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Table of Contents.

FOREST-TREE PLANTING.

An article appeared in our December number, from the pen of the Honorable Mr. Joly, on the necessity of planting our uncultivated lands with forest trees, and on the best plan to be pursued to that end. The author informs us that he has just finished sowing a piece of land with from 10,000 to 11,000 nuts of Black Walnut. At four feet intervals each way, that is, with 2,500 plants to the acre, this plantation would cover about 4 acres of land. It is probable that no such extent of land has been planted with forest trees in Quebec at one time, since the establishment of the province. Mr. Joly has promised to keep us informed as to the progress of his work, the results of which will be, if his former attempts of the same sort may serve as a guide, that the failure next summero will be found to be not more than five per cent of the nuts sown.

This is progress, indeed! And it may not be out of place to recommind that prizes of considerable value should be offered in, if possible, every parish, to those who have succeeded best in making plantations of forest trees. This should be the duty of the Agricultural Societies and of the Agricultural Clubs their funds cannot be applied to a better purpose.

Would it not be well to form a provincial society for the encouragement of the re-planting of the country? Our columns are open to all those who are desirous of contributing to this most desirable movement, and it seems to us, that if a hundred well wishers to the project were to subcribe one dollar a piece, the project would not fail to secure the immediate assistance of the provincial legislature. Who knows but that we might be able to offer prizes, considerable enough in amount to ensure the plantation of forest trees in several counties as yearly, even, as next year. The editors of the Journal of Agriculture, three in number, will do their part with all their hearts. We trust many associates may be found to aid us in our endeavour, and we beg our readers to forward us their opinion on the subject as soon as possible.

COLONISATION AND RAILROADS.

The following reflections, which we place before our readers, arise from the low price which the government receives from the sale of the crown-lands of the province. We are forcibly struck with the idea that, if the method of disposing of these lands were entirely changed, they would bring in enormous sums to our exchequer; and, at the same time, the progress of colonisation would be amazingly developed.

What does the government receive by the sale of a square mile of the public lands at the present prices of from 20 cts. to 30 cts. an acre? In the one case, $156 80, in the other $235 20—just about enough, exaggeration apart, to pay for the surveying and road-making! And more, these lands, when sold, are long before they are colonised; for the means of communication are so imperfect, that the exportation of the products is hindered greatly. Upon due consideration of these facts, the following ideas are submitted to our readers:

We have already spoken in our journal of colonisation railroads. Let us take up the subject again. A railroad that traverses a wooded region increases the value of the whole district for at least fifteen miles on each side of it, or, in the whole, a belt of thirty miles in width is increased in value from 30 cents an acre to $1.00.

It is admitted, that a first class railroad can be built across our public lands without drawing a cent from the provincial treasury; and that, by means of this line, an almost unlimited amount of colonisation can be developed.

But there is another feature of this question which seems to be neglected, the federal government derives a *direct* revenue from each new colonist. The federal government then has a direct interest in encouraging the construction of colonisation railroads, since it receives all the benefit of the customs and excise duties, and every increase, whether of population or of commerce, tends, directly, to augment its revenue. What expectation, then more reasonable, than that the opening up of the public domain of the provinces by railroads should be encouraged by a liberal subsidy from the federal government? We have said that the federal government benefits especially by colonisation. In fact, for the local government it is a source of direct expenditure, the revenue being only very indirectly assisted by it. On the other hand, the federal government reaps the direct profit, which, as far as it is derived from the regions traversed by the railroad, will be large in proportion to the wealth acquired by the colonists. In these districts, not only will the land be brought into cultivation, but, thanks to the railway, the woods will be utilised, the mines ransacked for their treasures, and trade of every description will start into life.

Let us consider, for instance, the application of the idea to one of the finest districts of our public domains, namely, that which is situated between Lake Nipissingue and Quebec. If we trace, on the map of the Dominion, an imaginary straight line, starting from Quebec and passing by the river Matawan to the north of Lake Nipissingue, we shall see that

its length measuring only to the Matawan, will be 367 miles. Now, a railroad running over this line will traverse one of the finest lumber districts of Canada. There, would be the true stem of the great Canadian Pacific, the one most appropriate to the development of colonisation, of our mines, and of our forests. Add to all this, that it would be the shortest route for the transport of the riches of the west to the seaport of Quebec.

How numerous are the advantages of such a line, when viewed in detail! In the first place, it would be only seventeen miles longer than the present line (tracé) of the Canadian Pacific from Matawan to Montreal, thus offering to the federal government by far the nearest route by which to connect the Pacific and the great International line. It would act as a most fecund feeder to this road, by supplying it with the rich productions of the vast regions which it will throw open to trade and commerce. A few leagues, only, separate it from the great centres of industry and colonisation. it would pass within about fifteen miles of the establishment of the Oblate Fathers, at Désert, on its road to Quebec; then, it would leave the district colonised by the Rev. Mr. Labelle, on the Rivière Rouge, 9 miles to the south, and, further on it would traverse the Brassard township, a short distance from Messrs. Brassard's works, on its road to join the Piles railway, thus binding together all these great establishments, and putting them in direct communication with Quebec.

What a stride in advance would this cause the district to take. It would not be long ere, all along the route, new industries would spring up of their own accord, and the proprietors of the great timber limits of the Ottawa valley would find it their advantage to forward their lumber direct to Quebec, on its road to the workshops of the older continent.

When, in the construction of the new line, we arrive at *les Piles*, we find ourselves in direct communication with Quebec, viâ *The Piles* branch, and the Q. M. O. and O. road. And owing to this fact, it will be permissible to put off to a later period the building of the last part of the direct line from The Piles to Quebec. In addition to this, the railroad in question will put us in communication with the valley of Lake St. John, by the line now in course of construction in that direction.

Thus, then, a grand trunk line would be opened. passing through a country overflowing with riches of every kind, placing in communication with each other lines of industry already in operation, serving to start others into life, and giving us a road through the very heart of a country, now for the most part an uncultivated desert. The land would at once bring an appreciable amount of revenue into the federal treasury, our nationality would benefit by an increase of population, and, above all, it would afford a sure asylum for those unfortunate countrymen of ours now in exile and in danger of losing that national and religious feeling which is the distinguishing characteristic of the Canadian race.

The articles from the pens of Mr. Gibb and Mr. Pattison, written for the Montreal Horticultural Society, have been kindly forwarded to us for publication. The advantage gained by their being so early in the hands of the public will be evident to all our readers.

ORNAMENTAL TREES.

NOT NATIVES OF THE PROVINCE OF QUEBEC,

BY CHARLES GIBB, ABBOTSFORD.

(*Written for the forthcoming report of the Montreal Horticultural Society.*)

MORUS.—Mulberry.

There seems to be one variety of this tender tree of probable hardiness here. Last winter proved severe for most of the kinds in the experimental grounds in Washington. Of these, the Alba Moreltiana from China and the Constantinopolitana appeared the most hardy.

The Broussonetia or paper Mulberry is tender some distance to the South of us, and Downing's Everbearing is not perfectly hardy North of the city of New York.

Russian Mulberry.—It is to this I wish to draw special attention. It is said to have been introduced by the Mennonites into Nebraska from lat. 49 on the Volga. This would be about 180 miles South of Scratov, a climate, I am told, very nearly as severe as that of Montreal.

Some think that it is a cross between the M. Nigra or black mulberry of Persia and the M. Tartarica of Russia.

The Fruit Record says that "trees the seed of which was planted five years ago, are twenty feet in height and six inches in diameter, and have borne full crops of fruit since they were two years old. Color of fruit red and black, flavor sub acid. In Russia they are used as we use raspberries and blackberries. Large quantities of this fruit are sold annually in the markets of Russia. The trees grow very large, frequently reaching a height of fifty feet. The timber is hard and durable and the fence posts made from it have the lasting qualities of catalpa or red cedar."

"The Russians also use it as a hedge plant, and it stands shearing as well as any tree on the list. It also grows as readily from cuttings as cottonwood or willow. Last year cuttings made trees from three to five feet in height. The tree is perfectly hardy. Mercury thirty degrees below zero and not even the twigs injured."

The above statement is like many others which have been made about it, and, even if we make some allowance for the enthusiasm which surrounds new things, yet it seems worthy of fair trial. I procured one dozen trees last spring. Now our Abbottsford F. G. Assoc. is introducing it, I hope others will do so also.

PAULOWNIA.

P. *Imperialis.*—This is a striking tropical-looking tree, from Japan, with large catalpa-like leaves. It is a favorite street tree in Brooklyn. In Boston there is a medium-sized tree of it in the Public Gardens, but, I am told, there is scarcely another in the neighbourhood. At Rochester it is said to stand, though its flower-buds are often hurt. We cannot hope to grow it as a tree, yet if cut to the ground in the Autumn, and heavily mulched, it makes a growth of 6 or 8 feet, the following season. Its leaves are often 1 foot or more in diameter, and on that account decidedly ornamental.

PHELLODENDRON.

P. *Mandshurica.*—This tree was introduced a few years ago by Prof. Sargent, at Busy institute, Jamaica Plains, Mass. It has large Butternut-like foliage, and grows to a height of 60 ft. in its native land. Mandshuria is that province of China which runs northward into Siberia, as Maine does into Lower Canada, and lies between lat. 42 and 53. It is a country whose climate is much like our own, but with flora very different, a country from which we may expect a great many useful and interesting plants. All trees, however, from the Southern part of this Province may not be quite hardy here, and I regret to say the yearling shoots of the Phellodendron killed back somewhat with me last winter.

P. *Japonica.*—More recently introduced at Busy Institute, is a good grower, and shoots its terminal buds *there* without hesitation.

PLATANUS.—Plane.

P. *Occidentalis. American Plane* or *Buttonwood.*—This is a tree of large size, and of colossal diameter of trunk, common in the milder portions of Ontario and the States. It thrives best in a deep loose moist soil.

Mr. Drummond mentions that trees of it used to grow

about London, Ont., which measured 15-20 feet in girth. And Scott mentions a tree in Cayuga Co. N. Y. with a hollow interior of 15 feet diameter. It was formerly planted a good deal as a street tree.

I only know of one tree of it in Montreal. It is on the West side of St. Lawrence Street, just above Sherbrooke, a tree some 30 feet in height and apparently hardy. It should be tried for the sake of variety.

P *Orientalis. Eastern Plane.*—This is the tree that has been chosen to line the avenue leading to the Horticultural Hall, on the Centennial grounds at Philadelphia, and the front avenues to the Capitol at Washington. It is intended also to plant it along the boundary road, on the four sides of of the district of Columbia, which would make a drive of 40 miles under the shade of this beautiful tree. It is a native of the Levant, Asia Minor, and Persia, but I am sorry to say not quite hardy at Rochester.

POPULUS.—Poplar.

This is a race of rapid growers. Especially useful for re-treeing our treeless country. "I never met a tender Poplar" said Mr. Brown to me. I have done so, and yet I cannot name a kind I know to be tender. Kinds from Southern climates as a rule, do not suffer from our severe winters.

