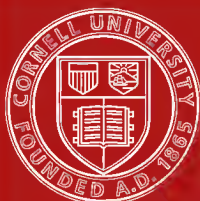


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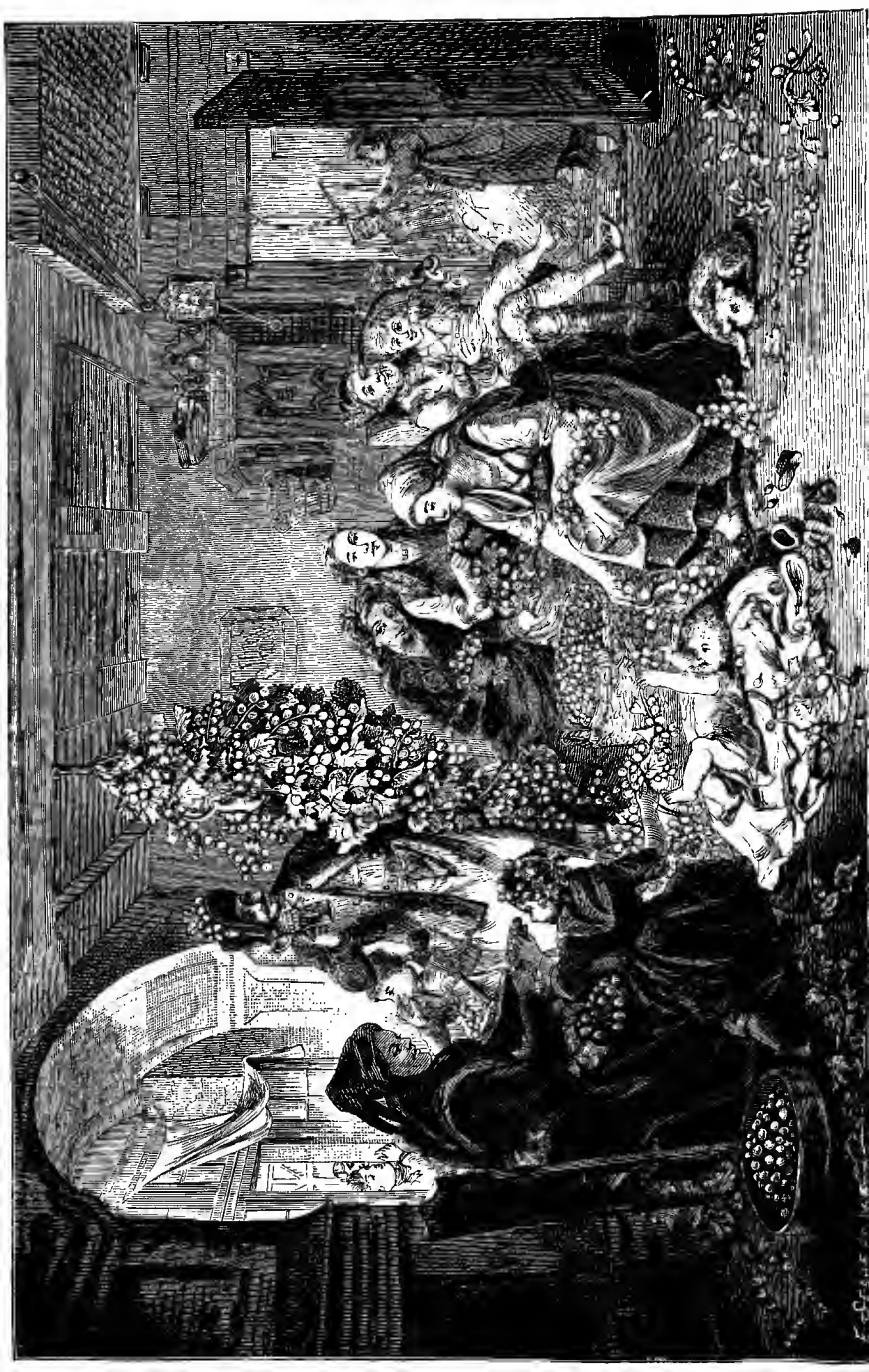
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July 12. 1911.



HOP CULTURE

IN THE

UNITED STATES

BEING A

PRACTICAL TREATISE ON

Hop Growing in Washington Territory,

FROM THE CUTTING TO THE BALE,

BY

E. MEEKER.

WITH FIFTEEN YEARS' EXPERIENCE OF THE AUTHOR, GIVING
MINUTE INSTRUCTIONS HOW TO PLANT, CULTIVATE
AND CURE THE CROP:

TOGETHER WITH

ELABORATE AND GENERAL STATISTICS OF THE HOP TRADE OF
THE WORLD, COST OF PRODUCTION, HOW TO START A
HOP YARD, BEST MODE OF PRESERVING HOPS;
WITH A SYNOPSIS OF ENGLISH AND
GERMAN METHODS.

*To which is added an exhaustive article from the pen of
W. A. LAWRENCE, Esq.,
Waterville, N. Y., on Hop Raising in New York State.*

WITH ILLUSTRATIONS.

PUBLISHED BY

E. MEEKER & CO..

PUYALLUP, WASHINGTON TERRITORY.

PRICE, \$1.50.

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PREFACE.

THE high value of hops prevailing for the past four years, culminating in the unprecedented price of one dollar per pound for the crop of 1882, has naturally attracted a wide-spread interest. An article that can be produced in large quantities, and sold for nearly ten-fold its cost, engenders a speculative feeling akin to that of a veritable gold-mining furore of the palmy days of '49, when the discovery of gold in California was first made known to the multitude. Then, as now, the few amassed fortunes; this was speedily followed by the sore disappointment of the many who rushed into the mines unprepared and inexperienced. Such results, it is feared, may follow those who attempt to engage in hop culture, without knowledge or means, or both, and without first thoroughly investigating the new business proposed.

That hop-growing in the United States is profitable, if conducted with intelligence and care, none can doubt. We have abundant proof of the fact by the success of those who through a series of years have stuck to the business through thick and thin, always producing a good article and prudently placing it upon the market. That it will pay in the future, taking a series of years, is patent to every observing mind, but to those only who will move up to the head of the list, and produce the best quality. No product of the farm known has so wide a difference in value, between the highest and lowest grades, as hops; a difference frequently equal to the cost of production; none are so susceptible to injury by mismanagement or disease; none are so utterly worthless when not properly prepared or not wanted for the use intended;

none are so limited to a single use or so variable in yield; hence, the violent fluctuations in price, and consequent loss in years of plenty and over-production, or in cases of inferior quality from whatever cause.

Having gone through the ordeal of gaining his knowledge of the hop business by keen, dear-bought, actual experience without a guide to rely on, the author appreciates and can testify as to the difficulties that beset the new beginner, sealed as that experience was by heavy financial loss to himself and neighbors. None of the pioneers of the Puyallup valley had the remotest knowledge upon the subject of hop-growing, until the small beginning was made to raise them for market in the year 1866. The result was that many thousands of pounds were lost and totally perished in consequence of inexperienced management; many *hundreds of tons* injured from the same cause, bringing great numbers to the verge of bankruptcy and some to complete financial ruin.

This treatise is not published with a view to *induce* people to embark in the business of hop-raising, but for the purpose of enabling those that contemplate engaging in, or are already in it, to avoid the mistakes of the early pioneers, and save them from great loss, thereby benefiting all in the business by building up such a reputation for the hops as their natural growth deserve.

The export trade can be greatly increased if the standard of quality is raised and kept up to the point our growth will warrant, and in the form of hop-extract as well as with hops in the bale, take possession of the great English markets with other American products.

E. M.

PUYALLUP, W. T.,

April, 1883.

CHAPTER I.

THE CLIMATE, SOIL, LOCATION AND FORMATION OF THE HOP REGION OF WASHINGTON TERRITORY.

THE valley land of the Puget sound basin, or western Washington Territory, is singularly well adapted for raising hops, always producing a certain crop, a heavy yield and uniform extra choice quality. None of the pioneers in hop-growing, in Washington Territory, knew anything of the business; many of them had never seen a hop-vine growing before the planting in the Puyallup valley, of about half an acre in the spring of 1866.

The writer first engaged in the business two years later, planting a couple of acres, and raised the first year a few hundred pounds. The yard has gradually been enlarged, until his crop-yield of 1882, was more than seventy-one tons, giving the Puyallup valley the banner crop, as to quantity, of any in the United States, and as claimed by some, in the world.

A short description of the soil, climate, resources and location of this now famous region, will doubtless be interesting to non-resident readers. It is a region underlaid with coal, and is to the Pacific coast, what Pennsylvania is to the Atlantic seaboard.

Words cannot convey an adequate idea of the immensity of the timber supply or of its value. Lime and iron are found in abundant quantities and in convenient localities. Fish abound in the waters of Puget sound and the numerous rivers emptying into it. Game is abundant and affords rare sport for the hunters; coupled with this is the equable climate, never excessively cold in winter, or hot in summer and always healthful.

The Puget sound basin lies between two mountain ranges, running parallel with the Pacific coast and about seventy miles apart, one the Coast, and the other the Cascade range. Each in many places touch the perpetual snow line, and one peak, Mt. Ranier, more prominent than many others, is the source of seven rivers, being nearly three miles high, with a base of over thirty miles in diameter.

The Puyallup, one of these rivers, is about fifty miles in length, and near its mouth is two hundred feet wide, and from three to seven feet deep, with a rapid current. There are a number of like rivers emptying into Puget sound, all forming rich valleys, adjacent to tide-water. The soil is a rich alluvial deposit, known to be one hundred and forty-four feet deep in the writer's hop yard, where years ago an attempt was made to sink an artesian well, and is exceedingly rich and fertile. There is no subsoil, the hop-roots penetrate deep into the soil and to moisture. In ditching through the hop-yard we found hop-roots very abundant at four feet from the surface, and roots nine feet long have been seen where exposed by the wash of the river bank.

As before mentioned, the great mountain, Ranier, is the source of the Puyallup river. Adventurous spirits have followed the stream up to the perpetual snow line to ascertain from whence came this milky-white turbid water, for fully ten months of the year, and were repaid for their toil by the sight denied to the many, of the actual *live* work of the glazier in the mountain gorge. Issuing from under a vast body of ice, these explorers followed the river in the ice-cavern until only a small speck of light was visible behind them, and were forced to halt. There, under the moving mountain of ice was nature's great mill at work, constantly grinding up the material that is carried by the water to the lower levels and deposited in the sluggish current. Off the mouth of the Puyallup river, where the waters of Puget sound are known to be several hundred feet deep, within the memory of the writer, the land has visibly encroached upon the water; and so the process still goes on, vegetable growth springing up and taking possession of the new-made land. Recently a bridle-path has been cut to this great glazier which can now be reached from New Tacoma, twenty miles by rail and thirty upon horseback, which will doubtless be visited by thousands of tourists in the near future.

New Tacoma, the terminus of the Northern Pacific, is on Puget Sound, near the mouth of the Puyallup river. The hop-region is along and near the branch line of the Northern Pacific, running to extensive coal mines in the mountains. A branch railroad also runs to Seattle through the adjacent valley of White river. This valley is longer and wider than the Puyallup, and is fast becoming

a noted hop-region. The two combined could easily produce as many hops as are now grown in the United States, if labor could be obtained to pick them. The hop-crop in this whole region has never failed, or been attacked with disease, as in older hop-districts of the world, hence the growers of Washington Territory have enjoyed the singular good fortune to have full crops when prices were high. Not so with many other hop-raising districts of the world, for prices run high because of the failure of their crops. In Washington Territory a crop can be raised the first year from the cuttings, planting in the spring and harvesting in the fall. This is accounted for from the fact of the long-growing season, the rich virgin soil, and the strong, vigorous cuttings obtainable.

The nights are always cool in summer, and days never excessively hot; the growth is constant, regular and vigorous. During fifteen years' experience no enemies of the hop have appeared or disease attacked them; it is the hope and belief of hop-growers in Washington Territory that the peculiarity of their climate will always protect them from the ravages of disease so destructive elsewhere.



CHAPTER II.

FIRST HOP-GROWING IN WASHINGTON TERRITORY AND DURATION OF HOP YARDS.

JACOB R. MEEKER, who did not live to see the importance of his work, was the pioneer in the business of hop-growing in Washington Territory. Charles Wood, familiarly known as "Uncle Charlie," a small brewer, residing in Olympia, furnished the cuttings or sets from his garden, and encouraged the enterprise by promising to buy the hops. The roots (about half a bushel) were packed fifteen miles, by J. V. Meeker, on his back to the spot where they were planted, and which to this day is about the centre of the great hop growing region of the Puyallup valley.

These were duly planted in the spring of 1866, and yielded, the first year, one hundred and eighty-five pounds, and were sold to "Uncle Charlie" for eighty-five cents per pound. This "first crop" was cured in the loft over the living-room. The poles were carried to the barn and chairs provided for the "women and children" to sit in while picking. For curing a second crop a small twelve by fourteen feet log-house was duly "fixed up," closely chinked, daubed and underpinned, the earth banked up around the foundation so that not a breath of air could get in below the hops. On the roof, though of clapboards, and open, a formidable ventilator was erected; below a large stove was set, with pipe running around the room, of a capacity for a house of three times the size of the one in use.

The writer will never forget the look of despair depicted upon the countenance of his father, when arriving upon the ground, where he had gone to see the "new hop-house work," and found the upper room filled with fog and the moisture dripping back upon the hops. The old gent was in a "peck of trouble," as he said, declaring that he believed if the "burned thing" (referring to the house) "was turned bottom side up it would draw." After considerable persuasion he consented to tightening the roof and

opening some holes under the foundation, when the fog immediately disappeared, and the "first kiln of hops" in Washington Territory was speedily dried.

In the milder climates of Europe, where the soil is favorable, hops are grown for centuries upon the same ground, yet in practice, yards are changed at stated periods, and many fail after a period of twelve to fifteen years. On this subject Morton says: speaking for England, "No rule can be given for the length of time during which hops can be successfully grown upon the same soil. This must be ascertained by actual experience; but we may state, generally, that hops grow best on a *new* soil, all other circumstances being equal. Ordinary land should be changed once in ten or twenty years. The durability of the hop-plant is very great when growing upon congenial soil, with careful cultivation. It is difficult to ascertain the age of particular plantations; we have one, however, in our possession, which has not been replanted for at least one hundred and fifty years, and it is as flourishing as ever." The same author also mentions a hop-yard that had been in uninterrupted cultivation for *three hundred years*. There are well authenticated cases where hop-roots have been traced *thirty feet deep*; how deep they will go it is probably not known.

In Washington Territory hops have been grown continuously for fifteen years upon the same land without any seeming diminution of the crop, or weakening of the plant. There are hop-yards of that age without a missing hill, or sign of decay. Judging from the great depth and richness of the soil, coupled with the equable mild climate, we may reasonably expect a hop-yard, with proper care, will last and flourish for centuries; hence, great care should be taken in the selection of the land, preparation of the soil, and planting of the roots for a new yard.



CHAPTER III.

PREPARING THE GROUND—METHOD OF PLANTING—SEEDLESS HOPS.

WITH all the conditions favorable, a full crop can be harvested from cuttings planted in March or April. To insure this, sod-ground is selected and double-plowed, that is, a light sod is turned and a second plow run deep in the furrow thus opened, covering the sod with fresh, mellow earth. The next thin sod is turned into the bottom of this deep furrow, which in turn is covered as before, and so on until the whole is double-plowed.

With such management the writer has, for many years in succession, raised full crops from cuttings planted in the spring. Where but one pole to the hill is intended, the plants should be seven feet apart, set in squares. Some growers prefer to set two poles to the hill and in such cases usually plant seven feet by seven and a half or eight.

There is a difference of opinion among growers as to which method is best. Where two poles to the hill is set, the vine is less liable to slip down, as one or the other of the poles are likely to be rough. With one pole to the hill there are many "squat" hills late in the season, as the vines become loaded, especially if the poles are split from clear, free-rift timber.

The objection to the double poles is the vines become interlocked to such an extent that both poles must be taken down at once, which is quite difficult to do without waste, and at best very heavy work. Most growers prefer only one pole to the hill, which is, in the opinion of the writer, the best, and set the hills seven feet apart, in squares. The ground is carefully marked off by stretching a long wire or cord, upon which are short strips of red cloth, fastened the proper distance apart, and short stakes are set to mark the place; the particular method being fully described elsewhere, in the article on hop-growing in New York State.

Each hill of hops consists of two distinct sets of roots or feeders besides the runners or suckers near the surface. Immediately

under the hill is found a sweetish, bulbous root, usually about six inches long and from three-quarters, to an inch and a half in diameter. These are deep down under the crown of the hill and are connected with it by string-like attachments. They are so numerous that from a peck to a half-bushel may often be found in a single hill, are nutritious and are used as food in some parts of Europe. Above these are found a distinctively different kind of root, that extend out laterally from the hill, gradually deepening and ramifying, and are doubtless the main feeders of the plant.

