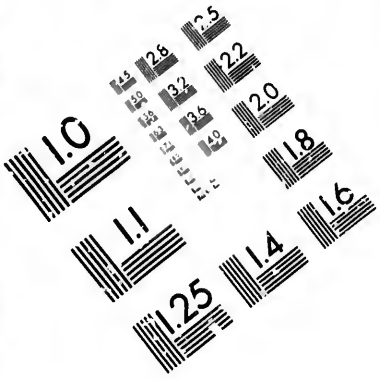

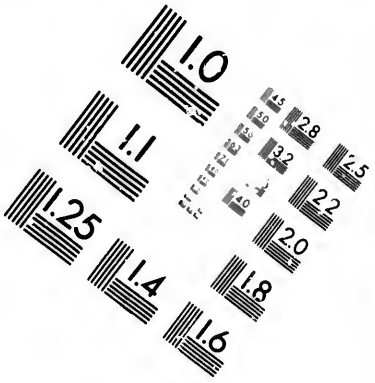

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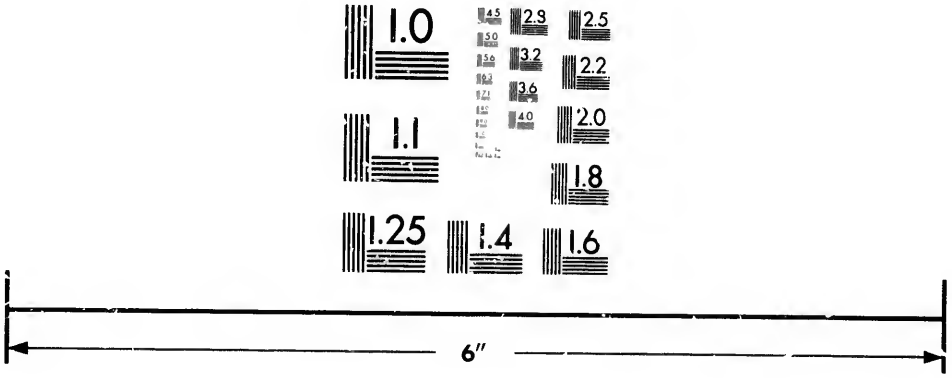

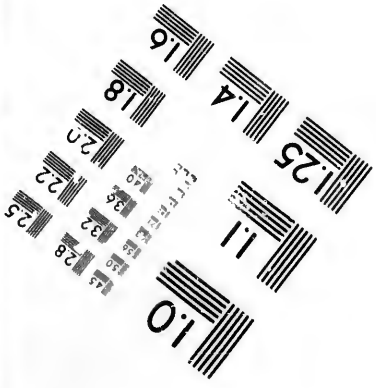

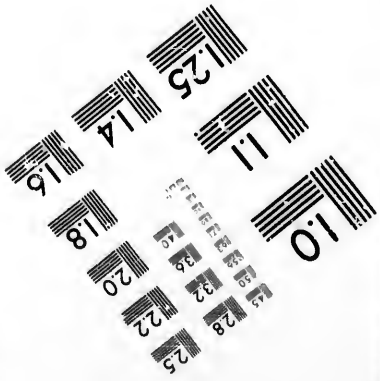

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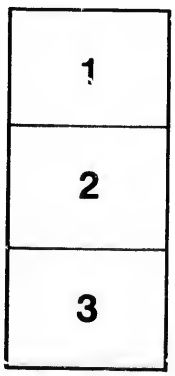

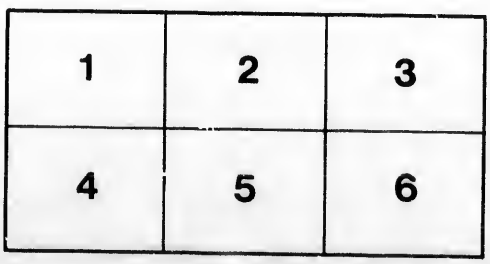

Can Pam Kirkwood, Alexander

A SHORT TREATISE

ON THE

MILK-WEED, OR SILK-WEED,

AND

THE CANADIAN NETTLE,

VIEWED AS INDUSTRIAL RESOURCES.

BY

ALEXANDER KIRKWOOD.

READ BEFORE THE OTTAWA NATURAL HISTORY SOCIETY, 15th FEBRUARY, 1867.

"To base conclusions only on that which is capable of examination and proof, is the path of true philosophical inquiry."—LIEBIG.

Ottawa:
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TO THE

Rev. William Hincks, F.L.S.,

PROFESSOR OF NATURAL HISTORY,

UNIVERSITY COLLEGE, TORONTO,

This Essay

IS DEDICATED

AS A TESTIMONY OF RESPECT,

BY

HIS VERY HUMBLE SERVANT,

The Author.

PREFACE.

Providence has assigned to man the glorious function of improving the productions of nature by judicious culture, and of working them up into objects of comfort and elegance with the least possible expenditure of human labor.

The object of manufactures is to modify these productions into articles of necessity, convenience, or luxury, by the most economical and unerring means.

A textile fabric, or article of clothing, it has been somewhat shrewdly remarked, is composed of a something of which man has previously denuded something else.

The object of the present treatise is to offer to the agriculturist, and through him to the manufacturer, some new materials for clothing; and to trace their natural history, production, and preparation, namely:—Asclepias cornuti, *milk-weed*, or *silk-weed*, Asclepias incarnata, *swamp silk-weed*, and Urtica canadensis, or *Canadian nettle;* textile plants indigenous to Canada, but hitherto neglected, and almost unknown; and to view them as new industrial resources. The raw materials are presented to us in abundance, but we must bestow labor upon them before they are fit for our use.

If we have not the spindles and the looms to manufacture them into textile fabrics, we can export them to the mother countries, where good elastic fibres are always in demand; and where we may see to what extent capital, industry, and science, may augment the resources of a State, while they meliorate the condition of its citizens.