P *Alba. White* or *Silver Poplar* or *Abele.*—This is a very common tree in Europe, where it is found growing to a height of 80 or 90 feet. It is a tree of Northern habitat, being found as high as latitude 57 but it is also found plentifully in Northern Africa, Persia, and the Caucasus. There are also extensive tracts of it in France, and its wood is that commonly sold in Paris as the "*bois blanc.*" It is of very rapid growth, and, as a young tree or shrub its silver-lined leaves are very ornamental. It is "The Poplar that with silver lines its leaf." When older it cannot be suffered in gardens on account of its pernicious habit of suckering. I have seen its suckers growing as thick as oats in an oat field. As a street tree it is said to stand smoke and dust well, but its growth is rather spreading except for wide avenues. It soon becomes bowed with age. A tree in the Public Gardens at Boston only 20 years old, appears to have been planted for at least half a century. On very dry soils the leaf is small, and the tree quite looses its ornamental character, but in moist soils, closely grouped with trees of dark foliage, and especially in windy situations, it forms one of the finest contrasts with other trees.

Var. *Canescens* is much like the above, but is less white on the under side of the leaf, and therefore, less ornamental.

Var *Nivea.*—I can see no difference between this and the common Abele, though I have them growing side by side.

P. *Angustifolia* is a narrow-leaved variety from Utah, where it grows to a large size. Its diminished leaf-surface seems adapted to those dry regions.

P. *Balsamifera. Balm of Gilead* is a well known native tree. I especially wish to call attention to a variety growing in Longueuil with leaves as large as the basswood. One tree is in the main road, half way between the parish church and the road leading to the wharf.

P. *Caroliniana. Carolina Poplar.*—This tree is a favourite in the streets of Washington, especially for damp soils, where it is called a sanitary tree, on account of the amount of evaporation from its large leaf-surface. It is one of the best of the Poplars for a street tree. In Washington, 13 miles of street have been planted with Poplar, the larger part of these with this variety. In leaf and growth it is much like our own Cottonwood. There are two fine trees of it in Montreal, introduced from the South, some years ago. They may be seen about 100 yards west of the West-End of Belmont Street.

P. *Crispa Lindleyii* is a rapid grower, with leaves long and very narrow. yet like those of an elongated Balm of Gilead.

P. *Fastigiata. Lombardy Poplar.*—Scott speaks of this as "A silvan sentinel," its tall, spiral form being especially effective when grouped with round-headed trees. It is perhaps difficult to say of where it is a native. It has been planted in Lombardy and France, and in other places, as a road side tree, to a most monotonous extent. There, it is altogether over-planted. But *here* under-planted. Those who have come from old France, and brought their "Lares" with them should plant this tree.

P. *Græca pendula. Athenian Weeping Poplar.*—A native of the Archipelago, is, in leaf, like our common trembling Poplar, but of weeping habit of growth.

P. *Grandidentata* is a native tree, growing to a height of 30 to 40 feet having large massive leaves with indented margins.

P. *Grandidentata pendula. Weeping Tooth-leaved Poplar.*—This is the finest of the Weeping Poplars that I have seen. When top-grafted it hangs in graceful parallel lines around the stem. I planted three trees of it, which after the first winter began pushing their buds without any injury, but, in each case, they were unfortunately grafted on some tender stock, which winter-killed. Poplars like moist soil, and the very dry place in which they were planted may account for their failure.

P. *Monilifera.*—The Cotton-wood so common in the West is also a native of our Province. It is a very rapid grower and one of the best where quick shade is needed.

P. *Nigra pendula* is, in leaf, much like some others, but more pendulous than any except grandidentata

Parasol de St-Julien is a variety from France much like Graeca.

P. *Rotundifolia*—Round leaved Poplar. A species from Japan, with roundish leaf, and rather pretty.

P. *Suaveolus*, is a narrow-leaved variety from Northern Asia, received through Dr Rigel, of St. Petersburg, by Prof. Sargent. Possibly it is a variety of Balsamifera.

————a species from Turkestan, also received from Dr. Rigel. It has a leaf much like the Abele, but in nursery is as erect as a Lombardy. The tree is now too young to predict its form in middle and old age, but a silver-leaved tree as erect as a Lombardy would be an acquisition indeed.

————Another variety of unknown name I have already described in the Journal. Grand old trees of it may be seen between Longueuil and Varennes, which as I was going down by steamer, I mistook for Elms. At a distance it certainly does rival the White Elm in both size and grandeur. However it is clumsy in twig, and has rough bark, even on branches but 3 inches in diameter, and has a leaf like a Cotton-wood.

I am told that it is not a native, and suppose it may have been brought out from Europe, by the early French settlers along with the Lombardy and Abele.

PTEROCARPA.

P. Fraxinifolia is a tree related to the Walnuts and Hickories. It does not seem to have been long known in this country; yet it was introduced into Europe long ago from the Caucasus, as the *Juglans fraxinifolia.* It proved only just hardy at Paris, and, I have been led to believe that those more recently brought to the States are not likely to prove hardy here.

PYRUS SORBUS, MOUNTAIN ASH.

This is a highly ornamental species of tree. well adapted to severe climates. It is pretty in leaf, and flower, and still more so when bearing a profusion of bright red berries in the autumn. One fault ,however, it has. It is affected with borers,

which, I should think, could be as easily dug out of a Mountain Ash as out of an apple or peach tree.

P. Aucuparia-European Mountain Ash.—This is a larger tree than our native species, it has finer foliage, and is, I should say, decidedly more ornamental. It is to be found in very cold districts in Europe, even on the shores of the gulf of Finland, near St. Petersburg. It should be planted freely.

Var. *Latifolia. Broad-leaved Mountain Ash.*—This has broad leaves, downy underneath. I have not seen it in fruit, but its foliage is quite striking. There are several other varieties, of curious foliage, well worthy of a trial.

Var. *pendula. Weeping European Mountain Ash.*—It is always budded or grafted, 6 feet from the ground, and forms a curious drooping tree, very effective if properly shaped. It is just as hardy as other species.

P. Aurea Hybrida. Golden Hybrid Mountain Ash.—Seems a vigorous grower and has large cordate leaves, very downy and whitish beneath, well worthy of trial.

P. Domestica. True sort, or Service tree.—Is a native of parts of Middle and Southern Europe. I have not seen it, but it is said to have foliage like our native, and to bear larger berries, which are often eaten as are medlars, when partly decayed. Mr. Brown tells me that there are trees of it in good health on the Côte des Neiges Road.

P. Hybrida Quercifolia. Oak-leaved Mountain Ash.—Has foliage lobed like an oak, and bears flowers and fruit like the others. It has proved a good hardy tree in a very exposed situation at Como.

QUERCUS. Oak.

"It is a fact" says Scott "that not more than one American out of every thousand has ever seen the full expansion of a white oak grown to maturity in the open ground."

Are there any such trees in this Province? I might ask. If not, centuries must pass before they can be seen here. In England there are oaks believed to have been old in the time of William the Conqueror. The largest specimens mentioned by Loudon are from 48 to 78 feet in circumference of trunk. No wonder it is spoken of as

"Jove's own tree (1)
That holds the woods in awful Sovereignty."

The oak is often planted in England as a boundary tree, to mark boundaries between countries or properties. If such were the custom here, how much more beautiful our country would be a century hence, and how easy it is to drop a few acorns here and there.

The oak is a tree of very varied form and foliage. In the group of oaks in the grounds of the Department of Agriculture at Washington, Q. Daimio is as massive in leaf as a magnolia, another (Q. Pedunculata pteropyhlla dissecta of Britain) has long, thread-like leaves with thread-like laterals, more fringy, and not less aerial or feathery than an Imperial cutleaved alder. The Willow oak (Q. Phellos) has leaves much like a willow, the Q. R. Pedunculata fastigiata as erect as a Lombardy Poplar.

Of European oaks Q. Pedunculata and Q. Sessilifolia are found as far north as lat. 60. in Finland, and lat. 50. in Russia. The Q. Robur known as the Royal oak of Britain, is found from Sweden to Barbary, so that its habitat gives no clue to hardiness. Mr. Brown, many years ago, grew a number of young trees from Scotland, which proved quite hardy in nursery. Yet I can only hear of two or three trees about Montreal, and these are in a very sheltered situation.

Q. Cerris or Turkey oak has proved hardy in Montreal, though a very, very slow grower. In Washington it was killed to the ground. The fact is, Q. Cerris is a species of great variety found throughout Central and Southern Europe, and parts of Asia, of very varied beauty, and varied hardiness, some are even ever-green. The Q. R. Pendun. taraxicifolia of Britain, has pretty purple foliage, but was hurt by winter in Washington, while the Q. Sideroxylon of Mexico, along side of it, was not injured.

Our first experiment should be made with our American species. Our own White Oak has scarcely a rival, though slow of growth. Our Red Oak grows much more quickly into a large spreading round-headed tree.

The Mossy Cup, or Over Cup, or Oak? (Q. Macrocarpa) is "a beautiful tree, more than 60 feet high," says Michaux, with "leaves often 15 in. long, and very much indented." I have not seen it, but it is well known, as it is a native of Manitoba and the Western States. It is a fast grower and very ornamental. Mr. George Dawson, however, tells me that that found in Manitoba seems to be a different species, a tree not much more than 30 feet in height, and shorter in leaf and acorn. One of the most admired of these varieties seems to be the scarlet oak, (Q. Coccinea) a tree I do not know, though it is a native of our own Province. The white Chestnut Oak (Q. Prinus palustris) does not seem to be of Northern habitat, but the Rock Chestnut Oak (Prinus monticola) grows in groups in dry rocky places on the shores of lake Champlain. Downing considers it "the finest of our Northern Oaks" though it does not attain large size. The Pin Oak (Q. Palustris) is a tall pyramidal tree of rapid growth, which makes a fine street tree. There is a fine avenue of it at Flushing, Long Island. However, it is not a tree of Northern habitat. The willow leaved oak (Q. Phellos) is seldom seen North of New York. One foreign oak I must speak of,—the Japanese Oak (Q. Daimio). It has dense massive foliage, and is a good strong grower, and the specimens I saw in Washington and Long Island suffered no injury from last winter, a winter there of previously unknown severity.

ROBINIA.—Locust or Acacia.

The airy lightness of foliage, and long clusters of blossom of the Locusts would make them general favourites, if these advantages were not counter-balanced by weak points.

R. Hispida.—Moss or Rose Acacia.—This tree has very attractive foliage, and long clusters of rose-coloured flowers, in the early summer. It is of rapid, spreading growth, seems hardy for a few years, and then dies suddenly. It however replaces itself in a very short time. It is quite common in some parts of the Province.

Var. Grandiflora.—Is a pretty dwarf tree with larger leaves, and said to have larger flowers. It has not yet been tried here.

R. Pseud-acacia.—Yellow Locust.—This is quite a pretty tree when young, but lacks beauty as it becomes old. When old it has, as Scott says, a look of seedy gentility about it. It has too, a most pernicious habit of suckering, so that, as an ornamental tree I do not recommend it, as a rail and fence-post tree it is worthy of our thought. Mr. William Brown had some of these trees 40. ft., in height, and 30 years planted which seemed quite hardy, and I see some old trees of it about Montreal. Forty little trees which I planted in the spring of 1880, have made a growth during the last two years very nearly equal to the Poplars of different kinds along side of them. The durability of the wood is well known, and it is of easy and rapid growth, and on that account the fences on all the best farms in Pennsylvania and other States, are made of it. However, it becomes badly affected with borers, and, if this be the same borer that attacks our Apple trees, then let us be on our guard in planting this tree. (1).