The runners are found near the surface and extend frequently several feet without diminishing in size and have numerous eyes or buds. These are cut into lengths of from four to six inches according to eyes in sight, two or more being desirable to each cutting; or the butt of the vine of the previous year's growth is cut from the crown with two or more eyes or buds attached, make excellent sets to plant, which are called crown-roots. All cuttings should be carefully protected from frost or the drying effects of the atmosphere until planted. Likewise care should be taken not to keep them in piles so as to generate heat. We usually mix them with dry earth, placing a thin, alternate layer first of roots and then of earth, so that the layer of roots shall not touch, the whole covered to keep free from the drenching rains so prevalent in Washington Territory. These runners are usually dug at odd spells during the winter or early spring and immediately prepared by cutting into suitable lengths, and assorting out the largest for planting.

If the ground has been properly prepared, the planting is speedily done. From three to five cuttings are planted in each hill to insure a crop the first year. These are set with the eye or bud pointing to a common centre and upward, the whole being lightly covered and the earth packed well around them. Each set should be planted separate and not in a bunch. Sometimes double hills a foot apart are planted with three cuttings to each and the pole set between them the first year, after which one-half are plowed or grubbed out. This is only done with a view to increase the crop-yield the first year. Every one-hundredth hill is reserved for the male or staminate plant. These are necessary or else the hops will be seedless, unless there are other yards in the

vicinity that have staminates. These will impregnate yards half a mile distant, to our certain knowledge, and possibly farther where the wind is favorable. Many brewers are of the opinion that seedless hops are best, believing the seeds to be worthless, and give great preference in favor of the German hop, in consequence. In an extreme case a Wisconsin hop was found to contain *twenty-one* per cent. of the weight in seeds. We incline to the belief that a less number of staminate hills would be desirable and possibly none would be better. Certain it is that if the seeds *are* worthless, a large amount of dead weight is being transported at a high rate of freight, and which eventually comes out of the grower's pocket by the lessened price his hops will command. The male hills are set afterwards, and a large stake driven deep, close by the hill to permanently mark it.



CHAPTER IV.

CULTIVATION—GRUBBING—SETTING THE POLES—TRAINING.

WITH a new yard nothing is required but to keep the ground well cultivated by frequent plowing and harrowing; also to keep the hills free from weeds or grass, by hand-culture. All vines that appear early in the season, are trained the first year.

The cultivation and care is more expensive, particularly after the second year, when grubbing is required. The runners heretofore described, are usually grubbed out each year, and the crown of the hill cut back to the surface.

After a yard is thoroughly established it would seem that no amount of ill-treatment would kill or subdue it. The most common way to grub is with pronged hoes, carefully digging out the runners and cutting them off, close to the hill as well as the crown of the hill, with a knife. Some take a sharp grub-hoe and cut off the crown close to the surface which also destroys a part of the runners. This is frequently done even after the vine has grown several feet, every vestige of growth being destroyed without apparent injury. In such cases the after-cultivation is depended upon to destroy a sufficient number of the runners, so that what is left is not enough to seemingly injure the crop. A more "barbarous" way to accomplish the same result, sometimes resorted to, but not recommended, is to plow the land from the rows close to the hill and then with a sharp, heavy, two-horse harrow, run lengthwise over the rows; the crown of the hill and runners are destroyed and the whole leveled down to a fine tilth.

One would think such treatment would utterly destroy the hill, but it does not, and large crops follow after such harsh methods. In any event the runners must be kept under subjection to obtain good results. Before the poles are set in the spring, the ground is plowed deep with a double team. We have with fine results followed this first plowing with a subsoil-plow in the bottom of the furrow, sixteen inches deep, requiring three heavy horses abreast.

This was done in March and April. Millions of roots were cut and broken as could be attested by sight or sound following the plow. The after-growth showed the effect the whole season by a more vigorous growth of dark-green foliage in the driest weather, and an increased yield. We also cultivate deep during the whole season, as will be described later on.

One cannot be too careful in setting the poles in a good, substantial manner. If careless work is done, much trouble follows, and oftentimes loss, by the breaking of arms or vines, interlocked with other hills where a pole topples over from the heavy, accumulating load. Sometimes a gust of wind will throw down a good many. We never let this work out by contract and always feel shy of men who boast of the great number they can set in a day. It is *very* important that this work should be well done at the start, for no amount of after-care can repair the damage and make a good job, if once poorly done. A sharp-pointed tool, called a "dibble," is used to make the holes, and in our alluvial, sandy-loam soil, this is easily and speedily made to the required depth, of from sixteen to twenty inches. An expert man will set the pole with a "thug" letting go before it reaches home, to prevent laceration of the hands. One can tell by the sound whether a pole is well set.

Where there is but one pole to the hill, it is set as near perpendicular as possible. With two poles to the hill, the case is different; the tops are leaned out apart, to let as much sunlight as possible in the hill. The cultivation now begins in earnest, and consists of plowing, harrowing or cultivating according to the condition of the yard or fancy of the grower. The best results undoubtedly follow from deep culture, though many growers shrink from the deep plowing, fearing lest breaking the roots, will result in injury.

We have followed this deep culture up to the end of the cultivating season, with good results. A long, narrow-bladed shovel-plow, which we call a "bull-tongue," is a capital thing to root down deep, running it after and in the bottom of the furrow of a side-plow. We aim to plow, harrow, cultivate or in some way go over the yard every week, but generally fall behind, and get around about every ten days. The cultivation is usually done

by the first week of July, for by that time the road is blocked by the arms reaching across the rows and interlocking, so as to utterly preclude the direct passage of man or beast.

Aside from this, we believe the cultivation should be discontinued by the time the bloom begins to appear. At that time the surface of the ground becomes "matted," so to speak, with a mass of fine, infinitesimal roots, that shoot up to the surface, so numerous that a pin could hardly be stuck in the ground without encountering one. These, it is true will re-form if destroyed, but at this stage of growth it is thought best not to disturb them; any way we cannot if we would, on account of the obstructions before stated.

There is a difference of opinion among growers as to hilling up or level culture. Both methods are practised with seeming like results, though more now incline to hill up, both with the plow and by hand, as there is less labor to keep the hill clean, by throwing in fresh dirt to smother the weeds than to remove them. The main point is that the cultivation should be thorough.

The hoeing and weeding of the hills usually begins with the second plowing, and with some, not until the third. It is true economy to begin early and do thorough work in the start; more benefit is derived by so doing, and the after-hoeing is very materially lightened. The pronged-hoe is usually preferred for the first time, as the soil can be dug up around the hill with less damage to the roots than with an ordinary blade-hoe. Later in the season, the pronged-hoe is discarded, as then earth is thrown into the hill around the butt of the vines, to cover up the young growth of weeds.

Simultaneous with the cultivation the training requires the most constant vigilance, first to see that the pole is stocked with the requisite number of vines, and afterwards to fight down the excess of vines, always ready to take to the poles. This last costs us more labor than the first. With new yards, all the vines are allowed to go up the poles that start early enough to bear a crop, but with the old yards the case is different. Where but one pole to the hill is set, from three to five vines are trained, but where there are two poles, three vines to each pole is not considered too many. However, the crop is not measured entirely by the number of vines

trained, as where less in number, the loss is partially compensated by a more vigorous growth, longer arms and further ramifications. In practice many growers let the vines take to the poles, helping only such as go astray, and then later on go through and thin out the excess. This frequently becomes an interminable job, particularly if not attended to in the very nick of time, as often a dozen or more vines are half-way up the pole before attended to. A better way is to train the proper number from the beginning, and persistently fight the excess off. As the growth proceeds, the rank, vigorous growers frequently "get lost" particularly in cloudy weather, and must be helped back to the pole and tied up.

Tying the vines to the poles is usually done with ravelings of coarse burlap, cut in squares for the purpose, or from strips of the inner bark of the cedar; sometimes cotton twine is used. With whatever material it is done, care should be taken not to tie the vines too tight, or in winding them around the pole not to haul it taut to the sharp corners of the poles and thereby break or bruise the vine. This tying is repeated as often as the vine goes astray until the pole is stocked, and gives very much more trouble when it is cool and cloudy than in warm, growing weather. Where there is one vine securely climbing the poles, no tying for new ones are needed, as the training can be done by winding first around the pole and then interlock with the vine above.

By the time the cultivation is done the poles are well stocked with vines, the arms not only reach out across the rows below, but likewise interlock from hill to hill at and near the top of the pole, until by the harvest season there is a perfect canopy of hops almost shutting out the sunlight below. This tends to prevent the growth of weeds, or at best to check them from want of sunlight. From this on, until harvest time, nothing is required but to see to it that the fallen poles are properly propped up and the "squat" hills are attended to. These last are frequently numerous where only single poles are set and the timber from which the poles are split has been clear and the rift fine, leaving the poles smooth. What are termed "squat hills" are where from any cause the vine has slipped down the pole. This frequently

happens as the load of hops accumulate, settling down to the ground, and if not attended to, but left in such a bunch, the hops that rest on the ground will be destroyed, and all will be injured from want of sunlight. Workmen are sent through the yard to carefully push these up the pole with the hand and by help of a wooden fork, then driving a hard-wood wedge into the soft cedar pole. This will effectually keep the vine in place until harvest time.

The whole cost of cultivation and care of hops until picking time, including setting the poles and training, is not far from thirty dollars per acre.



CHAPTER V.

INDIAN HOP PICKERS—HOP BOXES—CARE OF GREEN HOPS.

THE "hops time," as the Indians term the hop-picking, has come to be their regular harvest. The bulk of the hops are picked by Indians; they come from far and near, some in wagons, some on horseback, a few on foot, but the greater number in canoes. Two thousand, five hundred Indians came into the Puyallup valley during the hop-harvest of 1882. They were of all conditions, the old and young, the blind and maimed, the workers and idlers, making a motley mess curious to look upon. These were from all parts of Puget sound, from British Columbia, and even from the confines of Alaska. The furthestmost tribes come in their large canoes (made from the immense cedars of that region), so large that they dare and do venture to sea in them, in their seal-fishing season, manned with twenty men or more. The voyage to the hop-yards is all by the inland channel and among the islands of Puget sound. Oftentimes a month is occupied in making the trip, leisurely working their way, camping here and there to hunt or fish, as their inclination prompts.

Wherever night overtakes them they are at home, and when they arrive at the hop fields a few hours suffices to construct their camps, and be ready for work. When fairly settled down to it they are inveterate and reliable workers, going to the hop-field as soon as they can see to work carrying their dinners with them, and remaining until pitch dark. Experts among them make as high as three dollars a day in some cases, but taking the average, only about one dollar and a quarter a day.

It sometimes happens that all the hops cannot be hauled, though the teams frequently run until nine or ten o'clock at night. In such cases, the hops are stirred in the boxes during the night if any signs of heat is developed. Great care is required with the full boxes at the kiln while awaiting their turn to be emptied. If neglected a discoloration follows, that at least mars the look of

the sample, if no other harm follows. Some growers empty the hops as brought in, on a floor prepared for the purpose. Latterly this is not practised as at first. Of course where no such room is provided for the green hops, there must be extra boxes. In practice, more than double the number being used in the field, is required, as some are standing full on the platform, while a part are in transit to and from the house, and a few always in the carpenters' hands for repairs. It is great economy to have plenty of boxes.

These standard boxes, now generally adopted, are five feet, ten inches long, by two feet, ten inches wide at the top, and four feet, four inches in length by one foot, four inches in width at the bottom, all inside measure. The corner-posts are made of fir, two inches square; the bottom is also made of fir, and should be one piece, of three-quarter-inch stuff. The sides and ends measure twenty-eight inches in depth on the slope and consist first at the bottom of fir, one by four inches, and to which the bottom board is securely nailed; next above this is half-inch cedar, then next above this on the sides, a clear strip of fir one and a quarter by four inches, and eight feet long, which project at each end (as shown in figure 2) and are of a shape suited for use as handles with which

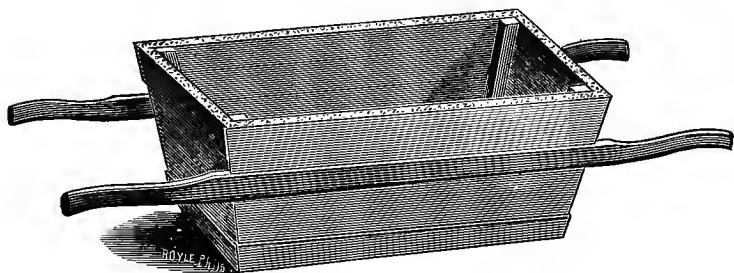


FIG. 2.—HOP BOX.

to carry the box; above this is another ten-inch cedar. The upper edge of this should be thickly driven full of brads or lath nails to prevent pickers from slyly reducing the size of the box by splitting off part of the top board. At the ends, the four by one and a quarter inch fir strip, to correspond to that of the handle should be at the top, as protection from breaking by weight of poles laid on it. Formerly the corner-pieces projected above the

top of the box, upon which cross-pieces were mortised, to furnish a rest for the pole, but these are being discarded, and temporary forks set in the ground used instead. These projecting pieces were found to be inconvenient in hauling or storing.

From what has been written one can readily see that the cultivation of hops require constant care and vigilance; our *real* trials only begin after the cultivation is ended. If ever there was cause for anxiety the hop-growers of Washington Territory have it when harvest time approaches. Most of the picking is done by Indians, many of whom come long distances, some of them three hundred miles in their canoes, bringing with them their dogs and their cats, their chickens and trumpery as though they had come to "stay all summer." The question of questions with the hop-growers, will enough come? if so, will they arrive in time? From a supposed short supply of help timid growers will become scared and begin to bid up and run after fresh arrivals. The Indians are quick to perceive the situation and ready to profit by the anxiety of growers and to drive the best bargain possible. They are masters of the situation, or think they are, and oftentimes there is much trouble and expense incurred from the scramble among growers to procure pickers. As the acreage has increased however, the supply of labor has thus far been ample, so that there has never been any real loss from lack of pickers. How far this can go is a vital question, for upon the answer to this depends the possible extent of the production of hops in Washington Territory. We could raise hops enough to supply the world; just how many can be picked is a problem that will be speedily tested by the increased acreage being planted.



CHAPTER VI.

RIPE HOPS—EARLY PICKING—HAULING—TAKING DOWN THE POLES—PICKING.

BEFORE picking begins the yard is carefully examined to select the ripest portion. At best the work must begin prior to the hops being fully ripe, or else before the picking is done the hops would be over-ripe and be injured. A hop when fully ripe and well matured will be well and compactly closed at the point; it becomes harsh and crisp to the touch and makes a rustling noise when clasped in the hand. The seed will be hard and a dark, purple color. The color of the hop will have changed from a greenish cast to a light yellow or golden. The lupuline will be abundant, not only at the base of the leaf or carpel, but will extend well out on the leaf; the little yellow globules of lupuline will show brighter and larger than in an unripe hop. Great loss in weight as well as of value follows from early picking. Another description of a ripe hop found in Morton's Cyclopædia; says: "A hop may be considered ripe when it becomes hard and crisp to the touch; when the extreme petals project in a prominent manner at the tip of the hop; when the color is changed from a light, silvery green to a deep primrose yellow, and when on opening the flower the cuticle of the seeds is of a purple color, and the kernel or seed itself is hard like a nut. Even after the hop has attained a lightish-brown color no real injury to its quality will have accrued, and for many purposes, such hops are most esteemed in the market."

Chas. Whitehead, says: "Hops are not, as some suppose, distinct flowers, but are strobiles or collections of imbricated scales (bracts) under which are yellowish, aromatic, lupulinic glands. These strobiles are like the cones of a fir tree, being in reality the fruits of the hop-plant rather than its flowers, which are represented at an earlier stage by the burr. The time at which these fruits or strobiles are fit to pick is indicated by the change of color from a

light golden to a somewhat deeper hue; also, by their closing up at the tips, and making a rustling sound when touched. Their seeds or glands, should be firm and dark in appearance and should "cut hard" before the hops are gathered."

Doubtless much greater loss occurs from too early picking than at first thought would seem possible. There is an actual loss in weight from the lack of a full development of the lupuline, which will frequently amount to as much as eight or ten per cent. of the whole, and *forty to fifty* per cent of the intrinsic value.