Of the five leading staples of hemp, flax, wool, silk, and cotton, the total yearly consumption of raw material in Great Britain and Ireland alone may be valued at nearly £60,000,000 sterling, and yet their consumption has already far outstripped the supply. If we, therefore, by any practical attention given to these new fibres, can increase the supply of spinning material, our labor will be remunerated, the income of the land-owner enhanced, and these products of the soil rendered of some importance to the civilized world.

A SHORT TREATISE

ON THE

MILK-WEED, OR SILK-WEED,

AND

THE CANADIAN NETTLE.

NATURAL HISTORY.

Asclepias is the Greek name of the Æsculapius of the Latins. The Asclepiadæ, the descendants of Asclepias, or Æsculapius, may be regarded as the founders of scientific medicine.

The mode of fecundation in the Natural Order of Asclepiadaceæ has been the subject of much research by botanists. A complete history of the various statements and conjectures on the structure and functions of the sexual organs was published in 1811 by Baron Jacquin, in a volume entitled "Genitalia Asclepiadearum Controversa." Several essays have since appeared on the same subject, and the history of these various investigations may be found in the admirable paper of Brown in the 16th Volume of the Transactions of the Linnæan Society.*

The American genus Asclepias gives its name to a natural family of considerable extent, chiefly prevailing within the tropics of the old world, the whole of which is characterised by the silky appendage to the seeds, and generally remarkable also for the tenacity and beauty of the inner bark fibre.

The juices of the plants of this order, although milky, like the cow-tree, are not a wholesome and delicious beverage; but on the contrary are acrid, caustic, or bitter. It is very singular that, in a tribe of plants so generally poisonous as these are, the young shoots of some species should be an article of food.

* See also this celebrated Botanist on the structure of the flower of Asclepias syriaca in the *Transactions of the Wernerian Society*.

Loudon says that "A. Syriaca (A. Cornuti) is very odoriferous, and in Canada, when in flower, charms the traveiler, especially when passing through woods in the evening. The French there eat the tender shoots in spring as we do asparagus. The natives make a sugar of the flowers, gathering them in the morning when they are covered with dew, and collect the cotton from the pods to fill their beds."

ASCLEPIAS CORNUTI—*Decaisne.*

Silk-weed, Milk-weed.

Follicles muricate with soft spines.

Stem mostly simple, thick, nearly smooth, leaves ovate elliptical, obtuse or with a short abrupt point, velvety pubescent underneath, the petioles short; umbels lateral and terminal, somewhat nodding, many-flowered; lobes of the crown ovate, the margin two-toothed at the base; horn as long as the lobe.—*Decaisne in* D C. *prodr.* 8. *p.* 564. A. Syriaca, *Linn, sp.* 1. *p.* 214; *Pursh, fl.* 1. *p.* 273; *Bigel, fl. Bost. p.* 101; *Beck, bot. p.* 235; *Darlingt. fl. cest. p.* 169, *Hook, fl. Bor.-Am.* 2. *p.* 52. A. Syriaca, B., *Michx. fl.* 1. *p.* 114. A. Syriaca, B. Illinoensis, *Pers. syn.* 1. *p.* 275.

Root long and fleshy, branching. Stem 3-4 feet high, erect. Leaves 4-8 inches long and 2-3 inches wide, nearly smooth above, whitish pubescent underneath, umbels 2-3, or sometimes rather numerous, each bearing from 50 to 100 flowers; the pedicels an inch or more in length, hairy. Flowers sweet-scented. Calyx about half as long as the corolla, hairy; the lobes lanceolate. Corolla dull greenish purple, sometimes pale; the segments oblong-lanceolate, at first spreading, but soon turned downward. Staminal crown erect-spreading; the lobes thick and fleshy, concave, the margin one-(or sometimes two-) toothed on each side; horn curved, broad at the base and sharp-pointed, resembling the claw of a cat, the point just reaching the margin of the stigma. Stamens closely surrounding the pistils: the filaments united into a tube; anthers united to the stigma at the upper part, two-celled, on the inside with a projecting wing-like cartilaginous margin or appendage, which is broader below; a longitudinal chink appearing between the margins of each contiguous pair of anthers. Pollen-masses yellowish and waxy, suspended by pairs in the cells of the anthers; each pair being lodged in the cells of two adjoining anthers, and connected with the arms or processes of the gland; terminal membrane of the anthers inflexed over the top of the stigma. Ovaries 2, tapering into short styles, which

are surmounted by a large five-angled stigma, to the angles of which are attached the glands with their processes. In the young flower-bud, the pollen-masses are quite unconnected with the stigma; but before the expansion of the flower, they become firmly united with the arms of the glands or corpuscles. Follicles 3-5 inches long and an inch or more in diameter, erect, woolly, of a papery texture, ventricose and acuminate, armed with flexible spines about one-fourth of an inch long. Seeds closely imbricated, flat, ovate, with a winged margin, crowned with a tuft of long white silky hairs.—*Torrey in Natural History of the State of New York.*

The milk-weed grows in old fields and along road-sides; is common, and flowers in June and July.

Torrey states that Dr. Knieskern informed him that the dried leaves are employed in preparing the indigo dye in woollen manufactories.

The name of this species was changed by Decaisne from Syriaca to Cornuti, it not being a native of Syria as was once supposed. It has, however, become naturalized in some parts of Europe.

The Syrian Dogbane (the true Asclepias Syriaca), though a native of the burning plains of Syria, grows as far north as Upper Silesia. It is, like A. Cornuti, easily propagated either by seed or by parting the roots. It thrives luxuriantly in any light soil, but will flourish on any poor land. The silk-like down which surmounts the seed of this plant, is not more than an inch or two in length; but it has, nevertheless, been usefully applied for articles of dress manufactured of it both in France and in Russia, and the fibres of the stem, prepared in the same manner as those of Flax and Hemp, furnish a very long fine thread of a glossy whiteness.

MEDICAL PROPERTIES, AND USES.