(1) "It may well be called Jove's tree, since it drops such fruit." *As you like it.*

(1). It was this Locust that Wm. Cobbett tried to get planted on a large scale in England, some 70 years ago. A. R. J. F.

Var. Umbraculifera.—Globe or Parasol Acacia.—This is a pretty little lawn tree, of dense foliage, and globular outline, well worthy of trial.

R. Glutinosa or Viscosa.—The *Gum or Clammy Locust.*—Is a smaller tree than the yellow Locust and of more Southern habitat. Mr. Brown had some of these trees ten feet in height, and 15 years of age, which were quite hardy.

SALISBURIA.—Ginkqo or Maiden hair tree.

S. Adantifolia.—Is a botanical curiosity. It is a resinous tree, and yet has a leaf, and it is unlike that of any other tree, and resembling the maiden hair fern. It is a native of China and Japan where it attains large size. The largest tree I have seen of it is in the Boston Common,—a tree of about 15 inches in diameter, and 35 ft in height. This has been chosen for the avenue leading up to the Department of Agriculture at Washington. We seem to be upon the extreme Northern limit of its culture, and yet a tree has stood with me in a very exposed place unhurt during the last two winters. I am also told by Mr. Beall, general agent in Montreal for Morris, Stone and Washington of Toronto, that there is one in Durocher Street about 10 ft. in height, and apparently quite hardy, and that many trees of it planted in Montreal stood last winter without injury.

SALIX.—Willow.

The Willow family embraces an immense number of varieties of all sizes and forms, from creeping-plants to gigantic trees. Some are not hardy with us, while some are of even Artic habitat. *S. herbacea*, and *S. Artica* says Loudon approach nearer to the Pole than any other ligneous plant.

S. Alba.— White Willow.—This is found over the greater part of Europe and Northern Asia. It is well known here, and has also been planted largely in the Western States, as a wind-break and fuel tree. It well cut back, it soon makes a live fence, especially useful in swamps where posts heave with the frost.

S. Babylonica.—Babylonian Weeping Willow.—This is one of the most beautiful of all trees, and a great favourite wherever the climate is not too severe. It is a native of the North of Africa, America, Japan and China. Chinese pictures are always introducing it, showing it to be a favourite there. It grows well about Niagara. It has been tried here, but will not stand.

S. Caprea Var. Pendula.—Kilmarnock Weeping Willow.—Is pretty well known. Grafted 5 or 6 feet from the ground its forms an umbrella-shaped head unlike almost any other tree. Mr. Brown imported it from Scotland, just as it was beginning to be propagated, and it proved quite hardy with him. I have seen it in many places showing no signs of winter injury, yet it sometimes dies suddenly. Mr. Beall tells me it has thus done badly with Colonel Rhodes at Quebec.

Dry soils are not suited to most Willows, though the English Goat Willow is said to be found in their dryest pastures. In the States it is largely planted on a great variety of soils, yet is not spoken of there as of uncertain life. A few postmortem examinations would explain this.

I recommend that this variety be grown also upon its own root, and tied to a stake to keep its leading shoot erect. I saw a tree of it grown in this way at Flushing, — a tree of striking eccentric form.

Var. Tricolor.—Tri-coloured Goat Willow.—This tree has leaves clouded and shaded with white, and is quite pretty in contrast with others. It should be top grafted.

S. Laurifolia.—Laurel-leaved Willow.—Is probably a native of Britain. It has large and very dark glossy leaves, and is appropriately named. I have seen large bushes of it, 30 ft. in height, in Central Park, where it was very effective. At Abbotsford it has not been injured at all during the last three winters in my bleak exposure, and I do strongly recommend its trial.

S Longifolia.—I took a fancy to this in the Botanic gardens at Cambridge Mass., and they kindly sent me cuttings. It has a long glossy leaf, and reddish stem. It is a faster grower and less leafy, and only on that account less ornamental than the Laurel-leaved.

S. Palmæfolia.—Palm-leaved Willow—This has small deep green leaves, and very red twigs. It is a fast grower, and seems quite hardy.

S. Pendandra. Has broad, thick leaves, and is not to say pretty.

S. Purpurea Pendula. American Weeping, or Fountain Willow.—Is probably of European origin. Grafted standard high, its head forms the centre from which radiate innumerable slender branches with slender little leaves. It is feathery and graceful and very unlike others. It proved hardy with Mr. Brown many years ago, and I have seen trees of it near Montreal. It, too, is well worthy of trial.

S. Regalis. Royal Willow.—This I saw for the first time in the grounds of Ellwanger and Barry, at Rochester. It was not green, but looked just like frosted silver. It needs dry weather to make it appear to the best advantage. In Central Park, I was struck by a fine contrast in colour in the distance.—A tree of whitish foliage was grouped with others that were unusually dark. It was this willow and the Laurel-leaved. It was one of the finest contrast to be seen there. I have never seen plants of it higher than 20 of 25 feet. At Abbotsford it killed back with me, somewhat, the first winter, but less, or hardly at all since, then. Those I have on moist ground seem hardy. It is hardy enough I should think for sheltered places about Montreal.

Oh! how beautiful some parts of our Mount Royal Park could be made by the planting of trees like these of easy culture.

S. Rosmariinifolia. Rosemary leaved willow.—Is a graceful feathery tree, sometimes light in colour of leaf, sometimes dark. In the public gardens in Boston, where it has been planted freely, and with good effect, the leaf is so much darker than mine that I supposed it to belong to some other variety. I have the light kind, and it seems pretty hardy. At St. Pie, there are some street trees of the dark sort, which are very effective. It is a native of Sweeden any Finland, north Germany and Britain, and of the States from Pennsylvania to Carolina. Whether one of these is native and the other European, or no, I cannot say. The dark colored is, I think, the hardier of the two, and I think also, forms the larger tree.

S. Vitellina. Golden Willow.—This grows to large size, and is planted on account of the bright yellow colour of its young shoots towards spring.

S. Wisconsin Weeping.—We cannot grow the Babylonica, but it seems likely that we can grow this instead. Wishing to fill up a corner in my garden, I planted some, but they failed from dryness of soil. This willow needs more moisture than Regalis or the Laurel or Rosemary-leaved. One I gave to a friend which he planted near a watering trough is fast growing into a beautiful tree. Mr. John M. Fisk has found it hardy in nursery, even on dry soil, as long as that soil is cultivated. It is hardy with me when the soil is moist. It does not push its terminal buds; however an inch on the end of a Weeping Willow matters little. I do not know its ultimate size, but I do heartily recommend its trial.

S. Wolseyana.—Is a pendulous variety with small grey leaf. I have been struck by its delicate beauty, but know nothing of it hardiness.

TAXODIUM. — Deciduous Cypress.

There are fine young specimens of this tree in Forest-hill

Cemetery near Boston, and Mr. Beal tells me it is grown in the Niagara peninsula, but that it is not hardy at Toronto. We need scarcely try it here.

TILIA. Basswood or Linden.

This tree is not planted largely as it deserves. It is not common in Montreal. In Washington there is an avenue 6 miles long with 4 trees abreast of our native Basswood, an "Unter den Linden" of which that capital may well be proud. In Washington 10½ miles have been planted with Linden, and that mostly with our native species.

T. Europea. European Linden or Lime.—This is a tree of smaller and smoother leaf than our native species, and is a favourite tree for street planting in the cities to the South of us. Some prefer it to our native species, others prefer our larger but coarser-leaved native. It is a tree of high northern latitude, especially the variety Parvifolia which is indigenous in Norway up to 62. It grows in high latitudes in the interior of Russia, and is common in a large part of Siberia. It is this variety which grows about St. Petersburg. Loudon says that in Sweden the Lime is met with for miles together with twigs bright red, or yellow, or quite green. The red and yellow twigged varieties are also natives of Britain, so that we must not assume hardiness from their Swedish habitat. Mr. Brown has trees of it 30 feet in height, so have Captain Raynes and others. It seems to be quite hardy.

Var. *Alba. White-leaved European Linden.*—This tree is said to be from Hungary. It has thick leaves, white and downy on the under side. It is as yet a rare tree. I have never seen one more than 25 feet in height. It stood rather a severe test of hardiness with me last winter. It is a tree of great ornamental value, well worthy of being introduced.

Var. *Alba Pendula. White-leaved Weeping Linden.*—This tree is much like the above, but is of weeping habit of growth. I have only seen small trees of it, and cannot tell its ultimate size.

Of other European varieties which I have seen, Laciniata (cut or fern-leaved) seems the least likely to prove hardy. Laciniata Rubra (red fern-leaved) is a slow-grower, and not of the same rugged health as those that follow. Platiphylla (Broad-leaved) which is indigenous from Sweden to Spain, has larger and rougher leaves than the common kind. Vitifolia, (grape-leaved) is a vigorous grower with large thick smooth leaves like a grape vine. It is a very interesting variety which should be tried. Dasystyla is a vigorous grower with thick smooth glossy foliage also well worthy of being tested.

ULMUS.—Elm.

Our native species are so beautiful that we have experimented but little with foreign sorts, yet Europe can boast of fine trees also. Still Michaud gives us the palm and describes the White Elm as the most magnificent vegetable of the temperate zone.

U. *Campestris.—English Elm.*—Is also a noble tree. Were the grand old trees of this kind on Boston Common suddenly re-placed by trees of equal size of our American species, the Common would lose much of its varied beauty. The Campestris is found from the shores of Finland to the coast of Barbary, but as to the hardiness of the trees imported from the nurseries of Scotland, or the States, I can say to nothing. North of the McGill College grounds there are two trees about 25 in height, and their little side shoots suffer from our winters. They are so very slender in twig that I do not think they are the common variety of the Campestris.

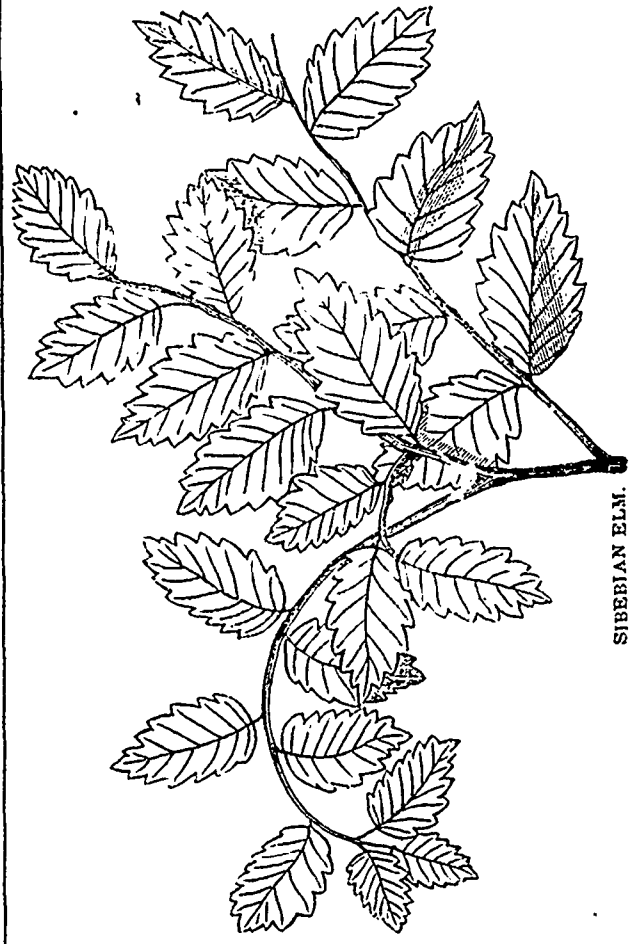
Var. Purpurea.—Purple leaved English Elm.—With me it has proved a failure as a purple-leaved tree. The few I have seen in the States had foliage slightly more tinted, but the name Purple-leaved is quite misleading. However three of these trees have stood perfectly with me for the last three winters, and promise to be fine trees some day.

