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price than is now paid for them; they are tough and strong, and will wear longer than any textile material now used. It is said that garments made of it by the Chinese last through several generations of constant wearing.

But the product is not all coarse and of inferior quality. The French manufacturers maintain that the finest stuff can be fabricated of it, as we know is done in China. It can be readily dyed in various fast colors, and can be applied to all purposes for which the mulberry silk is used. The thread is smooth, strong, lustrous and supple, and the material leaves no waste in carding or spinning. It is reasonable to presume that a tissue of such a character, so easily procured, will play an important role in our industrial pursuits. Even if it furnished nothing more than the lining of our garments, instead of the classic satin, the ephemeral character of which we all know, it would be an invaluable addition to our economic products.

Reliable estimates of the cost of raising a pound of this silk can only be proximately made, but under any circumstances it could not amount to one-fourth the cost of raising a pound of mulberry silk. The fact is it would cost nothing but a little care, and as the worm is so hardy it can be left to do its work without any particular oversight. The unwinding of the cocoons would cost a little, but this could be done by young or aged people at very little expense. The rearing of these worms, which requires no capital to begin with, would be a profitable employment to that class of the community. For the method of "education" I refer to my paper in the report of last year, (p. 374,) where full information is given.

THE MANUFACTURE OF MAPLE SUGAR.

BY C. T. ALVORD, WILMINGTON, VERMONT.

From the earliest settlement of New England to the present time the manufacture of sugar from the sap of the maple tree for domestic purposes has been carried on as one of the branches of agricultural pursuit. Although in its infancy, like many other arts pertaining to the profession of agriculture, the details of the business were but very imperfectly understood, and the different processes in the manufacture but poorly executed, in consequence of the lack of means to do it with, as well as the want of knowledge; yet, notwithstanding all the difficulties that had to be contended with and overcome, and the disadvantages under which the hard and sometimes severe labor had to be performed, the inhabitants in those sections of the country where the business has been pursued have been able to supply themselves from year to year with this indispensable article of food and luxury.

The improvements which have been made in the implements used in the manufacture of maple sugar, as well as the additional knowledge obtained in relation to the different processes to be performed in its manufacture, have been equally great with that of any other department of agriculture. In consequence of the additional facilities afforded, the business has increased and improved from year to year down to the present time—not only affording the manufacturer a superior article for home consumption at a very low cost, but furnishing a large quantity for sale. The demand for maple sugar has increased with the manufacture of the article, so that at the present time there is a ready market for all that is made at very remunerating prices; thus affording profitable

employment to a large portion of farmers at a season of the year when little else can be done in the other departments of farm labor, and wherever the business is extensively and skilfully carried on making it one of the largest and most profitable branches of agricultural industry.

There are, probably, but comparatively few persons, except those engaged either in the manufacture, transportation, or sale of maple sugar, who are aware of the magnitude and importance of this branch of agriculture in this country, and also that the business is carried on in so many different portions and so large a part of the United States. Although it would be difficult, and perhaps impossible, to obtain all the minor details of this department of the industry of our country, yet enough to serve our present purpose can perhaps be obtained from the reports of the seventh census, published in 1850, and the eighth in 1860. From the following statistics published in these reports we are enabled to see the amount of maple sugar and molasses made in each State and Territory of the Union:

States.	Pounds of sugar.		Gallons of molasses.	
	1850.	1860.	1850.	1860.
Alabama	643	543	.....	.....
Arkansas	9,330	3,097	.....	115,673
California	.....	.....	.....	.....
Connecticut	50,796	44,259	665	2,277
Delaware	.....	.....	50	.....
Florida	.....	.....	.....	.....
Georgia	50	991	.....	20
Illinois	248,904	131,751	8,351	21,423
Indiana	2,921,192	1,515,594	170,155	203,028
Iowa	78,407	248,951	3,162	97,751
Kansas	.....	1,548	.....	2
Kentucky	437,405	380,941	3,077	139,036
Louisiana	255	.....	.....	66,470
Maine	93,542	306,742	3,167	.....
Maryland	47,740	63,281	1,430	2,404
Massachusetts	795,525	1,006,078	4,693	.....
Michigan	2,439,794	2,988,018	19,923	384,521
Minnesota	2,950	370,947	.....	21,829
Mississippi	.....	99	.....	.....
Missouri	178,910	142,430	4,241	18,289
New Hampshire	1,298,863	2,255,012	9,811	.....
New Jersey	2,197	3,455	954	8,088
New York	10,357,487	10,816,458	56,547	131,841
North Carolina	27,932	30,845	514	17,759
Ohio	4,588,209	3,323,942	197,298	392,932
Oregon	.....	.....	.....	.....
Pennsylvania	2,326,525	2,768,965	50,711	127,455
Rhode Island	28	.....	4	5
South Carolina	200	205	.....	.....
Tennessee	158,557	117,359	7,223	6,754
Texas	.....	69	.....	3,606
Vermont	6,349,357	9,819,939	5,988	.....
Virginia	1,227,665	937,643	40,322	100,139
Wisconsin	610,976	1,584,406	9,874	83,003
Total	34,253,436	38,863,568	598,160	1,944,299