This plant (A. Cornuti) was discharged from the secondary catalogue of the U. S. Pharmacopœia, but it is thought on insufficient grounds, considering the extent to which it has been used by regular practitioners, to say nothing of its reputation with others.

It gives out a white juice when wounded, and has hence received the name of milk-weed. This juice has a faint smell, a sub-acrid taste, and an acid reaction. According to Shultz, 80 parts of it contain 69 of water, 3·5 of a wax-like fatty matter, 5 of caoutchouc, 0·5 of gum, 1 of sugar with salts of acetic acid, and one of other salts. (Pharm. Central Blatt, 1844, p. 302.) Dr. C. List has found the chief solid ingredient of the juice to be a peculiar crystalline substance of a resinous character, closely

allied to lactucone, and which he proposes to call *asclepione.* To obtain it, the juice is coagulated by heat, filtered so as to separate the liquid portion, and then digested with ether, which dissolves the asclepione, and yields it by evaporation. To purify it the residue must be treated repeatedly with anhydrous ether, which leaves another substance undissolved. It is white, crystalline, tasteless, inodorous, fusible, insoluble in water and alcohol, soluble in ether, oil of turpentine, and concentrated acetic acid. A strong hot solution of potassa does not affect it. Its constituents are carbon, hydrogen, and oxygen, and its formula C_{40} H_{34} O_6 (List, Liebig's Annalen, Jan., 1849.)

Dr. Richardson of Massachusetts found the root possessed of anodyne properties. He gave it with advantage to an asthmatic patient, and in a case of typhus fever attended with catarrh. In both instances it appeared to promote expectoration, and to relieve pain, cough, and dyspnœa. He gave a drachm of the powdered bark of the root, in divided doses, during the day, and employed it also in strong infusion. In a letter dated January 22nd, 1850, Dr. A. E. Thomas, of Rocky Spring, Mississippi, stated that he had employed the root in scrofula with great success, and in dyspepsia with advantage. He found it cathartic and alterative, but observed no anodyne property. He was induced to try it by having noticed that it was much used by the planters in scrofula and other diseases, and by the recommendation of Dr. McLean, of Kentucky, who had employed it in scrofula for twenty years.—*U. S. Dispensatory by Wood and Bache.*

CORNUTI FIBRE

as a Textile Material.

The original observer of nature confers as great benefits on society by his discoveries, as the inventive genius in art.

Mankind must have been far advanced in civilization and the observation of nature, before it discovered a material for clothing in the labors of the caterpillar, and perceived that the little yellow ball which adhered to the leaf of the mulberry tree could be unwound into slender filaments, and made to form the thin gauze, the thick velvet, and the stiff brocade.

It may at first sight seem singular to a casual observer, that a textile material possessing the properties which the fibre of A. Cornuti does, has not till the present day had them discerned and developed. But who is to say how many ages elapsed before the idea of utilizing the labors of the silk-worm occurred to any mind? Or what centuries passed away before the cotton fibre was made tributary to civilization? It is indeed a well attested fact that cotton manufacture was confined to India for many centuries,

even after a considerable intercourse with the East had been established by Europeans.

Cornuti fibre forms the bark tissue, as it is termed, of the bark of the plant, and is found in the inner bark, and amongst it are the vessels through which the sap descends, transformed by the action of the leaves into proper juice or latex, which in this plant is milky or sticky.

In the stem of the milk-weed, we find in the centre a circle of white cellular tissue, called pith, and round it a layer of wood-like matter, which in some plants, as flax, is called *boon* or *shove*. This is surrounded by layers of cellular tissue, which form a tubular sheath, inclosing the other parts, sometimes called *bast*, or *harl*, which sheath is covered externally by a delicate skin, or cuticle, and these are cemented together by gummy and azotized compounds.

The spinning filaments are separated from the stem, and from the milky juice, either by steeping the plants in water, or by rolling them in their green state. The former acts by exerting a slight degree of fermentation in the substance which attaches the fibres to the vegetable vessels and membranes.

Automatic mechanism is now so extensively employed in the arts of spinning and weaving, that any peculiarities which the fibre may possess can be met by peculiar machinery. It so far resembles other fibres of vegetable origin, as to require torsion and extension to convert the slender filaments into thread; and it possesses the three requisites of elasticity, softness, and tenacity, for the production of raiment for comfort and decoration.

Like flax, and hemp, and unlike cotton, wool, and silk, it consists of fibrils, bundled together in parallel directions, which are easily separable into more minute filaments.

Professor Hincks, in a letter to the author says, "I have submitted the prepared fibre which you sent me to a very careful microscopic examination, going up gradually to the highest power that I employ. The bark fibres are very long and fine, and separate very completely. Their appearance resembles flax, and they certainly equal, and I think exceed that substance in quality, as judged of by the eye. I measured the diameters of several fibres under a magnifying power of 450 diameters, and found it to be about $\frac{1}{3000}$ of an inch. It appeared to me that the substance of the fibre is strong, because the internal channel is very narrow, yet it evidently possesses the quality of flexibility in a very high degree. I should expect it to form a very valuable textile material, probably equal to the very best vegetable fibre hitherto used."

According to the researches of Bauer, and Ure, the diameter of the filaments of flax, viewed by daylight with a good microscope, varies from the two-thousandth to the twenty-five-hundredth

part of an inch. The thickness of a hair of the best Spanish and Saxon wool is about $\frac{1}{1500}$ of an inch. The filaments of cotton measure about the two-thousandth part of an inch in diameter, while those of silk vary from $\frac{1}{1800}$ to $\frac{1}{2500}$ of an inch.

There are few arts in which more sagacity has been displayed, or where the inventive powers of man have been called more into action, than in the preparation of the materials employed for clothing. The earliest dresses of mankind probably consisted of the skins of animals.* But for inner clothing these are liable to the objection of being impervious to the cutaneous exhalations. The materials which are the best non-conductors form the warmest clothing. Cornuti fibre may, from its fine texture and elasticity, be made into cloths of great warmth, yet very light, soft, and pliable. It may, like silk, be better calculated for outer than inner garments; and for purposes of elegance, than utility. As a warm covering, however, it will have some valuable qualities.

