

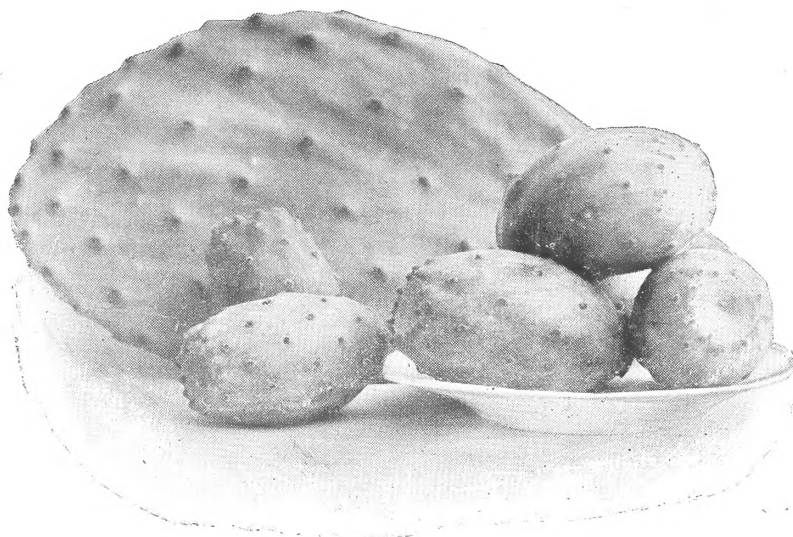
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The New Agricultural-Horticultural Opuntias

U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

PLANT CREATIONS FOR ARID REGIONS



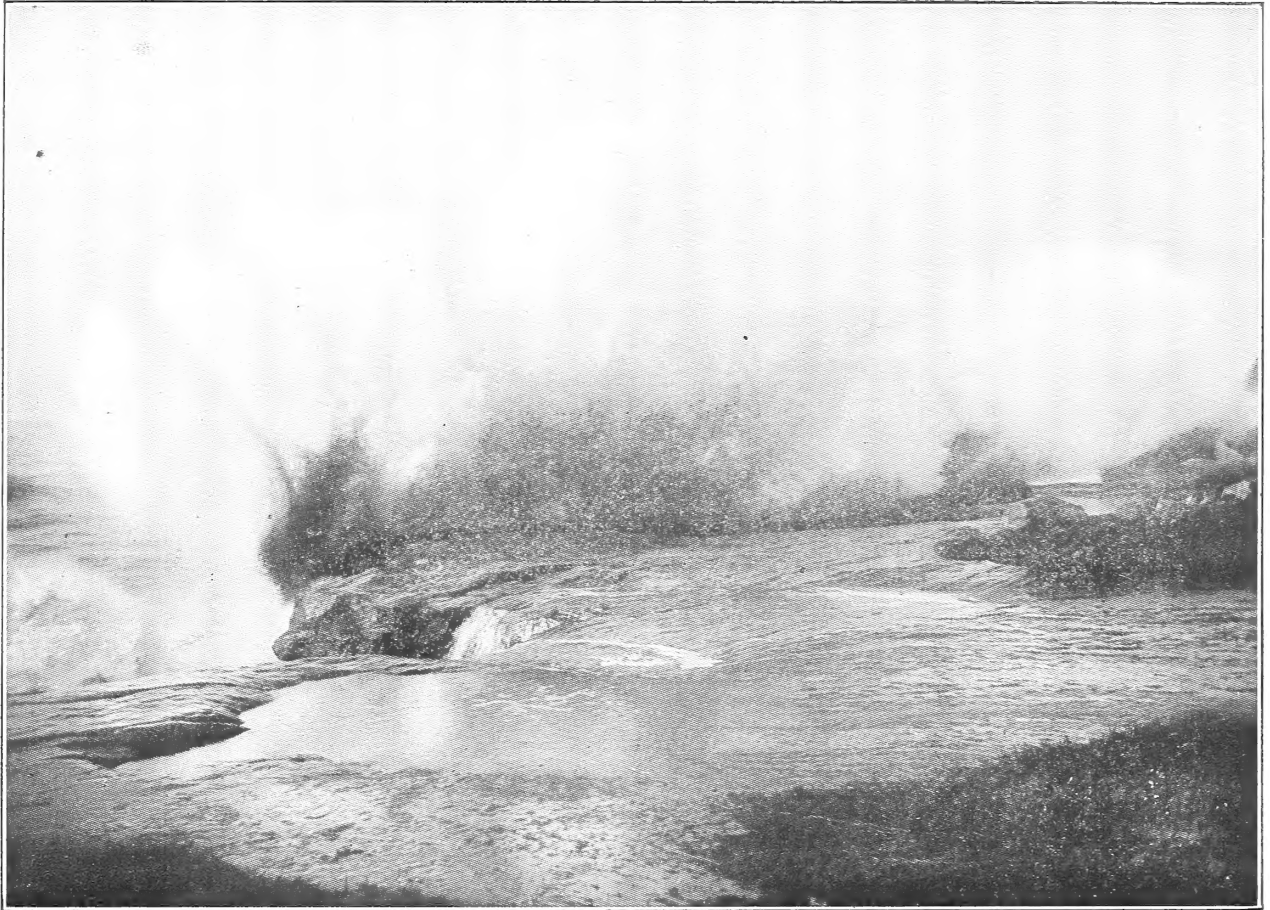
Improved Spineless Opuntia Leaf and Fruit.

"How to judge novelties: look to their source."

Luther Burbank:

SANTA ROSA, SONOMA CO., CAL. U. S. A.

JUNE 1, 1907.



"Where the Broad Pacific ocean breaks against the Land."

IT IS AN interesting fact that these agricultural and horticultural Opuntias thrive as well in the fertile valleys, on the mountain sides, and near the coast, as they do in the arid wastes of the world.

CACTUS AS A FOOD CROP

THE SPINELESS OPUNTIA AN ESTABLISHED FACT.

PART ONE.

The Fodder Crop for Arid Regions.

FOR more than fifty years I have been quite familiar with "thornless cactus" of many species and varieties. In fact, one of the first pets which I had in earliest childhood was a thornless cactus, one of the beautiful Epiphyllums. The Phyllocactus and many of the Cereus family are also thornless, not a trace to be found on any part of the plants or fruit. Thus the somewhat indefinite popular name of "thornless cactus" has been used by persons unacquainted with these facts, for be it known that "thornless cactus" is no more of a novelty than a "thornless" watermelon. But among the Cacti which grow to an immense size with great rapidity and which can be readily cultivated in garden, field or desert no perfectly thornless ones were known and very little interest taken in the cacti of any kind either thorny or thornless as to their agricultural or horticultural value until the work of improvement was taken up on my experiment farms and improved perfectly thornless rapid-growing varieties had been produced and made known within the past few years. Some of the best growers among these will produce three or four times as much weight of food per acre as will the wild thorny ones under exactly the same conditions. But better yet, hardy ones are being produced which will already withstand 5 or 10 degrees more freezing than others of the wild type. This was not unexpected as the genus Opuntia is a surprisingly variable one even in the wild state. The best botanists—even those who have made the Opuntias a special study—declare it to be one of the most difficult genera to classify, as new forms are constantly appearing and the older ones so gradually and imperceptibly merge together. The facts without doubt are that their ancestors had leaves like other vegetation and were as thornless as an apple tree, but in ages past were stranded in a region which was gradually turning to a desert, perhaps, by the slow evaporation of some great inland lake or sea. Being thus stranded the plants which could adapt themselves to the heat and drought which as the years passed by became each season more and more severe, survived, at first by dropping the leaves thus preventing too much evaporation, leaving the fat smooth stems only to perform the functions of leaves. The Opuntias even to this day always shoot out very numerous rudimentary leaves which persist a few days or weeks and then having no function to perform drop off. But the Opuntias had yet to meet another enemy; desert animals were hungry for their rich stores of nutriment and water, so the rudimentary leaves were replaced by awful needle-like thorns placed at exactly the right angles for the best defence, and, at the base of these—partially embedded in the stems—(now leaves) are numerous bundles of smaller needles, more than ten thousand to each leaf and these are even more dangerous than the larger needles, often producing great pain, inflammation and at last death, to animals who were pressed by starvation to consume them for food.

The Opuntias, having once been thornless, there is no reason why they should not sometime again revert to a state of partial thornlessness and this is exactly what they do. In the Hawaiian Islands a partially thornless Opuntia is sometimes found, always growing, however, in places absolutely inaccessible to browsing animals. In California, Mexico, Colorado, New Mexico and Texas small patches of half thornless ones are sometimes found almost always in inaccessible crevices among rocks. And on some of the South Sea Islands where vegetation is abundant and browsing animals few, the Opuntias having no use for thorns have either reverted back to thornlessness or often the thorns have become hair-like, diminished and perfectly harmless.

Some twelve years ago, while testing the availability of a great number of proposed forage plants from the various arid regions of the world with a view to the improvement of the most promising, I was greatly impressed with the apparent possibilities in this line among the Opuntias which from their well known hardiness, remarkable vigor and rapidity of growth, easy multiplication and universal adaptability to conditions of drought, flood, heat, cold, rich or arid soil, place them as a class far ahead of all other members of the great cactus family, both as forage plants and for their most attractive, wholesome and delicious fruits, which are produced abundantly and without fail each season. These fruits which are borne on the different species and varieties, vary in size from that of a small peanut to the size of a large banana and in colors of crimson, scarlet, yellow and white, and have more various attractive flavors than are usually found in most other fruits except perhaps the apple and the pear, the product of a single plant being often from 50 to 200 pounds per annum, some bearing one crop, others two or more each season like the figs, the first or main crop ripening as the second comes into bloom on the same plants.

The Opuntias, from root to tip, are practically all food and drink and are greatly relished by all herbivorous animals from a canary bird to an elephant and for this very reason have to be on the defensive and perhaps nowhere in the whole vegetable kingdom have such elaborate preparations been made; the punishment inflicted is immediate, the pain severe and lasting, often ending in death, so that all living things have learned to avoid the Opuntias as they do rattlesnakes, and notwithstanding their most delicious and nourishing fruit produced unfailingly in greatest abundance have not been systematically improved by the Agriculturist and Horticulturist as their merits so well deserve.

By my collectors and others I secured the best Opuntias from all sections of Mexico, from Central and South America, from North and South Africa, Australia, Japan, Hawaiian and the South Sea Islands. The United States Agricultural Department at Washington, through my friend, Mr. David G. Fairchild, also secured eight kinds of partially thornless ones for me from Sicily, Italy, France and North Africa, besides a small collection of Mexican wild thorny ones which were in the Government greenhouses at the time. Besides these, I had the hardy wild species from Maine, Iowa, Missouri, Colorado, California, Arizona, New Mexico, Dakota, Texas and other states. All these were grown and their agricultural and horticultural values studied and compared with great care. Many so-called thornless or partly thornless ones were obtained, but not one among the thousands received from all these sources was absolutely free from thorns and spicules and even worse, those which were the most promising in these respects often bore the poorest fruit, were the most unproductive of fruit or produced less fodder or were less hardy than the wild thornless species and varieties. The first work was to select the best of these, cross them, raise numerous seedlings, select the best of these and so continue hoping for improvement. One of the first and not unexpected facts of importance to be observed, was that by crossing, the thorns were often increased rather than diminished, but not so with all. Some very few still became even more thornless than their so-called thornless parents greatly increased size and quality of leaves (raquettes or slabs) and among them

a combination of the best qualities of both parents with surprising productiveness of slabs for feeding. The work is still in progress but on a still larger scale and now the improved Opuntias promise to be one of the most important food-producers of this age, some of these new creations grown from the same lot of seed yielding fully ten times as much feed as others under exactly the same conditions.