From the above table it will be seen that maple sugar is made in twenty-eight States and maple molasses in twenty-three. The State of New York makes the most sugar, and Rhode Island the least. Ohio makes the most molasses, and Rhode Island the least.

This report of the maple molasses crop is evidently incorrect, as no returns are given from the States of Maine, Massachusetts, New Hampshire, and Vermont. In the report of the seventh census the returns of maple molasses from these States were as follows: Maine, 3,167 gallons; Massachusetts, 4,693 gallons; New Hampshire, 9,811 gallons; and Vermont, 5,988 gallons—making, in the aggregate, 23,659 gallons. If the ratio of increase in the quantity of molasses is the same as that of sugar in these States from 1850 to 1860, the amount of molasses would be nearly double what it was in 1850, which would make the amount for these States, for 1860, about 46,000 gallons, making the aggregate amount 1,990,594 gallons. From these reports it will be seen that the excess of maple sugar made in 1860, over that in 1850, amounted to 4,610,132 pounds, and the excess of molasses 1,346,139 gallons.

Of the increase in the amount of sugar made in the time mentioned, the Superintendent of the Census says:

"The increase is not large, but sufficient to afford gratifying evidence that our beautiful maple groves and forests are not becoming extinct, while many are preserved with commendable care. We wish it could, with truth, be added that the cultivation of this noble tree was extending in a ratio equal to that wherein the old trees in the forest are diminishing under bad treatment and the demands for new land for tillage. The land-holder who appropriates a few rods of land to the preservation or cultivation of the sugar tree not only increases the value of his estate, but confers a benefit upon future generations."

It will be noticed that the proportional increase in the quantity of maple molasses manufactured in 1860 over that of 1850 is much larger than that of maple sugar. I attribute this to the fact that many farmers are now making "maple sirup" to sell, instead of maple sugar. At present prices it is thought to be more profitable to make sirup than sugar.

A few figures will show the magnitude and importance of the maple sugar crop of any town in Vermont, where maple sugar is manufactured, and the important influence it has on the wealth and prosperity of the inhabitants; the same results extended to counties, states, and the nation, will show corresponding influences and bearings on the wealth and prosperity of larger communities. Take, for example, the town of Wilmington. Calling the amount of sugar annually made in this town 200,000 pounds, it will furnish to each inhabitant 140 pounds. Divide it among the fourteen school districts, and it will give about 14,000 pounds to each district. Reckoning the price of sugar at nine cents per pound, it will amount to $18,000 for the town; this, divided among the school districts, would give about $1,285 to each district, or nearly $14 to each inhabitant of the town. From the foregoing estimates, it will be seen that in all those towns where maple sugar is or can be manufactured, the inhabitants have a reliable and unfailing source from which to obtain a supply of sugar for their own consumption and a surplus to spare. Should it be expedient or necessary, the amount of sugar annually made could be largely increased, as the sugar orchards on many of the farms have not been fully worked. This is probably true of most places, especially in those towns where the later improvements in the manufacture of sugar have not been introduced. The ready sale of maple sugar for a few years past, and the prices which it has brought, I think, are sufficient inducements for all, who have the opportunity for doing so, to engage in the manufacture of this article, and thereby add to the wealth of the country and to the amount of their individual incomes. The maple sugar crop in any section of the country where successfully manufactured is one of the most profitable crops made, and there is probably no branch of the farmer's business that affords as much income and clear profit according to the amount of capital invested and labor expended.

The art of manufacturing maple sugar, in its infancy, in New England, like many other arts pertaining to agriculture, was but imperfectly understood; and in consequence of the lack of means among a large portion of the inhabitants the business was performed in a primitive manner. To a

person accustomed to manufacture maple sugar with all the conveniences and improvements of the present day, it would seem almost impossible to produce the article with the rough and uncouth-looking implements and the scanty and inferior accommodations which our forefathers used. Yet with industry and perseverance they accomplished, in a limited manner, what those of the present day perform on a larger scale.

It will, perhaps, be interesting and instructive to notice the main features of the business as performed by the early settlers of New England, in connexion with the implements used in the prosecution of the work; also to glance at some of the improvements subsequently introduced in carrying on the business, and to speak of the business, as now conducted in this vicinity, with such improvements as have been introduced and successfully used at the present time.