As the art of spinning has undergone a complete revolution by means of some of the most curious and complicated machinery ever devised by human ingenuity, there is no doubt but yarns of various degrees of fineness, adapted to different tissues, can be successfully spun from this vegetable silk. Its qualities are length of fibre, strength, softness, and flexibility. The more remarkable it is for these, the less waste it will suffer in spinning, and the higher the price it will fetch. Next in importance to its fineness is its softness, which consists in a peculiar feel approaching to that of silk or down. It is well known that Indian wool is far superior to the very best of the Merino fleeces, and yarn made from it fetches a much higher price, not on account of the superior fineness of the thread, but for the softness of the wool which is imparted to the cloths made from it. Cornuti fibre will be found to be well adapted for fabrics of mixed materials, such as poplin and bombasin, or may be worked up with silk into a peculiar style of goods, as is done with the extremely fine silky hair of the Angora goat, known as mohair.

OBSTACLES TO BE OVERCOME.

While the bounty of the Creator has furnished textile materials in inexhaustible abundance, His wisdom has given them in such forms, as to exercise the industry and ingenuity of man in applying them to useful purposes.

As every merchantable commodity must yield a profit to the manufacturer, to the wholesale dealer, and to the retailer, so should every farm crop yield a profit to the grower.

---

* Yates, *Textrinum Antiquorum.*

Considerable difficulties are encountered in bringing any new article into use, in sufficiently large quantities, to be an object of commerce. When a new product is sent into the market, purchasers hesitate to buy it before they know whether it is suitable for their machinery and manufactures. But when worked up and found useful, it gradually attracts notice, as its properties are determined, and its real value is ascertained. Until then, there will be the inconvenience to the merchant, or broker, of not having advances made upon what he may have shipped, as is done with the ordinary articles of commerce.

But the cultivation of this plant will greatly depend on the supply required by such manufacturers as may be first induced to employ it, as well as on the sustained demand for it as an article of trade. We must inform the European spinner of the quantities we are capable of supplying, and send it to market in such a state as to attract his attention. Specimens should also be sent to the Trade Museums at home, which have been formed for the diffusion of information respecting the raw products of all parts of the world.

SOIL AND METHODS OF CULTIVATION.

The milk-weed is well known to almost every farmer, and, next to the Canada thistle, is viewed by him as his greatest pest. It is an herbaceous perennial, a vigorous, robust grower, and fears no frost. Although the spontaneous production of the North American Temperate Zone, the quality of its fibre will, no doubt, vary in some degree according to the soil on which it is grown, and the method of cultivation pursued.

As stated by Dr. Royle,* the fibrous product of plants is only the woody fibre in a younger state, and may be considered as wood in a separate form, while wood may be described as consisting chiefly of amalgamated fibres. Exposure to light and air favors the proper secretions of the tree, and the thickening of the woody fibres but necessarily diminishes their flexibility, and, therefore, is not suited to plants which are grown on account of these fibres. Hence, to favor their shooting upwards, and to prevent the formation of lateral branches, their seeds are sown thick, and the plants grown closer, as the fibre is required to be finer.

The first duty of the farmer will be to direct his attention to the description of soil requisite for its growth, then to prepare the land so that he may produce a fibre of a fine and valuable quality. Much, therefore, will depend on the nature, as well as the condition of the soil, and experience alone must be the guide of his operations.

* "Fibrous Plants of India."

It may be taken for granted that any soil suitable for the growth of flax or hemp, will be adapted to the milk-weed; but a deep, dry loam, with a clay sub-soil will produce a larger quantity, and a finer quality of fibre.

As the roots run deep, sub-soil ploughing will be beneficial before sowing. It will best follow a green crop that has received a liberal allowance of manure, as potatoes or turnips. The seed may be sown, and covered lightly, in drills about a foot apart, or broadcast, as soon as the ground can be worked by the plough, and reduced to a fine tilth, as frost is not injurious to its growth. If weeds make their appearance, they should be pulled, or cut with the hoe in dry weather. If the crop is top-dressed with short manure in October, the rain will carry down nutritive matter to the roots for the next season's growth. Planted in drills, about one foot apart, or sown broadcast, the stems will be finer and more uniform than in their wild state; easier to cut, to steep, and to separate from the fibre. So far as the author's experience goes, the difference in steeping is remarkable; the thick stems of the wild plant retaining their greenness on the grass, long after they have been taken out of the water, and are clammy to the touch; while the smaller ones dry readily, and assume a whitish appearance in a comparatively short space of time.

Future experiments must determine, whether the above method of cultivation will produce two crops in one season; or, in other words, whether the plants will grow so luxuriantly that they may be cut twice.

CUTTING OR HARVESTING.

Should experience prove that the plants will bear two cuttings in the same year, the first may be done in the month of June, at which season, the flowers and seed-pods not having been formed, they may be cut, tied up in small bundles, and taken immediately to the watering pools or streams, in their green state.

The proper time for harvesting the crop, so as to obtain both the fibre from the stem, and the silky-down from the pod, is in the month of September, before the leaves begin to change color and fall, and before the stems begin to blacken at the base. The simplest method will be to cut the plants as near the ground as possible, with a cradle-scythe, or mowing-machine. Before carting the bundles to the water, the tops should be cut off at the lower branches by some expeditious means, to separate the seed-pods. These may be left in the field for a few days, or taken under cover to an airy loft, and spread out to dry. The farmer can choose his own time for removing the seed from the silky-down, but it should be done before the pods become so dry as to burst,

and leave the down to escape like a parachute, as it naturally does, when left on the plants in the field. Until some machine, like the cotton gin, is invented for this purpose, the work will probably be best done by hand round the fire-side in the long November nights.

