

DISPOSAL OF THE ASHES.—When the fire goes out, it is not necessary to dump the fire-box entirely, the ashes can be shaken through the grates, leaving the cinders above, and, when the coals are alight, they will, in turn, ignite the cinders underneath.

The minimum amount of cinders that usually comes down from a kitchen range is 10 per cent of the coal used, and, with coal at $11.00 or $12.00 per ton, the saving of these cinders in the course of a winter is of considerable importance.

As ashes, when cold, do not fly as readily as when hot, they should be removed before the grates are shaken. It is true economy to purchase a dust-sifter. The advantage derived from its use is as soon as the ashes are taken out, they can be sifted, either in the cellar or in the wood-shed. When one of the old type of open sifters is used in inclement weather, the sifting will be done carelessly, if at all.

When sifting cinders, all white lumps and clinkers should be picked out. Their introduction into the fire a second time will favour the formation of clinkers which are hard to remove. It is not necessary to keep a separate place for cinders; they can be placed in the coal bin and mixed with the coal, unless required to dampen the fire overnight.

—C. D. Norton, Deschênes, Que.

Bituminous Coal for Use as Kitchen Fuel

Price of Anthracite will Remain High. It is Important, therefore, to Know How to Use Bituminous Efficiently

The high price of anthracite coal, or, to use its popular name, hard coal, and the certainty that there will not be any material reduction of that price in the near future, is constraining consumers to turn either to bituminous (soft) coal or to artificial anthracite.

A manufacturer of stoves for burning bituminous coal has contributed the following statement:

To burn bituminous coal with any degree of satisfaction the following conditions are absolutely necessary:

(1) An adequate supply of air.

(2) An absolutely air-tight combustion chamber.

To provide an adequate supply of air do not put in too much fuel at one time. Never use a coal scuttle when putting bituminous coal in your cook stove. If you do, you invariably get either too much or too little coal and, in addition, the fuel is not in the right place in the fire-pot. Bituminous coal, therefore, should be fed into the stove with a small shovel and, for a kitchen range, not more than two shovels should be put in at one feeding, except at night and, then, never more than three shovels to hold fire until morning. Remember that the fuel should be placed in the fire-box at the side farthest from the oven, leaving the side next to the oven always showing red coals.

Bituminous coal contains a large percentage of what are called volatile gases. These gases pass off very soon after the coal is put into the stove and, unless they have an opportunity to pass over clear red coals, they will escape up the chimney without being ignited or burnt, and thus their fuel value is absolutely lost. By a proper system of firing, you can save from 25 to 30 per cent of the heating value of your fuel.

By a proper system of firing, you not only save fuel but you do away with many of the unpleasant features of using bituminous coal. Feeding the fire frequently with a small quantity of fuel prevents the accumulation of large quantities of carbon and soot on the bottoms of cooking utensils where it is found necessary to lift the lids of the stove and set kettles down for the purpose of boiling. This method of feeding fuel also assists in keeping the flues more or less clear of soot and unburnt carbon. The covers on the range should be lifted just as little as possible as the introduction of cold air not only prevents combustion but also allows the feathery carbon dust to escape into the kitchen, which settles upon everything, making an endless amount of extra kitchen work.

If the women of Canada would boil and cook entirely upon the top of the stove, bituminous coal would be nearly as good a fuel as anthracite, but the habit of lifting lids and having black bottomed pots is hard to eradicate. This method of cooking, however, is most extravagant so far as fuel is concerned, especially on the cheaper ranges, which have very ill-fitting tops.

The tops of many of the higher grade ranges are much better fitting and, with a small percentage of extra cost for fuel, this lid-lifting practice might be continued. If discontinued, however, it would free the kitchen of all soot when using bituminous coal. It, therefore, follows that the top of the range is the factor that determines whether we can, or cannot, use bituminous coal as a fuel in our kitchens. It also follows that the more ill-fitting the top, the more disagreeable the burning of bituminous coal will be and the greater the amount of fuel consumed.

The best British and American fuel engineers are agreed that:

(1) To burn fuel economically in a kitchen range the fire should never be more than 6 inches in depth.

