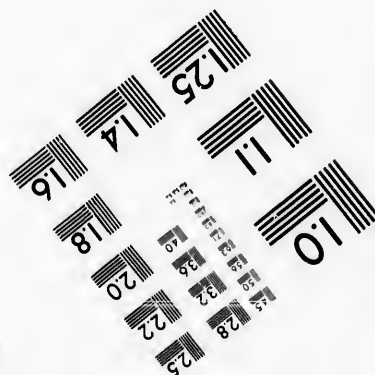
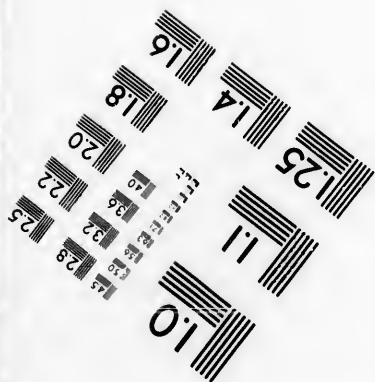
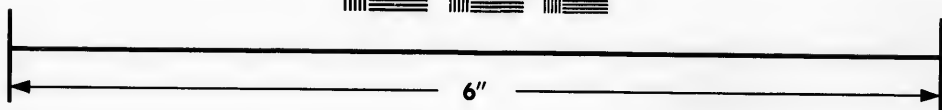
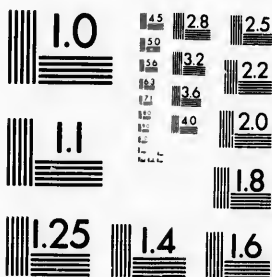


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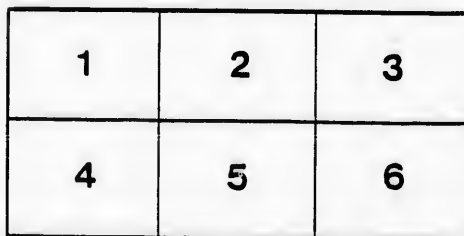
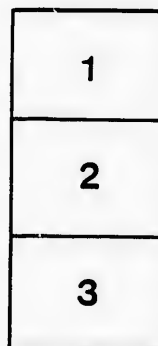
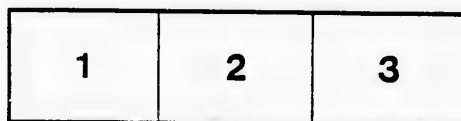
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The utilisation of moss land :



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THE UTILISATION OF MOSS LAND

—BY—

THOMAS MACFARLANE, F. R. S. C.

Extracts.

READ BEFORE THE OTTAWA SCIENTIFIC SOCIETY MAR. 4th, 1898.