We will suppose that one of the early settlers, a farmer, is going to engage in making maple sugar, he would commence operations in something like the following manner: The first thing to be done is to procure something in which to catch the sap, and just before the season for making sugar arrives, he takes his axe, goes into the woods where the work is to be done, and proceeds to make a sufficient quantity of troughs. These are generally made out of soft timber, such as will split freely and work easily; trees of about one foot in diameter are selected and cut into lengths of from two and a half to three feet; these are split through the centre, and the blocks thus made are dug out with the axe, and made large enough to hold from one to two pails of sap. He next wants some spouts to conduct the sap from the tree to the trough; these are made of some timber that splits well, and are made by cutting or sawing blocks one foot in length, and splitting them into thin, narrow staves. If a crooked "frow" can be obtained to split them with, they are of the desired form; but if they have to be split with an axe, as is frequently the case, then a shallow groove has to be cut on one side for the sap to run in; one end of the spout is sharpened to correspond with the shape of the tapping iron. This instrument is about one foot in length, and made of iron in the shape of a carpenter's gouge, the cutting end being about two inches wide and usually made of steel.

When the sap will run, the trees are tapped by making two incisions on the body of the tree, near the ground (or as near as the snow will admit;) these incisions are made in the form of the letter V; just below the point of these cuts, another is made with the tapping iron by driving it into the tree with the axe, and into this the sharpened end of the spout is driven, and under this spout a trough is placed to catch the sap. Previous to tapping the trees, a place is prepared to boil the sap; this is done by felling a large hard wood tree; from the butt end two logs are cut, the length of these depending on the number of kettles to be used. If only two are used, they would be about six feet long. These logs are placed on the ground parallel with each other, with a space between them wide enough to hang the kettles. At each end of the logs a crotched stick is set into the ground, and across these a pole is laid; from this pole the kettles are suspended. These are generally iron, and hold from twelve to fifteen gallons. In boiling the sap, when the logs are burned up, others are cut from the same tree and rolled up to supply their places. If the tree did not supply logs enough for the season, and others could not be brought conveniently to the fire, a tree was cut in another place and the boiling place removed. It was usually the custom, however, when it was desirable to have a permanent boiling place, to go in the fall or winter previous and cut and pile logs enough near the boiling place to last through the season; sometimes wood was cut and piled ready for use, but generally the wood used was green, and cut from day to day as it was wanted. The sap was gathered and carried to the

boiling place in buckets or pails suspended from the ends of a wooden yoke, made to fit the shoulders of the person who gathered the sap.

In gathering sap when the snow was deep, unless paths were made to go in, it was necessary to use snow-shoes to go around on the snow. Generally a rude shanty was erected near the boiling place, under which the tools that were used and sometimes a little dry wood were placed, and into which the man himself could also go when occasion required.

Our fathers had but limited means for storing the sap when gathered; and during a *good run* much of it would be wasted, and during stormy weather much snow and rain would get into the sap. In boiling sap in kettles hung between logs, the wood to make the fire with had to be set endwise between the logs and kettles, and as the lower ends burned off, the tops of the small sticks would frequently fall into the kettles; leaves and ashes would occasionally be blown in by the wind; and when the sap was nearly boiled down to sirup, it would burn on the sides of the kettles, thus giving the contents of the kettles an additional color. What the precise quality or complexion of the article thus made was, I shall leave the reader to imagine. In some instances the sirup was strained through *hemlock boughs*, and then boiled down to sugar, if a mixture made by boiling such a compound together could be called by that name.

Those who wished to make a nice article would strain the sirup through a linen strainer, then clarify it with milk or eggs, then strain it again and boil it to sugar. In this way a much better article of sugar was made than one would suppose. At the close of the season the troughs were turned bottom upwards by the tree, or set endwise against it, where they were ready for use next spring. The spouts were taken from the trees, and, with the kettles and other tools, carried to the dwelling-house of the owner for future use.

After a series of years wooden buckets began to be used in the place of troughs, and instead of tapping the tree with the axe and tapping iron, an auger was used. The trees were tapped by boring a hole into the tree from one to two inches in depth, and short, round spouts driven into the holes; an iron spike was driven into the tree a few inches below the spouts, on which the bucket was hung by means of a hole bored through one of the staves near the top.

A cauldron kettle was substituted for boiling the sap, and this large kettle was hung up to one end of a long pole resting on a crotched stick set in the ground; this pole was so balanced that when the kettle was filled with sap, the other end of the pole would rise and let the kettle down to the fire; but when the sap was boiled down low, the kettle would rise out of the way of the fire. The advantage of having it hung in this way was, that much less of foreign substances got into the sap while it was boiling; and if the person who was boiling the sap should be absent from the fire for some time, and the sap get low, it would swing up from the fire, and thus prevent it from being burned.