HARDY SPINELESS OPUNTIAS READY FOR THE HYBRIDIZER.

Among the very numerous wild seedling Opuntias, partially thornless ones have appeared from time to time and these have been growing generally unnoticed here and there in every part of the earth where the thorny ones grew, the seeds no doubt scattered by birds and other agencies. Some of these bore good fruits and have been locally cultivated, but so far as known have never received specific horticultural names or descriptions though the fruits of these and the thorny ones have long been used extensively as food and are the principal source of food for millions of human beings for about three months in each year.

Systematic work for their improvement has shown how pliable and readily moulded is this unique, hardy denizen of rocky, drought-cursed, wind-swept, sun-blistered districts and how readily it adapts itself to more fertile soils and how rapidly it improves under cultivation and improved conditions.

Some one asks: "Won't they run wild again and produce thorns, when placed under desert conditions?"

Has the "Burbank" plum which though introduced twenty-two years ago and is now more widely grown than any other plum on this earth, shown a tendency to be different in Africa, Borneo, Japan, Egypt, Madagascar or France? No, it is the same everywhere and the residents of Chicago, Auckland, London, San Francisco, New York and Valparaiso consume them in great (and rapidly increasing) numbers of carloads each season. The

same may be said of the later introduced Wickson, America and numerous other plums and of my improved fruits and flowers which are extensively grown and generally offered for sale by most responsible firms in all civilized countries and are generally slowly but very surely replacing the old and heretofore standard varieties.

It will be so with these "new creations" in *Opuntia* which I now offer for the first time. Thousands and thousands of others not now ready to be distributed are under test, this preliminary circular partially describing only the beginnings of a great work with the *Opuntias*.

Does this work which I have only just briefly outlined mean anything? Intelligent stock raisers everywhere know well that it means a new agricultural era for whole continents like Australia and Africa and millions of otherwise useless acres in North and South America, Europe and Asia. And now during the past two years the United States Department of Agriculture have despatched agents to all parts where cacti grow to look up this matter and last season gave some valuable information* gathered from those who had for years been feeding the wild, thorny ones to their stock with good results when properly prepared by fire, though it is acknowledged that thus prepared a portion of their nutritive value is lost and though the dangers of loss from feeding to stock are lessened, are not by any means made safe, even by singeing or any other process, while many of these new thornless ones are as safe to handle and as safe to feed as beets, potatoes, carrots or pumpkins.

But let it be understood that these thorns are not growing on the wild *Opuntias* for ornament any more than poison fangs, teeth, claws and stings are possessed by various animals. They are for defence, and when deprived of these defences they must be protected from stock like any other feed grown in farm, fields or gardens. Still some doubter who has no knowledge of desert conditions will say, "Will it pay?" Does anything pay? Some people seem to think that corn, wheat, oats, barley, cotton, rice, tobacco, melons and potatoes pay. How many tons of hay, beets or potatoes can be raised each season on an acre of good soil? Yes, well, by actual weight in the summer of 1906 in the cool coast climate of Sonoma County, Cal., on heavy, black "adobe" soil, generally thought wholly unsuited for cactus, my new *Opuntias* produced the *first year, six months* from single rooted leaves, planted about June 1st, an *average* of $47\frac{1}{2}$ pounds per plant on one-fourth acre, yielding at the distance planted ($2\frac{1}{2}\times 5$ feet) at the rate of **180,230 pounds** (over ninety tons) of forage per acre. Some of the best varieties produced *very much above this average*, though planted much too closely for permanent field culture; yet these notes are of interest on a subject of which little has been known. These *Opuntias* are always expected to produce nearly or quite double as much feed the second and succeeding years as they do the first season of planting. Yet, I would not expect one-fourth the above yield on desert soil *without* irrigation but would expect nearly or quite *twice as much as the yield mentioned above* in a very warm climate with one or two light irrigations each season.

These improved *Opuntias* must of course be fenced from stock; the leaves to be fed to the stock when most needed, and in countries where great numbers of valuable stock are lost in times of unusual drought will be of inestimable value and will also, without doubt, prove of great value in less arid countries *as a common farm or orchard crop even on the best agricultural soils* but more especially on barren, rocky, hill and mountain sides and gravelly river beds which are now of no use whatever.

The small, hard, wild thorny cactus has been a common everyday food for horses, camels, mules oxen, growing and beef stock, dairy cows, pigs and poultry for more than fifty years, though millions have died from the thorns,† yet, no systematic work for their im-

*"The Prickly Pear and other Cacti as Food for Stock." Bureau of Animal Industry, U.S. Department of Agriculture, Bulletin No. 174.

† The wild cactus is prepared by boiling or steaming in Australia in times of drought, but even though great loss of stock is sometimes reported when thus prepared, some are saved from otherwise certain starvation.

provement had been taken up until some fifteen years ago; now agriculturists and horticulturists in every land are deeply interested and the governments of many counties are taking measures to secure a stock of the improved Opuntias to avoid if possible the too common occurrence of famines for the Opuntias can remain uncultivated and undisturbed year after year, constantly increasing in size and weight until needed; then each acre will preserve the lives of hundreds of human beings for months until other food can be obtained.



SPINELESS AND SPINY OPUNTIAS GROWING SIDE BY SIDE.

Though the wild cactus is generally prepared for stock by singeing the thorns with fire, yet this never destroys the numerous bundles of innumerable needles imbedded in the leaves and cannot always remove all of the larger thorns even. Those who have fed the wild cactus extensively acknowledge that cattle are often seen with blood dripping from their mouths, and that their throats and tongues become at last inflamed, very painful and hard like a piece of sole leather. How would you enjoy being fed on needles, fish-hooks,

toothpicks, barbed wire fence, nettles and chestnut burrs? The wild, thorny cactus is and always must be more or less of a pest. Millions of cattle, sheep, goats, hogs, ostriches and other animals have been destroyed by it. The best newer thornless ones will withstand frost, flood, drought, heat, wind and poor soil as well as the wild ones and will produce ten tons of fairly good food where the average wild ones will produce one ton of poor food.

Varieties undergoing Experimental Culture.

Some of the species and varieties of *Opuntias* which are growing under test in my collection for comparison and experiment:

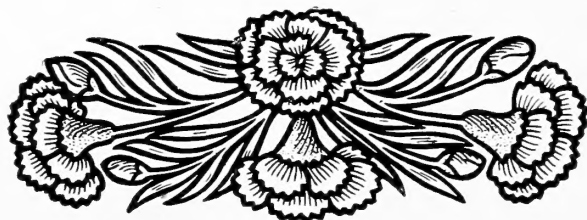
Albispina, *arbuscula*, *arborescens*, *basilaris*, *bernadina*, *brasiliensis*, *camanchica*, *dermatus*, *Emoryi*, *Engelmanni*, *formidibilis*, *frutescens*, *fulgida* (*cholla*), *fragilis*, *galapageana*, *gummosa*, *humifusa laevis*, *leptocaulis*, *lurida*, *missouriensis*, *monacantha*, *macrorhiza*, *nigricans*, *papyracantha*, *phaenacantha*, *Rafinesquii*, *senilis*, *spinosoir*, *triacantha*, *ursina* and numerous other species.

Opuntia Tuna Varieties.—*Amarillo*, *blanca*, *cardena* (U. S. 10179), *chavena*, *colorado*, *crystalina*, *grande*, *jarilla*, *morado*, *tapuna*, *xoconostle*, *vulgaris* and about fifty other varieties.

Opuntia Ficus Indica Varieties.—*Anacantha* (U. S. 9352), *Arizaga* (white), *Arizaga* (yellow), *blanco*, *Bryant*, *catania* (U. S. 3642), *colorado*, *gymnocarpa* (U. S. 12402), *Hayne*, *inermis*, *Malta* (U. S. 9352), *maurisi* (U. S. 9850), *mission*, *monelova*, *Myers*, *Skelley*, *Watson*, (No. 1), *Watson* (No. 2), and numerous others, also *Nopalea*, *Ceruus*, *Pilocereus*, *Mammillaria*, *Echinopsis*, *Phyllocactus*, and others, with twelve thousand seedlings and hybrid seedlings from the best, hardy, most nutritious and rapid-growing so-called thornless varieties.

Climatic Conditions and Geographical Distribution.

The *Opuntias* differ astonishingly in hardiness. Some strains of the common prickly pear (*Opuntia vulgaris*) will grow readily in Alaska and several of the thorny species will endure forty degrees below zero without injury. The best agricultural and horticultural species and varieties are not quite as hardy as the fig, yet are more so than the orange lemon, lime or common blue gum (*Eucalyptus globulus*). Old plants are very much hardier than the young, soft ones. The *Tapuna* strain of the semi-tropical *Opuntias* is the hardiest and bears superior fruit in the greatest profusion and when quite young. The *Tapunas* seem to be almost as hardy as the fig and will withstand moisture better than most of the others.



Of Easy Culture and Rapid Growth.

GROWN FROM CUTTINGS.

Everybody knows that Baldwin apples, Bartlett pears and our favorite peaches, plums and cherries cannot be raised from seeds; just the same laws hold true with the improved Opuntias, but fortunately they can be raised from cuttings in any quantity with the utmost ease—more truly they raise themselves, for when broken from the parent plant, the cuttings attend to the rooting without further attention, whether planted right end up, bottom up, sideways or not at all.

WHERE TO PLANT.

Plant wherever you wish to have them grow, on rich level land or the steepest poorest rocky hillsides, old river beds or rock piles, but their growth and succulence are greatly increased by good soil, some culture and in very dry soils by one or two light irrigations each summer. By such treatment the fruit is greatly increased in size and quality, and the slabs for feeding are doubled in weight and succulence. Nothing responds more promptly to fairly good treatment. They will flourish almost anywhere except where it is too wet for anything else to grow.

WHEN TO PLANT.

Unlike most other plants the Opuntias root best during the heat of summer, and this is the time also to transplant them. They should not be moved at other seasons. No one who is familiar with them would undertake to root or transplant them during cold damp weather such as would be best for other trees and plants. During June, July, August and September they will thrive under almost any treatment; the leaves, blossoms, buds, half-grown fruits or any part of the plant will make roots and grow, even on the floor back of a cook stove, in the pocket of your winter overcoat or on your writing desk.

HOW TO PLANT.

The Opuntias differ from nearly all other plants as the cuttings must first be wilted before they will grow, after which nothing grows so readily. When received place them in some warm sunny place and allow them to remain a week or more, after which they will readily form roots and start to grow anywhere, even on a board, a pile of rocks or the roof of the house if you choose. When wilted, the usual way is to plant so that about one-third of the cutting is below the soil they may be planted in an upright position or at any angle from the perpendicular, it makes no difference to the Opuntias.