Var. Serratifolia.—Serrated-leaved Elm.—Is curious, but I think quite cut out by the following.

Var. Urticæfolia.—Nettle-leaved Elm.—Is well worth trying on account of the extreme peculiarity of its crinkled saw edged leaves.

U. *Montana.—Scotch or Wych Elm.*—Is a native of the Northern and middle parts of Europe. It is large in leaf, and of rapid growth, but does not attain a height of more than 40, or 50 feet, except when drawn up by other trees. Captain Raynes has some trees of this kind about 30 ft. in height which are quite hardy.

Var. Camperdownii Pendula. Camperdown Weeping Elm.—This forms one of the most picturesque of drooping trees grafted on a stock of erect growth say six or eight feet from the ground. I have seen young trees of this kind at the Beaconsfield Vine-yards, near Point Claire which seemed quite hardy. I am told that it is doing well in Quebec. With me it has proved quite hardy. It is one of the best lawn trees as a shade for a rustic seat, and deserves to be planted widely.



SIBERIAN ELM.

U. *Siberica.*—What a lovely little thing this is, one may judge from the annexed cut. I have only seen young trees of it, and cannot state its ultimate size.

The above list of deciduous trees is far from complete, very far from complete even on the points upon which it touches, but correct in what it does say. Of the trees above mentioned I have or have had 90, or more, varieties. We

need more exprimenters, we need complete lists to guide experimenters. It is intended to re-issue this in another form. Will those who can throw any light upon any point kindly confer with the writer and thus do their share in this much needed work ?

First steps in Farming—(Young man's Department.)

FARM YARD DUNG.

Manures may be defined as added plant-food. They are of various kinds, but may be simply divided into organic and inorganic, just like the natural plant-food in the land. The most usual form of manure is *farm yard dung;* which, as you all know, is composed of the liquid and solid dejections of animals mixed with the straw, or other substances, which is used for litter. This mixture is good or bad in proportion to the quality of the food supplied to the animals, and to the care used in the preparation. If the cattle eat straw alone, the dung will be poor, almost valueless; if roots be added to the food, the manure will be much richer; if grain, linseed, or the refuse of the oil-mills (cake) be given, the dung will be highly valuable; and if the liquid or urine be preserved, added to the solid manure, and the whole preserved from too much or too little moisture, perfection will be arrived at.

In other countries where farming has been long carried out to a very high degree of perfection, and where, in consequence, sheep are made the mainstay of the farmer, certain crops are sown expressly for the supply of those animals, and the crops being consumed in the place were they grow, the liquid and solid excrements are immediately covered by the plough, and all expense of carting, as well as all loss, is avoided.

The management of farm yard manure is a most important point in carrying on a farm. It contains all things necessary for the growth of every description of plant. It is necessary that care should be taken to mix the excrements of all the different sorts of stock, and for this reason: the dung of the horse is hot; that of the horned animals cool; and that of the pig between the two. Therefore, they would not heat equally in the heap, unless the distribution were equal, and the temperature and fermentation would be difficult to control.

It is clear enough, that if the manure in its fresh and green state were carried out laily, spread, and immediately ploughed in, as is the case with the sheep, there would be no loss, and the crops would receive the full benefit of the plant-food it contains.

For you must not imagine that the fermentation or rotting of a heap of dung adds anything to its contents; on the contrary, however carefully it is managed, some loss must take place. Manure is rotted for two reasons: first, because the heat of the fermentation destroys the seeds and roots of weeds; secondly, because the dung is thereby prepared, or cooked, for immediate action on the plants. Ploughed in, the same process of cooking would, sooner or later, take place; but months would elapse before the change occurred, and, in the mean time, the crops would be gaping after their food, close to them, but unavailable.

You may like to know what you are putting on your fields, when you give them a dressing of good mixed farm yard manure, well fermented and well preserved :

Water	75.42
Soluble organic matter.....	3.71
Soluble inorganic do	1.47
Insoluble organic do	12.82
Insoluble inorganic do	6.58
	100.00

The soluble and insoluble organic matter contain .606 0/0 of nitrogen, equal to .735 of *ammonia*; and here, we must pause a little, for this ammonia is the most useful, as it is the most costly, of all the constituents of our manures.

You saw that the organic or burnable matter of plants was divided into two groups, one of which was distinguish ed from the other by its containing *nitrogen.* When animal or vegetable substances containing nitrogen are decomposed, whether by burning or decay, ammonia is formed, which consists of nitrogen and hydrogen; it is very volatile, and highly pungent—smelling salts are carbonate of ammonia, and you know how they bite when fresh, and how quickly, if the cork is left out of the bottle, they lose their power.

The fermentation of dung, then, may be described as a decay, brought on by the decomposing influence of the nitrogenous matters present, whereby the non-nitrogenous matters present also undergo fermentation. Ammonia is formed from the nitrogenous matters of the manure; and carbonic acid, or some of the organic acids, such as the *ulmic* or *humic* acids, from the non-nitrogenous matters, and the value of the manure depends vastly on which of these acids is formed. If the heap is allowed to get dry and hot, carbonic acid is produced, and combining with the ammonia walks off with it in the very volatile form of carbonate of ammonia; but if the manure be kept moist and moderately cool, one of the organic acids will be formed, and you will have say, *ulmate* of ammonia or *humate* of ammonia, either of which will be easily retained by the mass if it is kept from being washed by the rains or melting snows.

To retain the ammonia is simple enough : keep the heap moderately damp, and, if possible, return all the soakage from it on to the top of the dung. If, on opening any part of the mixen you find a strong pungent smell, you may be sure the heap is too dry and the ammonia is escaping—moisture is wanting. If, however, the dung is dry and mildewed-looking, it is too late to take any precautionary methods; the most valuable part of the dung is gone, and is as likely to benefit your neighbour's land as your own. If you don't believe that the ammonia is escaping, if you want the proof of your eyes as well as the proof of your nose, take a glass rod, and dipping it into a bottle of *muriatic acid,* hold it over the place whence the smell proceeds: white fumes will be visible, and these fumes are ammonia.

If you want your manure to be valueless, keep it dry, let it heat violently, and when it has done fermenting get it well washed by the rain, and the job is finished. Many and many a farmer carries out to his fields a dead body from which the spirit has departed.

How far the fermentation of dung should be carried, depends entirely on two points: the quality of the soil to which it is to be applied, and the crop it is intended to feed. If the land is heavy and the desire is, as it naturally will be, to lighten it, then the manure, if free from the seed and roots of weeds, cannot well be applied in too green a state: all the elements of fertility are there, and the conversion of the insoluble into the soluble, and of nitrogen into ammonia, will take place as surely, and with a better chance of being retained, in the ground as out of it. For experiments by Dr. Way proved, long ago, that, whereas, a solution of ammonia, in water poured into a tube full of sand, open at both ends, passed almost as unchanged as it entered; the same solution traversing the same depth of pulverized clay left almost the whole of its ammonia behind it. Thus you see sand is a bad guardian and clay a good one.

Even on heavy land, if the crop to be sown is fall-wheat, the dung should be well fermented before it is ploughed in, if not, when the long dung rots the furrow will be hollow, and the roots of the young wheat having no firm hold will be

easily drawn out by the frost: all wheat, but especially fall-wheat, demands a firm bottom.

Light lands should receive their meals of manure in a well rotted condition; for it is useless to make them more open than they naturally are; and, their memories being very short, the food should be given frequently, and in an advanced state of preparation.

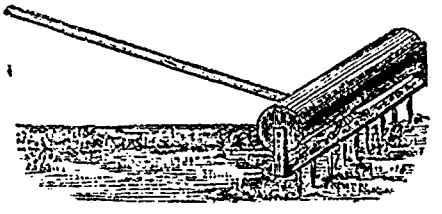
Again, if the crop is wanted in a hurry, as in the case of early potatoes, it is advisable to apply the dung in a thoroughly decomposed state, the rootlets will find it easier to attack, and the juices will be more ready for their greedy little mouths. In England, and in fact wherever advanced agriculture is practised, this is not so necessary a feature; for artificial manures cooked to a nicety are there always presented to the plant on its springing from the seed—in fact, superphosphate, guano, nitrate of soda, &c., &., are the soup, and dung is the roast beef of the plants' dinner table. Before the introduction of bone dust into Scotland, it was the custom of the best farmers to keep the manure intended for swedes, sown. there in the early part of May, from the previous year's supply. So necessary was it thought to be that the young plant should find its food ready on demand.

In very heavy soils, autumn manuring for roots is a wise practice. The dung is ploughed down in early winter, as late as possible, but before frost, and the grubber, harrow, and roller, complete the work of cultivation in the spring. Here, the dung if free from weeds, may go on as it comes from the cattle; and it will be found a means of growing roots with success, in places where it was considered hopeless to attempt it.

In laying down a dung-heap, I strongly recommend first placing a couch of earth, say, six to nine inches in thickness, to absorb the oozings. The heap should be of the same height all over, and, as nearly as possible, of the same texture, that is, the foot, on walking over it, should not sink more deeply in one place than another. The rotting will then proceed equally all through the mass, and, if in turning, the outside and the top be thrown well into the middle, the whole will be of the same strength, quality, and consistence, when it is finally spread on the land. A few shovelfulls of earth should be thrown on the top of the mixen after turning, to keep in check the fermentation. Recollect, that the value of farm yard dung depends, in the first instance, on the food eaten by the animals whose excrements compose it: *the beast that eats straw voids straw;* that the rapidity of rotting depends upon the admission of air to the heap, so that, if you want the dung ready soon you must lay it up lightly; if, on the other hand, it will not be required for some time, draw the loaded carts over it. The quicker the fermentation, the greater the danger of ammonia escaping, and, therefore, the greater the necessity of being able to moisten the heap in moderation; a well managed moist fermentation preserves the ammonia, but a rapid, dry fermentation expels it into the air.