At best not more than eighteen per cent. of the gross weight of hops is of value to the brewer; if half of this is absent, or say nine per cent. of the whole, the intrinsic and eventually the commercial value of the hops will be reduced in like proportion. The grower loses in weight by picking unripe hops in the first place, and the brewer still more by the undue proportion of weight of no value to him; but sooner or later he comes to know the value of such and rightfully throws the whole loss upon the grower, by a reduction in price, and he gets not only a smaller quantity but likewise a less price; a keen-cutting, two-edged sword that surely ought to open the eyes of the least observant growers.

A touch of a reddish cast on a hop-sample, where not caused by disease is not held to be a blemish, but rather as an evidence of ripeness, which it is, and hence does not detract from its salable value, but rather adds to it. This early picking will doubtless in part account for the varied experience of brewers with "Territory hops," some giving nothing but unstinted praise while others only unmeasured condemnation. The grower naturally will ask what is he to do about it? He can now only barely get through his harvest in time to save the last of his crop. Nothing can be done except to provide more drying capacity, secure more pickers and shorten the harvest season. This can only be done at considerable increased cost, but in the end will pay. It would be better that the later picking, if blackened, should be sent to the extract factory, rather than that immature hops should be put on the market to throw discredit upon the whole product. This will imply higher prices for picking, and with a likewise corresponding increase of expenditure for transportation of the greater number of pickers required, (as doubtless, soon at least, a

part of the transportation charges will have to be paid by the grower), and an earlier limit of the acreage possible to get picked will be reached. It will also imply farther, that in seasons of excessive yields and low prices that the ripe, mature hops will sell, while those known as early-picked growths will remain unsold until either ruinous prices are accepted or become trash and dumped out of warehouses to save further storage charges. It has been suggested, and is more than probable, that an immature hop has not the keeping qualities of a ripe hop; it stands to reason that such is the case.

The hop-boxes are each single, and are constructed wider and longer at the top than at the bottom, that pickers can easily stand up close to them as likewise that the box may not strike the heels of the front man in carrying to and from the wagon, or in and out of the kiln. These hold nineteen and an eighth bushels struck measure, which weighs an average of one hundred pounds when green and twenty five pounds when dry. The hops are hauled on wagons or sleds in these boxes and emptied from them directly on the floor of the kiln. No certain number of pickers are allotted to a box, as the Indians come in families and work accordingly. In fact, most of the hops are not picked into the box directly, the Indians preferring to pick on mats or blankets spread on the ground, and when a sufficient quantity is picked to fill a box, they are transferred quickly in baskets by the pickers. This is done by the pickers to avoid the settling of the hops incident to long standing where the hops are picked directly into the box.

Although not quite so many hops are got into the box in consequence of this practice, it is preferable as affording a better opportunity to examine the picking and insist upon good work. Of course the hops should be picked free from leaves; as near as practicable they should also be picked separate and not in bunches. The vine is cut three feet from the ground, and the lower portion unwound from the pole. It is thought best to cut them well up from the ground to prevent the hill from bleeding.

The vines that interlock with other hills at or near the top of the pole are then cut with a hook made for the purpose, usually from a worn ten-inch file. This hook is fastened to a long handle so that the topmost vines can be easily reached. The pole is then

swung to and fro as it stands, to loosen it. Great care is required in this to prevent breaking. Many are broken in this way at best. The pole is then lifted up clear of the ground and placed either with the top end projecting over the box and the butt end on the ground, or on wooden forks improvised by the pickers for their own convenience. One stout man to every twenty pickers is considered necessary as a helper in taking down poles, cutting the vines apart, making roads and as a general assistant. The Indians clamor for more help, generally for one of their own number, who if not watched, will infrequently help his friends in picking while drawing wages, instead of doing the work allotted to him. In practice the Indians will lay hold and help themselves to a pole rather than wait for the assistant.

A general superintendent and paymaster is constantly in the field to pay for and receive the boxes. In large yards, where there are a great many pickers, and necessarily scattered, it has been found advisable to have a number on each box, so the foreman can make a note of it in his book when he receives it, otherwise before the wagons come, and the foreman is in a distant part of the field, a box may disappear and pay claimed for it a second time. A check of the value of one dollar is paid for boxes the size described. In some yards a regular system is inaugurated; the foreman is charged with the checks in the morning that are issued to him; he, to protect himself, exacts a receipt from the teamsters, who in turn deliver the boxes to the foreman at the kiln, where a strict account is also kept. These checks are paid at the office in specie (generally silver), as presented. Sleds are frequently used in hauling the hops where the yard is small and the distance not great. These are very objectionable because of the injury to the yard, packing down the ground very solid. Latterly wagons have been more in use.

The poles are thrown in convenient piles by the pickers and the vines left on them until later in the season, when the yard is "cleaned up." The vines are then stripped from the poles, and these last put in piles crossed at one end, or in some cases stood up in stooks. It is best not to burn the vines until later in the season, after the leaves have fallen off. In fact it would be better not to burn them at all if they could be cheaply cut and plowed under, but no way has yet been devised to do it without too great an expense.

CHAPTER VII.

DRYING—IMPORTANCE OF LOW TEMPERATURE—GREAT LOSS FROM HIGH DRYING.

THE value of a hop is contained in the lupuline, a yellow substance found at and near the base of the leaf. This substance is the bitter principle of the hop and consists of numerous small globules of a bright, golden color, that in their natural state are seen to stand out prominently with a fairly shining, or almost glistening color, and emits a sharp, pungent flavor, readily known by experts, but not so easily described.

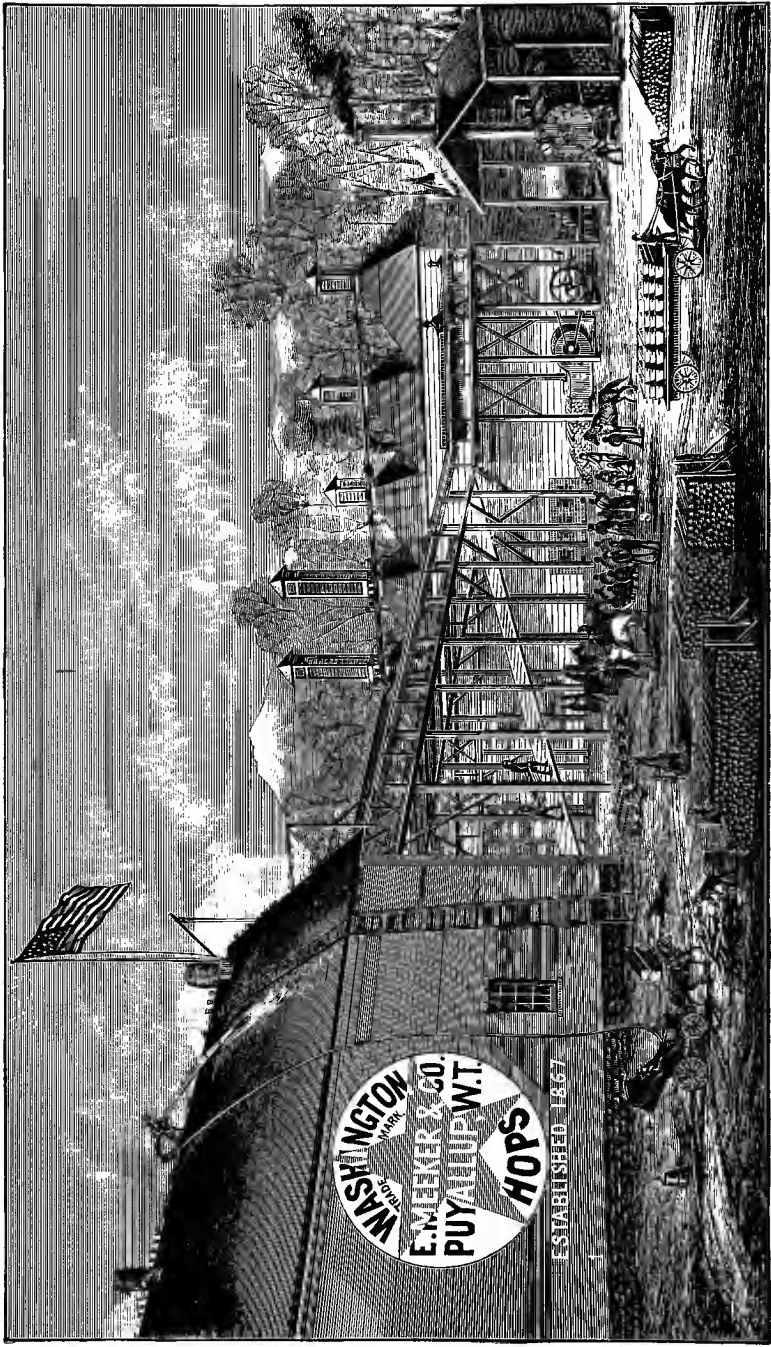
This substance is most sensitive to injury by high heat, and hundreds of tons of hops are injured annually, and in many cases their value almost totally destroyed by the careless or ignorant manner in which they are dried. The writer knows by actual experience that when hops are subjected to a heat of over 160° Fahrenheit, that there is to the naked eye, a visible change in the appearance of the lupuline in many samples that can be selected in a flooring of hops, though not all will show the effect alike. We are led to believe from this that either the length of time after being dried, that the hops are subjected to the current of heated air, or else some unknown condition of the hops, before going on the kiln governs this visible sensibility to heat; be that as it may, the fact stands out prominently so that any observing hop-grower can demonstrate it with no expense and but little trouble. As the heat is increased the change becomes more apparent, until at about 180° the globules begin to disappear and run together, presenting a dull brown or red appearance, of all shades, according to the degrees of intensity, and as we believe, duration of time the hop has been subjected to this high heat. If to the naked eye there is a visible change in this delicate substance, from the effects of heat, how much more apparent it becomes when subjected to the rigid scrutiny of the chemist or the practical test of the brewer.

The extract, or bitter principle of the hop, according to *Thausing*, "assumes a reddish, yellow color when heated above 140° Fahrenheit, and when cooled off, can be rubbed into a fine powder." * * "At 212° F. the hop bitter swells up under decomposition, and combustion takes place with a sooty flame." And yet, in the face of such facts, our American authority, yet in print, recommends 180° F. as a safe temperature. We know from experience that it fairly cooks the hops and destroys much of their value.

Charles Whitehead, in his work entitled, "Hops from the Set to the Sky-Lights," published by Effingham Wilson & Co., Royal Exchange, London, says:

"Drying hops thoroughly in twelve hours, necessitates the maintenance of a high temperature, equal to at least 125° Fahrenheit, throughout the process. In the opinion of those who have studied this subject, a great waste of valuable, essential principles is caused by the system of drying hops at such high temperatures. The hops that are dried by sun and air in Germany have a much higher percentage of essential oil and other principles, valuable in brewing, than the finest East and Mid-Kent hops, that have been subjected to great heat. Spalt hops do not naturally contain a larger proportion of these principles than those of East and Mid-Kent, but in the former case the method of desiccation preserves their valuable qualities while in the latter the merciless treatment of stewing or baking, to which they are subjected, causes an absolute visible loss of lupuline or gold dust, besides the loss of invisible essences.

"Analyses made of various samples, by Mr. Porter, the analytical chemist, showed most conclusively that Spalt hops partially dried in the sun and brought to England and dried again, at a comparatively low temperature, upon Hopkin's patent kilns, (Fan process) contained a larger percentage of oil, resin, and bitter principles, than various samples of Kent, Sussex, Bavarian, Belgian, and American hops, dried in the usual manner, quickly and at a high temperature. A sample of Worcester hops, dried slowly and at a low temperature, upon Hopkins' patent kiln, was proved by Mr. Porter, to have a somewhat larger percentage of oil, resin, and bitter principle than the Spalt hops, with a consider-



DRAFT AND FAN-BLAST HOP KILNS, WITH MOVABLE FLOORS, E. MEYER & CO., PUYALLUP, WASHINGTON TERRITORY.
 1, Warehouse—2, Hydrant—3, Indian Gamblers—4, Draft Kilns—5, Fan-Blast Kilns—6, Fan—7, Movable Floors—8, Engine and Boiler—9, Indian Hop Pickers' Encampment.

ably smaller amount of moisture. For example the Spalt sample contained 14.08 of oil, resin, and bitter principle; and of moisture 6.96, while the Worcester sample contained 14.98 of oil, resin and bitter principle; and only 4.92 of moisture.

The samples of East and Mid-Kent, Bavarian and American hops, showed percentages of oil, resin, and bitter principle, varying from 8 to 13.27; and of moisture, from 6.15 to the high figures of 9.87 in the Sussex, and 10.25 in the Belgian samples.

These experiments demonstrated scientifically what practical brewers had long perceived, that the generally adopted system of drying hops causes great waste of 'ethereal residues,' with a corresponding diminution in their actual brewing value. According to Hopkins' method, the temperature to which the drying hops are exposed, never exceeds 100°. That they are thoroughly desiccated, or in other words, that the moisture is driven off, is proved by the analyses given above; at the same time, the essential and useful properties are retained. All the other samples dried quickly at high pressure showed curiously enough more moisture and less of the desiderated principles."

The Hopkins' kiln mentioned in the above extract is the "Fan process" applied with double floors and a suction fan at the top of the kiln.

From this it will be seen that the best English authority calls 125° a *high* temperature with which to dry hops. This doubtless accounts for the very wide range of value of the numerous samples of hops tested, showing a difference in value of nearly *sixty per cent.*, which our author accounts for from the "merciless treatment of stewing or baking" to which they are subjected.

In addition to the loss or waste of the "ethereal residues," as claimed, there can be no doubt but there is a greater loss in the non-keeping qualities of high-dried hops, as compared with those cured at a low temperature.

Almost any inexperienced farmer can raise hops, but nothing short of the most vigilant, careful and intelligent management will prepare the crop, without injury, ready for market; hence the curing is the all-important part of hop-growing, and if not properly done, results in great loss and final failure.

What would be thought of a farmer who would raise wheat or

corn, or any other farm produce, and year after year, so manage his crops that nearly *two-thirds* of their value were destroyed? His financial ruin would be inevitable and speedy; and yet this very thing is happening with the hop-crop of many growers, which tells on them in years of plenty, being shunned by experienced buyers, leaving their hops to become trash to be sold for packing material.

Nor is this all; the commercial value of the whole crop is effected by the careless or ignorant management of any considerable proportion of growers; as dealers and consumers will judge all growths from any particular locality to some extent by one which they have tried and found to be inferior. This particularly applies to hops, as the general appearance is the same and the injury is not always detected until it is too late.



CHAPTER VIII.

HEATING THE HOUSE—CURING BY CURRENT OF HEATED AIR—
LAYING THE FLOOR—DEPTH OF FLOORING—SULPHURING—
TURNING THE HOPS.

HOPS as brought to the kiln in the green state, *i. e.* uncured, contain seventy-five per cent. moisture for an average of the harvest. To withdraw this moisture speedily, without injuring the hops, is most difficult. This must be done by passing a current of heated air through them and not by radiated heat. The air, coming in contact with the hops, becomes partially saturated with moisture, which is constantly replaced by a fresh supply of dry air, and so the process goes on until they are dried, the air retaining the moisture until expelled from the ventilator above by the force of the current constantly coming up through the hops from below. Hence it will readily be seen that it is essential to admit an abundant supply of fresh air at the base of the building. There is no rule to guide how large a space to leave to supply a sufficient quantity of air; I should say open out under the foundation, to admit all you can use and keep to the required heat; *the more the better*. We have fully twelve inches all around, under the foundation of our ordinary draft-kiln. With our fan-blast kilns, a large fan is driven by steam, at a high rate of speed, the hum of which can be heard for five miles around, pouring a volume of cold air around the heated furnace and pipes, below, forcing a strong current through the hops. In such a kiln we can lay the hops "waist deep," and cure them at a low temperature, in ten hours.

A particular description of this process will be found in the chapter on houses. The principle is the same but the increased current of air hastens the process; *hence the central idea should be to get as strong a current of air to circulate through the hops, as possible up to the amount of your heating capacity and to keep in mind not to run up a high temperature.*

The fires should be started in the commencement of the hop-harvest, at least twelve hours or more before any hops are put on the floor. This has been found necessary, to dry the walls of the house and at least partially the earth floor of the building; otherwise the moisture from these sources will retard and in some cases, entirely prevent the first floor from drying, until it is too late to save them from injury. In practice we usually put a watchman on the night before beginning to pick, keeping fire all night and the next day, until the first load of hops is received, just the same as if the flooring was laid; or what is a little more economical run the fires the previous day when the sun is shining and the atmosphere is not so cool.

The hops are brought to the kiln in the boxes (described elsewhere) in which they are picked, on wagons or sleds and as soon as enough accumulates, are carried into the house and emptied on the floor. They are then forked over, as the workmen spread them evenly on the floor. This requires great care and considerable skill, to spread a flooring of hops so that the curing will be done evenly, for if one part of the floor is laid heavier than another, or one portion carelessly settled by dropping the fork, stepping on them, or in any other way settling any portion of the flooring, to render it more compact than the rest, that portion will not dry rapidly and will be left as a damp spot and delay the whole flooring. Assistants should be taught to scrape their feet on the floor in moving through the hops and under no circumstances to step on them.