(2) Improper feeding will cause a serious loss.

(3) Air entering the fire must all pass through the grates.

(4) Air introduced into escaping smoke or gases invariably represents a loss of efficiency.

In burning some varieties of Pennsylvania soft coal, coking or hardening takes place and this must be broken down with the poker. When doing so, lift only one cover at a time and always open the direct damper at the bottom of the pipe. The reason for this is obvious.

The foregoing refers only to the kitchen range, but, with slight variations, it also applies to hot air furnaces and to Quebec heaters, but not to base burners. On a fresh fire, as a general rule, bituminous requires more air than anthracite. As the fire advances, bituminous requires less air.

The next consideration is the second essential, namely, an absolutely air-tight combustion chamber which includes the fire-box and the flues connecting the fire-box to the smoke pipe.

In burning bituminous coal under steam boilers, greatly increased efficiency has been obtained by installing self-feeder stokers and by increasing the size of the combustion chamber. Doing away with the opening of the fire-doors to feed fresh fuel, makes the combustion chamber more nearly air-tight. These changes save one-third of the fuel. If kitchen ranges were thus equipped, they would be very cumbersome and more expensive and, to make the combustion chamber air-tight, it would be necessary to do away with the fire-door and the covers and

cross centres on the top of the range.

One pound of good bituminous, if burned in an air-tight chamber, will produce 14,400 heat units, but, when burned in a kitchen range with an ill-fitting top, it will produce only 4,400 heat units and soot and unburnt carbon will clog the stove instead of generating heat.

Bituminous coal can always be burned with greater satisfaction when the chimney has a good draft, and the cleaner the chimney the better the draft.

A poorly constructed range will create the heat in the fire-box, but, to carry that heat to the back of the stove and around the oven, requires a substantial and air-tight construction. A properly constructed chimney will draw air through every crevice in a range. This air is drawn from the room and is at a temperature of about 70 degrees. It tends to chill the hot air and burning gases within the range, thus impeding combustion and causing the deposition of soot within the range. The carbon thus deposited prevents the radiation of heat and destroys the efficiency of the range for both heating and cooking purposes.

When starting a fire in a hot-air furnace or a hot water boiler, a good supply of wood and kindling should be used; then, gradually add coal in small quantities until you have the fire-pot well filled, taking particular care to have the coking parts well broken down before adding any further fresh fuel.

It is good practice, at all times, to keep the ashes well shaken out of the bottom of the fire and always allow the fire to brighten up by giving it extra draft before putting on a supply of fuel. When you have your fire-pot well filled with glowing coals, add fuel as required—add it in small quantities and add it frequently. This will enable you to get almost the full value of the fuel consumed and will materially prevent flues and pipes filling with ashes and soot.

In the Middle West and in the Western States, bituminous coal is used almost entirely for domestic purposes even in the kitchen ranges. The women in this region have become fairly well accustomed to this fuel and very seldom lift a lid. As a result, the openings around the lids and the openings around the cross centre pieces become filled with soot and, in time, the top of the range becomes nearly air-tight. Thus, when using soft coal, even a very cheap range with a very ill-fitting top will improve, provided the lids are not disturbed.

To be obliged to burn bituminous coal even in our present appliances does not impose real hardship and this fuel will improve with added experience in its use.

PULVERIZED FUEL

Pulverized coal was first utilized in cement plants and was found to be an excellent low-priced fuel of high efficiency. Later, it was applied in certain metallurgical processes and, during the last four years, several United States railways have successfully operated locomotives with this class of fuel.

In copper smelting, notable results have been achieved; furnaces with a rated smelting capacity of 500 tons of ore per day, are now smelting twice that amount with pulverized coal. Notable economies have been obtained where it has replaced oil fuel, and a better distribution of heat has been obtained. Mr. W. G. Wilcox states that by comminution "we have changed entirely the characteristics of coal as commonly known." In addition to the greatly increased efficiency obtained, pulverized coal is practically smokeless, small coal can be utilized, anthracite culm, bituminous screenings and coke breeze assumes a new importance, inferior grades of coal can be mixed with better grades and burned successfully, and the labour of the fireman is reduced to a minimum.