Where you have plenty of black bog-earth, or *muck*, near your stable, I approve of drawing a sufficient quantity, when dry, to act as an absorbent of the urine of the cattle. But I am convinced that you will never find it pay to drag about from swamp to stable, and from stable to field, several hundred loads a year of *muck;* a plan, I see, recommended by some of the agricultural journals of the United States. To show you how absurd the arguments of these journals are I will merely state what I saw in one of them last week. "a ton of *muck* laid up and drained of its water contains four times as much nitrogen as an equal amount of farm yard dung." We will see, now, if this were true, what is the value of a ton (2000 lbs) of muck. Farm yard manure, as we observed at page 151, contains, when properly managed, .606 0/0 of nitrogen, equal to .735 of ammonia. Ammonia, in the form of sulphate, costs, at the Montreal Gas Works, 4 cents a pound, each pound of sulphate contains a quarter of a pound of pure ammonia, which, therefore, costs 16 cents a pound. If, then, muck contains four times as much nitrogen as farm yard dung, it must contain $.735 \times 4 = 2.940$ per cent of ammonia, that is, a ton must contain 58 pounds of ammonia, worth, at our quotations, $9.28—I need hardly say that this is pure nonsense. The sample of muck sent to the chemist for analysis was probably taken from a place where a cow, or some other animal had been buried, and hence this very delusive statement. It is hard upon the chemist, but I cannot help that. Fifty years ago, both in England and Scotland, much labour was expended in the construction of *composts;* at present they are entirely exploded, thanks to a more perfect insight into the functions of the three great manurial agents, nitrogen, phosphoric acid, and potash. (1) Where yard dung has to be applied as a top-dressing to grass or grain crops, it can be used either fresh or rotted.

ARTHUR R. JENNER FUST.



Combined Rake and Roller.

The annexed engraving, taken from the *American Agriculturist*, represents an implement which will be found very useful in the kitchen-garden. To make it, take a rake of wrought iron, and cutting off the last tooth at each end, raise the ends until they are right angles to the back of the rake. Then, make a roller of hard wood, about three inches in diameter, and of the same length as the space between the raised ends of the rake. The arrangement is completed by passing two pins through the holes left by the removal of the teeth of the rake, and fixing them in the roller.

By this cheap and simple operation we obtain two implements of great utility in one. J. C. CHAPAIS.

THE RUST.—UREDO SEGETUM.

Many people, every farmer unfortunately, know too well what the *rust* is; that disease which so often causes the crops of wheat, barley, &c., to fail. But how few know whence it arises, and how to prevent its ravages.

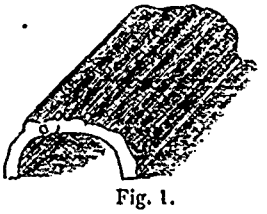


Fig. 1.

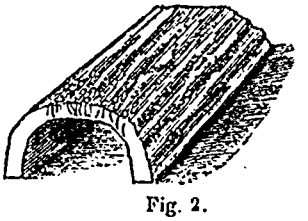


Fig. 2.

Having lately met with some engravings which give an excellent representation of the *rust*, in its different forms, I take the opportunity of giving some information about its origin, the way it sets about its work of destruction, and the means of destroying it.

The *rust* is a microscopic *fungus*, of these fungi there

(1) See article on "Coprogène."

are many sorts, and many shapes, as for example, *mildew* (Uredo Carbo, Ustilago) which attacks oats, barley, Indian corn, devouring stalk, leaves, and glumes; *Uredo caries*, which feeds on the ear of the wheat, and the *rust*, properly so called (*Uredo rubigo vera*) which attacks all grain, but more especially devotes itself to the wheat-plant.

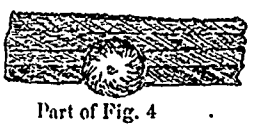
Ergot, most abundant on rye and rye-grass (*Lolium perenne*), is simply the stem (*mycelion*) of a fungus (*sclerotium*) which developes itself on the flower of the plant. The cause of the rotting of the potatoes is another, the *Botrytis*, but I do not intend to cary my excursus further than the *rust*

Fig. 3.


Fig. 4.

proper, for the history of one of these fungi is, with hardly an exception, the history of the whole family; the remedy for one answers against the rest.

Mr. l'abbé Provancher, in his Flora Canadensis, page 754, has given so good a description of the genus that I am tempted to borrow it: "The numerous fungi of this genus," says the learned abbé, "are all developed in the *parenchyma* (*tissue*) of living *phanerogamous* plants (those in which *stamens* and *pistils* are visible), and particularly in the *graminaceæ* (*gramen*, *grass*, wheat oats, &c., and the grasses proper). Simpler even, than the truffle, which has neither stem, nor root, fruit nor flower, they want every sort of filament except those which constitute the *spores* which reproduce them. Thus, each spore is a perfect individual plant, since although they are massed together in great numbers, they have no connection with each other. The following description of the manner of their reproduction may be trusted, as it is the fruit of long and serious investigation: Each microscopic spore or globule, which composes the *dust*, so to speak, of these fungi, when, buried in the ground it meets with the necessary condition of heat and moisture, swells to twice its size, and thrusts out a filament or tubercle five or six times the length of its diameter. The tubercle then divides at its end into six, eight, or even ten branches, sometimes *sessile*, sometimes *pedunculate*, which soon show *articulations*, or, rather, infinitely small internal berries, and the


Part of Fig. 4

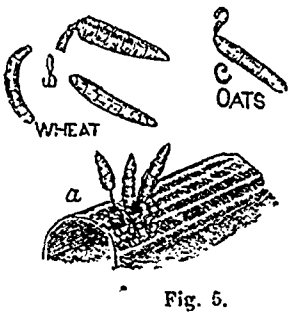


Fig. 5.

globules ultimately fade and die. If, at the moment when the branches of the spore divide into berries, they happen to come in contact with germinating grains, or even with the extremities (*spongioles*) of the roots, the berries absorbed by the juices flow with them through the capillary tubes of the plant, until they find conditions favourable to their development, when they oblige the *epidermis* to give them entrance, and show themselves, externally, in the form of yellow, brown, or black patches. In absorbing the nourishment intended for the support of the grain, or in diverting the sap from its ordinary course, the fungi constitute a real state of disease for the plant, and frequently cause its death."

Rust, then, is a fungus whose seed, scientifically called spores, falls to the ground in the form of dust, and remaining hidden there until it finds its way into the plants, is nourished at their expense, and frequently repays its nurse by bringing it to destruction. The fungus often, carried along by the air, settles on the exterior of the plant itself, and aided by a moist state of the atmosphere, attaches itself irremovably there.

To make my readers more thoroughly understand the nature and mode of growth of the rust, let us examine, closely, the engraving which accompany this article. Fig. 1 shows one of the spores which has just deposited itself in a wrinkle in a stalk of wheat. In fig. 2, is shown the condition of this spore 48 hours after it deposition. The warmer and moister the air, the more rapid the growth of the fungus. Fig 3, at *a*, displays a group of fungi bursting through the epidermis (envelope) of a wheat-straw. At *b* and *c*, the same engraving shows a capsule containing spores, one of the wheat-rust, the other of the rust affecting the oat. These capsules are magnified 800 times.

It is these cells which cause the reddish-brown dust which covers wheat attacked in its green state by rust; and the dust is woefully visible when the said wheat is undergoing the process of threshing. In fig. 4, is shown the progress of the rust, after the death of the straw which supports it; and its later appearance, when the straw begins to rot, is depicted in fig 5. Lastly, fig. 6 shows the rust at maturity: the pods of the fungus contain, each, myriads of spores or seeds. In all these engravings, the different parts represented are, of course, greatly magnified.


Fig. 6.

It takes the rust about six weeks, from the middle of June to the end of July, to pass through all the changes we have described.

In the propagation of the rust fungus, that which attacks wheat differs from that which attacks oats in the form of the spores, in fact, they are never alike on any two sorts of plants; whence, some botanists conclude that the fungi belong to different species, whilst others think that the form of each is modified by the nourishment it finds. This point is not clear. That the rust can hardly, if at all, attack successfully a strong, healthy plant, because its tiny root cannot pierce the strong, thick epidermis, is a very reasonable conjecture, and leads us to the study of the means of combating the parasite we are discussing.

If we examine the epidermis of wheat, barley, oats, and other plants of the same order, we shall find it to consist of a sort of glassy substance. This glass is composed of *silex* or sand, with, as a base, potash, soda, lime, &c., according to the character of the soil on which the plant in question grows, and these akalis form with the *silicic acid* matters that are called *silicates*. So we may conclude that the soils must contain a fit proportion of alkalis and silicic acid to form a proper envelope for the plant against the attacks of the rust.

We now begin to see that where land is troubled with the rust, it is not a highly nitrogenous manure that is wanted, so much as a dose of silex or sand, or of alkalis, which may be added by means of a dressing of clay. Experiments have proved that these dressings have banished the rust, or at least minimized its ravages, on land which had been previously rendered almost useless by the attacks of the parasite. Salt has frequently been recommended as a manure, but I must say I have little faith in it ("I have none at all" A. R. J. F.). Still, where there are little few alkalis in the

soil, salt, from the soda it contains, should be beneficial. (1)

The chief remedies against rust are, in the first place, a thorough draining of the land; for it is moisture which favours the development of the spores. In the second place, the soil should be made rich, so that the plants may vigorously repel the attacks of the enemy: a weak plant is more easily subdued than a stout one. Thirdly, the land must receive such elements, in the form of dressings, as may contribute to the formation of a hard epidermis, by way of a buckler against the spores that would otherwise succeed in attaching themselves to it. To these we would add, the wisdom of getting our seed-grain from places untouched by the rust; and, once again, we recommend the liming of suspected seed before sowing. Lastly, if possible, lands that have been free from this plague for some years past should alone be sown with grain.

I hope I have now given each of my readers a good idea of the rust. I know parts of the province, where, from time immemorial, grain crops, especially oats, have suffered almost every year from this disease. It is in these districts that we should endeavour to use, with the greatest care, the remedies which the experience of others has rendered worthy of trial. Here, as in every other battle with the enemies of agriculture, *vigilance* and *activity* should be our watchwords.

J. C. CHAPAIS.

VETERINARY DEPARTMENT.

Under the direction of D McEachran, F R. C. V. S., Principal of the Montreal Veterinary College, and Inspector of Stock for the Canadian Government.

Diseases of the Horse's Foot.

SAND-CRACK.—This term is applied to a fissure or separation of the fibres of the wall of the foot in a longitudinal direction. The terms, quarter-crack and toe-crack, are used to indicate the part of the foot in which the crack exists. To understand its nature, we must bear in mind that the wall of the hoof consists of a conglomeration of hairs or fibres placed longitudinally, and held together by a matrix. The internal surface presents a number of laminæ also running longitudinally, and dovetailing with the sensitive laminæ which cover the *os pedis*, the external surface being covered by a glutinous covering which prevents evaporation of its moisture and the injurious effects of moisture and of the atmosphere. Whatever therefore will lessen the quality of the cementing matrix will increase the liability to solution of continuity of the fibres. The principal causes are · uneven shoeing, rasping away the external glutinous covering, concussion on hot dry roads, or on hard frozen surfaces. Both high and low temperatures favour the tendency to splitting of the fibres, and the term frost-crack is as appropriate as sand-crack.

SYMPTOMS—Usually the first indication is the oozing of a little blood from an almost imperceptible crack in the side of the wall, which, on examination, is found to penetrate the crust through its entire thickness. It is usually accompanied by lameness, heat of the foot and pain on pressure. The fissure most commonly appears on the quarter, although it is also seen in front of the foot. The fore feet are more liable to it than the hind, but the latter are also affected in the same way.

Some feet are more liable to sand-crack than others, and the quality of horn and form of foot predisposed to it, are hereditary.