Fifteen inches is as deep as hops should be spread, to get the best quality, except where power is used, as described elsewhere, though most growers put on heavier floors than this, even up to eighteen or twenty inches in depth. There is undoubtedly economy in heavy flooring, up to the point the hops do not sag. This is accounted for by the known fact that heated air coming in contact with a moist substance does not become fully saturated by the first contact, but like a sponge, will by contact again and again take up more moisture and carry it off as invisible vapor. More work is done by a given quantity of heated air, though somewhat at the expense of quality, as the lower strata of hops become dry first and with heavy floorings are subjected to this heat, long

after being thoroughly cured, until all are dried. Double floors can be used but have not to any great extent because of the supposed inconvenience.

The primary object of burning sulphur under hops, while drying has been to bleach them. This, in Washington Territory is unnecessary, as they are free from disease or blemish; but there is a direct benefit to be derived from the practice, that of preserving them, and likewise accelerating the drying process, which is mentioned elsewhere.

The observant hop-grower quickly discovers that his hops dry much faster with a given heat, if sulphur is burned under them at the beginning of the drying process. Many, however, defer sulphuring until the hops are well-warmed up on the kiln and partially dried.

The fumes of the burning sulphur acts upon the hops so as to decrease their power of retaining moisture, and while of great benefit in accelerating the drying, yet is doubtless of still greater benefit in enabling the grower to dry more thoroughly than he otherwise could, except by long exposure to heat and consequent injury.

The sulphur should not be burned rapidly; the best method probably is to heat a pan hot enough to set fire to the sulphur, when put into it, and then let it burn without further heat; or as is sometimes practised, heat a bolt of iron until it is red and thrust into the pile to set it on fire. A greater benefit will doubtless accrue to partially shut off the draft to the building, while burning a given amount of sulphur, yet the same results will follow by burning more, and leaving the draft on.

It is best for the purpose of thoroughly drying, and for preservation, to burn at least a part of the sulphur just before finishing the drying process, and which should be done with partially closed ventilators. At this time, when the hops are so near dry, the bleaching effect will not be so thorough, as when moist, but that is what ought to be avoided.

Two pounds of sulphur burned to each hundred pounds of dried hops, is in no wise objectionable, as will be seen by reference to the eminent authority quoted elsewhere, and if burned with the ventilators open, and a strong draft doubtless more can

be used to advantage, as much of the effect is lost in such cases by the rapid passage of the sulphur fumes through the hops.

The practice is almost universal to turn or mix the hops when about two-thirds dry. This is done by carefully turning them over with a large, wooden fork, wading through to mix them, or piling in the centre of the room and after the lapse of about fifteen minutes relay them evenly on the floor.

Probably a better way is not to disturb the hops at all until dry; for handle them as careful as you may while hot, they will break up more or less, which mars the sample very materially, and results in a positive injury to their keeping quality.

The surface may with slight injury be run over with a long handled rake when the hops begin to rattle in spots, to scatter the less dried hops over those that have become dry at the surface.

No definite time can be stated that will be required to cure a flooring of hops. This depends upon many contingencies, such as the condition of the hops, whether very ripe, middling or early picked; depth of the flooring laid, temperature of the heated air used, volume of the draft and many other minor considerations.

With hops in good condition, plenty of draft and 150° F. temperature, I should say to cure an inch deep an hour is as much as can be counted on. This will cure, approximately, fifty pounds of hops an hour, in a house twenty-four feet square. Lowering the temperature to 120° will doubtless reduce the capacity to one-half of the above, or about twenty-five pounds per hour, so it will readily be seen that here is where the "tug of war" is encountered in hop-growing.

We now approach the most difficult and critical part of the whole work, that of judging when the hops are sufficiently dried; if turned off too soon they are liable to heat in the bale, and finally perish; if left on too long, great injury follows, especially if the heat is, or has been, high. No definite rule can be laid down in words, and no one should undertake this part of the work without first having been taught by experienced hands.

An ideal cured hop would show only a wilted stem, or core of a purplish-green cast, being soft to the touch and flexible; the globules of lupuline, standing out prominently, bright and unchanged from that of an uncured hop. In practice, however,

most of the stems are not only wilted, but are dried so as to be brittle and harsh to the touch, and show the "sharp corners," which will be readily understood by any one taking a specimen between the thumb and finger and rubbing the hop to pieces. Because of the presence of these over-dried hops, we are able to turn off the flooring with a small percentage of "fat hops," being those whose stems are not wilted, but show as green as when placed on the kiln. Floorings, with ten per cent. of such stems, may be turned off, and yet keep if otherwise well and evenly cured and properly handled afterwards, though I should by no means advise leaving so large a percentage; probably not five per cent. of such stems are left in ordinary practice. Whatever there may be will have disappeared in a couple of days, and such stems as were green will be wilted and the moisture absorbed by the balance of the hops. The "after-handling" referred to, consists in forking the hops over after having lain a few days and began to "warm up," as hops in bulk will do where not dried thoroughly. A better plan is to cure at a lower temperature, which will insure a larger percentage of wilted stems, and less of those with "sharp corners," as likewise of the green stems and a more even sample of hops.

The keeping quality of hops and the cause of the early loss of their value will be treated in another chapter. It is only necessary in this connection to say that moisture is one of the active agents causing such loss, and the English authorities recommend baling the hops *while hot* to prevent them from absorbing moisture from the atmosphere



CHAPTER IX.

BALING—MIXING THE HOPS—WEIGHT OF BALES—BALING CLOTH.

THE dried hops are usually taken directly to the warehouse and there stored in bulk, until the harvest season is over. Some growers have their warehouses adjoining the kiln and convenient to transfer directly from the one to the other; others, more cautious, build them a safe distance from the kiln to be free from the danger of fire, and carry or haul the dried hops to the warehouse. In the latter case there is a cooling room or storage for one flooring, attached to the kiln; a convenient inclined walk is constructed, so that the hops can be carried in to the gable-end of the building and there emptied, till the house is filled or the crop all gathered. Some of these houses have a middle floor, and after the upper story is partially filled, the hops are dropped down to the lower story, which thoroughly mixes them and lets the heat incident to the sweat escape and secures the grower from danger of heated hops. Hops so managed, or what is the same, to fork over, or move the pile from one part of the warehouse to another, enables the grower to turn them off with less drying. The hops will gradually part with considerable moisture while lying in the warehouse, particularly if the warm hops are continually emptied directly from the kiln to the warehouse.

A better method is to build more dry-houses and less storage-room, and cure at a lower temperature, but thoroughly, and bale directly as cured. I have practised this for a number of years, contrary to the general custom of the country, but have never had a bale of hops injured thereby, and have been able to get into the market from two to three weeks earlier, avoid the extra risk from fire, and the extra expense of warehouse buildings. On this subject, Mr. Charles Whitehead, says, of the English method: "Formerly the dried hops were spread all over the

floor to cool, and were not packed up for twelve or eighteen hours, or even longer, in order that the hops should not be brittle and broken up by the feet of the men who trod them into the pockets, by jumping violently upon successive layers raked into these. Now they are put in lumps and pressed up at once while hot, and before they absorb moisture from the atmosphere."

One objection to the practice of baling immediately after curing, is that the grower's crop will not run as even in quality as if carefully stored, in order that they may mix the whole thoroughly. The earlier picking will be lighter, that is not so rich as the later, besides no field of hops will be of exactly the same quality and color, even if picked on the same day. To most effectually mix, so as to have the whole crop uniform, the warehouse should be filled in layers, first covering the whole floor about two feet deep, and gradually fill by adding successive layers; then when baling, by taking the whole depth of the pile, there will be no appreciable difference in color or value.

If not baled immediately after cured, and once in the warehouse, then a better way is not to press them until required for market. The hops in bulk will keep much better than in bale, as is abundantly proven by experience. This subject will be treated elsewhere, under the head of preservation of hops, to which the attention of growers is particularly drawn, as a matter of great importance.

The bales should be put up to weigh one hundred and eighty to two hundred pounds. Hop-cloth, weighing twenty-four ounces per yard, is best, and is strong enough, if well sewed, to hold the bale together to ship to any part of the world. Heavier than that is useless weight and brings complaint from brewers who object to paying for more tare than necessary; lighter than this is not stout enough at the seam unless rope is also used to bind the bale together. This last practice is now nearly entirely abandoned, as it is found to be useless. The Harris press is found to be the most economical, but requires more tramping than some home-made horse-power presses. Now all such are discarded, and only the one kind of press is used. A lively crew will turn out twenty-five bales a day. Sometimes this is let out by contract at five dollars per ton.

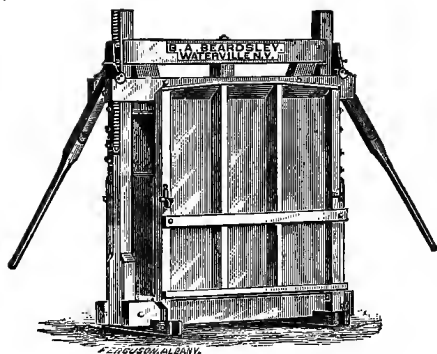


FIG. 3.—IMPROVED HARRIS PRESS.

of the Harris Press. A still greater improvement is in a movable head that precedes the downward movement of the follower, a device that entirely dispenses with the troublesome end-board, that formerly had to be removed, as the follower was brought down, causing much delay.

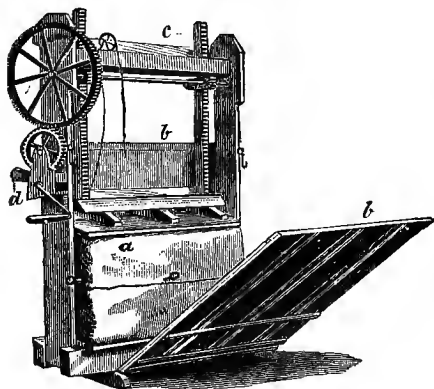


FIG. 4.—MCCABE PRESS.

The improved Harris Press, manufactured by B. A. Beardsley, Waterville, N. Y., is a great improvement over the original, as first patented. These have double bearings of the pawls upon the upright ratchet, that is a great security against breaking the pawls, which has been found by experience to be the weak point

The same gentleman also manufactures what is known as the McCabe Press; (see cut fig. 4). These are so constructed that the follower can be easily and speedily brought down, and again run up which presses the hops in by layers, instead of tramping, as with the Harris Press. These are simple and easy to work, though probably not quite

so speedy as the "Harris;" they are heavier and cost about thirty dollars more. Parties on the Pacific slope, can obtain either kind at Puyallup.

CHAPTER X.

QUALITIES OF HOPS — STORING AND PRESERVING — SMOKING WITH SULPHUR — SELLING.

THERE are three essential points necessary for the hop-grower to know, that he may succeed intelligently, viz:—*First*. To know how to economically produce a good hop, and to do this he must know a good article when he sees it. *Second*. How to best preserve his crop; and *Third*, How and when to sell.

I. The aim of the preceding pages has been to teach how to best proceed to produce the finest and best quality of hops, yet as conditions vary, so will management necessarily also vary, hence it is important that the farmer should know at sight if he is not succeeding, so as to at once apply the remedy. The producer's opinion is of but little value as to what is a good article, unless based upon that of the consumer, hence, to ascertain what points or characteristics of hops give them the greatest commercial value, we naturally turn to the consumer's authority for our authority. The following extract, which tersely states what brewers want, and what they wish to avoid, and which, while authority primarily with the brewer, is secondarily as much a guide to the hop-grower, taken from Julius Thausing's work on "Preparation of Malt and Fabrication of Beer.*

QUALITIES OF THE HOPS AND THE BUYING OF HOPS.

"The brewer in determining the value of hops is forced to take "into consideration certain external qualities, far more so than in "barley, for he can reach a conclusion as to suitability of the

*"Qualities of the hops and buying of hops," "The smoking of hops with sulphur," and the "Storing and preservation of hops" is taken from the German work "The Theory and Practice of the Preparation of Malt and the Fabrication of Beer," by Julius E. Thausing, Professor of the School for Brewers and of the Agricultural Institute, "Fransisco-Josephum," of Modling, near Vienna, and translated from the German by William T. Brannt, thoroughly and elaborately edited by A. Schwarz and Dr. A. H. Bauer; published by Henry Carey Baird & Co., 810 Walnut Street, Philadelphia, Pa. Price, \$10.00.

“ hop for the fabrication of beer from external appearances alone.
 “ We will here give the good as well as the bad qualities of hops.

1. The cones of the hop should not be too large ; the carpels
 “ should not be thick and leathery, but tender, and their ribs should
 “ be thin. The color of the cones should be yellowish-green,
 “ and not light-green, red, or reddish brown. The peduncle
 “ should not be stripped of leaves, and loose carpels should not
 “ be mixed with the hops in large quantities, but the cones should
 “ appear closed with the carpels lying tightly above each other.
 “ Cones of a light-green coloring and open, are frequently proof
 “ of unripe hops, which contain less flour and have a weaker, aro-
 “ matic smell. A light-red coloring and a very shiny surface of
 “ the carpels is an indication of the hops having been allowed to
 “ become over-ripe. The consequence of over-ripeness is a loss
 “ of the valuable flour, yet this is not so injurious as when the com-
 “ ponent parts of the hops have suffered injury from having been
 “ heated during drying, and the hops have acquired a dull brown
 “ color in consequence. This appearance is called ‘ground red’
 “ (‘bodenroth’). The hops have a similar appearance when they
 “ have been baled too damp and have become heated in the hop
 “ bale, when they largely lose their agreeable aroma and very
 “ frequently become entirely useless. If the hops have been dried
 “ too much, or have been frequently repacked for whatever rea-
 “ son, the carpels become detached from the peduncle, the cones
 “ appear to be torn, and they have lost some of their flour. If the
 “ hops have been dried by artificial heat, at too high a tempera-
 “ ture, the flour assumes an orange color and they acquire an
 “ empyreumatic smell.

“ 2. When a few cones are torn to pieces as large a quantity of
 “ hop flour as possible should be seen on the inner surface of the
 “ carpels. The richer the hop is in flour, which is the bearer of
 “ its most valuable component parts, the more valuable will it be,
 “ if it also possesses the other good qualities. The flour of fresh
 “ hops is of a light-yellow color. The fruits situated on the base
 “ of the carpels should be as small as possible ; large granules,
 “ which weigh heavy, are an indication of a not very fine hop.

“ 3. A fine, strong, aromatic odor should be perceptible when
 “ the cones are rubbed between the hands. Hops of poor quality,

“ or raised under unfavorable conditions, possess a garlicky odor.
 “ Hops smelling mouldy or musty, or which have suffered injury
 “ in drying, or in the hop bale, should not be used.

“ 4. The separate cones should stick together when the hop is
 “ pressed together in the hand, it should ball together, and only
 “ slowly separate again ; this is an indication of the hop being rich
 “ in resin. If it contains little resin it does not ball and feels dry.
 “ When marks are made upon the hand with separate cones, these
 “ marks should be sticky and of a yellowish color ; unripe cones
 “ make light-green marks.

“ 5. The taste of the hop should be pure and agreeably bitter.

“ 6. It should be free from the leaves of the vines, pieces of
 “ vine and other admixtures. The cones should not be covered
 “ with mold or the parasitic fungus, smut (*Fumago Salicina*),
 “ which covers the leaves and cones with a sooty coating, and is
 “ very injurious to the hop plant. This fungus may destroy an
 “ entire hop harvest. Plant lice frequently make their appearance
 “ as forerunners of this disease, adhering in skins to the hop and
 “ contaminating it.

“ 7. It must not be too old. Old hops do not possess certain
 “ of those already-mentioned good qualities ; they have lost con-
 “ siderably in value, as the volatile oil, as well as the hop resin,
 “ has deteriorated. Hop cones, which have been stored for
 “ some length of time, have a brownish color, the fruits are easily
 “ detached from the peduncle, the agreeable odor has changed into
 “ a disagreeable, cheesy (rank) odor, the flour has a reddish col-
 “ oring, and the hop has lost its stickiness. The examination of
 “ the hop flour by a good magnifying glass or the microscope is
 “ to be recommended as a means of distinguishing old hops from
 “ fresh ones. Even then, when the before-mentioned characteris-
 “ tics of old hops have in some manner been obliterated with
 “ fraudulent intent, a microscopic examination is still a sure guide.
 “ The separate glands of fresh hops, which form the hop flour, are
 “ full, glossy, and of a lemon color, have a smooth surface, and,
 “ when pressed, discharge the contents of the gland, showing a
 “ light-yellow coloring. The glands of old hops are shriveled,
 “ wrinkled, and the fluid discharged from them is of greater con-
 “ sistency, and has a dark-yellow to brownish color, and this color

“will show itself the more the older the hops are, and the smaller the quantity of hop balsam. In time the hops have become poorer in oil, which has been partly oxidated and changed its color.”