To obtain the best results, about 85 per cent should pass a 200-mesh screen and it should not contain more than 1 per cent of moisture. After being reduced to this high degree of fineness it is blown through a burner nozzle, the volatile gases of the pulverized coal igniting instantly. The fixed carbon is consumed by the heat of the volatiles, the flame resembling an oil or gas flame. By increasing or decreasing the supply of air or fuel, the operator regulates the supplies and has the operation under absolute control.

Mr. W. G. Wilcox, in the "Mining and Scientific Press," June 22, 1918, p. 850, says: "By grinding an inch cube of coal so fine that 85 per cent will pass a 200-mesh screen, we have increased the surface exposure from 6 sq. in. to approximately 1,800 sq. in. Thus, we have increased the velocity of combustion 300-fold. By doing so, we have changed the characteristics of the fuel. We now have a fuel relatively 300 times more active than the inch cube of coal, a new type of fuel that has in it inherent possibilities not found in lump or slack fuel."

Mr. Wilcox further points out that the increasing of the surface exposure speeds combustion. The rise of temperature doubles the velocity of combustion for each rise of 10° C., and, thus, pulverized fuel affords a combustion that is hundreds of times faster than when burning lump coal.

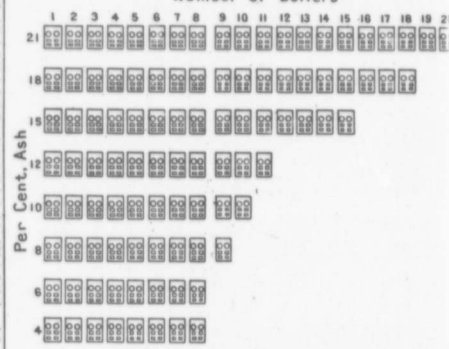
HEAT VALUES OF WOOD

In a discussion by the Forest Products Laboratories, Montreal, of the heat values of dry wood, it is stated that the below amounts of wood have equal heating value to one ton of anthracite: 1.00 cord of birch, 1.15 cords of tamarack, 1.20 cords of Douglas fir, 1.50 cords of jackpine, 1.55 cords of poplar, 1.60 cords of hemlock, and 2.10 cords of cedar.

The above comparison is based on the supposition that the calorific value of the coal is 13,000 B.t.u., but the grade of coal received in Canada last winter was much less, possibly as low as 10,000 B.t.u., which, in comparison, would decrease the above-stated quantities of wood by 23 per cent.

A heavy crop of onions was reported last year in the marsh lands of Kent county, Ontario. The yield was from 300 to 500 bags per acre and prices ranged from $1.55 per bag up.

COMMISSION OF CONSERVATION



NUMBER OF 500-HP BOILERS REQUIRED TO GENERATE 300,000 LB. STEAM PER HOUR

Cut No. 178

Effect of Excessive Ash on Coal Values

Steaming Qualities of Low-Grade Coal Much Inferior to those of Better Grades

Coal as marketed contains a certain proportion of preventible non-combustible and a certain proportion of non-preventible, both of which are referred to as "ash." The non-preventible is mineral matter which is so thoroughly incorporated with the structure of the coal that it can not be separated mechanically. The preventible ash consists of shale and other impurities which can be separated mechanically.