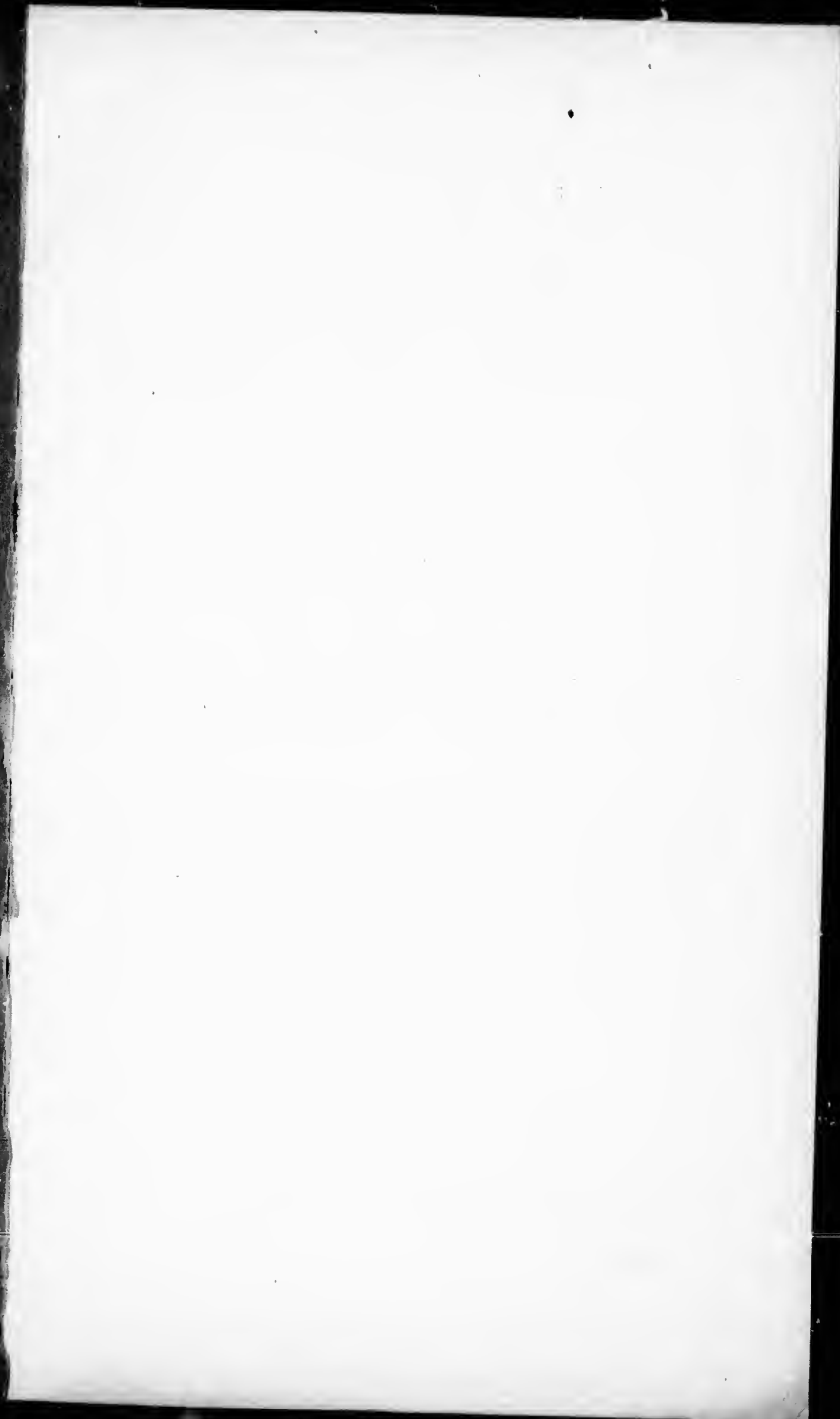
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