DISTANCES FOR PLANTING.

On fairly good soil in general field culture for stock feed, the giant-growing kinds should be planted about three or four feet apart in the rows and the rows should be about eight feet apart. In orchard planting for the large growing, fruiting varieties probably four by ten or twelve feet would be better.

Economic Values of the Opuntias.

First. The *plants* are used for hedges or fences as well as for ornament.

Second. The *leaves* as food for all kinds of stock including poultry.

Third. The *fat young leaves (joints)* make most excellent pickles and are a good and wholesome food when fried like egg-plant. They are also boiled and used as greens and



SPINELESS OPUNTIA IN FRUIT AND PORTION OF SPINY ONE.

are prepared with sugar producing a sweetmeat similar to preserved citron, and may be flavored with ginger or other spices.

Fourth. The abundant mucilaginous juice from the fruit and leaves is extracted for mixing with whitewash for making it lasting when exposed to the weather.

Fifth. The *leaves* are extensively used and most admirably adapted for poultices and as a substitute for hot water bags (thornless kinds of course preferred).

Sixth. The *fresh fruit of the improved varieties* is unique in form and color, superior to the banana in flavor and is usually sold at the same price per box as oranges, and can be produced at perhaps one half the expense of producing oranges, apricots, grapes, plums or peaches, as there is never a failure in the crop which can be shipped as safely as the other deciduous fruits.

Seventh. Most delicious jams, jellies and syrups are made from the *fruits*.

Eighth. The *juice from the fruits of the crimson varieties* is used for coloring ices, jelly and confectionary.

The *fruits and leaves* are sometimes served in various other forms for food by those who are familiar with them.

THE KINDS TO CULTIVATE

As Food for Farm Animals and Poultry.

SPINELESS OPUNTIAS ARE SURE AND HEAVY CROPPERS

PART TWO.

Descriptions of Some of the Best Varieties.

IT HAS been found necessary to give some appropriate *name* to those not having any, as otherwise confusion would reign supreme and no satisfactory classification or description could be given for the guidance of planters.

This list includes nearly all of the older Opuntias well tested on my grounds which seem to be of unusual promise agriculturally or horticulturally. Hundreds of other varieties have either not been fully tested, have been received under several names or have not proved themselves of value equal to those here described. Many so-called "thornless" ones have been received which were far from being of any value except as freaks. Life is too short to be constantly under the surgeon's knife for the removal of spines.

THE BEST OF THESE IMPROVED SPINELESS OPUNTIAS WHEN GROWN UNDER FAVORABLE CONDITIONS ON GOOD CULTIVATED SOIL IN A WARM CLIMATE MAY CONFIDENTLY BE EXPECTED TO PRODUCE ONE HUNDRED TONS OF FEED PER ACRE EACH SEASON.

The *Tuna* and *Ficus indica* classes are without doubt from the same original source, the *Ficus indica* class being only a more thoroughly domesticated one having been more carefully cultivated and selected. For convenience classed as "Barbary figs" and "Tunas."

The *selection of Opuntia cuttings* is of importance. Those who have grown them on the shores of the Mediterranean for hundreds of years always select "*bearing wood*" if fruit is the object, and the least thorny and bristly leaves if a plantation is to be produced for forage. Some of the partially spiny ones may be made almost wholly so by careful selection of cuttings.

ANACANTHA (U. S. 3423.) (*Ficus indica* class.)

This variety has been received from many sources under the name given above, and several others. It is on the whole *nearly or quite the best of all of the older varieties for stock feed*; a tremendous grower rapidly producing great leaves *two feet* or more long by six or eight inches wide, quite thick and often weighing six or eight pounds each, two or three of the larger leaves being enough to feed a sheep a day. No bristles and only a few short, weak spines which can be eliminated by selection. Fruit late and sparingly produced, four and one-half inches long by two inches in diameter, greenish crimson, flesh light yellow, good quality. Seeds abundant but small, extensively grown in North Africa for forage.

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.



YOUNG SPINELESS OPUNTIAS WITH THEIR FIRST CROP OF FRUIT

SMITH (*Ficus indica* class).

This is one of the parents of many of my spineless hybrids, imported from North Africa with five other varieties some fourteen years ago by Prof. Emory E. Smith. A somewhat similar variety but bearing large yellow fruits of good quality was imported by Mr. John Rock thirty-two years ago and sparingly planted, both being more or less thorny, though the thorns are very insignificant when compared with the ordinary Barbary fig. Both are extensively grown in Southern Europe and North Africa and the fruits commonly offered for sale in Paris and other markets. The Smith is a strong grower with rather large leaves (thalli) which as well as the fruit are generally well supplied with bristles and some spines. A most productive variety. Fruit nearly five inches long by two or two and one-fourth inches through. Skin thin, flesh crimson of most excellent quality. One of the best kinds to grow for fruit as it ripens early and is large and attractive by its crimson color but rather difficult to pick or handle unless the bristles are first removed with a whisk broom or by some other means.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.

MYERS.

This extremely fine variety was discovered by Mr. Frank Myers in a garden near Trapuato, Mexico, and has never been known except in the garden where found. The plant is *always absolutely* free from even the least trace of spines and except in rare cases is totally free from bristles and these only on the old trunks. An upright but rather slow grower, leaves sixteen inches long by six wide, very thick and fat. Said to bear large, white, fine, sweet flavored fruit abundantly. The general appearance of the plant suggests that it may be a natural cross of the Tapuna and *Ficus indica* types.

Cuttings: Ten pounds, \$2.00; one hundred pounds, \$15.00.

MALTA (U. S. 9352) (*Ficus indica class.*).

Received through my esteemed friend David G. Fairchild. A good, hardy, rapid grower. Leaves medium size, eighteen inches long by eight wide, very few, short, weak, hair-like spines; bristles almost wholly absent. Fruit nearly four inches long by two in diameter. Skin yellow turning to light red when fully ripe, flesh salmon with crimson shadings, sweet and good but not of best quality. Bears abundantly even when quite young.

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.

GYMNOCARPA (U. S. 12402) (*Ficus indica class.*).

Extra good compact grower, bluish-green leaves eighteen inches long by nine wide and quite thick. Very few, small, weak spines and rarely any bristles. Fruit red, three inches long by nearly two and a half in diameter, free from bristles, flesh crimson, solid, meaty, superior quality. Promises to be one of the very best, for fruiting especially.

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.

SKELLEY (*Ficus indica class.*).

Received from Mr. E. R. Skelley of Riverside, Cal., who imported it from Sicily in October 1895. Strong compact grower of drooping habit; thornless except a few weak, hair-like remnants, almost no bristles. Leaves sixteen inches long by eight across, thick, pale green. Has not borne fruit here yet. Mr. Skelley informs me that it produces superior fruit and is extensively grown for food, being generally offered for sale throughout the Island in the markets. Mr. Skelley found it extensively grown on the bare lava of Mount Aetna without rain for months, "the trunks in some cases being larger around than a man's body."

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.

CORFU (*Ficus indica class.*).

Resembles the Skelley *Opuntia* very much in all respects, it is however not quite as strong in growth and has almost no spines and no bristles. Leaves fifteen inches long by eight wide; thick, pale green. This was imported by Mr. E. R. Skelley in 1899 from the Island of Corfu in the Adriatic where it has been extensively grown for several hundred years. Mr. Skelley writes that "the fruit is delicious." Has not borne fruit here.

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.

CATANIA (U. S. 3642) (*Ficus indica class.*).

From village near Catania, Sicily. Received by the Bureau of Plant Industry through Mr. W. T. Swingle, July, 1900. Said to be a very good fruiting *Opuntia*. Leaves eighteen inches long by eight wide, fairly thick, nearly spineless, bristles short, generally absent altogether. Strong grower, broad weeping habit, has not borne fruit here.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.

MISSION (or Hall) (*Ficus indica* class).

Very similar to Corfu and Skelley but the leaves are larger, fifteen inches long by nine wide, only a few scattering weak spines and no bristles. A good grower of compact weeping habit; fruit size of a hen's egg, red, seedy, fair quality.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.



SPINELESS SEEDLING OPUNTIAS, OCTOBER, 1906.

BLANCO (White) (*Ficus indica* class).

Received from Mr. Walter Bryant, Tepic, Mexico. Strong, compact grower, leaves light green, eighteen inches long by eight wide, some small weak spines, some bristles, not yet fruited here.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$7.00.

MORADA (Reddish) (*Tuna* class).

From near Tepic, Mexico. Similar to Blanco but with dark green leaves twelve inches long by six wide and quite thick, some weak spines and bristles; has not fruited here yet.

Cuttings: Ten pounds, \$1.00; One hundred pounds, \$7.00.

COLORADO (Red) (*Tuna* class).

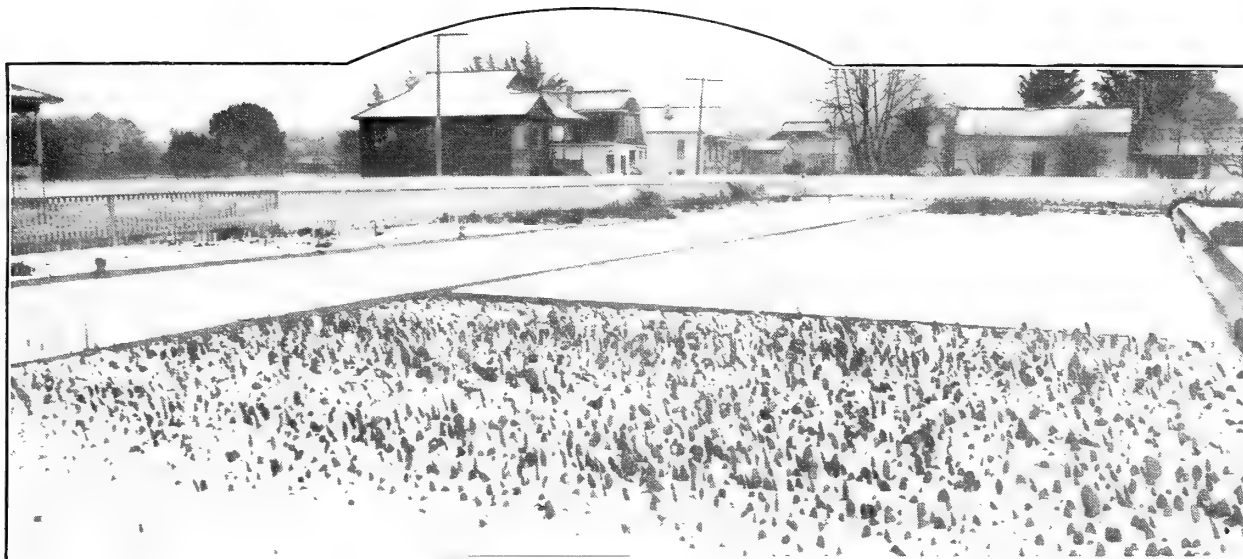
From near Tepic, Mexico. Plant similar to Morada but with smaller leaves. Fruit good, dark red, size and shape of a hen's egg, abundantly produced.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$7.00.