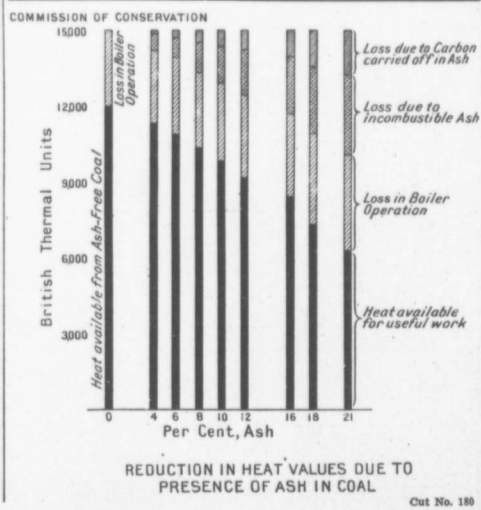
The effect of excessive ash is well illustrated by the following statement: In the United States, the non-preventible ash content of clean bituminous coal varies from an average of 6 per cent in Wyoming coal to an average of 16 per cent in Colorado coal and, for the whole country, averages about 10 per cent. In good practice, 10 boilers of 500 h.p. capacity each will generate 300,000 lbs. of steam per hour with coal carrying 10 per cent ash. If, however, the coal carry 15 per cent ash—5 per cent more than normal—it will require 15 boilers to generate the same amount of steam. If it carry 21 per cent of ash, it will require 20 boilers to do the same work. The reduction in heat values is due, in part, to loss due to the incombustible ash, and, in part, to the carbon carried off by the ash. The effects of high ash content are startlingly demonstrated in the diagrams.

Based on heating values, to haul coal carrying 15 per cent ash necessitates the use of 18 per cent more cars than if the ash content were only 10 per cent, but coal carrying 21 per cent ash content requires the use of 65 per cent more cars than if it contained 10 per cent.

Last year, enormous amounts of slate, shale and dirt were contained in the bituminous and anthracite coal marketed by United States mines. About 85 per cent of the coal was hauled by the railways. Each per cent of avoidable ash meant the haulage of 5 million tons of useless waste. It has been stated that the impurity ran as high as 20 per cent, and it is estimated that it averaged at least 5 per cent more than normal. As shown above, this extra 5 per cent of impurity so reduced the efficiency of the coal as fuel that 18 per cent more cars were required to obtain the same heating values as from normal coal. Therefore, based on heating values, the railways of the United States did about 80,000,000 tons useless hauling last winter. Omitting the reduction of efficiency due to poor coal referred to above, the railways hauled at least 32,000,000 tons of dirt and rock, or about 640,000 car-loads.

The diagrams demonstrate the wastefulness and inefficiency of coal with high ash content. They show that the loss of efficiency is not great so long as the ash does not run more than about 10 per cent, but the fact that 21 per cent of ash reduces boiler efficiency to one-half what it would be with coal carrying 10 per cent ash, is a startling demonstration of the inefficiency of dirty coal.—James White, in "Fuels of Western Canada," published by the Commission of Conservation.

COMMISSION OF CONSERVATION



REDUCTION IN HEAT VALUES DUE TO PRESENCE OF ASH IN COAL

Cut No. 180

CONSERVATION OF HEAT

Heating a drafty house is like sailing out a leaky boat—for emergency only. A house properly ventilated without drafts takes less coal to heat. Chink all openings, but make proper provision for ventilation.

Commission of Conservation
CANADA

SIR CLIFFORD SIFTON, K.C.M.G.
Chairman
JAMES WHITE
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 proper conservation, and the publication of timely articles on town-planning and public health.

The newspaper edition is printed on one side of the paper only, for convenience in clipping for reproduction.

OTTAWA, JANUARY, 1919

TRAINING RURAL LEADERS

Life in the beautiful country isn't always beautiful. Poets and other writers have descanted on the wonders and attractions of living "far from the madding crowd" and people who dwell in towns and cities have been duped into thinking that social problems, peculiar to rural life, do not exist. During recent years, that strange, continent-wide migration from the farms to the cities has made thoughtful people curious and then anxious. So it has gradually come about that the science of rural sociology is steadily developing from infancy to lusty youth and is receiving a place on the curricula of some of our colleges.

Further, the churches are coming to realize the importance of providing special training for their rural ministers. It is being recognized that the most effective and lasting method of getting in touch with men and of serving them as the worthy minister desires to do, is to be able to help them with their everyday problems. To do this, the rural minister, in addition to his regular training, should make a study of the conditions under which his parishioners live. He would do well to know enough about their means of making a livelihood to be able to suggest real improvements. Then he can take an understanding lead in rural social betterment.