After this, those who had cauldron kettles began to set them in arches made of stone, and these arches were generally protected from the storm by a shelter of some kind, at the same time the wood for boiling the sap was cut the season before it was wanted for use, so that it would be dry when wanted. Those persons having sugar lots near their dwelling-houses, accessible to a team, and having conveniences at their dwellings for boiling sap, drew it and boiled it there; the sap was gathered and put in barrels, and drawn on sleds to the boiling place.

Soon after this, as there began to be a market for maple sugar, those engaged in the business began to build permanent houses and enlarge their accommodations and facilities for manufacturing. These sugar houses are generally built on the sugar lot, and were made large enough to contain the boiling fix-

tures, the storage for sap, the sap buckets when not in use, and generally the wood to be used.

These improvements in the manufacture of maple sugar which have been mentioned would bring us down to about twenty-five years ago in this part of the country, at which time considerable attention had been given to the business, both in the manufacture of the sugar and the preparation of it for market. About this time sheet iron pans began to be used for boiling sap, and from thence a new era seems to have commenced in the business. It was soon ascertained that those who used these pans for making sugar obtained a much better article than those who used iron kettles, and that those who made the best sugar sold it for the highest price; and that while there were generally plenty of customers for a good article, it was often difficult to dispose of an inferior one at paying prices. These considerations, with the increasing demand for maple sugar, have stimulated those engaged in the manufacture to make all the improvements that were possible, so as to produce a superior article at the least expense and with the least labor.

The most approved way of building sugar houses now, in this vicinity, is to locate them so that the ground on one side of the house will be several feet higher than on the opposite side. The general plan of the house and fixtures for boiling and storing the sap is as follows: The house is made large enough to enclose the arch and store-tubs at one end, with the wood in the other end, and the sap buckets in the upper part. The arch is built near one side of the house, and on the opposite side is built a platform on which the store-tubs are placed. These tubs are so arranged that the sap can be drawn by means of a faucet in the bottom of the tubs into a spout, and run into the heater or pans. On the outside of the building the ground is fitted at such a height that the sap can be drawn from the bottom of the gathering-tubs and run into the tops of the store-tubs. With this arrangement all the labor of lifting the sap after it is placed in the gathering-tubs or buckets and brought to the house is avoided; the only force used after this until the sap is in the pans is that of gravitation. In the sides of the building are doors, so calculated as to afford means for the steam from the boiling sap to pass off. The arches are generally built of brick, though where suitable stone can be obtained it is sometimes used. The arch is usually made wide enough to set on one pan and long enough to place one or two pans, as may be required, and a heater. The pans to be set first from the mouth of the arch, and the heater between the pan and chimney. The mouth of the arch is fitted with a cast iron frame and door. About eight inches from the bottom of the arch is a bed on which the fire is made; this floor is generally made of narrow, flat stones, with sufficient space between them for the coals and ashes to fall through into the lower part, and thus prevent the fireplace from getting clogged up, as it would do in boiling any length of time without the floor. In this arrangement of the floor, the draught of air passes under and up through the fire, throwing the flame and heat of the fire against the bottom of the pans. The pans are generally set directly on the top of the arch, which is made level and smooth for that purpose. The ends of the pans rest on iron castings made for that purpose. On the end of the arch where the heater is placed is fitted a cast iron frame, in which the heater sets.

The pans for boiling the sap are made of Russia sheet iron, and are of different sizes, holding from one to four barrels. The size of a pan holding one barrel is two feet three inches long, and two feet wide on the bottom; a two-barrel pan, five feet five inches long and two feet wide; a three-barrel pan, five feet four inches long, three feet three inches wide; a one and a half barrel pan, four feet four inches long, and two feet wide. The depth of the pans is seven and a half inches. The sides of the pans usually flare about three inches on a side, which would make the top of the pan six inches wider than the bottom.

Handles are placed on the sides of the pans near the the top. The cost of the pans will vary with the price of iron and also the quality of the stock; at present the cost is from eighteen to twenty-five cents per pound after the pan is finished.