TAORMINA (U. S. 9353) (*Ficus indica* class).

Both leaves and fruit are heavily armed with most diabolical spines and bristles. A strong-growing variety with large broad, fairly thick, pale green leaves. Fruit late, three and one-half inches long by two inches in diameter, pale yellow, shaded red; flesh greenish-white, very sweet and superb flavor, seeds small. Fine for making impenetrable fences. Barbed wire fencing is as cobwebs when compared with it for this purpose. Imported by Lathrop and Fairchild from Taormina, Sicily, Jan. 1903.

Cuttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.



SPINELESS SEEDLING OPUNTIAS JANUARY 11, 1907, UNDER 2½ INCHES OF SNOW.

HAYNE.

This variety was secured for me by Mr. Wm. Ashton Hayne in his travels in Mexico; like Myers it seems to be a cross of the Tapuna and *Ficus indica* classes. Fairly strong grower. Leaves nine by twelve inches, pale bluish-green. No spines and almost no bristles. Very promising. Fruit not seen.

Cuttings: Ten pounds, \$2.00; one hundred pounds, \$15.00.

WHITE FRUIT (U. S. 3186) (*Ficus indica* class).

Strong compact grower. Leaves twelve inches long by seven wide, not very thick, nearly free from spines and bristles. Has not borne fruit here. A promising *Opuntia* for both fruit and forage.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.

MONELOVA.

Secured for me by Mr. Carlos T. Plant near Monelova, Mexico. A strong hardy-appearing plant, leaves eighteen inches long by twelve wide, thick, pale bluish-green. Has short spines and bristles. Said to form a large plant, producing an abundance of excellent fruit. Although this is called a "thornless cactus," yet, the short spines and bristles do not recommend it for forage.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$7.00.

WATSON (*Tapuna class*).

Received from Prof. J. R. Watson of Central Mexico. One of the most vigorous and handsome of the Tapunas. Leaves nearly a perfect circle in outline, ten inches across and quite thick, pale bluish-green; only a few spines, some bristles. Most abundantly roductive. Fruit size and shape of a hen's egg, bright red, rather seedy but good. puttings: Ten pounds, \$1.50; one hundred pounds, \$12.00.

MARIN.

The only one of the older Opuntias which is absolutely without spines or bristles. Small plants, rather tender and of no special use as a forage plant now that better ones are known. Leaves thin, eight inches long by five wide; received from Florida, Hawaiian Islands, Mexico, and is also growing in many places in California. Has not borne fruit here. This Opuntia is often called "Marine" in the Hawaiian Islands and is said to have been introduced to the Islands by Don Francisco de Paula Marin in 1791. Another variety called "papiki", which means cattle-pen, was introduced by Sr. Marin at the same time and is quite common, and though very heavily armed with spines is often eaten by various domestic animals.

Mr. Gerrit P. Wilder, Honolulu, says, "The cattle on the dry and barren wastes of the ranges here depend during the droughts upon the green leaves for their water and we are glad to have discovered this variety here. I am sending you a sample of it thinking you may be interested and trust you will get it in good order. This plant has lately been introduced to the other islands of this group and samples have been sent to the Department of Agriculture, Washington, D. C."

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.

TRAILING

Curious, rapid growing, but still small, spreading plant. Leaves glossy green, always free from a trace of bristles but a single, long, slender spine will appear here and there on the plant, valuable principally for the complete absence of bristles though it will produce more feed per acre than the Hawaiian thornless variety (Marin) and it is much hardier. Leaves average six inches long by three wide and are quite thick. Fruit small, rather seedy.

Cuttings: Ten pounds, \$1.00; one hundred pounds, \$8.00.

Besides those here mentioned I have about three hundred other species and varieties and many thousand seedlings.

Our cuttings are lightly but safely packed so that they will reach you in good condition, transportation to be paid by purchaser.

Please state whether you wish the cuttings sent by express or freight; most of them are too large to be sent by mail. Special express rates are allowed on cactus and other cuttings and plants (if prepaid eight cents per pound).

No order can be accepted for less than one dollar. Terms Cash.

THE NEW OPUNTIAS

Now Offered for the First Time

ALL PRODUCTIONS OF BURBANK'S EXPERIMENTAL FARM.

PART THREE.

New Creations in Opuntias.

I have no time and no desire to introduce these or any other Opuntias and would gladly leave the matter to some one else but so much has been written about them that it seems necessary to have them distributed direct from my own grounds, under my own descriptions so as to avoid as much as possible any misunderstandings, exaggerations or misstatements.

These have all been produced on my own grounds. No person on earth has a plant or a cutting of any of these, except five cuttings, one each of the new "Santa Rosa," "Sonoma," "California," "Fresno" and "Chico" which are now being sent to Australia for sale exclusively in the Southern Hemisphere; and yet so-called "Burbank's Thornless Cactus" has been offered for sale by dishonest parties for two years or more in many of the large cities of both hemispheres.

In producing these new Opuntias many years and much thought, labor and capital have been expended, thousands of crosses have been made and many thousand seedlings raised. The finished product will receive a royal welcome everywhere by those who know.

No cuttings and no plants of those described in Part Third will be disposed of at any price before September first, except that the whole, or not less than one-half interest, including half the stock of any of these new ones will be sold at the prices mentioned. *After September first* if any variety remains unsold cuttings and plants can be supplied.

The analyses given below are by Prof. M. E. Jaffa of the State University.

"SANTA ROSA" (*Ficus indica* class).

This new creation in Opuntias is a strong, compact grower, producing joints (leaves or slabs) more rapidly than any other in my whole collection whether new or old, wild or cultivated, spiny or so-called spineless. The fat dark green slabs are often two feet long by ten inches wide, smooth and with *no thorns and no bristles*. *The first of its kind*. The original plant is only three years old this spring from a seed and yet it is six feet high, six and a half feet across, has now forty-four large slabs and twenty-six have been removed, all of which are now growing plants, besides one sacrificed for the analysis given below. A most remarkable three years' growth from one seed. The leaves are rapidly increasing in size each season. *One leaf* of this with the right to sell in the Southern Hemisphere including all of Africa has been sold to Mr. John M. Rutland of Melbourne, Australia, for one thousand dollars. The number of plants on hand by September 1st, 1907 should be about four to six hundred.

Price for the complete stock before September 1, 1907, \$10,000.

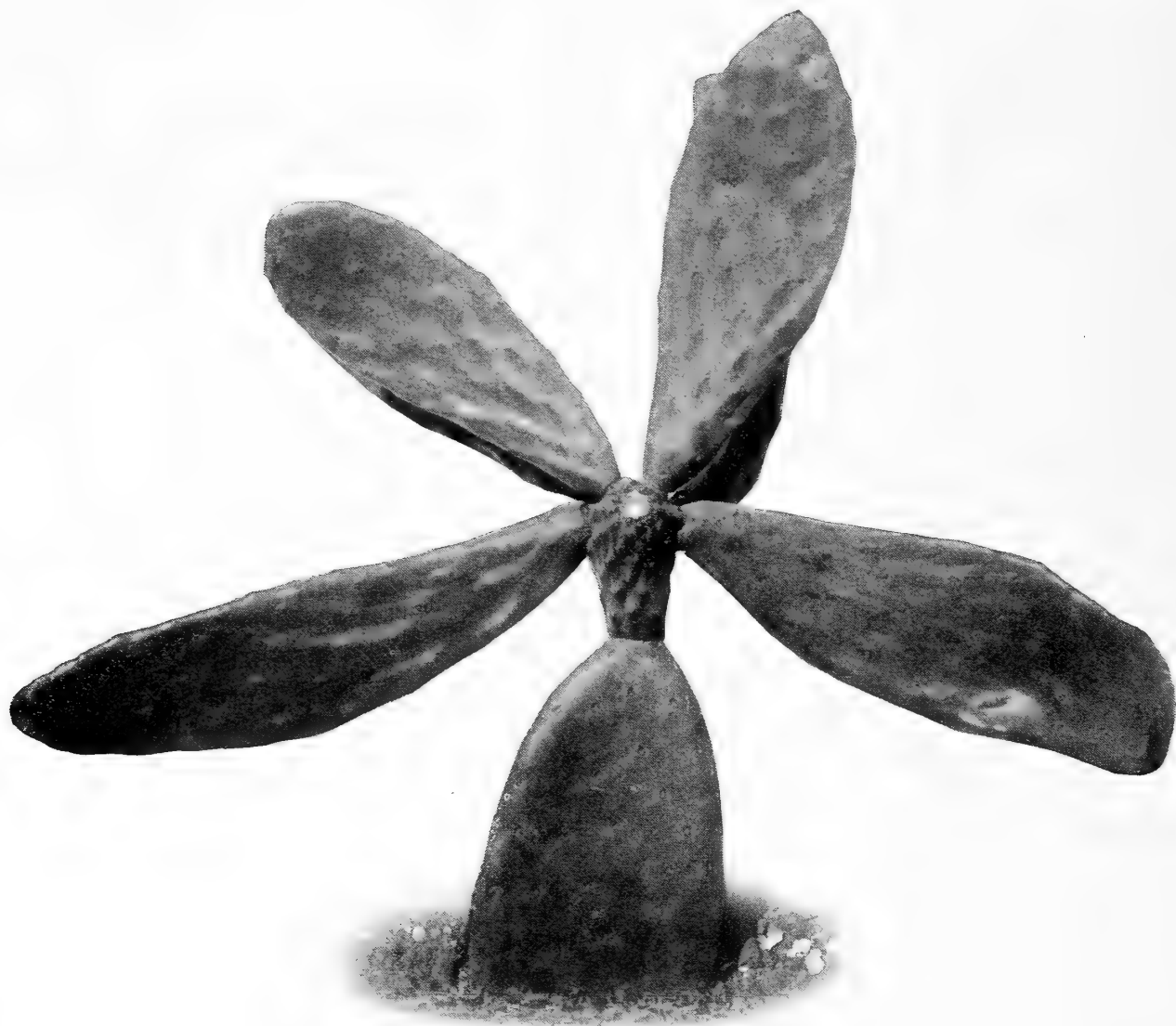
Analysis.—Water, per cent 94.70; Ash .96; Protein .66; Crude Fiber .75; Starch, etc. 2.88; Fat .05.

“SONOMA” (*Ficus indica* class).

Another new *Opuntia* which is of the same age (three years from the seed) as “Santa Rosa.” Its growth is more upright with pale yellow leaves twenty inches long by ten wide and of most remarkable thickness, *in this respect excelling all others.* Like “Santa Rosa” *it has no thorns and no bristles.* Fruit is expected on the original plant for the first time this season. One leaf of this also has been sold to Mr. Rutland with right to sell in the Southern Hemisphere including all of Africa.

Price of all stock before September 1st, 1907, old and young complete, \$5,000.

Analysis.—Water per cent 94.66; Ash 1.23; Protein.72; Crude Fiber .59; Starch etc. 2.71; Fat .09.



A SPINELESS OPUNTIA LEAF CUTTING.
With a single fruit from which are growing five large leaves

CALIFORNIA (*Ficus indica* class).