The Board of Home Missions and Church Extension of the Methodist Episcopal church of the United States is working out a plan for training rural leaders that may have far-reaching results. Specially qualified rural ministers are being given chairs in Methodist theological colleges. These ministers will be required to give courses of lectures on rural church methods and rural sociology. They will also have supervisory control of all student pastorates for which their particular colleges are responsible. In this way it is intended to save the rural community from apprentice pastoral work and at the same time give the prospective rural minister adequate training. These leaders will act as representatives of the Department of Rural Work of the church, which, in turn, has general supervision throughout the United States. The officials in charge claim that, hitherto, it has been difficult to obtain properly trained rural ministers to place in college chairs. This circumstance is being steadily improved by establishing relationship with agricultural colleges, where it is expected that properly trained recruits for this work may be obtained. In addition, arrangements are being made for a nation-wide normal training course lasting from four to six weeks for the benefit of rural ministers now in the field. By these means it is hoped to have within a year some 700 men available for this special rural work.

Rural sociology is now a recognized subject on the curriculum of at least one Canadian Agricultural College. Canadian Theological colleges might well avail themselves of graduates of such a college, so that rural ministers might be fully trained for all-round rural leadership.—*A. D.*

A NEW YEAR RESOLUTION

Canada, in common with the rest of the world, must husband her resources. The stupendous material wastage caused by the world war must be made good by the world at large. Moreover, history proves that war-time prosperity never lasts much longer than the war. True, the great domestic loans floated in Canada should make for the avoidance of financial crises, but personal and national thrift are none the less of prime importance.

The Government is seeking to inculcate habits of thrift by its War-Savings Plan. It is a plea, as well as a plan, for the investment of small savings with the Government. The idea is a worthy one. Its success will depend in large measure on whether or not individual citizens will cultivate the art of saving.

New Year's resolutions generally consist of an attempt at sloughing off old, out-worn, more or less evil habits. Why not celebrate this year, by taking on a nice, shiny new one and buy a war savings stamp every day, or week, or month, according to the measure of your ability? Your nearest banker or postmaster will tell you how you can do it.

GROW MORE FLINT CORN

A decided change has taken place in many of the corn growing districts of Canada during late years with regard to the variety of corn being grown. In many districts where flint corn was at one time almost exclusively grown, it is now quite difficult to obtain. This change has, no doubt, been brought about to a large extent by the advent of the silo. Farmers desiring to grow the variety which gives big tonnage per acre have gone in for the larger dent varieties. It is doubtful if it is wise to go to the extreme in this matter of not growing any flint corn. Flint corn will grow successfully and to maturity in many districts where it is not now seen. It is good for feed for all classes of live stock, for poultry and horses. Properly looked after, good yields of grain and fodder can be obtained from it. If husked before the silo is filled, the stover can be cut and mixed in with the silage. The early varieties will mature for seed where dent corn for seed cannot be grown. In years like 1918 many farmers would have been glad to have a few bushels of good flint corn for seed. It could be grown for seed on thousands of farms where it is not now grown and would insure a seed supply even though not of the varieties yielding a larger tonnage. If you decide to try some this year, secure your seed early.—*F. C. N.*

WORTH WHILE WORKS ON RURAL SOCIOLOGY

Introduction to Rural Sociology, by Paul L. Vogt. D. Appleton & Co., New York City.

Rural Life in Canada, by John MacDougall. Westminster Co., Ltd., Toronto.

The Rural Life Problem of the United States, by Sir Horace Plunkett. MacMillan Co., Toronto.

Chapters in Rural Progress, by Kenyon L. Butterfield. University of Chicago Press, Chicago.

Country Life and the Country School, by Mabel Carney. Row, Peterson & Co., Chicago.

The Brown Mouse, by Herbert Quick. Bobbs, Merrill Co., Indianapolis.

"The Brown Mouse" is a story concerning the introduction of new methods in rural school teaching by a young school teacher in the United States who undertook to apply a system of training suitable to the needs and requirements of the community in which he was situated.

POINTERS ON SEEDING CLOVER

One of the farmers conducting illustration work for the Commission of Conservation in Dundas county has the following to say in regard to the thickness of seeding clover.