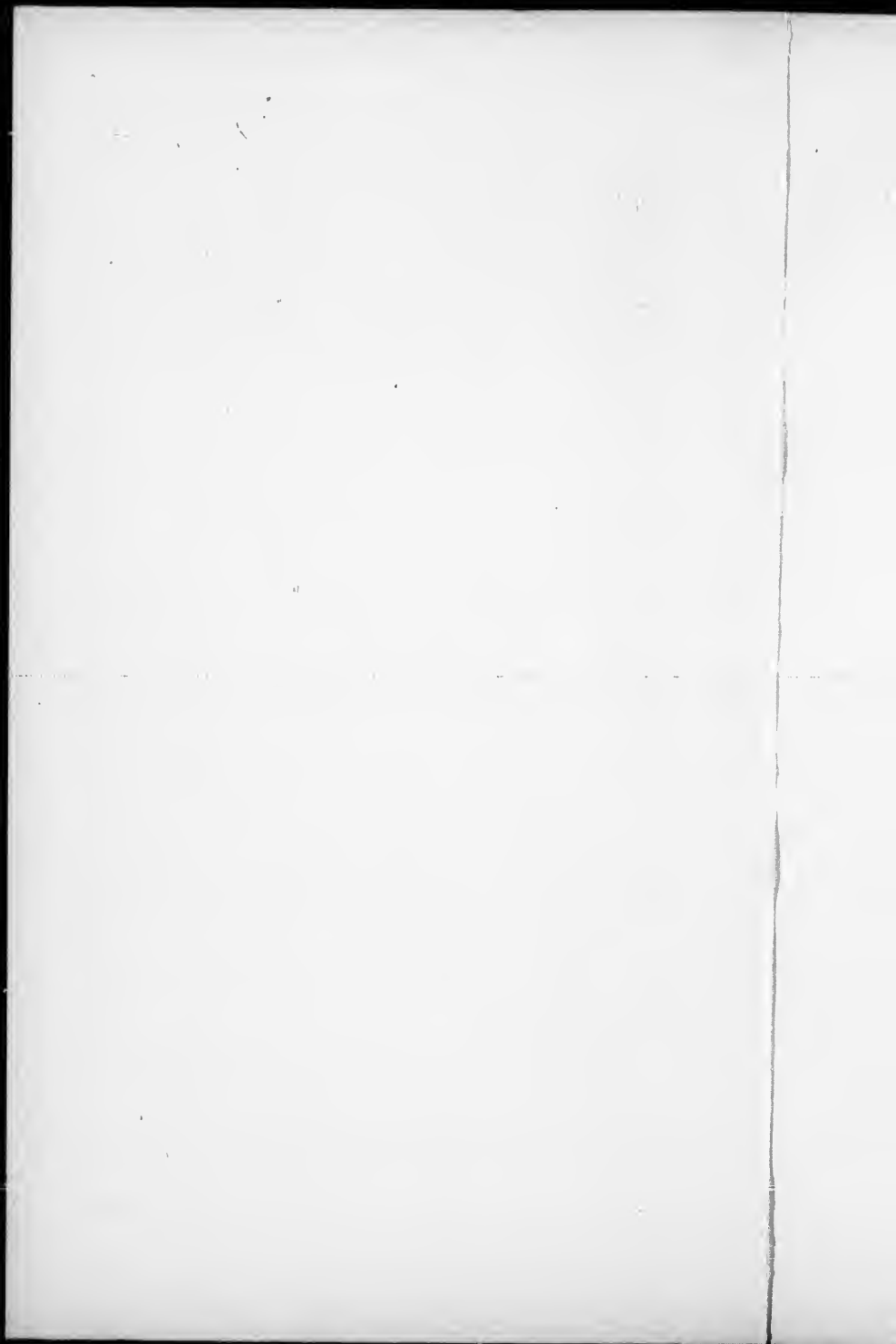
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Utilisation of Moss Lands.