TREATMENT.—Various methods are practiced in treating these fissures of the hoof, such as holding them together by clamps, *i, e.*, copper plates attached by screw nails; binding by wire; nails driven across the fissure and clenched. But the most successful plan of treatment is to soften the foot by a poultice, then with a rasp and sharp drawing knife cut away the horn from the secreting surface as far up as the crack extends, and about half an inch on each side of it, and, afterwards, merely dressing it with tar ointment. The animal must be kept idle for three or four weeks, or till a new growth of solid horn has been produced an inch from the coronet:—when, if the hoof be supported by a strap, and the shoe applied so that there will be no pressure on the wall immediately under the crack, the animal may return to slow and moderate work. Complete recovery seldom takes place, as adhesions are apt to form between the horny and sensitive laminæ which destroy the beautiful elastic attachment of the foot, and render it liable to a recurrence of the separation of the fibres.

The growth of horn will be expedited by blistering the coronet above the crack.

THRUSH.—The frog is the triangular pad of soft tough horn lodged between the heels of the foot, adding materially to its springy elasticity. The term *Thrush* is applied to a diseased condition of the sensitive frog from which the horn is secreted. It arises from a variety of causes, chief of which are maceration of the foot; in the hind feet, from standing on manure and urine, in the fore feet, from the too free use of cow dung as a stopping for the feet. It is common in colts running in a soft straw-yard, and is often attributed to the want of pressure on the frog by the use of calkins on the shoes. Doubtless, too, it is frequently the result of some peculiar habit of body; a *materies morbi* in the system making an eruption here, and is often associated with grease and swollen legs.

SYMPTOMS.—It is characterized by a fetid discharge from the cleft of the frog, which is very persistent in its odour; the horn becomes detatched, its secretion interrupted, deep fissures form in the frog, which becomes small and incapable of performing its functions; lameness follows, more or less severe according to the extent and the nature of the roads on which the horse travels; if rough, uneven, and covered by loose stones, he becomes dead lame, if the road is soft and smooth he may simply be slightly tender.

Thrush is usually easily dried up by cutting away all loose horn from the frog, scraping and exposing the secreting surface, and applying calomel freely to the denuded surface, keeping the feet dry. One or two dressings will usually suffice to heal it up. The foot should afterwards be dressed with tar, and a leather sole may be necessary as a protection for a few weeks, till the horn grows sufficiently to cover the diseased frog. When it is constitutional, purgatives with cleanliness and proper attention of the feet are required to prevent it.

Canker is a diseased condition of the sensitive frog, usually described as similar to Thrush, but of a more aggravated character; not confined to the frog, but extending to the sole, and often overrunning the whole ground surface of the foot. It is also said to "resemble much the grease of the leg both in its nature and in the class of animals it attacks, and very frequently both conditions are co-existent". Our experience of this disease leads us to differ from these opinions, and to look upon Canker as a specific disease, depending on a peculiar cachexia or condition of the constitution, and, if not actually a cancer, it is closely allied to it in many clinical features.

(1) From personal experience I can say that, in England, the richer and more luxuriant the wheat-crop, the greater the ravages of the rust. In 1850, 51, 52, on the best farmed lands in the Eastern part of England, the ravages of these hateful parasites were most destructive. I myself in 1852, sold 40 acres of wheat, standing, which were valued to the buyer at 52 bushels an acre, the yield of which when threshed, a fortnight or at most three weeks afterwards turned out to be only 22 bushels an acre. A R J. F.

It occurs most commonly in the heavier breeds of horses; may appear without any distinguishable cause; and may affect only one foot or all four. At other times it occurs from the degeneration, if we may use the term, of thrush into canker; also, in animals predisposed to it, it may follow wounds of the sole, bars, or frog.

SYMPTOMS.—It is attended by the same offensive odour as thrush, the tissues affected are overgrown with a shreddy, spongy fungus-growth—which, mushroom-like, grows and spreads rapidly, underrunning and detaching the sole. Of course, pain, lameness, loss of condition, and inability for work, are necessary consequences of this condition.

The treatment consists in removing the shoe; freely cutting away all loose horn; paring down the fungoid growths as closely as possible; and dusting calomel freely over the surface, applying dry tow which should be bound on with a leather sandal. Pure Carbolic acid, Chromic acid, Sulphuric acid, Nitric acid, and tar; Sulphate of copper and tar—are all useful in these cases, and may be used at the discretion of the practitioner. In no case is regular dressing and constant watchfulness more required than in the treatment of canker.

Even under the best treatment it will often prove incurable.

Occasional purgatives and diuretics, with soft feed, are necessary—Keeping the feet dry and giving regular exercise on dry ground, are essential parts of the treatment.—*Liquor arsenicalis* is recommended as a so called alterative: it is sometimes useful—Youatt recommends, that for humane reasons, the prolonged suffering of these cases should be prevented by the division of the nerves leading to the foot. The practical utility of such an operation in these cases we very much doubt.

AGRICULTURE.

Paris, November 5.

Among the most prominent events to record, is the Phylloxera Congress at Bordeaux. It did not lead to the revelation of anything new, so much so as to the official ratification of certain remedies. The origin of the disease was left in abeyance: the habits of the insect were relegated to the entomologists, and the latter declared, that were the winter egg of the insect discovered and extirpated, the enemy would be conquered. Three remedies or preventives were discussed in committee, and by the most competent authorities. Take the plan of autumnal irrigations known as the Faucon process, so named after that distinguished proprietor of Graveson near Marseilles. After the vintage, he floods his vines for two months, and in spring, doses the land with farmyard manure liberally. He thus saved his vines, while neighbors who declined to follow his example, were ruined. In the Medoc districts, this process is at present general. It implies however, the command of a supply of water, either natural or artificial; hence, why the government is doing all in its power extend canals and arterial drains, &c. Insecticides, or chemical preparations follow next in order: they are limited to two: Sulpho carbonate, and sulphuret of carbon. Both have drawbacks, and have not given uniform results. The first is very expensive to prepare, and in addition, necessitates a large supply of water to be distributed in the state of solution. Its use is hence limited to vines either very prolific, or possessing qualities of known reputation; in any case, of a nature calculated to pay the great outlay. The second, sulphuret of carbon, is cheap, but it requires much caution in being applied, or the remedy may be worse than the disease; its effects vary with the depth and porosity of the soil, to permit of the diffusion of the salt: the temperature also influences the action: excessive cold or excessive moisture can do more harm than good, if these follow the use of the sulphuret. As France is estimated to have lost five milliards by the invasion of the phylloxera, and the ravages still continue, besides preventing the march of the enemy, it is a necessity to replant where the devastation has been effected. Here there is really less room for dispute; the grafting of French vines on American stocks is the sole plan known. The roots of the American vines flourish side by side where French vines perish: ten years successful grafting confirms the remedy. The Riparia is the variety of American vines which is in general favor. In Portugal, sulphuret of carbon and irrigation are the measures adopted; in Switzerland and Italy, extirpating the sick vines finds most advocates. In Sicily, the peasants rose against the decree for eradicating infected vines, and the inspector, fortunately, escaped from being blown up, with his house, by dynamite.

At the present moment when the relations between landlord and tenant are the order of the day, the practice of the *métayage* system, which is making such rapid strides in France merits to be discussed. In the fewest words, and freed from complications sometimes introduced, *métayage* farming means, the landlord supplying the capital in live and dead stock, the *métayeur* and his family, the labor, and the two contracting parties, divide the produce. In the most successful working of this plan, no money transactions take place, save what goes to the state to pay taxes. Many farmers who cannot pay a fixed rent, adopt *métayage*, and prosper: many laborers find in the system the road to comfort and independence. There is nothing new in the plan; Pliny the younger adopted it on his estates and with success, when his tenants were five years in arrears of rent, and became reckless. As a general remark, landed proprietors in the east of France cultivate their own estates; in the north and north-west, there are tenants, in the centre and south, the metayage exists.

The plan not only ameliorates the tenant, but the soil, and secures a dividend certain for the owner. One half of the population of France lives by agriculture, and one-third of both sexes, by the actual tillage of the soil: one-fourth of the cultivated land is worked on the *metayage* principle, and every department of the country has farms so managed. In many cases the partners, for the contract is practically that, divide 7½ to 20 per cent net profits in a good year: the mean is 4½, and proprietors are always content, if they only realise 3½ on their capital, including that locked up in buildings, machinery, and improvements. The *métayeur* and his family are well fed, they have a like stake with the proprietor in the results, and at the end of a year, a laborer who would have remained a laborer still, has in addition to comfort, a cash dividend of 2,000 frs. The principal item of expense in farm management is wages; under the *métayage* plan, where the whole family labors, it becomes a minimum. It is evident therefore, that the more farm wages rise, the more the *métayage* solution imposes itself as a necessity.

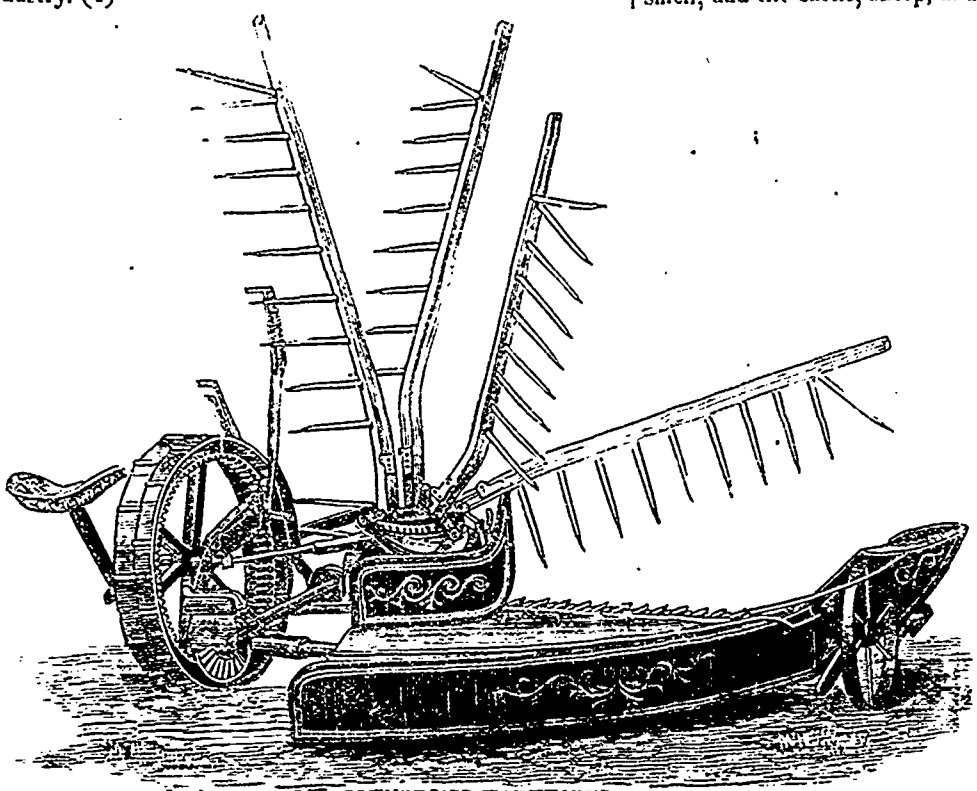
Salicylic acid, as a disinfectant and a preservative, still excites attention. No hygienic reasons exist, according to Pasteur, why in certain quantities, the acid ought not to be tolerated in food and drink: the French government has prohibited its use in beer and wine, as that use was abused. In the case of cattle disease, foot-and-mouth, lung, and *charbon*, salicylic acid is employed by veterinarians with great advantage: if it does not prevent the virus producing in the organism of the animal, it undoubtedly stops its march: one-tenth of an ounce dissolved in a quart of warm water, and sprinkled over the litter, will immediately sweeten a stable; half a quart of the solution mixed with the ordinary drink suffices for an animal diseased: the acid too can be dusted over the sore feet, or the mouth and nostrils washed with a solution. If

poultry be attacked with cholera, add a little in their drinking vessels, and mix some up in bread pills and honey.