"I think it pays well when seeding to clover to sow at least 8 lbs. of clover seed per acre. We find a good mixture to be 8 lbs. of red clover, 2 lbs. alsike, 2 lbs. alfalfa and 6 lbs. timothy. I find also that it pays well to sod down all grain crops, even if we do not need or wish to have it for hay, as the clover tends to keep down weeds that would otherwise start after harvest. It also furnishes a large amount of pasture and when ploughed down supplies the soil with humus."

The following is an extract from a letter received by the Commission of Conservation from one of the farmers conducting illustration work in Dundas county:

"Previous to conducting illustration work for the Commission of Conservation, which I began in 1917, I was sowing about 4 or 5 lbs. of red clover seed per acre. During 1917 and 1918, I sowed on a part of my farm as high as 8 to 10 lbs. per acre. The yield of hay on the thicker seeding was about one-third more than on that seeded at the usual rate."

UTILIZING RABBITS

Fully 200,000,000 wild rabbits are killed in the United States every year, according to estimates made by the Biological Survey of the United States Department of Agriculture. Many of them are jack rabbits, the majority of which have not been utilized in the past. If all the rabbits killed were consumed, they would furnish between 200,000 and 300,000 tons of valuable food, and if proper measures were taken to insure the collection of the skins, these alone would have a value of $20,000,000.

The Biological Survey has frequently been called upon to help western farmers in coping with the rabbit pest. In view of the probable economic value of rabbit meat and fur in the coming years, the energies of the farmers and ranchmen will be directed to the conservation of this important resource. Already a number of establishments for collecting, dressing, canning and shipping rabbit meat are in operation in Western centres. As in Australia, the transition of the wild rabbit in this country from its status as a pest to a source of profit is assured.

—*The New York Evening Post.*

BRITAIN PREPARING TO RENEW FORESTS

The Forestry Sub-Committee of the Reconstruction Committee of Great Britain recommends the afforestation of 1,770,000 acres in the United Kingdom. Taking eighty years as the average rotation, two-thirds of the whole should be planted in the first forty years. From the fifteenth year onward the scheme would begin to provide pit wood from the quicker-growing species on the better kinds of mountain land. By the fortieth year, the plantations made in the first ten years alone would contain enough timber to keep the pits supplied in emergency for two years at the present rate of consumption. The total cost for the first forty years is estimated at $75,000,000. After that time, the scheme would be self-supporting. The whole sum involved is, therefore, less than half the direct loss incurred during the years 1915 and 1916 through dependence on imported timber.

Farm Book-keeping Will Produce Thrift

Has Never Known it to Fail, Says a Business Man Dealing With Farmers

"Your *Farmers' Account Book* is a great idea to encourage farmers to know more about their business. Wherever farmers keep records of their business, if nothing more than the expense incurred, it seems to promote thrift. I have been dealing with the farmers 23 years and have always encouraged them along this line. I have a small farm and take much pleasure in knowing what the farm is producing each year and comparing one year's results with another. I will use your book now, since it is simpler and easier to refer to than my own method."

Thus writes J. B. Reed, a wholesale and retail flour and feed dealer of North Hatley, Que., to the Commission of Conservation. The *Farmers' Account Book* referred to above is a simple yet comprehensive set of farm bookkeeping blanks which any farmer may obtain from the Commission of Conservation, Ottawa, by stating in his application how many acres of land he works. If you are losing money, you want to know where you are losing it before it is too late. If you are making money, you likewise want to know what farm activities are doing it for you, so you can specialize in them.

Fire Patrols Must be Highly Trained

A New Profession Demanding Much Scientific Knowledge Has Grown Up

The modern forest officer, whether ranger or fire-warden, is accorded great respect and responsibility because of his highly trained and specialized public service. Few men except naval and aviation officers, who also must combine practical experience with technical knowledge and trained intelligence, are expected to be so proficient with hand and mind alike. Out of a service which, a few years ago, was not even skilled labour, and was assigned to any inhabitant of a forest region, has developed a profession of forest fire prevention which requires all the abilities of a thorough woodsman, knowledge of many engineering sciences, successful command of men, and a talent for law enforcement and enlisting public co-operation.