BY THOMAS MACFARLANE, F.R.S.C.

Extract.

[*Read March 4th, 1898.*]

After a few introductory remarks the lecturer proceeded as follows:—

Utilisation of course includes cultivation, but I do not intend to speak of cultivation only. I shall have something to say about the more modern methods of cultivating moss-lands later on, but the subject is not an inviting one. In these days when almost every one is prepared to tell you that "farming does not pay" he would be a courageous man who would advise a settler to reclaim a swamp.

There is a comparison attributed to Queen Elizabeth which points out that life is like a bog; if you stand still you begin to sink and if you want to keep afloat you must keep moving. I shall, therefore, ask you to leave the consideration of bogs as they occur in nature, and the possibility of cultivating them, and ask you to accompany me, in spirit at least, to see a more pleasing landscape, a moor drained, consolidated and in process of utilization, where art has come in to modify nature, and, as it generally does, to improve it. In describing such a moor I must avoid any minute reference to the plants by whose instrumentality it has been produced. I can only deal with vegetation in a very general way, and indulge the hope that the botanical aspect of the subject may on a future occasion be made the subject of a disquisition by my friend Prof. Macoun, than whom there is no better authority.

The imaginary trip on which I have invited you is to Holland, or, more properly, the Netherlands. Holland is

only one of the provinces of the Netherlands, only one of the Low Countries, although probably the most important of them. It adjoins the German Ocean, whereas the Province that we have to visit, that of the North Brabant, is bounded on the east by Westphalia, and is traversed by the river Meuse, which takes its rise in the Ardennes, flows through Belgium and the Netherlands, passes Rotterdam and reaches the sea at the Hook of Holland. It was by the Hook of Holland route from Harwich that I landed in Rotterdam, on the morning of a foggy Saturday in December, 1892. My business in the Netherlands was to study beer, moss and peat and my first glimpse of the latter article was at the Weimar Hotel where it seemed to be the only fuel in use. After using my letters of introduction diligently, I found that the chief producers of peat and moss litter were the brothers Van Griendt, the elder of whom invited me in the most friendly way to accompany him to his works and extensive moors in the province of North Brabant.

Faithful to my appointment with Mr. Van Griendt, I met him at the railway station in the morning, and was introduced to Mr. C. W. Lancaster, accountant, of Birmingham, England, who visited the moors at the same time. Our route lay across the Meuse and past Dordrecht, Breda, Tilburg and Bortel to Helmond, where we arrived about 11 o'clock. From here a carriage conveyed us along the Willems Faart, one of the numerous canals of the country, to Asten at the edge of Asten Moor. Strange to say, the Willems Faart Canal lies in lower ground than the Asten moor, but the canals which traverse the latter are connected with it and the general canal system of the country. In order that sloops, or scows may pass from the latter into the canals of the Asten Moor they have to be locked up several feet, which, proves that the Asten Moor is at present a high moor, and must have been higher previous to its having been unwatered and consolidated.

Here it may be profitable to point out the distinction which the Germans have made betwixt two great classes of moor lands, a distinction which might easily I think be carried out in English also. There are first what they call low lying, meadow or greenland moors, to which possibly our word "marsh" would apply. They are always to be found near creeks and rivers, follow the course of these and give rise to the formation of wet and sour meadowlands. The peat or turf which is formed in these is of a black color, and when

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lands, only one of the most important of the area of the Province of Friesland, is bounded by the river Ems, flows through the Hook of Holland and reaches Rotterdam, on the 1892. My business is in peat and the Weimar Hotel. After using my services as the chief promoter of the Van Griendt, a friendly way to the moors in the pro-

of Van Griendt, I was in Birmingham, time. Our route was to Tilburg and then to O'clock. From there to Faart, one of the moors at the edge of the Hart Canal lies in the peat which is the general character of the Aster, which, proves to be peat and must have been peat and con-

the distinction between the great classes of peat. I think they call it what they call peat which possibly is peat and give rise to peat. The peat is peat, and when

dried crumbles easily to dust. It is in these marshes in Canada that the farmer finds his black muck, which is uncconsolidated organic matter derived from vegetation of a varied character. On the other hand the heath moss, or high moors show a different character. They are covered by heath plants and instead of a varied vegetation the swamp mosses or sphagnum occur in huge quantity. Dwarf firs show themselves, but sphagnum varieties constitute the main vegetation. Indeed Professor Macoun thinks that the name of peat bog is exactly equivalent to sphagnum bog, and that the "muskegs" of the Northwest have the same mode of origin as the German *Hochmoor* etc. Of course there are intermediate formations between the "marsh" and the "muskeg" to particularise which would require too much time. Some of these might be characterised as "swamp" and, in these the bushes predominate over the mooses.

Every bog has its origin in a pond, and when the moss vegetation, living and dead, has filled up these and cannot spread beyond the edges it begins to increase and rise in the middle. The German name of "high moor" seems to come from this higher position, which is above the summer water level of the surrounding country. These high moors show a characteristic arching; being higher in the middle than at the edges, and instances of such moors are known which in the centre are from 15 to 25 feet higher than the level of the water in the basin in which the original deposit began. The vegetable matter which lies beneath the surface ranges in colour from yellow on the top to deep black in depth. These moors yield frequently two different products, moss litter and peat, the former after drying being brown, soft and spongy. The peat on the other hand is when dried, black, hard and unyielding.