This grand new *Opuntia* very much resembles “Sonoma” in its strong upright growth and light colored leaves which are twenty-two inches long by about twelve wide and extremely thick. Spines and spicules though not absolutely absent are so rare and so insignificant as to be almost imperceptible.

Price of all stock complete before September 1st, 1907, \$3,000.

Analysis.—Water per cent 94.01; Ash 1.35; Protein .61; Crude Fiber .54; Starch etc. 3.45; Fat .04.

THE TRAINING OF THE HUMAN PLANT

BY LUTHER BURBANK



DEDICATED TO THE SIXTEEN MILLION
PUBLICSCHOOL CHILDREN OF AMERICA
AND TO THE UNTOLD MILLIONS
UNDER OTHER SKIES.

60 CENTS NET ; POSTAGE 5 CENTS

THE CENTURY CO.

UNION SQUARE

NEW YORK

A REMARKABLE BOOK

A Treatise Which Should Prove an Epoch-Making Book.

A book, primarily, for every parent and every teacher, but, also,

A book to be read by every thinking man and woman.

It is a prophecy of the finest race the world has ever known.

It is a startling presentation of the possibilities of the ideal in character.

It is a plea for an heredity, environment, and training which shall realize here and now the ideal.

LUTHER BURBANK claims :

By placing ourselves in harmony and co-operation with the main high potential lines of human progress and welfare we receive the benefit of strong magnetic induction currents.

We are now standing upon the threshold of new methods and new discoveries which shall give us imperial dominion.

“Luther Burbank is unquestionably the greatest student of life and philosophy of living things, in America if not in the world.”—*S. H. Comings, Cor. Sec. American League of Industrial Education.*

“Well worth reading by all parents.”—*Friends' Intelligencer.*

“It should have a place in every normal school library and in that of every parent and all interested in the progress of humanity.”—*Kindergarten Review.*

“DURING THE COURSE OF MANY YEARS
of investigation into the plant life of the world, creating new forms, modifying old ones, adapting others to new conditions, and blending still others, I have constantly been impressed with the similarity between the organization and development of plant and human life,” is Luther Burbank’s introduction to his discussion of “The Training of The Human Plant.”

MR. BURBANK BELIEVES, FURTHER,
that upon a wisely directed crossing of species rests the hope of all progress, and that in the United States to-day exists the grandest opportunity ever presented of developing the finest race the world has ever known.

OUT OF THE RICHNESS OF HIS YEARS
of experience and investigation, Mr. Burbank urges an ideal training looking toward an ideal race. He shows that we are more crossed than any other nation in the history of the world, and that we meet the same results that are always seen in a much-crossed race of plants; if we follow the teachings of nature, we may produce the finest race ever known.

HE DEMANDS FOR THE CHILD OF THE RACE—most sensitive of living things—first and foremost an heredity and environment of love; differentiation in training, sunshine, good air, and nourishing food. He condemns the marriage of the physically unfit, and discusses at length heredity, predestination, training, growth, environment, and character. The fundamental principles of education, Mr. Burbank declares, should be the subject of earnest scientific investigation including *all* the causes which tend **TO PRODUCE MEN AND WOMEN WITH SANE, WELL-BALANCED CHARACTERS.**

EXTRACTS FROM THE BOOK.

“Every child should have mudpies, grasshoppers, water-bugs, tadpoles, frogs, mud-turtles, elderberries, wild strawberries, acorns, chestnuts, trees to climb, brooks to wade in, water-lilies, woodchucks, bats, bees, butterflies, various animals to pet, hay-fields, pine-cones, rocks to roll, sand, snakes, huckleberries and hornets; and any child who has been deprived of these has been deprived of the best part of his education.”

“We are more crossed than any other nation in the history of the world, and here we meet the same results that are always seen in a much-crossed race of plants; all the worst as well as all the best qualities of each are brought out in their fullest intensities.”

“Pick out any trait you want in your child, granted that he is a normal child—I shall speak of the abnormal later—be it honesty, fairness, purity, lovable-ness, industry, thrift, what not. By surrounding this child with sunshine from the sky and your own heart, by giving him the closest communion with nature, by feeding this child well-balanced, nutritious food, by giving it all that is implied in healthful environmental influences, and by doing all in love, you can thus cultivate in the child and fix there for all its life all of these traits.”

“The man or the woman who moves the earth, who is master rather than the victim of fate, has strong feelings well in hand—a vigilant engineer at the throttle.”



"FRESNO" (*Ficus indica* class).

Still another valuable new creation in Opuntias; this is a cross-bred seedling of Smith and unlike its parents and all its seedlings heretofore, has no thorns and no bristles. "Fresno" though *only two years old* from the seed begins to have leaves eighteen inches long by eight wide, quite thick and dark green. Gives promise of being one of the best new forage and perhaps also fruiting Opuntias.

Price of complete stock before September 1st, 1907, \$2,000.



SPINELESS SEEDLING OPUNTIAS UNDER THE SNOW.

"MONTEREY" (*Tapuna* class).

This class is hardier, generally more dwarf and even more productive of fruit than the *Ficus indica* class; the fruit is usually smaller and more egg-shaped, sometimes almost globular. "Monterey" is the most rapid-growing Opuntia and has the largest and heaviest pads, slabs or leaves, of any of this class in my whole collection; they are nearly circular in outline, pale greenish-white, ten or twelve inches across even on one year old plants and are extremely thick. Wholly free from spines except rarely a few short ones here and there; bristles, cottony, harmless. The leaves are yet too precious to spare for analysis; probably very similar to "Chico" as given below.

Price of complete stock before September 1st, 1907, \$3,000.

"CHICO" (*Tapuna* class).

"Chico" is one of the two best of my new Opuntias of this class. The plant is an upright, compact grower with large smooth, greenish-white pads which are *absolutely spineless* and with only small rudimentary bristles. The analysis of Prof. M. E. Jaffa of the State University given below shows its great value for food, the amount of fat and starch especially being a surprise.

Price of "Chico" complete before September 1st, 1907, \$2,000.

Analysis.—Water per cent 92.74; Ash 1.68; Protein .58; Crude Fiber .75; Starch etc. 4.06; Fat .19.



A FIELD OF SPINELESS OPUNTIAS IN A SNOW STORM.

“GUAYAQUIL.”

This new *Opuntia* originated from some seeds sent me from Guayaquil, Ecuador. The *Opuntias* from this source are somewhat more tender than usual but “Guayaquil” seems to be as hardy as any of the Barbary fig class; the leaves are unusually long, slender, thick and dark glossy green (eighteen inches long by six wide). In this new variety the spines are absent and the bristles so reduced as to be harmless. The strain from which this originated bears large, delicious, yellow fruits and this new creation being thornless and of a new type is of unusual promise horticulturally.

Price of complete stock before September 1st, 1907, \$1,000.

HARDY HYBRIDS (*Opuntia Hybrida*).

I now offer for the first time several hundred hybrids of the great spineless *Ficus indica* class and my new spineless, bristleless, hardy, northern *Opuntia vulgaris* (*Opuntia vulgaris* is hardy in Alaska if covered in winter). These *first*, new, hardy hybrids, though all grown from seed of *O. vulgaris*, are *upright growers* like *O. Ficus indica*: Leaves three to six inches long by three to four wide, pale bluish-green, and continue to grow throughout the year whenever the mercury is above the freezing point. The plants therefore increase in size very rapidly and may extend profitable field cactus culture half a thousand or a thousand miles farther north than has before been possible.

Prices for complete stock of some of these new hybrids \$800.00 to \$1,000.00. each before September 1, 1907.

THORNLESS AND SPICULELESS OPUNTIA VULGARIS SEEDLINGS.

For some twelve years I have been growing seedlings, much of the time extensively, from the more or less thornless *hardy* *Opuntias*, and have at last two varieties with no thorns and no bristles so that they may at all times be handled with safety. The fruit of these, though still small and seedy, is larger than usual, smooth, crimson color and of much better quality than the old Barbary fig, produced abundantly.

Also I have a new seedling with very large leaves and larger fruits; no spines and the bristles practically eliminated.

Prices for complete stock of any of these three varieties \$400. each.

Small Seedlings and Hybrid Seedlings of nearly thornless *Opuntias* of several species and numerous varieties per hundred, \$30.; per thousand, \$200.

Purchasers will do well to multiply these new creations in *Opuntias* as rapidly as possible, as there will be a great demand for them.

It is to be hoped that all reasonable questions have been forestalled some-where in this catalogue, as our time is of extreme value. If any questions need be asked they should be brief and strictly to the point.

Thornless Cactus cannot be raised from seeds: Do not ask for them.

Cuttings should always be wilted before planting.

Few of the caeti are of any economic value except the *Opuntias*; of these there are more than one hundred and thirty species and innumerable varieties; all are probably originally natives of America and were cultivated by the Indians long before Columbus discovered America. No class of plants are more easily grown, soil is not of much importance and cultivation almost or quite unnecessary.

For the fruiting *Opuntias* eighteen thousand pounds of fruit per acre is found to be a common crop on the poorest soils. The fruits differ in various ways like apples, plums or

peaches. By analysis they are found to contain about fourteen per cent of sugar besides a small amount of protein and fat. Some contain more of these, some less. Either may be greatly increased by breeding and selection as in the apple, peach, sugar beet and most fruits and vegetables.

The *Ficus indica* class has larger and more fleshy fruits with fewer seeds than the Tuna. Some of the earlier varieties ripen in June and July, the later ones in November and through the winter. Most of them commence bearing about the third year from cuttings.

To prepare the fruit for use cut a thin slice from each end through the skin, then slit from end to end when the skin may be readily removed.

[From Bailey's Cyclopedia of Horticulture.]

“Although extensively cultivated for their fruit in many countries where they furnish an important article of diet for four to five months each year, they do not as yet take a pomological rank with the horticulturist, though they are much more widely used and of far more economic importance than many plants which have been established place in pomological literature.”

* * * * *

“With these and more qualities to recommend them it yet remains for horticultural enterprise to develop a spineless and bristleless variety that will not only be of value for forage but will produce large crops of fruits as attractive to the educated palate as to the savage.”

* * * * *

“Of the *Opuntias* indigenous to the United States none as yet have been grown for fruit or with an effort to improve them.”

The Gentle Reminder by the Roadside.

No one could be more pleased to welcome the general public to my experiment grounds but over six thousand visitors were received during the year 1904. All the important experimental work was delayed beyond recall, grounds overrun with crowds from daylight to ten o'clock at night, no rest even on Sundays or holidays; business destroyed, rare plants died from want of care; attention constantly drawn from legitimate matters, letters neglected, telegrams delayed; meals taken standing, sleep disturbed, health at the point of destruction, visitors calling at all hours without regard to my own convenience, each one being under the fixed and unalterable impression that he or she was the one particular one who should be admitted.

This notice will now be found at every gate:

POSITIVELY NO VISITORS ALLOWED
WARNING—
ANY PERSON ENTERING OR TRESPASSING ON
THESE GROUNDS WILL BE PROSECUTED.

The general public has no moral, legal or other right to invade my grounds, home, private office or laboratories.