A gentlemen, alluding to the prevalence of typhoid fever in horses, says his have completely escaped, and this exemption he attributes to adding a little salt and chopped garlic—the latter in small quantities at first—to their oats: further, above their racks he places movable boards, which receive a fresh coat of tar weekly. In the case of severe bronchitis, French doctors prescribe the spreading of Norwegian tar on a plate in the sick chamber; the balsamic odor effecting good.

Some prizes were awarded to agricultural industries at the Electricity Exhibition, the subject however is not yet ripe for practical consideration. The problem to solve is, not the application of electricity as a motive power, but of the cheap production of electricity as that power.

Owing to the destruction of the vines, and the great damage done to orchards by the severe frost of 1879-80, the production of alcohol has diminished: to remedy this state of things, farmers are being actively urged to embark in the distillation of beet—why not potatoes, as in Germany, by the ordinary alembic; prizes are offered to encourage the new industry. (1)



JOHNSTON'S HARVESTER.

There was a milk or dairy show held at Ghent last July, when the milk of cows of the Durham, Dutch, and Flemish breeds, were exhaustively examined as to density and quality. it has been demonstrated, that the difference in richness can vary, as 1 to 3, that is, from 4½ to 15 per cent; the yield of milk per day, can vary as 1 to 5. in great majority of cases, the first milkings are superior in density to the others in a day, and that density oscillates between 1026 and 1038. Upon 168 samples of milk, 29 were inferior in density to 1029; hence, according to the experts, they ought to be suspected of being dosed with water. In addition to density, as a test for the purity of milk, must be included the percentage of cream: now at Ghent, milk unquestionably pure yielded only 5 per cent of cream. Practical conclusion—difficult to decide when milk is pure.

(1) *Alembic*, old English—modern, *still*.

Johnston's Harvester.

The engraving, on this page, is a rear view of a new controllable self-raker. It is the latest improvement. Its success is due to simplicity, lightness, an easy draught, and the great control which the driver has over his machine in light, as well as in heavy, crops.

At the Derby sheaf-binding trials of the English R. A. S., a machine of this sort, which finished the cutting after the trials were over, made cleaner work than any of the other harvesters on trial, and a strong opinion was expressed by many practical farmers that this machine, with "a gleaner and binder" to follow, was to be the practice of the future. Ag. Gazette, Eng.

A Successful Silo.

Mr Mark Dawes, of St. Anne's, showed me to day, January 15 th., part of the contents of his just-opened Silo. The corn is perfectly sound, fresh, and sweet, with a slightly vinous smell, and the cattle, sheep, and horses, eat it greedily. The corn was about 9 feet high, and was not cut up, but well tramped down by horses. A. R. J. F.

DAIRYING.

The first Monthly Meeting of this Club, after the recess, took place on Monday afternoon, November 7th, at the Inns of Court Hotel; the Chairman for the year, Mr. T. Duckham, M. P., presiding. The subject for discussion was "Dairying," the introducer being Mr. G. M. Allender, who read the following paper:—

In the study of any subject, no matter what that subject may be, the conclusion always arrived at, is that the more we learn, the more ready we are to acknowledge how very little we actually know.

Four years ago I stated, "Dairy Farming in England has undoubtedly been neglected." I think we shall be more ready to admit this *now* than we were *then*, because, more attention having been given to the subject, we the more clearly recognize our shortcomings. Still, we may look back with much satisfaction, for much has been accomplished since I read my former paper on the same subject that we have met to consider to-day. I was then obliged to state that this branch of Agriculture had been totally neglected by our national societies, and that the importance of the "products of the dairy were unrecognized."

This cannot be said now, for not only has the Royal Agricultural Society of England made dairy work a special feature at the four last meetings of the Society, but nearly all the other important associations have "gone in for dairying;" and even Lincolnshire has deigned to acknowledge that there is

such a branch of agriculture as dairy farming—an admission that would have greatly astonished the late Wm. Torr.

Dairy appliances and machinery of which we had no idea four years ago, are now in common use. At that time I possessed the *only* "butter worker" in the country; now there are many hundreds in daily work.

At Bristol, in 1878, we first heard that efforts were being made in Germany to devise a machine by the aid of which the cream should be rapidly removed from milk by centrifugal force. *Now* we have mechanical separators of at least five different forms; and so with other contrivances.

In Cream separators, certainly the most ingenious of all dairy machines, we have already reached the second generation. The original Lefeldts, Lavals, or Neilson-Petersens (none of them more than five years old) have been immensely improved, and several additional patents taken out. We have also the "Petersen-Moltrecht" and the "Fesca" machines; and others are coming into use in the United States.

To such perfection have these machines now been brought, that the separated milk frequently contains as little as .15 per cent. of fat, and the cream can be so perfectly freed from milk, that it will make as much as 18 oz. of butter to the quart of cream, whereas cream obtained by other methods seldom yields more than 16 oz. (1 lb.), and very frequently much less. Now that we understand how essential it is to obtain our butter perfectly free from casein, and indeed from milk, the advantage of this highly concentrated cream is obvious. I have had samples from the separator which have contained 38 per cent. of pure butter fat, and which have yielded 44 per cent. of butter.

To talk, however, of the appliances by the aid of which we can convert the raw material—milk—into its various products, is beginning in the middle of our story. We must remember the saying of the worthy Mrs. Glass with regard to her hare—"first catch it;" and so it is in dairying. Before considering what we shall do with the milk, let us inquire whether we produce the raw material either in proper quantity, or of proper quality.

I do not think we do either the one or the other. I believe that the milk yielded by the number of cows now kept might be increased by at least one-third if more attention were paid to *selection*. I am not aware whether the late Mr. Carrington left any record of the milk yield of his cows; I find, however, that I mentioned in my former paper that Mr. Carrington agreed with the late Mr. Harrison, of Gloucester, that 550 gallons might be taken as the average yield of a good ordinary cow between calving and calving; and that Mr. Jenkins quoted a yield of 700 gallons per cow, proved by carefully kept records at a farm in Denmark; and I further expressed my own belief that a well-selected herd of cows, dairy shorthorns, well housed and well fed, would average 900 gallons per cow in the milking year (say, forty to forty-five weeks). That the latter figure is *within* the mark is now proved by the very valuable record kept by Mr. Tisdall. I believe the returns which Mr. Tisdall has been able to furnish are the most complete hitherto kept in this country, and very many thanks are due to him for this most valuable information. I find that twenty-five cows, in milk ten to eleven months—say, therefore, about forty-three weeks—gave an average of 885 gallons each, and that in several cases the actual yield of milk from individual cows reached 1,000 and 1,100 gallons in the ten months, many of them continuing to yield milk in good quantities for a further period of two months. Mr. Tisdall mentions that ten animals gave an average of 12·88 quarts per cow per diem, for 12.3 months, or over 1,200 gallons each. Now our justly celebrated families of Shorthorns, the Booths and Bates; our great flocks, the Leicesters, the Lincolns, the Oxfordshires, and the Hampshires; our pigs, the Berkshires and the Yorkshires,—how have these renowned breeds been brought to their present state of perfection? Simply by the care and attention bestowed by intelligent, observant men to the selection of "*the fittest.*" If these be admitted facts, why should not similar means be applied to improve the milk-producing power of our cows? I see no reason why the same law should not apply; and if this be so, imagine the herd that might be looked for in three or four generations, carefully bred from such dams as these ten cows of Mr. Tisdall's! To quote from a recent article in the *Live Stock Journal*: "The main lesson to be derived from the inquiry is, that there certainly exists in the varied combinations of old famous herd elements a *mine* of wealth for the skilled and patient explorer who will devote due study to the subject."

Now, gentlemen, however you may feel inclined to cavil at, or criticise anything I may say to-day, no one will, I think, dispute the fact that just now the very bare possibility of the existence of a mine of wealth anywhere, or connected in any way, with farming, is a thing not to be despised, no matter if the mine be "only a little one."

Before quitting the subject of these valuable animals of Mr. Tisdall's, we may learn another lesson, and that is, how much more profitable, both to the farmer and to the nation, is a good cow than a fatting beast. Take one of these cows, producing in one year 1,200 gallons of milk. The milk in its natural state would weigh 12,000 lbs.—5 tons 7 cwt; as such milk would contain at least 12½ per cent. of total *dry* solids, this would give 1,500 lbs. Take the dead weight of such cow at 1,000 lbs., in the natural state of the carcase, the actual weight of dry solids would not exceed 500 lbs.; so that each of these animals would in the course of the year produce three times her own weight of dry solid matter, and during her life more than twelve times, besides, the value of her own carcase at last; or, supposing her 1,200 gallons of milk had been made into cheese, we should have looked for about 1,200 lbs. or 20 per cent. more than her own dead weight.

Reference to the wonderful milk yield of these cows leads one into a few more calculations. I am a great believer in figures, whether in the form of statistics or of accounts. I have had it said to me by farmers to whom I have suggested the keeping of careful and efficient records of various results, that such work would necessitate the service of a clerk. Certainly, if a farmer be too indolent or not sufficiently intelligent to undertake such a comparatively easy task, or if his farm and herd be of sufficient size to warrant the necessary outlay. How was Mr. Tisdall in a position to supply these valuable statistics? Because for years it had been his practice to carefully note the yield of each cow at each milking.

I say, a farmer who keeps cows, whether it be two or two hundred, and who does not ascertain, and carefully note, the quantity of milk each of his cows gives every time she is milked, makes a great mistake. What would be said, let me ask, of a manufacturer who did not keep a record of the produce of his works? I look upon this as the pivot upon which turns success or failure. That which is worth doing at all is worth doing well. Any one who has once experienced the immense advantage that statistics and carefully kept records are in business, will never be without them, as he will well know their value, and the power the information so obtained bestows upon the possessor. Once put in practice, the habit is one that grows rapidly. What can be more easy than to note the quantity of milk given by each cow, morning and night? A board, painted black, hung up in the cowhouse, or a piece of slate fastened to the wall, and a bit of chalk. Upon such board or slate the quantity to be marked as each cow is milked, and the whole copied at leisure on to a properly ruled sheet. Any one who will take the trouble to do this for the

whole of 1882 will, I will guarantee, never give it up again Every one will find he has a cow that, compared with the others, is a beginning towards that little mine of wealth. I want you to permit me to read an extract from an American paper, the *New York Tribune*, in which the value of good milkers is well pointed out:—

"TWO COWS IN ONE SKIN.