The presence of the milky juice suggests that the stems will steep better in their green state, than if previously left for a few days to dry. The fibre, would, indeed, be more easily detached from the cuticle and boon without the juice; but the process of separating the latter by crushing the green plants between two metal rollers, after removing their branchy tops may be considered too laborious by the farmer, if the retting process is afterwards required. The profits resulting therefrom, may, however, remunerate him for his toil, as the juice thus obtained will thicken into a semi-elastic substance, and form a kind of caoutchouc. When evaporated and dry, it may be worked up in hot water with a wooden kneader, and will, no doubt, prove a valuable product, either alone, or mixed with other substances.

WATERING OR RETTING.

Having been divested of their branchy tops, and leaves, the stems of the milk-weed have next to undergo the process of watering or retting. Retting is a corruption of rotting, since a certain degree of putrefaction takes place.

The main object of this operation is to obtain the silken fibre clean and free from all other material.

As almost every farmer is familiar with the watering of flax, or hemp, the method of putting the bundles into steep need not be minutely described. They should remain in the water not only till the fibres separate readily from the stem, but till the cuticle, or outer bark, is easily detached from the fibres themselves.

Great skill and precaution are necessary in this part of the operation. If the plants be left too long in the water, the filaments will become rotten and useless; and if not long enough, they will not separate with sufficient ease.

It is better to take them out rather at an earlier period, than to leave them too long in the water. The time they should remain will depend on the degree of ripening to which they had attained, and the temperature of the water. The mode in which the skeletons of leaves are prepared will illustrate this process. If leaves of trees be suffered to lie some weeks in water, the pulpy matter will decay, so as to be removed by the slightest rubbing, while all the veins of the leaves remain uninjured. These veins are similar in point of strength to the fibres in the bark of plants, and both remain equally entire after the soft matter has rotted.

When the bundles are put in the water, fermentation soon begins, evinced in the dingy infusion, by disengagement of gas, and the production of vinegar. It is the acetous fermentation that takes place in retting, and the plants should be taken out as soon as this is finished, and before the putrid begins. The sooner, therefore, that the decomposing parts of a plant,—that is, the mucilaginous, saccharine, and other constituents of the sap and pulp,—are removed, the whiter are the fibres, and the more they retain of their original strength.

The bundles may be laid in running, instead of stagnant water; in which case the decomposition does not go on so rapidly, and it will require longer time before they are sufficiently steeped; but the fibres will be stronger.

When the plants are taken out of steep, they should be handled very carefully, as the fibre is very tender when in a wet state; they should be placed upon their root ends to drain for some hours; the heaps should not be too large, otherwise they will injure by heating. They should then be spread upon the grass to dry, for the purpose of rectifying any defect in the watering, and for carrying on the decomposition to that point when the fibre will separate from the stem or *boon* with the greatest ease, as also from the outside cuticle or skin, which is known by rubbing some between the hands.

After retting, the *harl* still contains, besides the textile filaments, a certain portion of the glutinous cement of the milky juice which is not soluble in water, and the destruction of this by fermentation alone cannot be carried to the utmost limit without injury to the fibre. It is therefore effected by exposure to the weather, called grassing, and, if necessary, to another steeping process, as will be subsequently explained.

BREAKING, &c.

The stems of the Cornuti, after steeping and drying, cannot be scutched like flax, but they may be broken with advantage by passing them between fluted metal rollers.

The author, having prepared a few bundles of the milk-weed in the manner explained in the preceding chapter, was searching for some mechanical contrivance to separate the fibre, when the use of the beautiful model of Gelston Sandford's Flax brake was kindly granted him by the Patent Office. The fluted rollers of this brake, having a forward and reverse motion, left the fibre completely divested of the stem, but with much of the outer bark still adhering to it. Instead, therefore, of the scutching process, it may be necessary to have recourse to some chemical means, as steeping the fibre in a weak alkaline ley, which will dissolve the

glutinous cement which had resisted the retting, without acting on the fibres themselves.

In the West Indies, the operation of boiling plantain fibre in soda ley and quicklime is said to be important in separating the gluten. So in the East Indies, the natives boil the bast of certain plants in a ley of wood ashes, and then wash them in a weak solution of acid.

It is advisable to place over the boiler the means of lifting the mass of fibre when boiled, and allowing it to drain before it is carried away to be washed.

But Cornuti fibre may be steeped with advantage in a hot saponaceous liquid, like that used as a flax-steep in the process of Jennings or Dickson. In the latter a little acid is afterwards added, causing decomposition to take place, in consequence of the acid uniting with the alkaline base, when the oil which is set free assists in softening the fibre.

These chemical processes may be greatly aided by mechanical means. Pownall discovered that by subjecting flax (after it was taken out of the water in which it was steeped,) to heavy pressure between rollers, and a stream of cold water, the pressure forced out, and the water washed away, almost all the gluten remaining in the plants not removed by the fermentation. It may therefore be found that no advantage, but the reverse is obtained by drying fibrous plants, after maceration, before the outside bark is removed.

These rollers are now used in retteries, or steeping establishments, conducted on the factory system.

It has been remarked, that in the preparation of Cornuti fibre, the expensive operation of scutching is dispensed with. It may be necessary, however, to beat it a little by some mechanical means, or with a bat, or mallet, similar to that used by the natives of China, India, and Polynesia, in preparing fibre for bark cloth from the bark of the paper mulberry, [*Morus* (now *Broussonetia*) *papyrifera*]. This mallet is usually made about fifteen inches in length, and from two and a half to three inches square, one side being grooved very coarsely, another somewhat finer, a third exceedingly fine, and the fourth generally cut in chequers, or small squares.

In their cleanest state, after undergoing all these processes, the fibres are still more or less coherent or entangled, and of such variable lengths as to be ill adapted for spinning. They must, therefore, be operated upon by the heckle, which disentangles and separates them into their finest filaments.

SNOW-RETTING.