THE STORING AND PRESERVATION OF HOPS.

“We have repeatedly drawn attention to the instability of the valuable component parts of hops. The influences which exert an injurious effect upon the quality of this expensive brewing material, when it is stored, are moisture and atmospheric air, or rather the oxygen of it, and the brewer must be as much concerned about keeping them away; and thus secure the preservation of the hops, as he would be about the keeping of his beer.

“Hops can only be kept well when sufficiently dried. The drying of the hop cones after they have been gathered is an important and difficult work. The hop grower dries the cones either in drying lofts, where they are spread out in thin layers, or by an artificial heat in special hop kilns, ‘hop-oasts,’ so called in Kent, England. If two large a percentage of water is contained in the hops, when delivered to the brewer, he not only pays for a superfluous quantity of water, but there is also the danger that tightly packed in bales they will become heated and spoil. When bought shortly after the harvest they should be frequently examined. It is best to open the bales somewhat, so that the examination can be better proceeded with. Long, sharp-pointed iron rods may also be pushed into the bales as the heating of the hops will be perceptible on them. If heating of the hops is observed the bales should be at once opened entirely, and loosened or spread out and dried.

“Several methods have been recommended and used to protect hops as much as possible against the action of atmospheric air. * * * The pressing them meets with steadily increasing favor in England, and is generally used in America instead of treading them into bags as is customary in Germany. * * * This pressing is of decided advantage, but the hops must be well dried before they are pressed. * * * It has been recommended to press the hops into pitched barrels

“instead of bales, and to store them in ice cellars (*Scharr*).
 “*Bing*, of Nurnberg, presses them into square bales by hydraulic presses, the bales are then put into well-soldered tin boxes, and then are placed in well-pitched wooden boxes. It has been further proposed to press the hops into tin boxes, to close these hermetically, and to store them in a cold cellar (*Neubecker*).

“According to *Brainard's* method of preserving them, they are well dried and packed in bags, and brought into a storeroom, which can be kept dark, dry, and cool, and can be hermetically closed. For this purpose the store-room has double walls, and is provided with ice on the upper floor, in the same manner as *Brainard's* store cellar and fermenting cellar. It would be desirable if this method of preserving them would come into general use.* * * If the brewer cannot afford the expense of building a *Brainard* store-room, he should nevertheless observe certain principles in the construction of a store-room for them.

“The store-room should be closed as much as possible against the air, should be dry and cool. It should not be located directly under the roof, where damp air can easily enter, and a simple partition of boards is not sufficient for this purpose. The best plan is to build the store-room with bricks or double-frame sides, between which is placed an isolating layer. It may be recommended to keep the room cool with ice, but the cool air admitted must not be moist.

“Larger breweries should never neglect to smoke with sulphur and press certain quantities of hops in years when the price is low. If suitable storing is added to this they can be kept so well that, mixed with fresh ones, they may be well adapted for use the next year, when they may be very dear.”* *

THE SMOKING OF HOPS WITH SULPHUR.

“We will here say a few words about the frequently, and unjustly discredited treating of hops with sulphur. A similar apparatus as for drying malt, is used for smoking the hops with sulphur. The hops are spread upon hurdles made of slats, and

"covered with horse-hair cloth, and beneath these is burned one-
 "half to one kilogramme (1.1 to 2.2 pounds) of pure sulphur
 "for each cwt. of hops. The sulphur combines with the oxygen
 "of the air to sulphurous acid, which passes through the hops in
 "the form of vapor. The effects of the sulphurous acid is mani-
 "fold. They are bleached by being smoked with sulphur, as the
 "sulphurous acids destroys certain organic coloring matter, by
 "deoxidation or passes into colorless combination with them.
 "The sulphurous acid has further the quality of combining with
 "nitrogenous organic compounds (albuminous bodies), and to
 "protect these easily changeable substances from decomposition:
 "It further acts upon the membranes of the cells in such a man-
 "ner, that their power of retaining water decreases, and thus the
 "smoking with sulphur also diminishes the absorption of hy-
 "groscopic fluid. The sulphurous acid is, therefore, antiseptic in
 "its action, as it preserves the organic nitrogenous combinations
 "in an unchanged form and withdraws water, which is a neces-
 "sary condition of decomposition. To this must be added the
 "protection, which the sulphurous acid, passing through the hops,
 "gives to the hop oil and hop resin, against the oxidating action
 "of the oxygen of the air, with which it combines to sulphuric
 "acid.

"It is also the object of smoking the hops with sulphur to pre-
 "serve them. The use of hops smoked with sulphur is not in-
 "jurious to the quality of the beer, or to the health of the beer
 "consumer, as has been sufficiently proved by the experiments
 "made by *Liebig* and *Sedlmayer* in Munich. *Liebig* says: 'The
 "advantage of treating with sulphur is so great, that, if it were
 "not in use, and its value had not been confirmed by experience,
 "the discovery of smoking with sulphur would have to be con-
 "sidered as one of the greatest and most important acquisitions
 "in the brewing of beer.' But, nevertheless, the suspicion is
 "justifiable with which the brewer looks upon hops smoked with
 "sulphur, frequently to such an extent that they are never bought
 "in some localities. The bleaching effect of the sulphurous acid
 "is of especial advantage in the fabrication of light beers, but it
 "is just this bleaching effect that is misused. Hops discolored
 "by too long storing, faulty drying, or some other injurious in-

“fluences, receive again a beautiful light color by smoking with sulphur, thus destroying an important sign which marks the hops as being of little value. The brewer has good cause for being on his guard if the smoking with sulphur is done for this purpose, but not so when fresh, young hops are so smoked, for in that case it is a decided advantage, and the brewer should not neglect to smoke a part of the hops he intends to keep over summer, and he should do this at once, and not wait till the hops have suffered injury from being stored too long.”

II. In addition to the rules laid down for the preservation of hops, numerous instances are related by brewers, dealers and growers, of hops having been kept in bulk until a year old, being so well preserved as to be “scarcely distinguishable from new hops.” We have taken great pains to get exact information on this point, questioning more than twenty persons who have had experience; the universal and unanimous verdict was that hops *would keep better in bulk than in the bale.*

The general theory is that the baling tends to break the globules of lupuline, which hastens the loss of their valuable properties. Whatever the cause may be the fact stands out prominently, proved by experience, that such is the case and which is worth more than all theory or “much learning.” All agree that hops should be kept cool, hence our warehouses should be lined and the space between filled with some non-conducting material; that they should be kept free from moisture and the action of the air, hence the storage house should be closed.

III. No other farm crop is raised, where the fluctuations in value are so rapid and great, as with hops. The market is never quiet but values always changing. This can be accounted for primarily upon the fact of there being a wide range in the yield of the world's crop, from year to year. Another potent cause is the action of the growers, frequently, without cause, holding their crops for a time, far above their value, and then later, rushing them on a depressed market. It is a known fact that when the market is advancing and high, brewers are anxious buyers and farmers indifferent sellers, while the contrary conditions bring about contrary results, the farmer being anxious to sell and the brewers indifferent buyers.

This anomalous state of the hop market, is doubtless caused in a great measure by the fear in times of plenty that an over-supply may become almost worthless on the hands of the holder from age, and from a misunderstanding of the condition of the year's supply. A veteran dealer of New York, said to the writer: "The time to sell hops is when brewers' lofts are empty." The bulk of sales are made during the three months immediately after harvest, from which time trade usually assumes more of a retail character and appearance of dullness. Then it is that farmers and other holders begin to weaken and press for sale. If a part of each crop was securely stored in bulk where it was known they would keep well until needed, there would be a steadier tendency of the market, and in seasons of great plenty prevent the ruthless destruction of values by the pressure to force goods upon the market not wanted, as likewise to temper prices when needed, or at least, furnish a well-preserved hop better suited for use. Brewers and dealers would much prefer buying a portion of their hops, to be left on storage for a part of the season, than to have the whole crop on their hands at once, and those farmers that prepare for suitably storing their crop where the hops will keep in best condition will find ready buyers at advanced rates. This does not effect the question as to when best to sell, for that each must determine for himself, according to his own judgment in connection with his finances, inclination or preferences, yet if farmers were prepared to store part of their year's crop, where they would be well preserved, they not only could and would get the increase in price warranted by actual better values, but also the saving that would accrue in the direct transfer of their crops from their own warehouses, to that of consumers. One of the largest and most successful dealers in the interior of New York, always ships the bulk of his purchases direct from the farmer's warehouses, oftentimes months after their purchase, and in fact, this is practiced to a considerable extent by all the dealers.. They are thus relieved of the expense of the extra handling, warehousing, insurance, risks of heated hops and a host of like contingencies, while the brewer is likewise relieved in turn from the expense of being compelled to provide such enormous storage capacity; hence each in their turn are willing and do pay more for their hops with

such accommodation than they otherwise would. If, added to this, the fact were known that such portion of their supplies were being kept in better condition than they possibly could do themselves, then we can plainly see that consumers would not be slow to appreciate the difference and pay accordingly.

Another method of preserving hops, and that too so that they will keep for a series of years, is by extracting the lupuline and canning it up for future use. There is an extensive factory at Waterville, New York, where one hundred bales can be extracted in a day, and where before the present ruling high prices, a large business was done, and which will be resumed again as soon as prices will warrant. Hops can be extracted in the green state as well as dried, and we may yet see the day that we will turn our dry houses into extract factories, and instead of picking, clip off the arms and deliver to the factory, with but light expense; save the cost of picking, drying and baling; save the spent hops for manure; save eleven-twelfths of the freight charges; save us from these frightful jumps in the market; save us from the extravagance incident to sudden wealth, or the bitter disappointment from heavy losses. Then might we place our canned hops on board the wheat ships, bound for Liverpool, eventually take possession of the English markets, and have a product that would be as staple as old wheat in the bin.



CHAPTER XI.

GRADES OF HOPS—LABOR SUPPLY—COST OF PRODUCTION—COST OF STARTING A HOP-YARD—PROFITS.

IN general terms, there are five different grades of hops as to commercial value, caused principally by the manner of curing and handling by the grower, all within his control. These are usually known as "fancy," "strictly choice," "choice" or "seconds," "good brewing," or "medium," and "low grade," the best grade bringing fully *twenty-five per cent.* more than the lowest.

A "fancy hop" may be described as one cleanly picked, properly cured, bright in color, well matured, not broken, neatly baled, and free from all defects, in a word, practically perfect in all respects.

A "strictly" choice hop is one that contains all the intrinsic value that a "fancy" hop does but is what is termed a little off in color, not having that brilliant lively color, so fascinating to the brewer's eye, and will usually sell for at least five per cent. less than a "fancy."

A "choice" hop or seconds may lack one or more of the qualities of a "strictly" choice, and yet not be deemed a bad hop. Sometimes it may be assigned to that grade because of bad picking, or the picking and color may both have not been first class, or it may have been broken up in the handling. This last defect, that of having been badly broken, will in the English markets of itself send the hop down to the third grade, even though everything else about it is first class. This alone will send the price down fully ten per cent. below that of a "fancy;" in times like the present, with hops £20 per cwt. in the London market, makes a difference to the grower of *ten cents per pound.* It is useless to decry the unjustness of such classification, for the brewer is the authority and his tastes must be deferred to, just the same as all

manufacturers do with their customers, that is, to try and manufacture to suit the fancy of their patrons, but not with a view to make or control their likes or dislikes.

“Prime” good brewing or “medium” hops are such as have good, solid values but badly off in color, from whatever cause, or slightly mouldy or some similar defect, not so much effecting their actual, intrinsic value as in their appearance. These cannot be used by some brewers particularly in their pale ale and lager beer, but are useful in the brewing of heavy ales or porter, and in consequence of this limited use, sell for a much lower price.

“Low grades” are those usually injured by high drying (that is with a high temperature) or are “light” from early picking, or heated from lack of sufficient curing, all within the control of the grower. There are of course, low grade hops from other causes, such as blight or mould or other diseases, yet there are not many such. What are termed low grade hops will never bring more than seventy-five per cent. as much as “fancy” and more frequently less, and sometimes are crowded off the market entirely and finally sold at a nominal price. It may be safely assumed upon a moderate estimate, that the average of the whole of the hop crop is reduced in value fully ten per cent. by the careless or ignorant methods practiced by growers; a loss in such a year as 1882, of over a million of dollars, a snug sum to be sure, to be wasted for nothing.

Wherever an article of like quality or value can be produced cheaply, including the cost of delivery to consumers, there business will increase most rapidly, until an equilibrium, as between supply and demand, is established, or some one essential point is exhausted to measure the possible maximum production. This latter contingency, that of labor supply, is the vital “essential point” likely to first restrain the indefinite extension of hop-raising in Washington Territory, but will doubtless be closely followed by the contingency of over-production and consequent low prices. This first is a more formidable difficulty to surmount than that of the question of low prices, for in that the pressure will extend over the productive regions of the whole world. In the question of labor supply, the hop-growers of Washington Territory, will not only be confronted by the increase in cost of

picking, but likewise that of the question of getting sufficient labor even at a greatly increased cost. The following statement showing the present cost of producing hops compares favorably with that of any known hop-producing region, as will be seen by reference to the chapters on English methods and hop-raising in New York. To the cost here shown must be added a heavy freight charge, three cents per pound to New York, and four to London, incident to isolation from the centres of consumption.

The cost of producing an acre of hops, yielding sixteen hundred pounds (the average crop of Washington Territory), is as follows :

Cultivating,	\$27 50
Picking,	64 00
Expenses, getting three pickers to the acre, (estimated), .	3 50
Field help, per acre,	7 50
Hauling hops to kiln,	3 50
Drying, including fuel,	16 00
Baling labor, at \$6.00 per ton,	4 80
Baling cloth for 1600 pounds, 50 yards per ton, 24-ounce cloth, at 15 cents per yard,	6 00
Twine for 1600 pounds,	20
Rent of land, including value of poles,	20 00
Breakage and deterioration in value of poles, 5 per cent. per annum on cost of \$50 per acre,	2 50
Rent of buildings, including repairs,	12 50
	\$168 00

This shows in round numbers a cost of ten and a half cents per pound for hops in the bale. Numerous hop yards produce a ton, and some twenty-five hundred pounds per acre, which costs no more to cultivate than where only an average is obtained. The picking has been costing more and more each year, and will doubtless, in future years, cost still more as the demand for pickers increase, and expensive transportation bills will have to be met. The years of over-production are certain speedily to come, with the low prices incident to an accumulation of stock; then lower grades of hops will be neglected, their values destroyed by rapid deterioration in intrinsic worth, and constant accumulation of unavoidable, incidental expenses. Such will be forced to sell at any price, entailing heavy loss. This in turn will cause neglect

or destruction of the hop yards producing such. Not so with the best quality of hops, that are well matured, cured at a low temperature, properly stored (best without baling) in a cool, dry, and if possible, air-tight room. Such hops will never need to "go-a-begging," but will be as good as "old wheat" and like money in the bank. They will be surely called for at a profit, while low grades are perishing, and will be profitable to keep over in seasons of great plenty.

From the foregoing statement, it is plain to be seen that the only safe ground for a hop grower to stand on, is that of producing only the best quality, with ample preparation to take the best care of them when produced.

The cost of starting a hop yard, and the profits to be obtained, are two very uncertain quantities, particularly the latter. The writer has raised several, successive crops, without a dollar of gain; and yet there is on record, one crop, raised in Washington Territory, that yielded the owner, the snug sum of nearly ninety thousand dollars' profit. This last, of course, is an exceptional case, not likely to be repeated, though the first probably will.

The actual value of good hop land, ready for the plow, is now not less than one hundred and twenty-five dollars per acre. The planting will cost, at least, twenty-five dollars more; poles fifty; and buildings, with hop-press, boxes, etc., a further sum of one hundred; making a total of three hundred dollars per acre, for a yard ready for cultivation. Many tracts of land, only a part of which had been cleared, have recently been sold for less money, but what is here intended, is the actual value of the cleared land. To this must be added the cost of cultivating and harvesting a first crop, before any return can be obtained; a sum, determined to a great extent, by the crop yield, but which will bring the grand, total outlay to nearly five hundred dollars per acre.

Many small growers have begun the business, with practically no capital, but that of their time and farms, the last of which has often been obtained from the Government, free. In such cases, building is frequently dispensed with at the beginning, either selling their hops on the poles or depending on a neighbor's house to dry them.