EXPERT PUBLIC OPINION

At Home and from Abroad

RECOGNIZES THE GREAT VALUE OF SPINELESS OPUNTIAS

PART FOUR.

Voice of the Press and Public.

The following from the *Journal D'Agriculture Tropicale*, Paris, France contains so much valuable information that I have translated it entire for the information of my readers.



SPINELESS OPUNTIA LEAF.

Planted bottom up showing three weeks growth, indicating how readily they are grown from cuttings under almost any conditions.

"THE CACTUS AS A FOOD FOR DOMESTIC ANIMALS."

The known facts—The cultivation and use of the plant in Algiers and Tunis—The thorny cactus and the cactus without thorns—Leaves (Raquettes) or fruits? The proposed international investigation—Questions.
By M. A. Jehanne.

The Cactus or Indian Fig has a very extensive range. It is to be found today in America from California, Texas and Florida to the Argentine

Republic. It is found again in Madagascar, at Cape Town in Australia and in the Mediterranean basin, especially in Italy, Spain, Algiers and Tunis. In these last two countries stalks (raquettes) are sometimes used as food for domestic animals, and its fruits are much esteemed by the people. Still more is it prized in Italy where the "Indian Fig" cultivated for its fruit, has reached a high degree of perfection.

It is very desirable that the cactus should take as soon as possible an important place in the agricultural regions where prolonged droughts make it very difficult to furnish stock with juicy food where it is almost indispensable during periods of great heat. Many of our colonies would find it greatly to their advantage to cultivate the cactus; and every possible attempt should be encouraged to disseminate it and perfect its culture in Senegal, Soudan, the greater part of Madagascar, in some districts of New Caledonia and Indo China.

The culture of the cactus presents, in fact, some great advantages in the dry regions.

The cactus has a rare hardiness. In Tunis and Algiers it is to be found, to some extent, everywhere, in the plains as well as on the driest hills. In dry earth, on the slopes of hills, in situations most unfavorable to almost all cultivated plants it develops satisfactorily. It endures the highest temperature; although it loses part of its moisture in the dry season it quickly regains it when the first rains come. Again it grows vigorously in the mountain thickets at the edge of the zone of the olive where snow and frost abound. But notwithstanding its great powers of vegetation no region in Tunis or Algiers has ever had cause to complain of the encroachment on cultivated lands by this cactus which is like that produced in Australia, Madras, Cape Town, etc.

The planting and cultivating of the cactus is extremely easy, and the expense entailed is not very great. In Algiers and Tunis, in starting a plantation, it is only necessary to place single leaves (raquettes), or better single leaves with two shoots, in a series of holes on strips of plowed

earth separated by spaces, from which it is not necessary to remove the native vegetation. A little manure is placed in the bottom of the hole, the cutting is placed on top and some earth is heaped up at the base. After that one need only heap up the earth the second year and again the third. There is no need of weeding as the cactus defends itself against foreign plants. The *total expense of establishing and maintaining* a plantation would not much exceed 100 to 150 francs per hectare— (about two acres—\$10.00 to \$15.00 per acre.)

Even if the cactus yielded no product of direct utility, yet it would, on account of its great hardiness and rapidity of increase, perform a very distinct function in preventing the rain from carrying away superficial layers of soil from barren slopes which the rain waters would surely carry to the sea where would be wasted uselessly this most precious portion of the earth's crust, the portion most rich in elements of fertility. Moreover the cactus facilitates the penetration of the earth by waters which reappear below in the form of springs. It is impossible to repeat too often that, in such countries as Tunis and Algiers where frequently torrential rains are separated by long seasons of drouth, too great effort cannot be made to retain in the ground as much as possible of this water which ordinarily trickles away without benefit to agriculture over the numerous barren slopes. It is not necessary to wait until it forms into rivulets before trying to catch it. It is much sooner than this, when the water has as yet formed merely liquid threads which the tiniest obstacle can divert that the effort should be made to make it penetrate the soil. The cactus, planted on cleared strips, worked out according to the contour of the surface, may be advantageously employed to this end.

But, as we have just said, the cactus does afford products of great importance in the feeding of stock. The *Journal Tropicale D'Agriculture* has insisted upon this point and has been quite right in so doing.

In Tunis the stalks destined for stock can be harvested as early as the fourth year and that too without any expense in the maintenance of the plantation. Moreover this yield may continue almost fixed for a very long time as has been observed in the case of cactus plantations as much as fifty years old yet still vigorous and productive. Finally this food can be used during the period when green food is most scarce, *i. e.*, from July to November in North Africa.

This brief review of the services of the cactus is sufficient to prove that it is invaluable to dry regions. And yet, in spite of all its advantages, its area of culture is not in accord with the use which might be made of it. This state of affairs is perhaps due to some difficulties which could probably be overcome, which are presented by the attempt to employ the varieties actually known.

The varieties of cactus, truly very numerous but not thoroughly studied may be grouped from the agricultural point of view into two groups: (1) The varieties with thorns (Kermous en Nessara, of the Algeriens; Hendi Roumi, des Tunisiens) and the varieties without thorns (Hendi Ameles of the Tunisiens). This is a distinction based solely on the presence or absence of thorns on all parts of the plant. The stalks (raquettes) of the thorny cactus are used only with great difficulty as a food for stock. It sometimes happens, however, that stock will eat them when pressed by hunger or by the necessity of finding juicy food in the warm days of spring. But the cropping of this food is rendered difficult on account of the thorns which, moreover, are sometimes the cause of serious inflammation of the digestive organs.

In order to obviate this inconvenience one may expose the stalks to a quick fire; the thorns burn readily. Nevertheless the fact remains that when the stalks are intended to be used in the stock barns, as in mixing with other foods, the gathering and feeding of them is managed only with great difficulty and not without entailing some risk of injury to the workmen who handle them. Moreover it has been observed in Texas that in burning the thorns slight blisters are produced which result in a change in the food substance of the stalk which is capable of causing grave gastric troubles in the animals that consume the food thus treated.

The fruits of the thorned cactus present the same difficulties as the stalks. One may eliminate the thorns from the fruits also by means of a quick fire. The gathering of the fruits which often grow high is particularly difficult and requires considerable labor. This fruit must be consumed immediately as it begins to ferment a short time after it is detached from the stock: Fermentation is the more rapid perhaps because the season of maturity is that of great heat. They mature, in fact, during the summer season, beginning at the end of July and lasting not much more than two months. And at the time of the most abundant production of fruit the scarcity of fodder has not as yet begun to make its sad results so cruelly apparent.

The cactus without spines does not present certain of the difficulties of the foregoing varieties. But, on the other hand, in order to establish a plantation, it is necessary to enclose the field in order to keep the spineless plants from being devoured by stock, whence arises an expense quite large in comparison with the other expenses of establishing a plantation. Moreover, it has been observed, at least in North America, that the yield of fruits from the thornless cactus was less than that of the spined variety. One frequently sees a spined and a spineless cactus growing side by side, the former bearing 12 to 15 fruits to each leaf, the latter only 3 or 4.

In addition to the above disadvantages the cactus stalk is often considered as of no food value or of very little since its proportion of water is 93 per cent. But in spite of this great proportion of water, the stalk can still be of service in the feeding of stock. Different analyses* have shown that it has some nutritive value and also that there are numerous proofs of good results obtained by the mixture of cactus stalks and other food mixtures.

Mr. Ch. Riviere (Ch. Riviere, *The Thornless Cactus*. Review of Colonial Agriculture 1899, p. 136) reports that Mr. Couput recommended a method employed in Algiers for more than fifty years which consists in feeding beef cattle, milch cows, goats, etc., with thornless cactus and chopped straw mixed in equal parts. He points out that 150 lbs. of cactus stalks added to 45 lbs. of ground Carob beans slightly fermented and 25 lbs. of grain or oil cake make a good fattening and appetizing food for the larger cattle, especially for milch cows.

A stock raiser of Texas has also shown that for the fattening of young steers he used, with good results, 60 lbs. of cactus and 6 lbs. of cotton seed meal per head each day.

M. Grandeaup† in a clever article already cited believes that nothing could be easier than to compose a food mixture, equal at least to good wild prairie grass and much superior to the richest grain straw, by adding to the cactus the leaves or twigs of the native vegetation which abounds on the uncultivated lands of the the North of the Province of Tunis. He announces that mixed in equal weights with cactus stalks, the leaves of the strawberry tree, the twigs of the mastic tree and the branches of cytiscus form a food superior to prairie grass. And he adds that several years ago, during the scarcity of fodder, M. Lang, overseer of the Great Dormain in Corsica introduced very successfully into the rations of his cattle a mixture of leaves of the strawberry tree (arbousier) and cactus stalks. He states that the cattle and horses ate it greedily. He has called attention to the favorable results of using the leaves of the strawberry tree as a fattener, which is not surprising considering their heavy component of starchy matter.

In view of the small amount of nutritive matter in the cactus, it has been asked if it were not better to use the fruits in preference to the stalks. It is admittedly very difficult to obtain a crop of stalks and also of fruit the same year and to utilize them at the season when forage is most scarce. A priori, M. Grandeaup, is inclined to sacrifice the fruit to obtain the stalks for stock food; on the one hand because of the stalks' richness in water

which makes it a valuable food during the dry season. On the other hand because it seems better adapted for the coarse mixtures suited to the bovine species.

On the contrary, M. Bourde* is convinced that the use of the fruit is of more advantage than the stalks. In the analysis of Wolf, the Indian Fig is given the following composition:

Dry material	-----	21.60 per cent
Woody material	-----	3.70 per cent
Protein	-----	0.59 per cent
Fatty matter	-----	1.80 per cent
Sugar	-----	14.00 per cent

It should therefore be a very good forage plant of a nutritive value inferior to that of the potato or the Jerusalem artichoke but superior to that of the carrot or the beet. An analysis made in the Chemical Laboratory of the Department of Agriculture and Commerce of Tunis, has given results different from those of Wolf and according to which the nutritive value of the Prickly Pear would be appreciably less than that stated by Wolf. *It may be inferred from this disparity of analysis that the different varieties of cactus have different compositions. There is room therefore to make a careful choice among the varieties.*

M. Bourde, after his study of the cactus, was the originator of an inquiry to find a variety of cactus which would produce regularly the yield of fruit, sometimes cited, of 20,000 kilogrammes to the acre, and which would retain the nutritive value indicated by Wolf. Such a research deserves the most careful consideration. For the results it may bring may contribute greatly to the solution of the difficult problem of feeding stock in regions where prolonged dry seasons prevail, a problem of which the importance to most of our colonies is known to everyone.

In place of limiting the problem of the employment of the cactus as a stock food to the consideration of the thornless varieties alone, it would perhaps be better to extend the research to cover the following points:

1. Are there any regions where the thorned cactus is used practically in feeding stock? The same question as to cactus without thorns. In the case of the use of the thorned cactus, has anyone ever succeeded in completely overcoming the various difficulties arising from the presence of the thorns?

2. Have any differences in hardness been observed between the varieties with thorns and those without thorns? Also have differences in yield of the stalks and the fruits been observed? Are there differences in nutritive value between the stalks and the fruits of the different varieties? (In each case to define the differences.)