This new profession has been able to develop largely because improved organization of private and public fire forces has created both rivalry and co-operation among those with joint problems to solve. It has been stimulated by its very fascination to an active and inventive class of men and its ever-widening field, challenging them to divise new methods and equipment and to keep abreast of invention in other fields in order that such may be seized and adapted. Telephony, heliography, meterology, aviation, topography, range-finding—these are but some of the sciences which have been made part of methods for detecting and controlling forest fires, to say nothing of the mechanical perfection of equipment and the systematizing of feeding, transporting and handling men under the most adverse circumstances. To educate the public into greater care with fire, new trails have been blazed into the fields of psychology and publicity. The technique of forest legislation and the processes of enforcement is an essential knowledge. Finally there is the actual fighting of fire, never the same, defying all rules, profiting by all previous experience but calling always for new and decisive reasoning.—*From the Fire Fighter's Manual, published by the Western Forestry and Conservation Association.*

More Than 2,000,000 H.P.

(Continued from page 1)

452,508 h.p. capacity and 358 plants privately owned with a capacity of 1,655,235 h.p. The Niagara system of the Ontario Hydro-electric Power Commission is the largest under public ownership. It has a load of over 201,000 h.p., supplies 120 municipal distributing systems and serves an area of 210 miles long by 85 wide. The largest privately-owned system is the Shawinigan in Quebec, with a load of 205,000 h.p., supplying 76 distribution systems and serving a triangular area with a base of 140 miles and a height of 75 miles.

The largest hydro-electric development is 488,800 h.p., in the three large power plants at Niagara. The large installations are not all confined to this site, however, as there are, in addition, 5 plants of over 100,000 h.p. and 36 plants of over 10,000 h.p. capacity. The largest single plant is the Ontario Power Co., now operated by the Ontario Hydro-Electric Power Commission at Niagara, with a total capacity of 211,300 h.p. The largest single unit thus far installed in Canada is 20,000 h.p., at Grand'mere, Que., though the Ontario Hydro-Electric Chippawa plant will contain units of 50,000 h.p., while future plans contemplate the use of 100,000 h.p. units.

The average head of water utilized is not exceedingly high, but many large hydro-eletcric plants operate under fairly high heads, such as 140 to 180 ft. at Niagara, 145 ft. at Shawinigan, 83 ft. at Grand'mere and 400 ft. at the Coquitlam-Buntzen plants near Vancouver. The highest head in eastern Canada is 540 ft., at the 8,000 h.p. plant at Eugenia Falls, Ont., while, in the West, a head of 1,820 ft. is utilized at Britannia Beach, B.C., where the development also provides a total head of 3,530 ft. in two steps of 1,450 ft. and 2,080 ft. for the direct operation of other machinery. On the other hand, one of the largest plants, recently installed at Cedars, Que., operates under a head of 30 feet.

The 26,667-horse-power plant at Hamilton, Ont., is the largest steam-power plant in Canada and is used as an auxiliary. The 14,234-h.p. plant at Edmonton, Alta., is the largest steam plant operated continuously.

Storage Reservoirs Increasing

No less than 59 plants report the successful operation of storage facilities to provide for increased flow at low-water periods. Among government undertakings of this nature may be mentioned the three large reservoirs at lakes Timiskaming, Kipawa and Quinze to regulate the flow of the Ottawa river; La Loutre reservoir on the St. Maurice river; lake St. Francis dam for the St. Francis river, Que., the extensive system of smaller conservation reservoirs on the Trent river, Ont.; lake Minnewanka, on the upper waters of Bow river, Alta., and the reservoirs on Jordan river and Goldstream, near Vancouver, B.C. Most satisfactory results have been obtained from storage undertakings, the capacity of plants being frequently doubled or more than doubled.

City Departments Should Co-ordinate

Departmental Exclusiveness Expensive. Administrative Board Would Harmonize Work

The executive department, made up of permanent administrative heads, is the backbone of every municipal government government in Canada. The future of municipal government depends largely on the development, on the part of democracy, of the ability to use men of special training and attainments to perform special work, and the establishment of ways and means by which such officials can be effectively controlled, without so curtailing their initiative and independence of action as to destroy, more or less completely, the value of their services. Democracy does not consist in the practice of the belief that one man is as good as another for any job, but in the practice of the faith that every man owes a duty to society and that he should be placed where he can render the most valuable service.