Both of these products are found in the Asten Moor, the moss litter lying above the peat, each having a thickness of about four feet. Before the upper layer came to be utilised, and when working a peat bog in the old days, this higher part had to be removed at much expense in order to get at the denser and darker peat which was much more valuable as fuel. Now the upper part brings in more money than the lower, and the manner of working a peat deposit has been revolutionised. The total depth of the Asten Moor down to the soil underneath is about eight feet. This is the thickness after consolidation which is a very different thing from the depth of the bog in its natural state. The shrinkage which it under-goes

on draining is very considerable and amounted in this case to about two feet.

The surface of the consolidated bog is a much pleasanter place now than it ever could have been before. Except for the canals and drains you can walk over it everywhere without inconvenience. Standing in the middle of the Asten Moor the outlook is strange and almost impressive. As far as the eye can reach there is nothing but moor, but the monotony of the scene is very much relieved by the gigantic stacks of moss sods dried and ready for milling.

The Asten moor was not brought into this condition without much labor, carried on after the adoption of a plan thoroughly well thought out, and during the lapse of many years. The unwatering began 20 years ago and had to be done gradually, the first drain being dug only to a depth of about 18 inches. No deeper digging was possible until after the surface part had settled and solidified to such an extent as to prevent the rolling down of the fluid moss into the drain, and the consequent loss of all the labor. After the consolidation of the upper 18 inches, another deeper cut of 12 inches was made in the drain for carrying off the water; then intervened another delay for allowing the bog to settle, and by repeating this process, the gradual consolidation or compression of the ten feet to the eight feet thickness was effected, very slowly and at a rate not exceeding one foot annually. It may be thought that it goes without saying that the solidification of such a semi-liquid mass could have been effected in no other way, but we shall learn, later on, that other methods have been tried elsewhere, with very disastrous results to the parties interested.

One of the most remarkable phenomena to be observed on the Asten moor is the construction in it of canals filled with water, in which scows are floating for conveying the dried sods from various points on the moor to the mill. That such canals can exist without again impregnating the bog with water, and converting the peat and litter into their original semi-fluid state seems astonishing, and yet there are plainly to be seen, within a distance of six feet from each other, the canals in question and ditches by means of which the bog has been unwatered, the latter containing only dribblets of water oozing from the bog.

(Here the lecturer gave more minute details of the manner of producing moss litter at Asten.)
Of course there are works for the production of moss lit-

ter and peat elsewhere than in the Netherlands. Sweden, Oldenburg, Hanover and Bavaria are known to be producing largely of this material. In England, too, the manufacture is established in the neighborhood of Doncaster and Goole, Yorkshire. In 1896 I visited the moss litter beds near the latter city, and found them thoroughly drained, as in the case of the Dutch moors. There were, however, no canals to be seen for effecting the transport of the material, light railways being substituted for them. I saw the mill at work for teasing and packing the litter, the machinery in which much resembles that employed on the Dutch moors. The material packed had evidently had ample opportunity for becoming dry because the mill building was filled with fine floating dust, like snuff, which however had not the same irritating properties. At the time of my visit the Goole and other works of a similar character in England were suffering from extreme depression in the price of their product. When I visited the Dutch moors four years previously, one of the gentlemen of our party was a Mr. Lancaster from Birmingham, who took as close an interest in the bogs and studied them as thoroughly as I did. This gentleman belonged to a firm of chartered accountants who had been entrusted with an examination of the property from a mercantile point of view, and in order to the possible formation of a limited company for working it. It seems that, subsequently, the formation of the company was accomplished and that its operations brought down the price of moss litter in London from 24s. per ton to nearly one-half that rate. Hence those tears on the part of the Yorkshire people, who could not possibly compete with the Dutch in the matter of labour or freight.