The sap-heater is a modern improvement; the kind used in this vicinity was invented by a man in this town about fourteen years ago. The first heater that was made has been used every year from that time to the present, and apparently will last as much longer. Experience in the process of boiling sap has shown that whatever vessel is used, the larger the surface exposed to the fire the faster will evaporation take place, and that evaporation will proceed faster in shallow vessels than in deep ones; and on this principle the sheet-iron pan has been constructed. In the construction of the sap-heater the idea was to make a vessel in which a much larger surface of the vessel, and, consequently, the sap, would be exposed to the fire than was in the pan then in use. To accomplish this it was proposed to incorporate into a sap-pan the principle, and, as far as practicable, the form, of a high-pressure steam-engine. (I have been informed by those acquainted with the construction of the engine that this has been accomplished to a certain extent.) The plan adopted was to make a pan, with a box or pit extending down from the bottom of the pan. Into this box were placed a number of tubes; the ends of tubes to be made tight to the sides of the pit, and holes cut through the sides of the pit against the ends of the tubes. In making the pit the holes are first made in the sides; then the tubes fitted in. When the pan was placed on the arch the pit of tubes would be placed in such a position that the heat and smoke of the fire should pass through these tubes, thus exposing a very large surface to the action of the fire, and, consequently, when the vacant places between the tubes were filled with sap, a very rapid evaporation must take place. Another consideration in the use of the heater is, that no additional fuel or heat is required; the heater, being placed in the arch behind the pans, receives the heat from the fire after it passes from the pans, so that all that is accomplished in boiling with the heater is a clear gain in time and fuel. In using the heater it was found necessary to have the top part of it made high, to prevent the sap running over when boiling; for when the fires are hot the heater is filled with foaming sap. Even with the high top it is necessary to have one or two tubes or spouts in the side near the top, to let the boiling sap into the pan before it, and also to make the system of boiling arrangements complete, which will be examined hereafter.

The sap-heater is made of the best quality of tin; the usual size is as follows: The upper part is $19\frac{3}{4}$ by $13\frac{1}{4}$ inches wide on the sides at the bottom, and 18 inches high; the sides flare about two inches, so that the top is about four inches wider than the bottom. The pit is $12\frac{1}{2}$ inches deep. The tubes are $13\frac{1}{2}$ inches long, and $1\frac{3}{4}$ inch in diameter. A pit of this size will contain thirty-five tubes, placed in five rows, seven tubes in a row. Near the top of the heater, on the side next to the pan, one or two tubes are placed to carry the sap from the heater to the pan. On the sides of the heater, at the top, are handles for taking it off. The cost of the heater is from eight to fourteen dollars, according to the size. The method of taking off the heater is to have a windlass directly over it. When the heater is not in use in boiling sap, a piece of sheet or cast iron is used to cover the place in which it sets. To remove the pans from the arch when they contain hot sap or sirup various ways are used. The simplest and safest way that I have tried is to have a strip of board nailed to the studs on the side of the house, the top edge of the board level with the top of the arch; then have two strips of board just long enough to reach from the side of the house to the bottom of the pan on the arch; have the upper side of the ends of the boards next to the pan bevelled off to an edge; place these near the ends of the pan. After most of the sirup has been dipped

out of the pan, stand at the side of the arch between these boards; take hold of the handles of the pan and draw it upon the boards, where it can be emptied of the rest of the sirup. The plan for boiling sap in the arrangement just described is, after the sap has commenced boiling, to have a stream of sap running into the heater, and from the heater into the pan before it, in which it is boiled down to sirup. If two pans are used, the sap is dipped from one to the other.

The quantity of sap which can be boiled in a given time depends on many circumstances. Sap will boil much faster on a clear day than on a cloudy or stormy one, and weak sap will boil away faster than that which is stronger. With a three-barrel pan and a heater, with good wood and favorable weather, sap enough for eighty pounds of sugar can be boiled in a day as an average day's work. The kind of wood used may be either hard or soft, though it is now thought that equal parts of both kinds, mixed together, are the most economical. With one pan and heater the wood should not be cut over three feet long; some think two feet long enough. If the wood is too long it will clog up the back part of the arch with coals, so that the heater will not work as well. My own opinion is, that one cord of wood, (running measure,) two feet long, will boil as much sap as a cord four feet long. One cord of wood, two or three feet long, is calculated to make one hundred pounds of sugar.

The buckets used to catch the sap are made both of wood and tin, the wooden ones being generally used. These are made of pine lumber, hooped with iron, and painted with oil paint on both sides; at the top of the bucket, on the outside, is an ear made of sheet iron, through which is a hole large enough for the spike to pass on which it is hung. These buckets are made at factories, and cost from ten to twelve dollars a hundred, and will hold about ten quarts each. Tin buckets can be obtained at the tin shops, and will cost from twenty-five to thirty-eight cents each. The spouts used for conveying the sap from the tree to the bucket are principally made of wood, although metallic ones are used to some extent. The wooden spouts are made of hard wood, birch making the best. They are made by taking inch boards, sawing them into strips one inch wide, then cut into pieces the length of the spout, which is about six inches; these are then put into a lathe and turned round and smooth, one end of which is tapered down to a little less than half an inch in diameter; a hole about one-fourth of an inch is then bored through the entire length, and the spout is ready for use. These cost thirty-four cents per hundred. The spikes for hanging the bucket on the tree are made of wrought iron, and are about two inches in length, with the head on one side of the nail, to prevent the bucket from slipping off. The present cost is about forty cents per hundred. A common half-inch bit is used for tapping the tree, though many use one seven-sixteenths of an inch for that purpose, and a one-half inch bit for boring the second time.