From some experiments made by the author, though perhaps imperfectly, it was found that snow-retting may be advantageously

practised with the milk-weed, as with hemp in Russia and Sweden. After the first falls, about the end of December, the plants are spread on the snow, in meadow or pasture ground, and left there to be covered with other falls of snow until spring, when they are found to be sufficiently retted. When dry they should be put in the barn, and cleaned at leisure by passing them through the brake. This method entails very little labor or expense. It is only necessary to dry the plants well in the field after they are cut, and to put them under cover or in stack till after the first falls of snow. Thus the labor which water-retting and grassing necessarily impose upon the farmer, is done away with. Even the milky juice, which was an obstacle in the steeping process, seems to aid in the separation of the filaments in snow-retting. The strength of the fibre also, which is more or less affected by fermentation, is preserved, and the epidermis, or outside skin, instead of being firmly cemented to the fibres, as in watering, falls from them when passing through the brake, and leaves them in a clean state. Should future experiments confirm those already made, this plant will the sooner take its place among the productive resources of the country.

OTHER USES.

The pods of the milk-weed, on bursting, display a quantity of silky down attached to each seed, which floats them about like those of thistles and dandelions. This double product makes this plant the more valuable, as it is useful both for its down and for its fibrous stem.

Mr. Moncton, C.S., has made use of the downy substance contained in the follicles of the Mudar, another species of the Asclepias family growing in India. He has had paper made of it, as well pure as when mixed with two-fifths of the pulp of Sunn, or Jute. As the glossy and silky but comparatively short fibre is difficult to spin, a mixture of one-fifth of cotton was made, in order to enable it to be worked. A good wearing cloth, which stands washing, and takes a dye, was produced.

At the Fair of the American Institute, held in New York in 1863, a Bronze Medal was awarded to Mr. Thomas J. Dunkin for a cloth made from the down of Asclepias Cornuti combined with silk or wool.

In the Transactions of the American Institute of the City of New York, for the years 1864-5, there is an interesting report of some experiments by Dr. Guernsey of that city. He exhibited a variety of specimens of cloth, some plain-colored and some dyed, made from the pod fibre of the milk-weed. Some of the specimens were of the pure fibre, some mixed with six per cent. of cotton, and others with a small amount of silk and wool. It appears that

the secret of the successful manufacture of this fibre lies in the discovery, by James P. McLean, the patentee, of a mode of treating it with vegetable oil. Animal oil is used in the manufacture of wool. Cotton is naturally oily. By the use of vegetable oil the manufacture of this fibre is likely to prove completely successful.

The specimens exhibited were carded, spun and woven by hand from fibre gathered from plants which had previously been twice mown the same season for the purpose of destroying them. It is stated in the report that fifty cents a pound have been offered for the fibre, and that it has been estimated it can be grown at the rate of five hundred pounds per acre.

It is possible this estimate will be found too high, as the silky down is very light, and the flowers, although very numerous, do not all mature into seed-bearing pods.

The growing wants of the paper trade, which has been said to be as necessary for our comfort and commerce as for the continued and advancing civilization of the world, have naturally led the manufacturer to look for an increased supply of material. In making paper from this vegetable substance, we are not, to quote the words of Dr. Royle, "commencing improvement by repeating experiments which had already been made, and announcing results as new which had long previously been ascertained." The fibre from the pods will require far less preparation in the manufacture of paper than rags from any fabric, and may be classed under the denomination of *Fines*. Its suitability has simply to be established by its capability of cohesion after its reduction to pulp; the cost of production, and of alkaline and bleaching solutions, being also in its favor. The pods themselves have a papery texture, and the codilla, or tow, produced in the preparation of the fibre from the stem, can be used with advantage as paper material.

The appendages of the seed are as smooth as silk, and although possessing no felting properties, have been mixed with fur in the manufacture of hats. The furs of the hare, the rabbit, and the beaver, possess very little felting properties until they have been subjected to a process known in the trade as *carroting*. This consists in applying to the furs, when on the skin, a solution of quicksilver and aquafortis (nitrate of mercury), an art also called *secretage*. They are then mixed with other furs which have not been similarly treated, known as raw furs. The seed appendages, or pod-fibre of the milk-weed, are used in hat-making in this way as a substitute for raw furs.

PROBABLE YIELD AND PROFITS PER ACRE.

The milk-weed does not flower, and consequently does not produce any seed-down, the first year of its growth; the profits will,

therefore, be less for that year, and confined to the fibre of the stem, and its codilla, or tow. Assuming the normal value of this fibre for spinning purposes to be ten cents per pound, and five cents for the tow as a material for the manufacture of paper, the yield and profits for the first year may be as follows:—

To 200 lbs.	of	fibre,	at 10 cts.	per lb.....	$20 00
" 30	"	tow,	at 05	"	1 50
" 600	"	shoves,	at 00½	"	3 00
					$24 50

Second Year.

To 300 lbs.	of	fibre,	at 10 cts.	per lb.....	$30 00
" 50	"	tow,	at 05	"	2 50
" 700	"	shoves,	at 00½	"	3 50
" 200	"	pod fibre,	at 10	"	20 00
" 200	"	empty pods,	at 01	"	2 00
					$58 00

Third and succeeding years, until the plants naturally decay, or cease to make a remunerative return.

First Cutting in June.

To 200 lbs.	of	fibre,	at 10 cts.	per lb.....	$20 00
" 30	"	tow,	at 05	"	1 50
" 600	"	shoves,	at 00½	"	3 00

Second Cutting in September.

To 200 lbs.	of	fibre,	at 10 cts.	per lb.....	$20 00
" 30	"	tow,	at 05	"	1 50
" 600	"	shoves,	at 00½	"	3 00
" 200	"	pod fibre,	at 10	"	20 00
" 200	"	empty pods,	at 01	"	2 00
					$71 00

The farmer can deduct from these totals the cost of preparing the soil for the several crops, and the cost of preparing the crops for market; the remainders will give him the net profits per acre, and per year. The actual results in farm practice will be over, rather than under, the estimates given above, which will be found to be somewhat disproportionate to one another. The yield of fibre from the pods will be less than that from the stems; while, on the other hand, the empty pods will weigh more than the silky seed-down they contain.