In some cases a log-house has been erected, chinked and daub-

ed, a furnace to heat it, built of clay, with flues of the same material, covered with sheet iron, and an old-fashioned "cat and clay" chimney; the whole scarcely requiring an outlay of one hundred dollars, over and above the time of the pioneer, consumed in building. The writer has one of these, long since out of use, the first hop house built in the Territory, now standing, which is familiarly known as the "old experimental," and which now looks like a relic of antiquity; but many a pound of good hops have been cured there, in years gone by.

And now for the profits, which after all is the great question of questions upon which all others hinge. Excluding the present exceptional high-priced year, and taking the eleven preceding years, based upon actual sales of one million, two hundred and thirty-three thousand pounds of Puyallup hops, (mixed crops) sold by the writer, it was found the average price obtained was $19\frac{3}{10}\%$ cents per pound, at Puyallup. This included large sales, through the low-priced years, at from four to seven cents per pound. This price, it is known, is above the general average as reported by other growers, some having run as low as fourteen and a half, for a series of years, and so far as known, none higher than $19\frac{3}{10}\%$. Larger quantities have unquestionably been sold under seventeen cents than over, and it is believed that sixteen cents per pound, is near the average price that has been obtained for a series of years, excluding the present, for the hops that have been raised in the Puyallup valley for twelve years.

This will give a net annual profit of one hundred dollars per acre, the picking not having cost in former years as much as now. The cost of production is greater now than in previous years but the standard of quality has been raised; the shipping facilities better and speedier, so that we may reasonably expect a like return in the future as in the past, for those that go into the business prepared and determined to stay, yet we are as sure to see failures and loss in the future as in the past. Over-production is certain and inevitable, which will be followed by low prices upon all hops and almost a total obliteration of value in low grades.

CHAPTER XII.

HOP HOUSES—METHOD OF HEATING—FAN-BLAST PROCESS.

AS before stated the drying is the most particular, most important and most difficult part of hop culture. Any one can grow good hops with but little skill ; it would be a wonder if he cured them properly without experience, or instruction or both. No one however, can turn off good hops unless he has the "tools" to do it with. This implies quantity (extent) of his drying capacity as well as quality, (convenience) for a given quantity of hops to be dried. A person can no more produce "gilt-edge" hops where his drying capacity is limited, than he could make "gilt-edge butter" when he had to "run the heat up" to get through churning in a hurry. Either product may look well at first, without a critical examination, but both are as certainly injured, and will eventually have to be sold at a low price. Two pounds of dried hops to the square foot of floor-surface each day is as much as should be done during an average of the season. True much more is done in numerous cases, but what is here meant, where the best quality of hops are expected.

The picking season should not last over twenty days from the date of beginning till the last hop is picked. This implies not over eighteen days for drying. Working by this rule, it is easy for a new beginner to approximate as to what size kiln he will want, judging by the yield his neighbors are getting upon similar soil. If no hops are to be baled before the picking is finished, then a warehouse of the same size as the kiln, with eighteen feet walls, will hold the crop, but may possibly require settling a little, and from which no harm will come if the hops are properly cured ; if crowded for room, a few can easily be baled before the picking is all done, and which is greater economy than to provide an excess of storage capacity. Many practice moving their hops ; forking them over to insure their keeping ; a better method is to cure them sufficiently so that they will keep without this. The best way is

to have room enough, so as not to be compelled to cure but one flooring a day on each kiln, and let the hops lie without moving until partially cooled.

Latterly the tendency is to build larger houses, for the sake of economy; I would say not to build over twenty-four feet square at most. A single stove with large and abundant pipe will furnish ample heat for this size; but no more during a cool night. The walls of the house should be twenty-two feet high, with a steep hip-roof, (as shown in the cut,) and should be plastered up to the top of the ventilator, to give draft to the kiln. The floor should be seventeen feet from the ground, and is made of slats covered with light, open cloth, usually light burlaps. Some use ordinary house-lining.

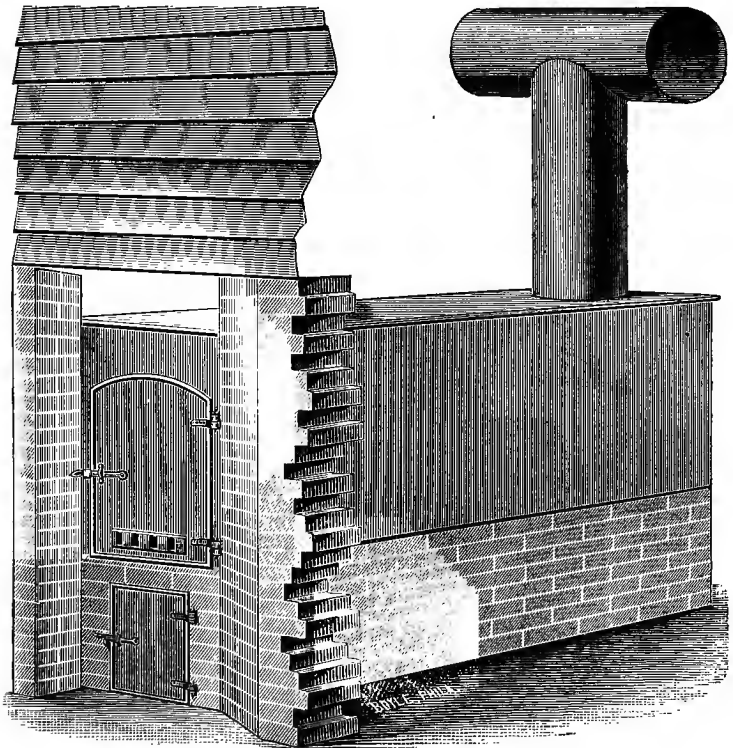
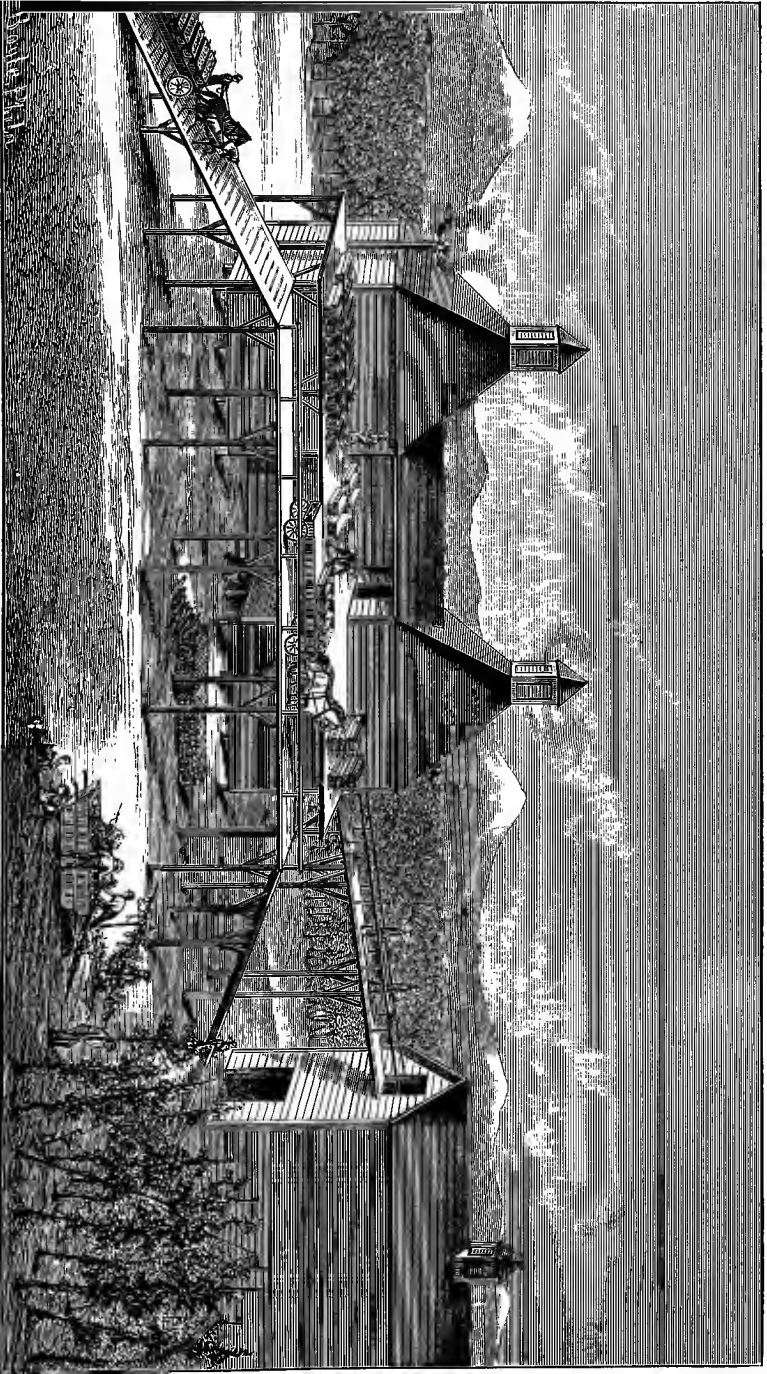


FIG. 5.—WOOD STOVE.



SCENE OF A HOP YARD IN PUYALLUP, WASHINGTON TERRITORY.

The stove for heating (shown in cut, fig. 5.) weighs about 1,000 pounds, and is made of heavy, cast-iron plates with a grate bottom. The whole is set on brick work and should have a deep ash-pit, or else the grates will speedily burn out and give trouble. Not less than thirteen-inch pipe should be used and be attached to a T, so the pipe will go both ways, half around the room, not less than two feet from the wall, and meet at the opposite side from the stove.

The stove should be large enough to admit of wood four feet long, and placed so the door is about one foot inside the wall of the building, which is cut away more than twice the width of the stove. Brick work is built diagonally from the corners of the stove to the walls of the building, the whole being so arranged that the fires are built without going inside the house. Some place the front of the stove, flush with the walls, leaving a space of four or six inches open above the stove, with a protecting lining of tin, which with the draught of cold air rushing into the building, secures the wall from taking fire. The back end of the ash-pit should be closed with a door that can be easily opened. The pit is frequently cleaned by raking the accumulating coals and ashes into the building. This is safer than taking out from the front, especially in windy weather, and besides is a saving of heat. A small pulley is fastened to the joist immediately under the hop floor and in the centre of the room. An endless cord is run on this to which a thermometer is attached. A pane of glass is set in the wall and the cord run through, above and below the glass, so arranged that the thermometer can be run down in sight without going into the building to ascertain the temperature of the air going through the hops.

Coal is the best fuel with which to dry hops and where available and cheap should be used. A steadier heat and more even temperature can be kept with coal, than with wood. The attention required is very much less. Three or four fires during a night will keep the heat up, while with dry wood, fuel must be added at short intervals.

The stoves required for burning coal, (see fig. 6) manufactured by Mr. Beardsley, are described as "48 inches high, and 24 and 30 inches (two sizes) in diameter; all cast iron. The stove and

ash-pit are formed by three, heavy, conical rings, requiring no bolts or rods, rendering it very substantial, and requiring no brick work to set it on."



FIG. 6.—COAL STOVE.

The grate shakes two ways, and when dumped, tips toward the door of the ash-pit, which makes it very convenient to remove the ashes. The fire can be kept burning any length of time, as there is an opening in the side of the stove, through which a poker can be used to remove the clinkers.

Wood, three feet long, can likewise be burned in these stoves, and some should be secured in any event, to provide for an emergency in the contingency of wanting a quick heat.

Where practicable, the house is built near a bank or side hill; in such cases the hops are delivered on the upper floor with but little expense. Where the ground is level, some build an inclined walk, upon which to carry the hops. This is very laborious, and results in loss of time. The most approved plan is to build a platform, twenty-four feet wide, alongside of the house,

on a level with the floor, and four feet below this a driveway, twelve feet wide, for teams, as shown in the cut. A double kiln, each twenty-four by twenty-four feet, with driveway, platform, stoves and warehouse will cost nearly two thousand dollars, fully completed and well painted. Such will cure from two thousand to two thousand five hundred pounds a day. The plan, as here shown, is arranged with the warehouse separate from the kilns as a security against loss in case of fire. The dried hops are carried over to the warehouse in a light frame work covered with ordinary burlap. This arrangement affords an excellent opportunity to empty the hops so the whole crop will be thoroughly mixed.

FAN-BLAST PROCESS.

The fan-blast process, as practiced by the writer for five years past, does not differ in principle to the ordinary method of curing hops, by passing a current of heated air through them and not drying by radiated heat. The sole object of the fan is to hasten the process, and at the same time be able to cure at a low temperature.

Every lady in the land knows that the clothes on the line will dry more rapidly when the wind blows than when calm, and so it is with our hops on the floor, the stronger the current of air we can bring in contact with them, the more rapidly they will cure at any given temperature. It would be possible, but probably with us in our climate, not practicable, to cure hops by forcing through them a heavy volume from the open air. In the warmer climates and particularly where there are warm nights this undoubtedly could be done.

This is not a patent-right fixture, but is free to all. True there is a patent on a certain manner of applying the blast on the furnace, but which is not essential to the economical use of the process. The principle has long been understood in Europe and applied by the use of a suction fan at the top of the building to accelerate the current by causing a vacuum above the hops.

A building where this process is used need not be so high as in the ordinary draft kiln. We find in practice, that the pressure in the room below the hops, caused by the fan, gives the same

temperature of air, at the lower part of the room, as directly under the hops, hence, if the heater is located outside the building in a brick arch, connecting with it, as it should be, the space below the first floor need not be but a few feet above the ground. We are using an ordinary draft kiln, making the room below the hops air-tight. The fan is outside of the building, and is driven at a high rate of speed by steam. An air-tight box or tube leads from the fan to the building, under the foundation, pours the cold air under and around the heaters, and is forced up through the hops. The hops are placed "waist deep," and cure speedily and evenly. We generally lay floorings three feet deep, in the early part of the season, and can take them off in ten hours. The beauty of this process is that the hops all over the floor cure evenly, not leaving any moist lumps or spots so often found (or left) in the ordinary methods.

The sulphur is burned outside the building, in close proximity to the fan, where the fumes are drawn into and through the fan, and is distributed evenly through the hops, and can be more conveniently applied than in an ordinary draft kiln. Although we cannot speak from experience, yet there is no doubt but the air could, with great economy, be forced through a second or even a third flooring of hops, with but a light addition of heat. We have had one house, an ordinary draft kiln, with double floors, and found that we could use the air a second time with good results, but discontinued the plan when building others, for movable floors as shown in the frontispiece.



CHAPTER XIII.

ENGLISH METHODS.

AS England is the great hop market of the world, and consumes our surplus, when their market requires it, a short account of their methods, crops, cost and productive capacity will not only be interesting to the hop grower, but in numerous ways, instructive. The conditions are different, and in many things not applicable to the hop grower of the United States, particularly those of Washington Territory, yet we have much to learn from them.

The information in this chapter is principally drawn from the English work, "Hops, from the Set to the Skylights," by Charles Whitehead, and published in 1881, by Wilson & Co., Royal Exchange Place, London, and sold at two shillings. It is a work that will well repay a careful perusal by every hop grower in America.

As early as 1808, there was 38,436 acres of hops under cultivation, in England. This was gradually increased, until there were 50,000 acres in 1820. From this time the acreage decreased for fourteen years, with variations, reaching the lowest in 1849, there being then 42,798 acres; but between these dates having reached 55,422 acres in 1836. From 1850 to 1861, inclusive, there was an average of 48,871 acres. For the subsequent period, where there were returns, viz: from 1866 to 1880, inclusive, the average acreage was 65,076; the highest of any one year, 1878, showing 71,789; ending in 1880, with 66,703. The average yield, from 1808 to 1861, inclusive, was 696 pounds per acre.

To propagate, cuttings are planted in nurseries, and there cultivated one year. These "sets" are then carefully transplanted to where the future hop yard is to be, and there cultivated. No return is expected or obtained the first year, and not a full crop until the third year. Upon the uplands, the yards fail in from fourteen to sixteen years, and are plowed up. In the valley land,

of which there is but a small area, the hops continue to thrive for an undetermined length of time, presumably forever, if continued manuring is resorted to and the missing hills replaced.

Early growth of vines is thought not to be the best, as if overtaken with sharp frosts, they are injured for the whole season; therefore, the "dressing" (grubbing as we term it) and hill manuring is not done until late in the spring. It is thought that vines which do not start until May, are best; meantime the whole surface of the land has been carefully dug over by hand, with a tool styled a "spud," being a three-pronged instrument, used as a spade.

The after-culture is done with an implement termed a "nidgett," being simply what we call a cultivator. The cultivation is continued until harvest begins, though late in the season, shallow cultivation is recommended, though not practiced by all.