In all sugar lots, where the surface of the land will admit of a team being used, the sap is drawn from the different parts of the lot to the sugar house, on sleds, by oxen. For this purpose a gathering-tub, holding three or four barrels, is used. This tub is made with a head in both ends, the diameter of the bottom being much larger than the top, to prevent it from tipping when filled. In the top of the tub a hole is cut large enough to turn in the sap; a lid is made to fit this hole, so that when the tub is full it can be closed tight, to prevent the sap from being wasted in going to the house. The tub is fastened on the sled with stakes or chains.

The tubs in the house for storing are usually about the size of the gathering-tubs; they have but one head, and the tops of these are the largest. Both the gathering and storing tubs are made of spruce or pine boards, hooped with iron, and usually painted on the outside. The storing-tubs should be painted

on the inside like the buckets, to prevent them from becoming sour and discolored with mildew.

Whenever storing tubs or buckets become sour, they should be immediately washed clean before putting more sap in them. In those lots where a team cannot be used to draw the sap, a hand-sled can be frequently used with advantage. Many of the sugar lots are located on the sides of hills so steep that neither teams nor hand-sleds can be used to draw the sap. In these lots leading spouts can be used in a way to save much severe labor. By having the sugar house located at the lowest part of the lot, lines of leading spouts can be put up from the house to different parts of the lot, and in these spouts the sap can be run from those places to the house. The first kind of spouts used was made of wood in the following manner: Spruce logs were sawed into scantling 2½ by 3 inches square, from 14 to 16 feet long; on one side of these sticks a groove was cut sufficiently deep for the sap to run; this groove is cut with a shaving or drawing knife made in the shape required. The ends of the spouts are made so that the end of one spout will lap over the other, and are fitted to match so that the sap will not leak at the joints. In the autumn, before the snow falls or the ground freezes, stakes should be set in lines as near straight as possible, extending from the sugar house to those parts of the lot from where the sap is to be brought. The distance between these stakes should be a little less than the length of the spouts. Into these stakes pins should be put for the spouts to rest on, and the pins should be so placed as to make the line of ascent a gradual one. In the spring, when the spouts are wanted for use, they are put up and remain through the sugar season, when they should be taken down and housed in a dry place. In places that are much exposed to the wind the spouts should be fastened to the stakes, to prevent them from being blown down. These spouts cannot be used when it snows, as the snow that falls into them will choke up the passage of the sap, so that it will run over and waste. In rainy weather considerable water will collect in the spouts if the line of spouts is a long one; but, by taking advantage of the weather these inconveniences can generally be avoided. At the upper end of the line of spouts a store-tub is placed; by means of a faucet the sap is drawn into the spouts, and the size of the stream gauged to their capacity. The tin leading spout, lately introduced in this vicinity, is a great improvement on the wooden spout. It can be used as well in stormy as in pleasant weather. It is made in the form of a tube or pipe, in lengths of eight feet. The size of the tube generally made is one-half inch, and costs thirty-seven cents per rod; one end of these spouts is made a little larger than the other, so that the ends will fit tight in putting them up.

The time for making sugar varies with the season. Some years I have known the sugar season to commence the last of February, and in others not till the first of April. The usual time, in this vicinity, is about the 10th of March, and generally lasts about six weeks. The method of tapping the trees is to bore the holes into the tree about one and a half inch deep, having the holes several inches apart. In large first-growth trees, two and sometimes more spouts are put into a tree. In second-growth trees, two spouts in the larger ones and one in the smaller ones is sufficient.

The quantity of sap which different trees produce varies largely; some will produce as many pailsful as others do quarts. As a general rule, second-growth trees that have the most top will produce the most sap; with first-growth trees the difference is not as great. Trees standing in open land will produce much more sap than those growing where the timber is thick. Sap varies much in saccharine strength. Trees growing in open fields, or in exposed places produce a sweeter sap than those growing in the forest. Some years the sap will produce much more sugar than in others. Taking one year with another, eight pounds of sugar to a barrel of sap is a good average yield. It has been

calculated that sap requires to be reduced to about one-twentieth of its bulk, to form good sirup.