ASCLEPIAS INCARNATA.

Swamp Silk-weed.

Stem somewhat corymbosely branched above, more or less pubescent; leaves oblong—lanceolate, pubescent, on short petioles; umbels numerous, erect, mostly in pairs and terminal; lobes of the crown oblong, scarcely exceeding the stigma, not toothed; horn subulate, exserted.—*Linn. sp.* 1. *p.* 215; *Michx. fl.* 1. *p.* 115; *Pursh. fl.* 1, *p.* 181; *Ell. sk.* 1, *p.* 320; *Bot. reg. t.* 250; *Torr. fl.* 1, *p.* 281; *Beck. bot. p.* 235; *Darlingt. fl. cest. p.* 172; *Hook. fl. Bor.-Am.* 2. *p.* 53; *Decaisne in D. C. prodr.* 8. *p.* 567; A. pulchra, *Ehrh.*; *Willd. sp.* 1. *p.* 1207; *Bigel. fl. Bost. p.* 163; *Sweet, Brit. fl. gard.* (*Ser.* 2.) *t.* 18.

Stem 2–4 feet high, with erect branches, either nearly smooth (except two pubescent lines), or hairy—tomentose. Leaves 3–6 inches long, smoothish above, more or less pubescent (sometimes woolly) underneath, very acute; the base obtuse or somewhat cordate: petioles 3–5 lines long, umbels on hairy peduncles: pedicels three-fourths of an inch long. Flowers half as large as in A. Cornuti. Corolla bright purple (or sometimes pale); the lobes lanceolate. Lobes of the crown truncated obliquely inward: horns erect, slightly curved. Tube of the stamens contracted into a slender neck under the crown. Follicles linear—lanceolate, acuminate, pubescent.

Low grounds, particularly on the borders of brackish marshes, but not confined to the sea-board; common, July–August. This is the most abundant species next to A. Cornuti. It affords but little milky juice when wounded. (*Torrey Nat. Hist. of New York*).

It is sometimes employed in domestic practice, and is considered anodyne, and diaphoretic.

The hoods of the crown in this plant are of a flesh color, hence its specific name—*incarnata*. Like A. Cornuti, it is an herbaceous perennial, growing naturally in rich moist ground, and on low banks of streams.

Robert Bell, Esq,, of Carleton Place, has successfuly tested its adaptation to cultivation on dry ground. The plants, from seed sown in spring, grew most luxuriantly, flowering, and coming to maturity the second year. When about half grown, Mr. Bell observed large numbers of caterpillars of the Archippus butterfly (Danais Archippus) making their appearance, and destroying some of the plants. This caterpillar lives on the common milkweed in June and July, as does also the leaf beetle, called *Chrysomela trimaculata*, from the middle of June till September. A little party-colored hairy caterpillar belonging to the genus *Arctia*,

is also found in great plenty on the common species in the latter part of July and the whole of August.

That the swamp silk-weed may be successfully grown on dry ground was proved by Mr. Freed, a gardener in Hamilton, C.W., who grew it in his garden for some years prior to 1860, in a dry sandy loam. In the spring of that year some of the stalks and fibre were exhibited at a meeting of the Hamilton Association. Mr. McMicking, a paper manufacturer in Dundas, valued the dressed fibre as a paper material at five cents per pound, but considered it worth ten cents per pound for spinning purposes. He found it had a beautiful high color and a brilliant lustre, and that it bleached in three minutes. From 1000 parts of the plant were obtained :—

Parts of shive (wood, bark, &c.)..... 737
Parts of lint (dressed fibre.)..... 263

This shews a yield of fibre equal to twenty-six per cent., which is greater than the average yield from an equal weight of flax straw.

These facts are found in a short paper by Judge Logie, of Hamilton, on A. Incarnata as a fibre producing plant, which was published in the "Annals of the Botanical Society of Canada," Vol. I, Part II, where he states that the application of the fibre to the manufacture of coarse cloth was not new, but that he was not aware that its capability of making fine cloth had been tested, or that any attempt had been made to ascertain whether or not it could be cultivated successfully and profitably. The cultivated plant, however, appeared to him to possess a stronger and brighter fibre than the plant in its native state.

The preparation of the fibre from this species will be more easy and less expensive than from A. Cornuti, because of the absence of the milky juice. In other respects the methods described, when treating of the latter, may be profitably followed.

URTICA CADANENSIS.

Canadian Nettle.—Leaves alternate.

Hispid and stinging; leaves ovate, acuminate, serrate; panicles axillary, loosely and divaricately branched, the lower ones sterile, upper ones fertile.—*Linn. sp.* 2, *p.* 985; *Michx. fl.* 2, *p.* 178; *Pursh, fl.* 1, *p.* 114; *Ell. sk.* 2, *p.* 573; *Bigel, fl. Bost., p.* 341; *Beck, bot. p.* 314; *Darlingt. fl. cest. p.* 523; *Hook, fl. Bor.-Am.* 2, *p.* 142.

U. Divaricata, *Pursh, l. c. p.* 113; *Beck, bot. p.* 314; U. Whitlowi, *Muhl. in Green's cat. pl. N. York.*

Perennial, stem 2-5 feet high, erect, branching. Leaves 3-6 inches or more in length, and 2-4 inches wide, thin, with coarse

acute serratures, sometimes cordate, sprinkled with hairs, panicles longer than the petioles; the lower ones mostly staminate: upper ones large and widely spreading, with very hispid branches. STERILE FLOWER, calyx 5-parted; the segments roundish, concave,—stamen short, incurved. Rudimentary ovary hemispherical. FERTILE FLOWER, calyx of two oblong concave sepals. Achenium much compressed, smooth, very oblique, finally refracted on the short, broadly-winged pedicel; persistent style lateral. Seed ovate-lenticular. Embryo large, in the midst of thin fleshy albumen: cotyledon orbicular, flattish.