3. What is the method of handling the cactus (stalks or fruits or both) which gives the best

*Manual of Algerian Agriculture, p. 219, reprinted in journal d'Agriculture Tropicale, 1902, p. 331, Riviere et Lecq.

†Grandeaup "The Cactus without Thorns," in Nos. 15-20 of *Le Temps*, September, 1903.

*Paul Bourde "Proposed Inquiry upon the Cactus as a Stock Food." *Revue de Tunis*, 1894, p. 54.

results from the points of view of feeding stock with the different aims that one may have (viz., breeding, working, fattening, etc.)? To find out the forage mixture containing cactus which gives satisfaction in each of the above cases.

4. Does there exist a thornless variety productive enough and with fruits rich enough to make its culture immediately profitable? If it does not exist, has anyone anywhere made attempts to create it?
A. JEHANNE.

Tunis, Jan. 15, 1904.

PRICKLY PEARS.

[From Law's Grocers' Manual, London, Eng.]

These are also known among plant lovers as Barbary Figs, Indian Figs, etc. They are the pear-shaped fruit of *Opuntia tuna*, a species of cactus.

There are several varieties, native of South America and Mexico, now grown in the West Indies, Brazil, Florida, etc., but we receive most from Spain, Algeria, and other parts of Africa.

The wild varieties—although sweet, nutritive, juicy and invaluable in dry, hot, sandy countries—are generally flat and insipid to the taste. They abound in India, around Delhi, and were introduced into the Deccan by a Sirdar of the old Poona Court to be grown as a defence against military attacks.

The plants are also found a convenient hedge between fields or a fence about farmsteads, being at once impenetrable and uninflamable. The jointed, juicy, columnar stems of the plant form an excellent fodder for cattle, so do the leaves and fruit, although both leaves and fruit are armed with minute but very sharp and stinging prickles, which produce violent inflammation and swelling, like nettles. Sheep and cattle are very fond of this fruit, and soon get fat on it. In some parts of Africa the leaves are chopped and fed to ostriches and dairy cows during droughts and periods of scarcity. The plant thrives best on barren spots, rocky shelves, etc., where nothing else will grow—and is, therefore, of great value in restoring vast tracts of desert lands to cultivation, although owing to the vitality of its hard seeds, it is difficult to extirpate it when it once spreads. * * *

The proper way to peel the fruit is to hold it on a fork or skewer while you cut it open and remove the skin. They should never be touched by the hand, or they will sting like nettles.

The White Prickly Pear is noted for its agreeable acid flavour. The Yellow is rather sweeter; the Crimson, both large and small, are quite sweet; the Japona is so called by reason of its costive effect when eaten in large quantities; the Pelona (a naked variety, almost destitute of the objectionable prickles) is a great forage plant, and will grow almost in any warm climate if not very damp. The leaves are very large and thick, averaging about 8 lbs. each.

Another variety, the Xoconostle, makes a most delicious preserve, its peculiar "foreign" flavour being much esteemed, and quite as distinct from other jams as Indian chutney is from English pickles.

In practice pear is very seldom fed alone. Even during the severest drought cattle are able to pick up some old grass and get a little browse from the abundance of brush that exists throughout the pear region. It is seldom that the Texas rancher feeds it without some cotton-seed meal, although the cactus of southwestern Colorado has usually been fed alone.

SINGED CACTI AS FORAGE

[From The Pacific Rural Press.]

During the periods of long drought, to which the southwestern United States is liable, range cattle frequently browse upon various species of cacti common to the region.

The Arizona Experiment Station has reported the results of studies regarding the utility of this class of forage plants, particularly after the spines have been removed by burning by means of a prickly pear burner—that is, a gasoline torch similar in principle to that which plumbers use. The spines of about 300 plants of the species of cacti commonly found in the neighborhood of the station, including prickly pears, chollas, etc., were singed, the spines being burned off at intervals for about ten days.

The first 50 plants that were singed were literally devoured by the stock, the prickly pears being eaten nearly to the level of the ground, while only the trunks and woody branches of the chollas remained. As the work was continued from day to day, it was evident that the stock (although under usual circumstances they will eat more or less of the cactus with the spines) were feeding entirely upon the singed plants, and that they readily distinguished them from the unsinged ones. This singeing and close browsing of the cactaceous plants, if continued, would surely result in their final destruction, which would add more distress to what already exists; so that in general not more than one-half of the plant should be singed, leaving the remaining half to restore the growth singed and utilized by cattle.

Conservative estimates indicate that from 7,000 to 11,000 lbs. of cactus forage can be prepared daily in this way at a cost of \$2.40, which represents eight gallons of gasoline at 30c per gal. The amount of water in this forage, as determined in the experiment station chemical laboratory, is approximately 75 to 80 per cent, leaving 20 to 25 per cent, or 1,600 to 2,500 lbs. of solid matter for the day's work.

Cacti have been analyzed at the Arizona and California Experiment Stations. Carbohydrates



ONE LEAF IMPROVED SPINELESS OPUNTIA.

Bearing thirty-two ripe fruits which, without the leaf, weighed seven pounds.

constitute the principal nutritive material in the dry matter of the cacti. The amount of protein present, as in the case with most green fodders, is small. The ash content was found to be high, "suggesting an explanation of the purgative effect of this forage upon cattle."

In the above estimate no account has been taken of the possible expense of one extra man to operate the burner, since ordinarily this work can be done with the paid help already at hand. The relative value of this class of forage is as yet in question. The expense and trouble of burning, however, will be amply justified if range stock can be successfully carried over periods of extreme shortage. The large amount of water in this forage is of no small value to thirsty, starving cattle, doubtless enabling them to feed much farther from their watering places than they could otherwise do.

J. J. Thornber, who carried on the Arizona investigations, states that in using a gasoline torch for singeing cacti, the tank should be suspended from the shoulder in such a way that the end which supplies the gasoline to the burner is always down. As a matter of economy it will be found desirable to maintain a good pressure of air in the tank, and to avoid using the burner in a brisk or even a moderate breeze, since one-third more gasoline is then required.

In connection with an extended study of Prickly Pear and other cacti as food for stock, carried on by D. Griffiths, of the Bureau of Plant Industry of the U. S. Department of Agriculture, data regarding different methods of singeing cacti, the use of the singed material as a feeding stuff, and other questions were considered.

The most prevalent practice in southeastern Colorado, according to Dr. Griffiths, consists in singeing the spines over a brush fire.

This operation is practicable where there is considerable brush or wood conveniently situated, but it has many disadvantages. The plants are collected and hauled to some convenient place where the fire is built. A brisk fire will remove the spines from one side of the joints almost instantly. It is then necessary to turn the plants over and burn them again on the other side. Some careful feeders often leave the plant on the fire until much of the outside has turned black from the heat, in order to insure the removal of the short as well as the long spines. Others exercise less care, and simply allow the flames to pass over the plant, burning off only the distal half or more of the long spines and leaving practically all of the short ones for the cattle to contend with. It often happens that the fuel used is greasewood (*Sarcobatus vermiculatus*) or shad scale (*Atriplex caenescens*), the young shoots of which are of greater nutritive value than the pear itself. On the arroyos and washes dead cottonwood timber is used, while in many localities juniper furnishes the fuel.

This is the most primitive method of feeding and one which has been practiced in Texas since before the Civil War, and is still extensively employed not only in Texas, but also in old Mexico, where singeing the thorns with brush is about the only method employed in feeding prickly pear and other species of cacti.

The use of the gasoline torch for singeing cacti, it is stated, originated in Texas, and is commonly practiced on the range. It is economical from the standpoint of the labor involved, as well as from the quality of the feed.

The process consists in passing a hot-blast flame over the surface of the plant, which can be very quickly done at small expense. The spines themselves are dry and inflammable. In many species one-half or two-thirds of them will burn off by touching a match to them at the lower part of the trunk. The ease with which they are removed depends upon the condition of the atmosphere, the age of the joints, and the number of the spines. A large number of spines is often an advantage when singeing is to be practiced, because the spines burn better when they are abundant. The instrument used for this purpose is a modified plumber's torch. Any other convenient torch which gives a good flame can be employed, the efficiency depending upon the lightness of the machine and the ease with which the innermost parts of the cactus plants can be reached by the flame.

Cattle brought up in (prickly) pear pastures do not have to be taught to eat pear. They take to the feed very naturally. After a day or two of feeding the sound of the pear burners or the sight of smoke when pear is burned with brush, brings the whole herd to the spot immediately, and they follow the operator closely all day long, grazing the pear to the ground—old woody stems and all—if the supply that the operator can furnish is short.

Pear, when burned, scours cattle much worse than when it is simply scorched enough to take the thorns off. * * * Burning with a pear burner tends to kill out the pear if close pasturing is practiced afterward.

CACTUS-FED BEEF.

[From The Butchers' and Stock-Growers' Journal.]

In our issue for March 31st last, under the above caption, appeared an article showing that cacti in general and the prickly pear in particular had been used as a food for stock, and that cactus "fed beef" had already been marketed. Further that that wizard of the vegetable and floral kingdoms, Luther Burbank, had succeeded in developing a cactus without spines and free from acid juice, and more nutritious than the prickly pear.

We have received a very interesting letter from L. Von Tempsky, manager of the Haleakala Ranch Company, Makawao, Maui, T. H., confirming all such statements and giving valuable particulars regarding the use of the prickly pear as cattle and hog food. As will be seen, he states that there is a wild spineless cactus in Maui, which is news to us. While it may not possess all the virtues of the Burbank variety, it is certainly worthy of investigation and propagation. When the right kind of cactus has been obtained there will not be an acre of arid land in California and Arizona which will not be open to cactus cultivation and sustain its share of cattle. This matter is of growing importance, and the letter which is given below, will be read with much interest.

Haleakala Ranch,
Makawao, Maui, T. H., April 17, 1905.

Editor Butchers' and Stock-Growers' Journal:

I read with much interest in your issue of the 30th ultimo the article on "Cactus Fed Beef."

On this ranch we have one paddock of twelve hundred acres covered very thickly with cactus or prickly pear; there is also a slight growth of Bermuda grass growing. In this paddock are pastured all the year round, four hundred head of cattle, and about seven hundred hogs. The cattle only get water when it rains, that is, during the months of December and January; the other ten months they subsist entirely and solely on the fruit and young leaves of the cactus which they help themselves to. It is a remarkable fact that during the dry months of the year, we get more fat cattle per cent from that paddock than from any of the others.

I consider cattle fed on cactus like these are, to have as fine flavored beef as any I have tasted in San Francisco or New Zealand.

The hogs, with the exception of a light daily ration of corn, fed to keep them tame, live exclusively on the young leaves and fruit, which are fed to them by herders, and thrive wonderfully. This cactus has a brick red flower, and a most beautiful claret colored fruit which the Hawaiians ferment, and distil into a very powerful spirit known as "Okolehoa."

The first stomach of cattle eating this fruit is unedible owing to the myriads of small spines which adhere to the walls. I have never known an animal to die from the effects of this.