In making maple sugar or molasses, one thing is indispensably necessary in order to make a good article; that is, *cleanliness* in every process from the time the sap is collected till it is made into sugar. Great care should be taken that all the implements used to hold the sap or sirup should be kept *clean* and *sweet*. The same care should be taken to prevent all foreign substances, such as bark, leaves, and dirt, from getting into the sap, and also to remove them as soon as possible, whenever they do get in, as everything of this nature has a tendency to impart a dark color and also an unpleasant flavor to the sugar. Sap usually runs best in pleasant weather, when the air is clear and wind west—an easterly wind dries up the sap—but at this season of the year, changes of weather and storms are frequent, and if it can be avoided, sap should not remain out to be exposed to the storm, as water from any source injures the quality of the sugar. Experience has shown that the sooner the sap is converted into sugar after it leaves the tree, the better; and especially is this the case when the weather grows warm; for the sap is liable to *sour* in the buckets, and also in the store-tubs. When the weather is quite warm—as it sometimes is for a day or two—sap will sour in twenty-four hours. At such times the boiling should be forced to the utmost extent, night and day, if necessary. At no time should much sap be allowed to accumulate on hand, if it can possibly be avoided. After the sap has been gathered, if there is dirt in it without ice, it may be strained as it runs into the pans. After the boiling has commenced, it should be kept up without cessation until it is reduced to sirup. Twelve hours is long enough to boil at one time for siruping off. The sirup should be boiled down as thick as it can be strained when taken from the fire. Whatever dirt and scum arises on the surface of the sap when boiling should be removed with a skimmer. As soon as the sirup is taken from the fire, it should be strained into a tub used for that purpose, and allowed to settle. The best strainers are made of home-made flannel—one thickness of cloth answering for a strainer.

After the sirup has settled, it should be made into sugar. Pour off that part which is clear into the pan or kettle to be used in boiling it, leaving the sediment in the tub. By turning some hot sap into this it can be settled again, and either boiled down by itself or with the next lot of sirup. It was formerly the practice to clarify the sirup with milk or eggs, to remove the impurities; but if the sirup be well settled it needs none, for the simple reason that there are no impurities to remove. After the sirup is placed on the fire it should be kept boiling with a steady fire until it is done. Sometimes, while boiling, it is inclined to run over. To prevent this, put a piece of butter the size of a marble into it, and sometimes it may be necessary to put in a second or third piece before it will settle. A very good way is to take a stick long enough to reach across the vessel; lay this stick across the top of it, and from the stick suspend a piece of fat pork; when the sirup rises against the pork, it has the same effect as the butter. If neither of these methods will prevent the sirup from running over, the heat of the fire must be reduced until it boils steadily.

The degree of hardness to which the sugar needs to be boiled depends on the subsequent treatment. If it is to be put into tubs and drained, it should be boiled only enough to have it granulate readily; if it is to be put into cakes, it should be done so hard that it will not drain at all; it is necessary to boil it as long as it can and not burn. There are various ways of telling when the sugar is boiled enough. A convenient and good way is, when snow can be obtained, to have a dish of snow, and when some of the hot sugar is put on the snow, if it does not run into the snow, but cools in the form of wax on the surface of the snow, it is done enough to put into tubs to drain. But when it is to be caked or stirred, it should be boiled until, when it is cooled on the snow, it will break like ice or glass. When snow cannot be obtained, stir some of the sugar in a

dish, and as soon as it will granulate, it is done enough to drain; when it will form *bubbles, feathers,* or *ribbons,* on being blown, it is done enough to cake or stir. To try it in this way, take a small wire or stick and form one end into a loop; dip this loop into the sugar and blow through it to produce the forms described. When the sugar is done it should be taken from the fire immediately, and cooled. It is then ready to be put up in any way that may be wanted. In large places, or where large quantities of sugar are made and the sirup is sugared off at the sugar house, a one-barrel pan fitted to a small arch is used to make the sugar in; but when the sugaring-off is done on the stoves of the dwelling-houses, as large quantities of it are, smaller pans or brass kettles are used. These pans are made of sheet-iron, tin, and copper: a convenient size is one of twenty-two inches long by thirteen wide on the bottom, and thirteen inches high, with handles on the ends. From forty to fifty pounds of sugar can be made in a pan of this description. The general method of putting up maple sugar for family use is to place it in tubs and drain it. When put up in this way, the sugar should stand long enough after it is taken from the fire to become well crystallized before it is put into the tubs. The best tubs for this purpose are those holding from one to two hundred pounds, made flaring, largest at the top, and having two bottoms. There should be a space of several inches between the bottoms, to contain the molasses which drains from the sugar. The upper bottom should be fitted loose, so that it can be taken out when the tub is empty. In this bottom one or more holes should be made for the molasses to drain through. When the tubs are to be filled with sugar, this hole should be stopped with a stick long enough to reach above the top of the tub. After the first batch of sugar put into the tub has become hard, the stick should be loosened and raised a little, and this process continued until the tub is filled. The molasses will drain through this hole into the receptacle below the sugar, where it is secure from dust and insects, and when wanted for use it can be drawn out by means of a faucet in the side of the tub.