Several varieties are usually cultivated with a view of extending the picking season, by planting the late and early kinds; some planters having as many as five varieties in one yard. More than twenty distinct varieties are mentioned, with numerous minor subdivisions, most suited to the different soils of the hop districts of England.

The enemies and diseases of the hop plantations are numerous and serious. Insects, blights and mould often destroys the crop entirely, or curtails the yield greatly, and injures the quality of what is produced. First the wire worm, or "click-beetle," attacks the new plantations, destroying the sets or eating the young growths under the ground. Then the flea infests the vines and leaves, sucking the sap, and finally attack the new formed hop, and in some cases the full grown. Then comes the "fly," a greater pest than either of those first described, called "the barometer of poverty," and "which often have changed in a few short weeks the appearance of the whole of the plantations in the United Kingdom, from the prospects of a plenteous crop to the blackness of utter blight." "A system of washing the plants with soap and water squirted over them, from garden engines, with hose and spray jets, was introduced about eighteen years ago, and now is regularly adopted by many planters when there are signs of blight." "This operation must be per-

formed by careful men, and the vine and leaves on each pole must be thoroughly washed, so as to dislodge every winged-aphis and every louse." "If all are not removed, the plants will be just as foul in a few days after as they were before the process." When the attack is late the washing is useless, and nothing can save the crop. Numerous instances are cited where the average yield for a given year was no more than one hundred and fifty pounds per acre, and doubtless the yield per acre for the year 1882 was no more.

There is a red spider that attacks the yards at times, but are often checked in their ravages, by a change in the weather. For these, washing the vines will do no good, and sulphur will not have the slightest effect. Other bugs and insects are mentioned as more or less troublesome, but none so formidable as those heretofore referred to. Mr. Whitehead, says: "Passing from the insect enemies of the hop plant to the diseases which befall it, the first to be noted in the latter category is 'mould,' or mildew, which has proved even more disastrous to hop planters than the blight caused by aphides. For this, sulphur is applied as in the case of blight, and 'many planters sprinkle the hop plants with sulphur, as a matter of ordinary routine, just as they dig, or pole, or manure them, whether there are indications of mould or not.' This is repeated three or even four times during the season."

The hop yards must be regularly manured to insure a crop. Our authority, previously quoted, says, on this point: "After the hops have been manured in the winter, with, it may be twenty tons of farm-yard manure, at a cost of £7 or £8 per acre, or with shoddy or rags at a cost of £5 or £6 per acre, it is the practice of some of the most enterprising farmers to put half a ton of rape dust around the hills, or two and a half cwt. of nitrate of soda, or four or five cwt. of guano, or other stimulating manures. It very frequently happens that the manure put on an acre of hops, in one season, has cost from £10 to £12."

Two, and sometimes even as many as four poles are set to the hill, varying in length from nine to eighteen feet, according to the kind of hops raised and the strength of the land, and are set the same as in the American method, described elsewhere. These cost, in some extreme cases, three hundred dollars per acre, and

have cost in recent years an average of nearly two hundred dollars per acre. Mr. Whitehead, says: "During the last three years (prior to 1881) there has been a great decrease in the value of wood-land, owing to the failure of the hop crop, and in this last winter it has been difficult to find buyers for the falls in many places. Directly hops pay well again, prices will revert to their former standard."

As many as one hundred thousand hop pickers "Come from the courts and alleys of London" in seasons of plenty. They are carried to the hop district on cheap excursion trains, and are to a considerable extent controlled by a society established for the purpose of engaging help, and which has established certain rules for their care, under sanction of the local government. They pick in boxes or large baskets holding twenty bushels and have a box-tender to every ten pickers. The pickers are paid an average price of two pence per bushel. The hops are sacked to carry to the kiln, as in New York and not hauled in the boxes as in Washington Territory.

The hop houses or dry kilns, (oast houses as they are called) are generally built of brick or stone, frequently round, and sometimes with two floors. The drying is done by building an open fire, with Welsh anthracite coal, fed by charcoal. The temperature is run low, 125° Fahrenheit being considered high and one hundred to one hundred and ten, is considered the highest heat admissible without injury. From fifteen to twenty pounds of brimstone is burned to a ton of hops, generally soon after the process of drying begins. The hops are baled directly after they are dry, while hot, and if not ready to receive them in the baler, are put in piles to keep them warm, to prevent the absorption of moisture from the atmosphere. Almost all are sold through the factors (commission) who sells to the merchant, and they in turn to the brewer. Many growths go from generation to generation to the same house as soon as packed. Each bale or bag is sampled, and in addition to that are carefully probed with a tryer, and the cloth sometimes stripped off entirely to give opportunity for thorough examination.

The cost of preparing the land, supplying sets, setting out stakes first year, manuring, cultivating, interest and rent of land

for an acre of hops is \$208.00. This does not include poles, which are accounted for in an annual charge afterwards ; neither for the cost of buildings.

Table, showing the annual outlay upon an acre of hops in full bearing, reduced to our currency :

Manuring, carting and spreading,	\$38 72
Digging, or plowing and digging,	5 08
Dressing,	1 44
Poling,	3 60
Tying,	3 36
Pulling vines, earthing, etc.,	96
Ladder tying,	1 92
Keeping land clean around hills,	1 92
Nidgetting, (cultivating) and harrowing,	8 88
Annual average supply of poles,	25 40
Stripping, stacking poles, etc.,	2 22
All expenses, picking, drying, selling an average of 696 pounds,	54 69
Rents, rates, tithes, taxes and repair of oasts, etc.,	26 40
Interest on capital,	14 52
	\$189 11

Average cost, 27 $\frac{1}{2}$

Where sulphuring is done, \$8.00 per acre more must be charged ; if washing is done, \$17.00 more must be added to the annual outlay, bringing the cost of producing a pound of hops to nearly if not quite, thirty cents per pound.



CHAPTER XIV.

HOP CULTURE IN THE STATE OF NEW YORK.

BY W. A. LAWRENCE,

Waterville, Oneida County, New York.

I. THE GROWTH AND EXTENT OF THE INDUSTRY.

MEN are still living who can remember the first hop yard, planted in the State of New York. It was set out by James D. Cooledge, in the town of Madison, (about six miles south of Waterville) in the year 1808. His neighbors, from year to year, obtained from him a few roots and set out small patches. The culture made but slow progress. The price ruled generally about twelve cents per pound, and the hops had to be hauled with ox teams, 100 miles to Albany, for sale. Four acres was then considered a very large plantation. The brewers then looked upon any American hop as far inferior to any English hop, and the American brewers prided themselves on importing their hops from London. This little hop-colony, in what was then the backwoods, in the centre of the great State of New York, was struggling with poverty, in the midst of an almost unbroken forest, and their presses and hop kilns were of the rudest description. But the hops raised on this soil, were found to be full of lupuline, rich and sound, and in spite of prejudice they worked their way into favor on a small scale.

The crops were heavy and 2,000 pounds to the acre was not considered an uncommon yield. The low price could not crush out the enterprise, so long as these large yields made up a fair return as compared with wheat and potatoes, and so these yards increased slowly for the first ten years. In 1822, however, some previous bad failures in England had cut off from the American brewers their supply of English hops, (the price in London in 1816 was 77 cents and in 1817 it was \$1.44 per pound,) and some of these same New York State hops were sold by the grower in Albany for \$1.50 per pound.

That gave the industry a fresh start. Its success was assured. It spread into adjoining counties. But still the bulk of the hops in the United States was raised east of the Hudson River, and in the states of Massachusetts and Vermont. Even as late as 1839 the State of New York raised only *one-third* of the entire crop of The United States. But in 1849 New York State raised *five-sevenths* of the entire crop of the United States and in 1859 *seven-eighths*.

The New England (or so-called "Eastern") hops could not hold their own against the richer hops and heavier crops of New York State. But while the New York State hop seems to keep up its reputation for *quality*, the *quantity* per acre has sadly fallen off since those good old times of a ton to the acre.

The present yield per acre throughout the State and the present extent of the hop industry here is best shown by the latest reliable figures we have; those of the United States Census of 1880, in which the figures are those of the crop of 1879.

These statistics were sent to me direct from the Census Office, at Washington, and I have found them substantially correct.

EXTENT OF HOP CULTURE IN NEW YORK STATE, IN 1879.

There are four counties in New York, any one of which raises more hops than the whole State of Wisconsin, or California, and for the sake of showing the relative standing of the counties in 1879, I have figured out the average production per acre in each of the twenty principal hop-growing counties and have prepared the following table for convenient reference:

NEW YORK STATE HOPS.

<i>Counties.</i>	<i>Pounds, hops raised, 1879.</i>	<i>Acres in hops.</i>	<i>Average lbs. per acre.</i>
Otsego,	4,441,029	9,118	487
Oneida,	4,075,651	5,737	710
Madison,	3,823,963	6,076	629
Schoharie,	2,982,873	5,871	508
Franklin,	1,083,850	2,075	522
Montgomery,	1,001,403	1,612	621
Ontario,	807,528	1,282	630
Herkimer,	512,963	972	528
Lewis,	398,201	828	481
Livingston,	310,574	422	736
Chenango,	302,857	794	382
Onondaga,	281,892	489	576
Oswego,	198,309	622	319
Delaware,	190,793	569	335
Monroe,	181,312	245	740
St. Lawrence,	177,866	331	537
Wayne,	145,573	189	770
Jefferson,	135,955	269	505
Albany,	123,182	243	507
Genesee,	121,813	185	658
Twenty principal hop-raising counties,	21,297,587	37,929—562 lbs av. to acre.	
Twenty other hop-raising counties,	435,734	943—462 lbs. av. to acre.	
Sixteen counties . . . . .	.....	.....
Total in N. Y. State,	21,733,331 lbs.	38,872 acres—559 lbs. av. to acre.	

With this table before us we observe: 1. A solid block of four counties, Otsego, Oneida, Madison and Schoharie, which produce more than two-thirds of all the hops raised in the State and more than half of the whole crop of America. Of these four, Otsego takes the lead in acreage and pounds produced, but Oneida is easily first in productiveness, giving 710 pounds per acre to Otsego 487. 2. Another remarkable group of counties we find in Ontario, Livingston, Monroe and Wayne, all close together and about a hundred miles west of the first group. Ontario is the seventh county in the State in order of acreage and pounds produced, but among these seven, it is second only to Oneida county, in point of yield per acre; while its companions in the group, Livingston, Monroe and Wayne, show the highest yields per acre in the whole State. One would expect in counties

favored like these. in point of productiveness, to see a large and rapidly increasing acreage, but the fact is that the large yield per acre is owing a good deal to the yards being confined to some narrow and fertile spot, as for instance, the Rose Valley farms, in Wayne county. Were the acreage extended over the whole county, as in Otsego and Oneida, the yield per acre would fall off materially. We can see by the figures, however, that taken together, the yield of hops per acre, determines whether a county, as a whole, will develop into a hop-growing county or not. The twenty principal counties, give an average yield of 562 pounds to the acre ; while the twenty-four other counties, in which hops are raised, give an average yield of just 100 pounds to the acre, less.

COMPARISON WITH OTHER HOP REGIONS OF THE UNITED STATES, IN 1879.

Turning now to compare the whole State with other hop regions, we find :

<i>Crop, 1879.</i>	<i>Pounds.</i>	<i>Acres.</i>	<i>Ave. lbs. per acre.</i>
New York,	21,733,331	38,872	559
Wisconsin,	1,966,427	4,438	443
California,	1,426,077	1,119	1,274
Washington Territory,	703,277	534	1,317

We notice at once the remarkable difference in the yield per acre of these, our four leading hop States. Washington Territory easily takes the lead in productiveness. The wonderful growth of hop culture in that Territory, is well set forth in another part of this book by Mr. Meeker, who is the largest hop grower in that Territory or in the United States. With the acreage on the Pacific Slope, averaging nearly three pounds to that of Wisconsin's one pound, it is no wonder that the Wisconsin acreage, since 1879, has fallen off nearly one-half, while that of the Pacific Slope, and especially of Washington Territory, is increasing enormously. It must be remembered that the crop of 1879, all over the country, was somewhat lighter than the usual crops, and that, perhaps, twenty per cent. may be added to the above figures to make a full, average crop.

CHAPTER XV.

SOIL AND CLIMATE OF THE HOP REGIONS IN THE STATE OF NEW YORK.

WE have already drawn attention to the fact that the great hop-raising counties of New York State, which produce more than half the hops raised in America, are in one solid block. From a point about 100 miles north of New York City, they extend northward about fifty miles and westward about 150 miles. The climate is cold in winter, the mercury often reaching twenty to thirty degrees below zero in the coldest weather. In summer it is seldom oppressively hot, but the seasons open early and the frosts come late, (not often before the 1st of November) so that the hops have plenty of time to develop and mature.

The face of the country is made up of great rolling hills with the valleys between, and generally from 500 to 1,500 feet above the level of the sea. These great hills are fertile to their very tops, taking kindly to sod and to all sweet grasses, and the region is famous for its dairy products as well as its hops. The soil is mostly a gravelly loam. There is plenty of limestone cropping out of the whole region here and there, and the small cobblestones which abound are largely fossiliferous, made up of the petrified remains of small shellfish, and to this circumstance I attribute a good deal of the richness of the hops grown on this soil. The yards are planted both in the valleys and on the hills, the valley-yards having sometimes a slight advantage in richness of soil, and the hill-yards a slight advantage in freedom from vermin. Most of the land is well adapted to endure drouth. It retains both water and manure; in other words, it is not "leachy," and this is a matter of the first importance, for nothing will diminish the weight of a hop crop more certainly than prolonged dry soil in July and August.

CHAPTER XVI.

METHODS OF HOP CULTURE IN NEW YORK STATE.

THERE are almost as many different notions about every branch of hop culture, as there are growers, but it would take too much space to describe them all, however interesting and profitable. I shall only attempt to give those methods which have stood the test of long experience, and which are adopted and practiced by our largest and best growers.

(1). PLOWING FOR NEW YARDS.

Where the soil is deep enough the subsoil plow is sometimes used, and with good results ; but generally the sod is turned under early in the fall, with an eight or ten-inch depth of furrow, and then in the spring, is cross-plowed and well harrowed to pieces. Potatoes or corn raised one year on land, before setting to hops, make a mellow soil the first year, but most prefer to let the hops have the first benefit of the rich sod. When the sod is not turned under early enough in the fall (and the 1st of September is not too early) to get well rotted by spring, good farmers do not disturb the sod by cross-plowing in spring, but harrow first lengthwise then crosswise of the furrows till the surface is mellow.

(2). ROOTS AND THEIR VARIETIES HERE.

The standard hop in this section, and the one from which most sets are taken for new yards, is now the English Cluster. It is a strong and large vine, a good "climber," and bears a good crop of rich hops of a fine golden color when well handled.

The "Grape" Hop is a very rich hop, but the vine is not so hardy, or so strong a climber as the "English Cluster," and the "Grape" roots are seldom called for. The Humphrey Seedling is an excellent hop of fine flavor, and has come largely into cultivation about Waterville, within three or four years, though it originated in Wisconsin. Last year (crop of 1882) the Humphreys generally came down with a rather light crop, as compared with the English Clusters alongside. But the Humphrey is a week earlier than the English Cluster, and came in contact, while just "in the burr," with a dry, hot spell which the English Cluster,

being not yet in this critical state, escaped. Lice are very fond of the Humphrey, but the week earlier picking has so far rescued these hops from any special damage.

The Palmer Seedling is a week earlier still than the Humphrey Seedling, but though a fine hop, in quality, the crop is so small that roots of this sort are now seldom set out.

The "Canada" Hop, from roots brought in here from Canada, is perhaps a week later than the English Cluster, at least it will "stand" a week later before picking, and on this account, added to the fact, that it is a fine hop of excellent flavor and a good bearer, the roots are sought after; but care has to be taken to get the "*True Canada*," as there has been a "bogus" Canada sold which has proved a complete failure here. Roots have also been brought here from California, and small yards about Waterville, set with California hops, promise very well; but are not yet sufficiently advanced or extensive, to admit of a fair comparison with the established sorts already tested by experience.

Now with these varieties of roots before us, from which to select for a new yard, it must be borne in mind that it is a great object *to extend the time for picking*. In all hop regions there is a great scramble for pickers. The grower who can offer the pickers the longest job will have first choice. Then even if you can get plenty of pickers so as to sweep the hops off a large yard, when the hops are just right, you are limited again by your facilities for drying, so that with a large yard, all of one sort, the chances are that you will have to pick some of your hops too green and lose both in weight and quality, or else let some of them stand too long. To avoid this, our largest and best growers aim to get in from one-third to one-fourth of their acreage in Humphreys, and the balance in English Cluster. Some of the more enterprising and extensive growers are also aiming at a still later hop than the English Cluster. My neighbor, Sylvester Gridley, has what I consider a model yard in respect to varieties of hop and proportion of each, namely: five acres Humphreys, ten acres English Cluster, and five acres True Canada. This proportion, one-fourth early, one-half medium or main crop, and one-fourth late is very desirable for even a hop yard of moderate acreage, if good roots of these sorts can be obtained.