Civic department heads have among others the following functions:

1. To prepare annual work programmes with estimated costs
2. To carry out the work programmes decided on by council within the appropriations allowed by council
3. To purchase supplies and materials
4. To let contracts
5. To appoint subordinates
6. To avoid duplication of work among departments or the undoing of the work of one department by another.

All these functions demand certain definite information and, as in the case of citizens and councillors, the greatest mistake in the work of permanent officials are always due to insufficient, inaccurate or delayed information.

Two departments tear up the same streets at an interval of two weeks or so, or purchase coal at different prices or of unequal grades, because of the absence of the proper information or of the co-operative machinery which would automatically produce the information.

Board to Secure Unity of Action

The functions of department heads are such as to demand joint action. The annual work programme cannot be prepared properly except by co-operation. Neither can the purchase of supplies, the control of the civic service, the installation of standard contract procedure, nor the avoidance of duplication between departments be done properly without it. A city often not one city but as many cities as there are civic departments. Civic departments are too often water-tight compartments. The city's programme is unitary and should be under unified administrative control. The remedy for the existing maladjustment of departments is so simple that it is a wonder that it has not received general adoption. It lies in the administrative board, made up of the permanent heads of civic departments, and responsible, as a unit, to the council for:

1. The formulation of the annual budget and programme of work
2. The carrying out of this programme as a unified project
3. The making of monthly, quarterly and annual reports containing the necessary financial and operating facts
4. The control of the civil service
5. The recommending of policies for the legislative action of council

The information required by such an administrative board would be even more detailed than that required by council. From divisional heads it would require daily or weekly progress reports; from the accountant, weekly statements of operating costs; from the city treasurer, weekly statements from the appropriation accounts. It would need a committee or bureau on civic service, another on purchasing and contracts, and still another on civic reports both to council and citizens.

Any system of effective democratic municipal government must be based on an informed electorate. It must proceed from, not reach down to, the people. The people are the masters of the city, but they must be educated by participation in actual governmental processes. Actual participation is the only method which has ever been found effective in any field, but it demands adequate information, and adequate information must proceed from official and unofficial sources.

—*Dr. H. L. Brittain.*

Only one county in Ontario has not adopted the county road system under the Provincial Act. The counties have taken over control of 9,200 miles of road and improved 2,325 miles to date.

ELECTRIC PLANTS IN CANADA SHOWING CAPACITY, OWNERSHIP AND PRIME MOVERS

Province	Plants		Ownership				Kind of prime mover					
			Private		Public		Hydraulic		Steam		Int. Combustion	
	Number	Capacity h. p.	No. of plants	Total capacity h. p.	No. of plants	Total capacity h. p.	No. of plants	Total capacity h. p.	No. of plants	Total capacity h. p.	No. of plants	Total capacity h. p.
Nova Scotia	38	27,177	24	23,064	14	4,113	12	3,474	23	23,478	3	225
Prince Edward Island	9	1,314	9	1,314	--	----	5	207	2	475	2	632
New Brunswick	23	18,607	16	16,212	7	2,395	8	7,463	12	10,014	3	1,130
Quebec	119	625,061	99	604,903	20	20,158	92	585,911	20	38,791	7	359
Ontario	173	899,856	105	609,658	68	290,198	113	831,004	50	66,519	10	2,333
Manitoba	23	103,015	8	53,706	15	49,309	4	78,550	13	23,841	6	624
Saskatchewan	62	30,593	26	2,682	36	27,911	--	----	15	26,585	47	4,008
Alberta	52	85,117	27	43,235	25	41,882	4	31,980	42	51,805	6	1,332
British Columbia	63	306,776	41	290,234	22	16,542	31	258,029	22	46,467	10	2,280
Yukon	3	10,227	3	10,227	--	----	1	10,000	2	227	--	----
Canada	565	2,107,743	358	1,655,235	207	452,508	270	1,806,618	201	288,202	94	12,923