Moist, shady soils, particularly along rivers. *Fl.* July. *Fr.* September. This, like several other species of the genus, affords a strong fibre like hemp, and has been proposed to be used as a substitute for that article.—(*Torrey in Nat. Hist of New York.*)

The genus Urtica contains many interesting species well worth knowing, from the products which they furnish. The name is formed from *Uro*, to burn, in allusion to the stinging properties of most of the species. U. Dioica is found all over Europe, also in Barbary, Siberia and Japan. It grows in hedges, neglected fields, gardens and pastures. The tops of the tender shoots are sometimes used as a pot-herb early in spring. A strong decoction of the plant will coagulate milk very readily, and without any disagreeable flavor. The stalk is found to have a texture somewhat like that of hemp, and to be capable of being manufactured into cloth, ropes and paper. The leaves are the only food of three of the most beautiful butterflies—Atalanta, Paphia and Urticæ, and the principal food of the Io. The caterpillars also of the Urticata and Verticalis moths feed on it; and the bases of the leaves are frequently disfigured by tubercles which contain small maggots, probably producing Musca Urticæ.

The Atalanta Butterfly was probably introduced into America from Europe with the common nettle, which it inhabits.* The caterpillars of the showy butterfly, *Vanessa Milberti*, live together on the Canadian species.

Boehmeria nivea, sometimes called Urtica nivea, and Urtica tenacissima (the caloee of Sumatra), produces the fibre called rheea, or China grass, of which two, or even three, crops are obtained in its native countries in the same season. It is cultivated, and succeeds very well in the open air, in the middle of France. Numerous experiments have been made with it in England, where it is spun in large quantities, and fetches, occasionally, £100 stg. per ton.

Another species, equally useful, is designated in France by the common name of *ramie* (Urtica utilis). From the descriptions of different Botanists it would appear to be identical with that which

* See Harris, on "*Insects injurious to vegetation.*"

produces the China grass. Experiments made with care, by order of the Government of the Netherlands, prove the superiority of its fibre, even over that of flax and hemp. Decaisne, who has written a special treatise on this plant, thinks, with reason, that it would be expedient to try its cultivation in other countries. The Canadian farmer's attention might be profitably given to these species, as well as to the native variety, as there are many places in our extensive country whose climate and soil will be found to be well adapted to their cultivation.

The Canadian nettle belongs to a family of which many of the species, as has been shown, are conspicuous for their fibrous properties. It appears to be useless, only because we do not enjoy the pleasure or take the trouble of reading the wide-spread book of Nature.

Soils that are suitable for the cultivation of flax and hemp will be equally so for the production of the nettle. An herbaceous perennial, the chief labor in its cultivation will be for the first year. Subsequent labor will mainly consist in keeping the plants free from weeds, and giving them an occasional top-dressing of manure. The land should, of course, in the first instance, be well ploughed and properly drained; also well harrowed and rolled, to have the top-soil in good tilth.

The seed may be sown broadcast, or in drills about a foot apart. The stems rise slender and fine, according to their proximity. When sown thickly together they shoot up into long, wand-like plants; air and light having less free admission, and heat having less influence in evaporating the sap, the effect is to produce a longer fibre, which is at the same time soft and pliable, as well as more easily separated, and is in larger quantity on the same space than when set widely apart.

They should be cut before the seed is fully ripe, but that which is required for sowing ought to be taken from plants allowed enough room to spread, and to fully ripen their seed.

After being cut, the nettles ought, according to some authorities, to be dried in the sun for one or two days, but it is a matter of doubt whether the plants should be dried before they are steeped. Some think this drying needless trouble; others that the plants should be put in the water as soon as they are cut. When put in green they require less steeping than when put in dry. The time will, however, depend a good deal on the temperature of the water.

The steeping of the nettle, called *water-retting*, is a very important part of its preparation, and is to be distinguished from another method, which is called *dew-retting*. The steeping places are often only ditches, three or four feet deep, varying in breadth and length, dug for the purpose on the margins of rivers. The

bundles are laid in a slanting direction in the water, covered with straw or other material, and loaded with pieces of wood and stones to keep them down. The object, as in the case of flax and hemp, is, by a slight degree of fermentation, to enable the epidermis, or outer skin, to separate readily from the bark, and this from the boon or reed. It can easily be ascertained when this object has been effected by taking out one of the stems, holding it by the root end, and drawing the thumb-nail up the stem to the top. If the fibre slip up the stem, it is a proof that it has been sufficiently retted.

The fibres steeped in putrid standing water will be softer than those which are steeped in running water. But in water which does not run they contract a disagreeable color. They are, however, notwithstanding this, easily bleached. It is, nevertheless, desirable to make a small stream of water pass through the steeping place.

When sufficiently retted, the plants are taken carefully out of the water, and set on end to dry, and next day carried to a field of grass that is clean and free from cattle. Here they are spread out very evenly, and turned over with light poles every three or four days. They are sufficiently bleached when spots begin to appear on the stem. When dry, they are tied up in bundles, and taken to the stack or barn.

Breaking by fluted rollers, and scutching, are operations similar to those in the preparation of flax and hemp.

Dew-retting is another method. The stems, after being cut, are allowed to stand in the stooks for two or three days. They are then spread out on grass land for several weeks, and require to be frequently turned. The process is completed when spots begin to appear, as before noticed. They should then be gathered, and tied up in bundles when dry.

Snow-retting may be practised with advantage, as described on a previous page.

CONCLUSION.

The culture of plants claims the first consideration in the economic history of a country, and in the improvement and development of its resources. It is hoped that those fibrous materials which have been treated of in this essay may be made to contribute to our wealth as objects of commerce. We must at first rely upon the efforts of the amateurs and patrons of agriculture, as well as upon those who are best acquainted with all the practical details of the art. Want of immediate success should not be ascribed to unfruitfulness in the soil, or unsuitableness of the climate. We must apply principles to practice, and we will inevitably obtain successful results.