We have also here the spineless cactus, which is identical with the before mentioned except for the lack of thorns. Where it came from I don't know.

L. VON TEMPSKY,
Manager Haleakala Ranch Co.

CACTUS FOR STOCK.

[From The California Cultivator.]

Many readers have read about the cactus or Prickly Pear which grows on the Great American Desert. This cactus is protected by sharp, stout thorns, which cut like a knife and remain painfully in the wound. Cattle are sometimes seen with these fearful thorns sticking in their lips and tongue, which indicates that in their thirst or hunger they are willing even to brave these weapons in order to secure the cactus. No one could expect them to furnish a Thanksgiving dinner for stock. The Desert is well covered with them in many places, and scientists and practical cattle men alike believe that if the spines could be removed the plant would offer fair food for stock. Various plans were tried for getting rid of the spines. The latest is found in a bulletin issued by the Arizona Station. It appears that a special burner for singeing cactus has been invented. It uses gasoline and gives a fierce heat and flame. The operator carries the gasoline tank on a strap fitted over his shoulder. The burner is supplied from this tank by means of a tube and can be held out at arm's length on the end of a rod. This appliance is moved over the cactus, so that the spines or teeth are singed off, the whole thing being much like a gasoline torch often used by plumbers. It was found that from 7,000 to 11,000 pounds of cactus forage can be singed in one day at a cost of about \$2.40. The cattle ate the fodder greedily after the spines were burned off; in fact they devoured the plants down to the ground at the risk of destroying them, so that now only half of the plant is singed at one time. This leaves half uneaten and the other part grows up again. The cactus plant contains on an average over 75 per cent of water and over six per cent of protein, which latter is about half the amount found in a sample of wheat bran. It would seem as though Nature had placed this food before cattle while in her most bountiful mood, and then in a moment of caprice has put on the spines to keep them away from it. This simple operation of singeing provides a new and excellent forage for range cattle.

CACTUS FEEDING.

[From The Southern Cultivator.]

Out in the cactus section where they feed the spiny cactus they have several ways of making the thorny stuff possible for the stock to eat it. The least troublesome way is to go around the bunches with a long handled knife and trim the edges of the lobes and then the cattle can nibble at it very gingerly, for while the outer rim is taken off there are hundreds of bristling spines to contend with and stick fast in the tender mouth. Mr. Johns of Colorado steams the cactus and this softens them so they are not so dangerous. In Texas they have cutting machines and generally when they cut the cactus up they do not burn the spines off first, but where they do not cut it they singe them off with brush fires, not an inexpensive experiment in a country where fuel is scarce. So the problem is to finally raise a spineless variety that will require no singeing, cutting or steaming. A cow will eat 70 pounds of the prepared cactus in a day and it keeps up the flow of milk.

TRYING TO GET CACTUS' SECRET**Professor endeavoring to discover from whence cometh its water.**

[From The Monterey (Mexico) News.]

Prof. A. F. Collyer, of Massachusetts, an authority on cacti and other desert plants, is in Monterey now and will remain here several days. Prof. Collyer has been in Mexico about six weeks and has visited many different localities in search of rare specimens of the cacti. He has shipped several lots to the United States and stated yesterday that he expected to make some new discoveries before he reached the border at Eagle Pass. The professor is accompanied by two assistants and the driver of the stage, in which they are traveling. Most of the distance is covered afoot, however, as all three of the parties are making researches for the benefit of science. Many curious discoveries have been made by the party and it is probable that most of them will find their way to the various botanical gardens throughout the United States.

In speaking of his profession, for Prof. Collyer says the study of the cactus plant is a profession: "Mexico offers a broader field than all the rest of the world," began the scientist. "There are more varieties of the plant in this country than anywhere else. Few people realize that the cactus is distinctly an American plant. It grows in North, Central and South America, but the mountains and deserts of the rest of the world know nothing of this peculiar plant.

Another point advanced by Prof. Collyer was that all desert cacti had thorns or spines, which perhaps told the history of their being so plentiful in some parts of the world. Were it not for these thorns and spines, the plants would have long ago been destroyed or devoured by man or animal. There are some species of cacti that are edible. The Indians of the southwestern part of the United States eat certain kinds of cacti and the fruits of many varieties are delicious. Here in Monterey one can get all sorts of cacti fruits offered for sale by the vendors and market merchants.

Scientists are endeavoring to discover how to make the cactus an animal food. When this discovery is made it will mean much to the cattlemen of Mexico as well as those of the United States. Another thing is, where does the cactus get the water that goes to make up its substance?

"This question is one that as yet has never been studied scientifically until recent years. Scientists are now making extensive researches and once the facts become known, it will naturally be of great benefit to the Americans of whatever country. There are some of these plants that contain as much as 80 per cent water and still they are to be found miles and hundreds of miles away from rivers, creeks and wells, nor have any rains visited the sections in modern times. Now the question is, where does this plant get the water? It may draw it from the clouds or from the earth and this is just the information we are seeking. I hope that the scientific world will have these facts in its possession before another year rolls by."

The party on leaving here today or tomorrow will go in a northern direction and expect to reach the border in a couple of months. They are taking their time and pitch camp whenever they feel so inclined. It is probable that after crossing the river at Eagle Pass the party will continue on its way to Arizona or New Mexico where additional searches will be made.

Prof. Collyer is writing several articles on the cactus plant which should prove interesting reading when completed.

CACTUS A POSSIBLE SOURCE OF WEALTH.

[From The Sacramento (Cal.) Bee.]

The demand for ethyl alcohol for industrial uses is expected to be very large, now that the heavy internal revenue tax has been removed on that product when made unfit for drinking purposes by the addition of a little methyl or wood alcohol and benzine. This denatured alcohol, as it is termed, may be used for fuel purposes and for lighting, as in Europe. It serves to run automobiles and engines of all kinds, and in the manufactures has a hundred uses. The extent to which it may be employed in this country will depend largely on the cost of making it as compared with gasoline, and estimates are current that under the requirements imposed by Congress it can scarcely be retailed at less than 40 cents a gallon.

Ethyl alcohol may be made from many substances, and one of them is the common cactus of the deserts. A bulletin issued by the New Mexico Agricultural Experiment Station gives some interesting particulars in this regard. It relates the experience of a man in New Mexico who cultivated cactus for a number of years, to see what results could be had. He estimated that if the plant were cultivated on 1,000 acres without harvesting for three years, 100 tons could be obtained indefinitely from that area every day in the year, making 73,000 pounds per acre annually.

That the millions of acres of desert land overgrown with cactus may be made a source of large revenue seems almost incredible, but stranger things have happened. Unless Burbank be badly mistaken, the spineless cactus is destined to become one of the most useful of plants, furnishing abundance of food for man and beast in regions which have been regarded as too sterile and desolate for any form of stock-raising or farming. And the profitable conversion of the common form of the plant into alcohol seems even better assured.

TO LOCATE A CACTI GARDEN.**Government Expert is Here and may Recommend Riverside for Cactus Experiment Station—To Develop Spineless Cacti.**

[From The Riverside Press.]

David Griffith, who is connected with the National Department of Agriculture, is in the city with a view to possibly locating here a cacti experiment station. It is the purpose of the government to locate in California an experiment station to develop the prickly pear into a plant of commercial value as a feed for stock. The government has already established stations at San Antonio, Tex., Organ Mountains, N. M., and a third near Tucson.

Mr. Griffiths will make tests of the thornless cacti developed by Burbank. Mr. Griffith says that all spineless cacti are less hardy than the thorny varieties and it is to breed a hardy variety that he will bend his energies.*

CACTUS CULTURE AN INDUSTRY.

[George P. Hall in The Fruit World.]

"When the laws are perfected so the trust will not have the advantage, the raising of cactus will be an industry of no small magnitude, and the spineless will have the decided preference, in all cactus-growing sections of our State, and a well-stocked cactus farm is one of the probabilities of the future, and he who owns one will be envied by the large landed proprietor and his daughters will be asking "who landed him?"

*This was accomplished on my grounds several years ago, but there is still room for improvement.

IMPORTANT BUT NEGLECTED PLANTS.

"The *Opuntias* are very important and much neglected fruiting plants."

DAVID G. FAIRCHILD,
U. S. Gov't Plant Explorer.

CHARACTERISTIC OPUNTIAS.

[From Forest and Stream.]

"There are many species of the *Opuntia* in Mexico, not less than a hundred, I should think. Some of these have almost no spines on the leaves. (It is by taking advantage of some extreme form like this that Burbank has produced the spineless cactus.) Others have the tufts of spines so far apart that a goat or a deer may insert his muzzle between and get a good bite, though a cow could not. Others have soft spines, especially when the leaf is new.

There are other very large cactuses—those, for example, known as the saguaro, the pitahaya and the sina—which do not provide good drinking water because their juice is very bitter and even nauseating; and it is interesting to note that these cacti, so unpleasant to the taste, are but slightly protected by the spines, while on the other hand the *visnaga* and their agreeable tasting allies possess an almost impenetrable armor of hooked and rigid spines."

BURBANK CACTUS IS A GOOD FODDER.

[From The Berkeley (Cal.) Independent.]

Berkeley, Feb. 8.—Experiments just completed by M. E. Jaffa, head of the department of nutrition and foods at the University, show that the new species of thornless cactus has properties as fodder for cattle which will equal many of the desert grasses. The tests were made at the request of Luther Burbank, the originator of the new species of plant, and have proved to the full the great importance of the new plant as a fodder for cattle in the waste lands. Professor Jaffa's report on the experiment has just been completed, and will be forwarded to Burbank in a few days.

A short time ago five species of the plant were sent to the agricultural station here to determine the food value. The series of experiments carried on by Prof. Jaffa show that the new plant carries nutritive powers which equal three-quarters of that of alfalfa.

SUCCESS DUE TO THE WILD OPUNTIAS.

[From Bulletin No. 74, U.S. Bureau Animal Industry.]

"It is owing to the existence of the prickly pear that the success of the rancher in southern Texas is largely due. He has in this crop a feed which does not deteriorate if not used for three or even ten years; it is as good at one time as another and can be fed by him in a couple of days notice under any circumstances, although it is the general belief that it is much more valuable in winter than in summer."

"As nearly as can be estimated eighty acres of good prickly pear has furnished a full ration for an average of eight hundred head of cattle for a period of six months."

"Hogs fatten very rapidly on cactus but the spines must be carefully removed."

"No manner of feeding cactus yet devised, without greater care than the feeder is usually willing to bestow upon the work, does away entirely with the evil effects of the spines."

BOYS CHRISTIAN HOME
DHOND (POONA), India.

Feb. 9, 1907.

Dear Sir, -

Will you kindly have sent to me a copy of your last priced catalog of seeds of trees, fruits, &c., and also let me know how soon the seeds of your new cactus will be for sale. Because of the two famines of 1896-7 and 1899-1900, the population of India was lessened by 21 millions of souls.

I believe your work in developing an improved, edible cactus will mean much for the saving of life among the poverty-stricken millions of Southern Asia. God bless you in your noble work.

Gratefully yours,

Albert Norton

THIS LETTER is just a sample of hundreds received from the arid regions of the earth.

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A Native of the Cactus Country in America.