Coming now nearer home, we have to remark, as regards the production of moss litter in Canada, that two attempts have been made, one at Musquash, N.B., and another at Welling, Ontario. In the former case I am extremely sorry to say the capital embarked in the enterprise has not yielded any return. Whether we are to conclude from this that the inherent and climatic difficulties of the undertaking are insurmountable, or that grave errors have been committed in conducting the work is not quite certain. I am, however, inclined to the latter supposition, and venture to point out two circumstances which may have gone a long way to render the venture abortive. In the first place no systematic survey, laying out, and consolidation of the bog was attempted. There was no difficulty in the matter of levels, and a drain

VI.

was brought to the edge of the bog and deep enough to un-water it. But any attempt to penetrate the bog at such a depth was futile. Its semi-liquid mass rolled into the drain quicker than it could be dug out, and made progress impossible.

In the second place it was thought possible at Musquash to get rid of the water more rapidly than by the slow steady-going operations of nature. Much ingenuity was displayed and much expense incurred in inventing and operating machinery for squeezing out the water from the mossy pulp but without success. Artificial heat was also used for effecting the drying more rapidly, but it is hard to conceive how that could have been done economically. Drying by natural means was supposed to be impossible. Indeed a sod of moss, dug direct from the unconsolidated bog, and exposed to the direct rays of the sun for a long time is still found to be extremely moist in the inside. Therefore it is that, previous to any attempt at drying such sods, their material must be previously drawn together; consolidated by pressure while in the original bed, so that when they come to be acted upon by wind and sun they will be better conductors of heat, and dry in a reasonable space of time. On the whole the failure at Musquash may possibly have been owing to the common fault of neglecting or undervaluing the experience which has been gained elsewhere.

In the County of Welland, bounded by the Welland Canal, its feeder, and the shores of Lake Erie, there is a large area of "marsh," the history of which occupies considerable space in the records of the County Council. The Ontario Peat Fuel Company is now engaged in trying to utilize the material of this marsh for making moss litter. The product has been placed on the markets of our Canadian cities and is to be purchased in Ottawa. We most sincerely trust that everything will be done by Canadians to make use of it, not only on account of its inherent good qualities, but on account of the advantage which is likely to inure to our agriculture by its extensive application to the various purposes for which it is suitable.

If ever the moss litter industry succeeds in Canada it will most likely to do so in the Province of New Brunswick, which is said to contain the most extensive moors in the Dominion. Many of these skirt the shores of the Gulf of St. Lawrence, and those near Point Escuminac have been described by the late Mr. Edward Jack of Fredericton. In his lifetime Mr. Jack was an enthusiast in exploring the moors

of his native province, and advocating their exploitation. Let us hope that his mantle will fall on a worthy successor, and that the working of these huge deposits of organic matter may at last be carried out successfully.

In the Province of Quebec, although the production of moss litter has not actually been accomplished there is abundance of the raw material as our Chairman very well knows. Anyone who has travelled through the province must have observed their occurrence at Valleyfield, Berthier, Three Rivers, Champlain, Levis, and at numerous points on the line of the Intercolonial Railway. Between Cacouna and St. Arsene there is an excellent example of a high moor, well situated for exploitation. I am not aware as to whether any statistics exist as regards the quantity of such land in Quebec, but the figures are obtainable for Ontario. In the Report of the Bureau for Industries for 1896 it is stated that there are in the province :-

Acres cleared	12,671,857
Acres woodland	7,264,167
Acres swamp or marsh	3,236,390
	<hr/>
Total occupied	23,172,408

Thus of the rural area or total number of acres of assessed land 25.5% or over one-fourth is bog or marsh, containing an as yet unappreciated store of fertilizing material. It so happens that the first successful attempt to utilize Moss Litter for sanitary purposes in Canada was made in the Province of Ontario. At Caledonia Springs the method of deodorising human refuse by means of the moss from a bog in the neighbourhood has been carried on for several years with the most satisfactory results to all concerned. The moss litter here referred to is unusually rich in nitrogen, assaying nearly 3%, and the compost resulting from its use is an excellent fertilizer.