Many families are in the habit of stirring a portion of their sugar, as in this form it retains its flavor better than when it is drained, and is in a more convenient form for use. When the sugar is to be stirred it should be boiled hard enough to cake. When it is done, take it from the fire, set the pan in a cool place, and with a wooden paddle commence stirring it briskly, and continue to do so until the sugar is grained and dry, or of the consistency of the brown cane sugars. If it is then put into tight boxes or tubs and thus kept, it will retain the fresh maple flavor for some length of time.

When the sugar is to be caked, it should be allowed to stand after it is taken from the fire until it is partially grained, when it should be run into the moulds. Care should be taken not to let it get too cold before it is put into the moulds, for it hardens so fast at this stage that it must be handled quickly in order to cake in good form. If it is desirable to have the sugar of a coarse grain, it should not be stirred while it is chrystallizing; but if a finer grain is wanted, by stirring it moderately while cooling, any desired grain can be obtained. Both wooden and tin moulds are used to cake sugar in, and these are made of different forms and sizes—the weight of the cakes varying from two ounces to several pounds. The general form of the cake is a square, as this is the most convenient one for packing in boxes, in which form it is put up for market. Previous to putting the sugar into moulds, they should be wet with water as this prevents the cakes from sticking. After the sugar is removed from the moulds, they should be washed before they are filled again.

In draining sugar most of the coloring matter can be taken out and a white sugar obtained; but in this process much of the maple flavor is lost. The method is to cover the top of the sugar with wet cloths, flannel generally being used. These cloths should be wet and washed daily in cold water until they are removed from the sugar

Within a few years the manufacturers of maple sugar in this vicinity have been, to some extent, making maple sirup or molasses for sale instead of sugar. Where it can be sold in this form it saves much labor that is required to make it into sugar. The sirup is put into wooden kegs holding several gallons each, and tin cans holding from one to four gallons each. These cans, after they are filled, are sealed up air-tight, so that the sirup will retain its flavor for some length of time and they can be safely transported to any part of the country.

It will perhaps be unnecessary in this place to speak of the various purposes to which maple sugar and molasses are applied, unless to those who are unacquainted with the article, and to that class of people it will be sufficient to say, that for any domestic purpose for which cane sugar or molasses is used, maple sugar and molasses can be substituted, and in all places where they are to be used in the raw state, I think the maple sugar or sirup is decidedly superior to that of the cane.

In the present complicated state of our national affairs the manufacture and production of maple sugar is a subject which commends itself to the consideration of every one having the facilities for engaging in this branch of business. The present high prices of sugar, if no other consideration was taken into account, are sufficient to induce those engaged in the business to enlarge and extend their operations as far as their means will allow, and also to stimulate others not now engaged in the business to improve those opportunities which they may have of increasing the amount of sugar made, both with profit to themselves and benefit to others.

Aside from the present pecuniary inducements to engage in the business there is another aspect in which it should be viewed, and that is, the relation which it bears to the prosperity of those States in which the business is prosecuted, and to the nation at large. It should be the aim and effort of every individual to develop and bring into successful operation all those industrial pursuits which tend to make our country prosperous and independent of other nations.

At the present time, while our nation is engaged in the great and momentous struggle for the maintenance of its independence and the restoration of its prosperity; while the means and energies of all classes are taxed so severely for its successful prosecution, it is a sacred duty which we owe to ourselves and to our country to exert every energy to the utmost, in whatever department of agricultural industry we are engaged, to produce and furnish all those indispensable articles of food which we need, and thereby do all in our power to restore our country to its former independence and secure its future happiness and prosperity.

FLAX-COTTON;

ITS ADAPTATION TO COTTON MACHINERY.

BY HON. CHARLES JACKSON, PROVIDENCE, RHODE ISLAND.

THE very elaborate and lengthy papers of Mr. Browne and Mr. Leavitt on the history, culture, and manufacture of flax, appended to the able report of the Commissioner of Patents for the year 1861, preclude the necessity, at this time, of further inquiry into those important branches of the subject.

It is proposed to make this paper very brief, and confine it mainly to the