"There is now manifested over the whole country a very lively interest in the improvement of the milking capacity of dairy stock. There is a rage for importing the very best milking animals of Europe, with rapidly-increasing efforts to multiply and cultivate their superior qualities. These efforts are encouraging, and augur good results to our dairy interest in the near future. They foretell an enlargement of that interest, with more certainty in its operations, and greater profits by way of cheapening the cost of producing milk. Larger yields per animal mean less cost in making them. If we can get 500 lbs. of butter from one cow in a year, it will certainly cost less than it would to get that amount from two cows in the same time.

"The food from which the butter is directly derived may be the same in both cases, but while that food is being converted into butter, we have, in one instance, to support the body of only *one* cow, and in the other the bodies of *two* cows. Then there is the extra investment and the extra labour of milking and caring for two instead of one, all of which makes quite a difference in the cost of producing milk. There will be, according to the economy used in producing and using food, a difference of 20 dols. to 40 dols. [£4 to £8] in the cost of the 500 lbs. of butter, whether derived from one cow or two, in a year—equal to 4 to 8 cents [2d. to 4d.] on each pound of butter, enough to make all the difference between profit and loss, or profit and no profit. If one man can live by getting 250 lbs. of butter per cow in a year, another can grow rich by getting 500 lbs. But when we come to divide again and get but 125 lbs. a-year per cow, which is about the common average, the difference in cost will be three times as great—at the above rate, 60 dols. to 120 dols. [£12 to £24] on 500 lbs., or 12 to 14 cents [6d. to 7d.] on each pound. This makes dairying an up-hill business. It is the dairymen who keep these 125-lb. cows, who sell the calves of their best cows to the butcher, and raise what they cannot sell; who complain of hard times, and that dairying does not pay; and who get frightened at the introduction of oleo-margarine [you see, the Yankees have their bugbears as we have here], and, forgetful of the rights of consumers, petition the Legislature to pass laws for keeping the price of butter up, so that they can live by dairying with such apologies for cows. But, thanks to the enterprise of the times, their number is growing less."

Now 500 lbs. of butter is what our American cousins would call a "*large order;*" but I should say that if the milk from Mr. Tisdall's ten cows had been made into butter, they would have shown a yield of 450 lbs. per cow.

This extract from the *New York Tribune* leads me to another point in my experience with our farmers.

A farmer who keeps a lot of cows that only give him 400 to 450 gallons per cow, stands to lose money, as a matter of course. He tells me he "cannot grow the milk at that price," and I acknowledge that he is correct in his statement; but it is not my fault that he keeps a lot of cows which are not only bad milkers, but which he feeds in an injudicious manner. On the other hand, a farmer who has a lot of 700 or 750 gallon cows gets along well; and if with more care as to selection and feeding, the yield could be got up to 900 or 1,000 gallons, a very handsome profit would be the result.

I have taken out a few figures that will show this in a most striking manner. In order to facilitate the explanation of these, I have fixed upon a few standard or base points. For instance, I put the price of milk, *at the farm*, at 8d. per imperial gallon, all the year round; this is near enough for all practical purposes. If a farmer cannot make that, either he is a bad manager, or he is working under exceptional circumstances. He ought to make more.

Then I take fifty cows as an ideal herd.

Cost of feeding and milking I put at from 6/ to 9/ per week, according to the views of the farmer as to whether it pays him to be liberal or otherwise. These points understood, let us look at the figures:—

FIFTY COWS IN MILK, SAY FOR FORTY-FOUR WEEKS.

Gallons per Cow.....	450	550	650	750	850	900	950	1000
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Gross Return, at 8d.....	750 0 0	916 13 4	1083 6 8	1250 0 0	1416 13 4	1500 0 0	1583 6 8	1666 13 4
Cost of Food and Attendance.....	780 0 0	845 0 0	910 0 0	975 0 0	1040 0 0	1105 0 0	1170 0 0	1245 0 0
At per Week.....	0 6 0	0 6 6	0 7 0	0 7 6	0 8 0	0 8 6	0 9 0	0 9 6
Profit.....		71 13 4	173 6 8	275 0 0	376 13 4	395 0 0	413 6 8	421 13 4
Loss.....	30 0 0							

It must be clearly understood that I do not give these figures as hard and fast under all circumstances, but only to show that the return on good cows compared with bad ones is in enormously greater proportion than the increase of cost; or, as will be seen, one man may be making a good profit where another makes a loss.

These figures do not, however, nearly represent the difference

in the value of the produce of these various herds of fifty cows each. As a matter of fact, the milk from the fifty cows giving, say, 900 gals., and being fed at a cost of £1,105 per annum, may be expected to be of better quality than the milk obtained from the fifty cows giving 450 gallons each, and being fed at the cost of £780. This would tell, especially if the milk were made into cheese or butter. Roughly speaking, the milk from the one lot of cows would not contain more than 12 per cent. of solids, if so much, whereas the other would probably show 13 5. Now the difference between 12 per cent. and 13·5 is one-eighth, or 12½ per cent.—an additional profit to the credit of 900 gallon cows of just upon £75. As I have previously said, I do not for one moment intend these figures to be taken literally, but they will, I hope, convey what I wish to be understood, and point the moral of what I wish to impress—namely, if you keep cows, *keep the best you can, and feed them well.* In noting the yield of cows, I recommend weighing the milk, as being more correct and more quickly done than measuring it.

Now we come to the question of food.

I do not mean to say that a cow is like a steam boiler—viz, that the more coals (food) you throw into the furnace (within limits), the better results you obtain; but I *do* maintain that the food, both in kind and liberal quantity, has much to do with the important items of profit and loss.

The cow should be, to all intents, from the dairy farmer's point of view, *a machine*; and a very sensitive and wonderful machine she is, and perfectly constructed for the work she has to perform—viz., the conversion of food into milk—the raw material from which butter and cheese are manufactured. To work this beautiful machine to its best advantage, is a question of the most vital interest to the owner. What would be said of a man who, requiring a steam-engine, would go out and buy the first he saw, and so long as there was a boiler, furnace, cylinder, piston, cranks, wheels, valves, and certain other appliances and fittings, take not the slightest care to ascertain by whom the machine was made—in fact, how it was bred—and having bought his engine, forthwith proceeds to put it to work, regardless of the description of coal, the sort of oil, or the quality of the water with which he supplied it, or whether it was left out in the fields, exposed to the weather, or housed under some tumble-down old shed, where all its most delicate parts and fittings became clogged with dust and dirt? Well, I expect that man's neighbours would think "it would not last long." This, however, is just what a lot of farmers do with their cows; they heed about as little how they are bred as how they are fed.

Let us begin with water. I do not think that half the attention is paid to the watering of cows that there should be, either as to the regularity of the supply, or the quality. Cows will rather drink foul water that is near them than go to a distance; when tied up they are, of course, totally dependent upon those in whose care they are. Depend upon it that the supply of clean, wholesome water, and in good quality, is of the greatest importance.

Salt, again, is a positive necessity to a cow. If salt be withheld, the quantity of milk will be lessened; and it is a question whether a good supply of salt does not greatly increase the keeping quality of milk. Every animal ought to have access to a large piece of rock-salt. While we are on the subject of water, let me impress upon all dairy farmers the importance of washing and bathing the cows' udders and teats; this ought to be done at least twice a day, before each milking. Attention to this has much to do with the flavour and keeping qualities of milk, butter, and cheese.

Last winter I put together some notes as to the yield of milk on twenty-three farms. The farmers filled up a form on the first of each month, giving the number of cows in milk, the number calved since the previous return, also the food used, description, and quantity. The quantity of milk was, of course, shown by our books, as each farmer sent all produced, except the requirements for his house. Almost daily analyses of the milk were made—at all events, at least twenty per month—ascertaining the total solids and the "fat." In order to be able to make a fair comparison, we worked out the quantity of milk each farmer would have sent, based upon what he actually did send per cow, if each had had fifty cows in milk. The results are instructive, and fully bear out the previous figures that I have given you.

The money value of the milk of fifty cows (at 8d. at the farm) ranged from £1 10 11 per day to £5; the total solids, from 11·53 to 13 98. I believe the milk shewing only 11.53 per cent. of total solids had been slightly watered; at all events, we talked very seriously to the sender, and the quality improved. The "fat" ranged from 2·52 to 3 66. These figures refer to milk received in the depth of winter. Last month, October, the total solids ranged from 14·85 to 12·68—mean 13·18; but some of this was from Jersey cows. Average of fat, 3·31, ranging from 4·19 to 2·99. It is most difficult, however, to arrive at reliable conclusions when you are dealing with milk from so many herds, as the proportion of recently calved cows, or of heifers in the herd, or other circumstances, have to be taken into consideration. I therefore selected six farmers who had over 20 per cent. of newly calved cows per month; and for our present purpose it will suffice to take the lowest and the highest of these six. We will call them 16 and 18, as those numbers represent their position among the twenty-three, as fixed by the quality of the milk—No. 16 having 12·42 total solids, and No. 18 12·40; so that virtually the milk was identical in quality. No. 16 had the advantage in "fat"—2·88 against 2·71.

The difference, however, to the pockets of these two farmr must have been very considerable; as, supposing each had had the same number of cows (fifty), and the average yield per cow had been at the same rate as that of the cows actually kept, the one farmer would have received £1 17 6 per diem, the other £5, or £562 10 for the year, against £1,500. The former was then using 1 peck of wheat and bean meal, mixed, about 1 lb of linseed cake, half a bushel of roots, and about one truss of hay to two cows; the other was using 5½ lbs of decorticated cotton cake per cow, and two trusses of hay to three cows. Now the food bill in the case of the former would be heavier than with the latter.

I believe decorticated cotton cake in conjunction with maize meal—in equal proportions—is, without exception, *the food* for milking cows; browers' grains (ale), if obtainable, say half a bushel a day, roots in season, and good chaff, with a sprinkling of some meal, bean, pea, oat, wheat or barley, and bran, in change, being given, with the cotton cake and maize. The latter together, in equal proportions, form, chemically, a perfect food, as the one is strong in the component parts in which the other is wanting.

Advocating, as I have done for years, dairy farming on *arable* land, I am sure that not anything like the attention is given to the growth of forage plants that the subject deserves. In my former paper I referred to Prickly Comfrey, then just introduced by Mr. Christy. This is a most valuable plant. Then again, on warm suitable soils, I am sure some of the varieties of maize would yield a great bulk of admirable food for soiling. Major Dashwood told me, the other day, that a small patch grown by him had equalled, I think he said, thirty-two tons per acre. I do hope some one will give ensilage a trial. I hear wonderful accounts of it from the United States; and I recently read in an American paper that "if the experiments are successful, and 'silos,' as the storage pits are called, come into common use, the capacity of the farms will be nearly

doubled." The drier climate of the States, of course, favours the adoption of this system, but the difference between our climate and theirs cannot render it impossible, especially if straw chaff were mixed with the green crop. This last summer has been *too* dry in America.

(*To be continued.*)

The Montreal Horticultural Society being desirous of introducing some good Seedling Apples that are late keepers, offer a First, Second and Third Prize, of $4 00, $3.00 and $2.00 respectively, for the Best Peck of Seedling Apples grown in the Province, and sent to the Secretary's Office, corner McGill and Foundling Streets, Montreal, on the 1st of May, 1882. The place of growth to be stated, also the probable age of tree, and whether the variety has been propagated or not.