I have now told you something about the production of Moss Litter, and must next anticipate the question—Well, what is the good of it all? What is done with the article and of what advantage is it to the human race in general, and to agriculture in particular? In answering such enquiries I must leave peat and its applications out of consideration, not because they are unworthy of attention, but because of the want of time on the present occasion. Furthermore, Moss Litter has about four times the value of peat, and the successful working of the former, which as a rule lies above the peat,

must precede the production of fuel from the lower beds of the sphagnum bogs. I very much fear that the want of success which has so far attended the working of peat bogs for fuel has been owing to the fact that the true nature of the upper parts of the "white turf" or "bastard peat" or moss litter as we call it was not taken into consideration. I am convinced that the way to success lies first in the utilization of the moss litter for sanitary and agricultural purposes. Even in speaking of that article I must, for want of time, restrict my remarks to two of its applications, both of which tend to the enrichment of arable land.

1. It is used in town and country all over Europe for bedding animals, and keeping the stables clean and inodorous. It is thus a substitute for straw than which it possesses better absorbent qualities. Its price is seldom higher than that of straw with which it competes vigorously. Here in Ottawa it sells at about double the price and consequently the trade in it is not very brisk.

2. It is used as an absorbent, deodoriser and disinfectant for all manner of domestic refuse, including human excreta and kitchen offal. It has also been found convenient to apply it in slaughter houses and factories, whose products are of an evil smelling sort. Anyone can easily convince himself of its deodorising qualities by mixing a little of it with kitchen refuse in summer time, by which means the latter is kept inoffensive until removed. Not only does moss litter, on account of its porous, spongy character, take up obnoxious gases, but it can also absorb from 10 to 16 times its weight of water. Drying by means of it, applied to organic substances, is one of the best plans for arresting their decomposition. (The lecturer next described the nature and constituents of moss litter the production of humus from it and the advantages of the latter in agriculture.)

It will scarcely answer in these days of steam and electricity to say that "there is nothing new under the sun," but so far as regards agriculture, the oldest of the arts, I believe that modern investigation reveals very little not previously known. Take the acquisition of the nitrogen of the atmosphere by the leguminosae, a fact now universally accepted by agriculturists, that seems to have been known to the ancients and a passage in Pliny shows that the Romans based their practice on it. Neither is there anything entirely new in the application of moss litter as an absorbent and deodoriser. When Professor Macoun was collecting his specimens of sphagnum

varieties in the Northwest, an Indian Chief asked him if he proposed to take them to his squaw. It seems that the Indian women collect and dry the sphagnum moss, and encase their babies in it, and that it keeps them perfectly dry and comfortable during the long journeys which they have often to undertake when they are swathed up in Indian fashion and carried on the backs of their mothers. Dr. Dawson also tells me that along the trails in the same region tufts of moss are to be seen stuck on poles, and exposed to rain, sun and wind. It is in this way that the moss is prepared and stored for the sanitary requirements of the Indian babies when travelling. That which has been the practice of Indian tribes for centuries is now being introduced in many German cities not only as the best system from a health point of view, but as the one likely to bestow great advantages on agriculture. The committee on manures of the German Agricultural Society is now devoting much attention to this subject, and any one, who wishes to know the progress they have made and the valuable results they have arrived at, should study the valuable book by Dr. J. H. Vogel, published in 1896, on the disposal of City Refuse.

It would indeed be a fool-hardy and Quixotic undertaking for anyone in the present day to begin a crusade against the water-borne system of sewage removal. The love of ease and modern conveniences, and the indisposition to look the problem of city sanitation squarely in the face are too strong to afford such a reformer any chance of success. But in localities where no such system has been established and in towns where local circumstances make it impossible, it would, in my opinion, be advantageous for the authorities to consider seriously the moss litter system of dealing with human excreta. Even in cities or their suburbs, where there are districts almost destitute of any system and where the removal of refuse is a source of constant annoyance, the use of moss litter might prove to be an unhopd-for blessing. The manure resulting from its use is entirely deprived of any offensive character, and would be of the greatest advantage to the farmers of the neighborhood.

(The lecturer concluded by referring to the various methods employed for reclaiming and cultivating moorlands in place, and gave particulars concerning the Rimpau dam system at Cunrau on the Elbe, and the Corporation farm on Carrington Moss near Manchester.)

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