3. MARKING OUT THE GROUND FOR THE HILLS.

Taking a single acre, and placing the hills on the outer edge, all round, will give more hills to that acre than will "pan out" in the case of a yard of several acres, for when you set a second acre alongside this first one, the first row of hills in the second acre alongside the first will come six, seven, or eight feet back from the outer edge.

In practice therefore and in round numbers, hills so set that the rows are seven feet apart one way and eight feet the other will give—

7 feet by 8 feet,	750 hills to the acre for several acres.
7 feet by 7 feet,	875 " " " " "
7 feet by 6 feet,	1,000 " " " " "
6 feet by 6 feet,	1,200 " " " " "

Yards are set out with us at all these various distances for the hills. Which is the best? That depends altogether on the situation of the grower as to means of cultivation and obtaining poles. If you have plenty of good, deep, rich ground, can get plenty of good cedar poles at a reasonable price, and propose to use two horses in cultivating between the rows, then I should say the experience of our growers is in favor of placing the hills in rows seven feet apart one way and eight feet the other way, and using two good poles to the hill. By having the rows which run easterly and westerly eight feet apart from centre to centre of hill and two poles in each hill, the poles standing northerly and southerly from each other at right angles to the line of the row, and each pole six inches from the centre of the hill, we have a yard in which the poles in each hill are spread open to the sun so that the hops on one pole will not shade the hops on the other, and there is left seven feet each way between the poles for room to cultivate with two horses.

Seven feet by seven is good where land is plenty, and for a "string" yard, or tent yard hereafter described, in which cases only one pole to the hill is used, and you can use two horses in cultivating. Seven feet by six is good for a yard with two poles to the hill where land is an object, and one horse is used to cultivate between the rows. Six feet by six feet is good for a one-pole-to-the-hill string yard and for cultivation with one horse. Two horses *can* be used in a six feet by six feet yard, but most of the time it is too close work.

Having decided which is your best distance for the hills, the best and quickest method for marking out is to get a ball of strong twine with not too much "stretch" to it. The stretch can be taken out, if too great, by dipping the twine in boiled linseed oil and drying it in the sun.

If your field is of such shape that you propose to have the opposite sides run parallel to each other, then for example suppose you wish to mark off into rows eight feet by seven feet apart. For the rows running northerly and southerly take a part of the twine of sufficient length, and by means of bits of bright-colored yarn or string, mark it off into spaces of seven feet each.

For the rows running easterly and westerly, provide *two* pieces of the twine, each of sufficient length for a row, and marked off by bits of bright-colored stuff into spaces of eight feet each.

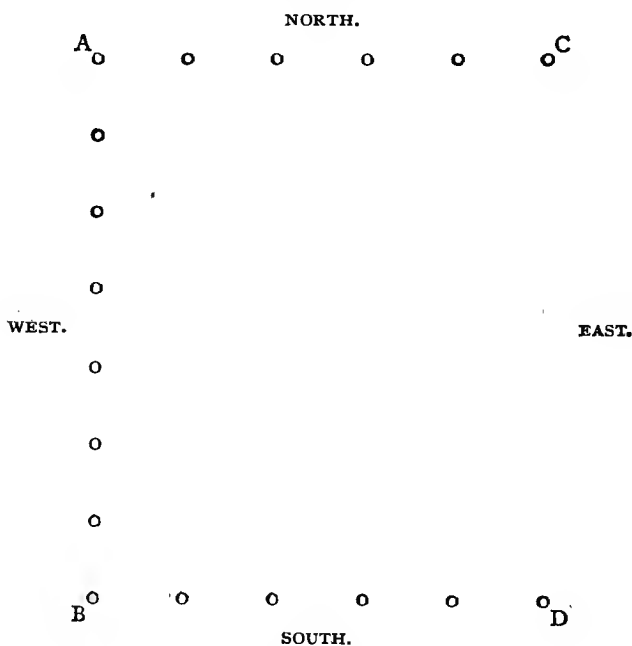


DIAGRAM.

Now referring to diagram opposite: Stretch your line of seven feet spaces from A to B, thus lining the first row running northerly and southerly, setting corner sticks at A and B, each representing an end hill of that row. Now stretch one of your lines of eight feet spaces from A to C, thus lining the *first* row running easterly and westerly, and set a stake at C, representing the end hill of that row. Now go to the opposite side of the field and stretch the other line of eight feet spaces from B to D as nearly parallel to A and C as your eye will guide you, and with the line attached to the stake at B, set a stake temporarily at D, representing for the moment the end hill of that row, the *last* row running easterly and westerly. Now bring your line A and B across to the opposite side of the field and stretch it from C to or near D, and from the stake B as a centre, swing the line B and D, till the stake D comes to such a point that your line brought across from A and B just reaches from C to D.

The opposite sides of your yard are now parallel, and your hills will be in parallel rows both ways.

You have now only to stick out the hills for the row between C and D by sticking one directly under each colored bit on your line, one of which bits is over the stake C and another over the stake D, which stakes will stand for the corner hills on that side. Then carry your line into the field, one eight feet space as shown and already measured by the colored bits on the line A and C at one end, and the line B and D at the other end. Stick this row, and so on through the field.

I have described this method with more pains, because it pays richly to start off "on the square" with a yard you have got to work in and have your neighbors "squint at" for ten or fifteen years. The sticks to mark each hill are split out of old cedar posts or hemlock stuff, and are about fifteen inches in length and one-quarter to one-half inch square on the end.

4. PUTTING IN THE SETS.

The sets are cut from the "runners" which are roots put forth by the hop near the surface of the ground. These runners are evidently intended in the main for propagation, for they have to

be removed from the hill every spring as soon as the ground will allow or else they will send up "suckers" or sprouts. As soon as these runners are grubbed out they are gathered up and saved or sold for new yards. They are sold in the rough as "roots" by the bushel or pound, or already cut as "sets" by the thousand. For an acre it takes all the way from two to five bushels according to the sort of roots.

Each set is cut so as to have two joints or sets of "eyes." Four sets to the hill is the ordinary allowance with us, but many of the best growers now consider three good sets as good as four.

With the ground staked out for hills, as before described, we send a man along with a "hop bar," such as is used for setting poles. He pulls up each stick, setting it a little to one side, and where the stick was pulled from he makes, with his bar, a hole about a foot deep and five inches wide at the top. It is a good plan to follow this man with one who carries a pail of "super-phosphate," which now costs about two cents a pound by the ton. This man pokes a little soil into the bottom of the hole so as to make it about nine inches deep. He then puts in about three tablespoonfuls of super-phosphate, and pokes in about two inches of dirt on top of it so as to keep the sets from contact with the super-phosphate and leave the hole now about six inches deep and five inches in diameter and ready for the sets. The man with the sets places them in the hole with the eyes pointing upward, and the sets nearly upright surrounding the centre of the hole in a circle about three inches in diameter. The dirt is pressed firmly around the sets with the fingers and the tops covered about two inches deep and the stick stuck back slanting over the hill to mark it. Of course any other fertilizer will answer in place of the super-phosphate, but few fertilizers are so convenient as this, for this purpose, and I know it gives the young vines a great start. As to sets for male hills you will probably find you have all you want, and more too, as roots are sold now-a-days. Four or five hills to an acre are sufficient.

5. MANURES USED FOR HOPS.

We see that the very first move in setting the roots in the ground for a new yard, has brought us to the subject of fertilizers.

No matter how well adapted the soil of this great hop section may be to the raising of hops, it certainly is not capable of raising them profitably, year after year, without the liberal use of fertilizers.

In general our most prosperous growers are those who are the most liberal and painstaking in the matter of manures.

In the fall, many put two good forkfuls of stable or barnyard manure on every hill. It is good not only as a fertilizer, but it protects the hill from being injured by the sudden thaws and freezes which occur sometimes in midwinter and often toward spring. But the supply of manure from cows and horses is but a small part of what the large hop grower must have, and there are several agencies in Waterville for the sale of concentrated fertilizers.

The "Super-phosphates" (in which the active principles are mainly bone, phosphorus and ammonia) take the lead. Then comes Lime, Ashes, "Plaster," and Salt, about in the order of mention, and great are the discussions as to their value. One grower, for instance, has used slaked lime freely one year with great effect, and thinks if he puts on lime every year he can keep his yard in good heart with nothing but lime.

Another has tried lime and would not give a cent a load for it. Now in this sketch of Hop-Culture, in New York State, I aim to give the practical experience of the best growers, and so in a case like this where experience varies so widely I can only say—follow the advice of St. Paul: "Prove all things; hold fast that which is good." But there are certain general laws in regard to fertilizers which he who follows will not go far wrong.

(1). The dung of horses, cows, hogs, and in fact of all animals, contains *all* the valuable elements necessary for the growth of plants, and is therefore the safest and surest manure, and the first to be obtained if possible.

(2). The flesh and bones of animals, such as the refuse of slaughter houses, comes next to dung in valuable elements, and in this lies the secret of the much-prized "super-phosphates."

(3). Next after animal matter, as a fertilizer, comes vegetable matter. The trouble with vegetable matter is that it decomposes slowly, and the effect is not quick enough to satisfy the impatient

grower. But forest leaves, meadow "muck," and straw, are slow but sure *manures*, and a compost heap (to help along the rotting process), let stand till well rotted and spread on a hop yard, will pay better in the end than most of the chemical and commercial fertilizers.

(4). Ashes is concentrated from vegetable matter by combustion, and, bringing a large constituent of the hop (potash) with it, is always a positive and active fertilizer. But Lime, "Plaster," and Salt, are often useful, not so much by what they bring with them as by dissolving *what is already there* in the soil, and digesting it so that the hop roots can absorb it. These chemical "manures" therefore may prove very valuable, the first year, as solvents of what is already in the soil, but after that future applications may do no good *till fresh vegetable matter is first supplied*.

It is no doubt owing to the operation of this law, that these chemical fertilizers do their best work in our best yards—those which are "rich in all the elements of fertility," but needing a solvent to render these elements at once available for food to the hop roots.



CHAPTER XVII.

VARIOUS METHODS OF SUPPORTING THE VINES.

HOP poles have always been an important factor in the cost of starting a hop yard. At the present writing this is particularly so, caused by the enormous demand and increased cost of poles, as will be seen by the following schedule of prices.

Hop poles delivered here : Canada cedar poles,

16 to 18 feet long, $2\frac{1}{4}$ to 3 inches at butt,	11 cts.
18 to 20 " $2\frac{1}{2}$ to 4 " "	15 "
22 and over, $3\frac{3}{4}$ to 5 " "	24 "
Michigan, 20 to 25 feet,	17 "

I should say that the number of poles brought by railroad into Waterville, within the year would be something like 400,000.

The largest poles are used for the "tent" yards, and the smallest are worked in on young yards and to patch up in old and unthrifty yards. It will be seen at once from the above prices that the item of poles absorbs a large amount of capital in extensive hop growing. An acre of 750 hills, two poles to the hill, calls for 1,500 poles at fifteen cents each, \$225, and in ten or fifteen years the poles are practically worthless. It is not strange, therefore, that the hop-grower and his sanguine friend, the patent right man, have been busy for many years trying to devise some way to hold up the hop-vines and at the same time get rid of at least a part of this great expense for poles. The cheapest of all these contrivances in original expense is undoubtedly the

(I). HORIZONTAL "STRING" YARD.

I have before me a description of one of the yards, written by a practical hop-grower of Otsego County, New York, in 1864. It was a "patent" (\$10 per acre for the right to use it), and called for stakes (one to each hill) eight or nine feet long, sawed one and one-quarter inches square and set one foot deep in the ground. There was an outer row of stakes two and one-half inches square, and the tops of all the stakes are connected by a twine running across the yard both ways tied to the outer stakes only, and wound once round the inner ones. He gives an estimate of the cost of preparing a yard for the vines in this way, and (including \$10 per acre for the right to use it) places the cost per acre at \$36, as against the cost of a yard with two long poles to the hill, (poles at twenty cents each) placed at \$297. He further says, "I consider this plan as far superior to the common plan with long poles, as the mower and horse-rake are to the haying implements used by the last generation."

Here, then, we have a plan which had been used to some extent for three years in Otsego County, previous to 1864, and then highly recommended by a good hop grower, with a saving of \$250 on every acre, in its favor. But now, twenty years later, the two long poles to the hill are found in three acres out of four in our hop-yards proudly holding up their burden of hops, while the Horizontal String Yard is almost forgotten. There are many reasons why it did not make its way on trial year after year.

The hanging "arms" interfere with later cultivation. The strings sometimes break, and anyhow it is continual trouble to keep the vines on them through high winds, and running in this *unnatural*, horizontal position. The natural course of the hop vine is an *upward*, spiral, twisting round "with the sun," and whoever tries to run it horizontally, and thus against nature has "a hard row to hoe." I make a special example of this "Horizontal String" system, in order to show how necessary it is to go slow in adopting a new system. Setting this "Horizontal String" system down then, as cheap but unsuccessful, we pass on to

(2). THE OLD-FASHIONED "EIGHT-STRING TENT" YARD.

Beginning on one side of the yard and with the row of hills next to the outside row, set a tent pole in the second hill of this second row and one in the fourth hill and so on, each alternate hill through the row, and each alternate row parallel with the first one set, so that there shall be first a stake hill and then a tent pole in every direction throughout the field.

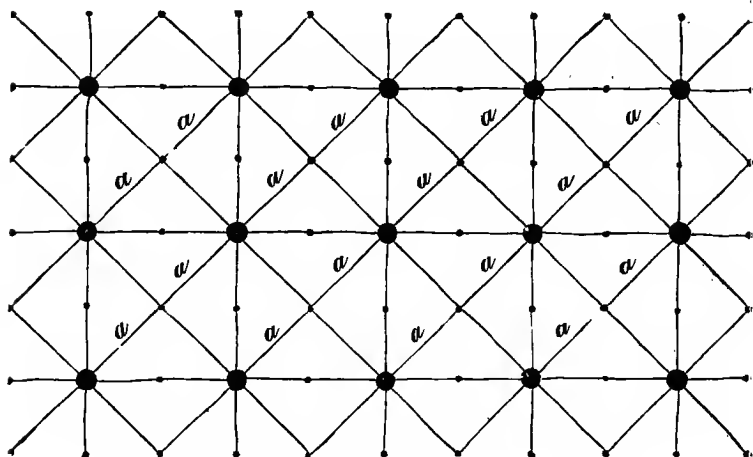


FIG. 7.—DIAGRAM OF EIGHT-STRING TENT YARD.

Referring to the diagram the large dots represent the tent poles, the small dots represent the stakes, and the lines represent the strings, converging from the stakes upward to the top of the tent poles, one pole in each "tent" hill. These poles are selected ones, and should be not less than five inches at butt and not less than twenty-two feet long. The stakes are five or six feet long so as to set one foot deep in the hill, and are made from old poles, or cut in the woods, or made of sawed stuff, one and one-half inches square on the end. In setting the yard it is found best and

quickest to first set the stakes and poles, just fitting the poles in the ground temporarily and setting the stakes permanently. Then two men with as many balls of string as there are to be strings to a pole enter the yard, take down the first pole, lay the ends of the strings together, and tie them in a stout knot round the pole at a point, sixteen feet above the sharpening (so it will be sixteen feet above the ground when the pole is set), then set the pole permanently, carry each ball of hop-twine to its stake, cut and tie, and so on through the yard.

Two vines are run to each string. The outside rows may be set with ordinary poles and four vines run up, branching two to string and two up pole.

(3). THE MORE RECENT SIX-STRING TENT YARD.

Referring to the diagram of the eight-string tent yard, we observe that the stakes have each two strings, calling for four vines to each hill, except the stake in the centre of each square of four tent hills which stake has four strings, calling for eight vines. This is too much for that hill. Accordingly the rule now is to omit on these stakes the strings which I have marked *a* on the preceding diagram (Fig. 7), and the result is that each stake hill has four vines, each outside row of tent poles seven strings, (except the corner hills, eight), and all the other tent poles, six strings each, and two vines up each tent pole. The outside rows, poles of ordinary size instead of stakes.

These "tent" yards have one advantage and one or two disadvantages. The advantage is in the beginning; in the saving of outlay on poles. For a yard with two poles to the hill, the expense for poles ready to set is now about \$250 per acre. The interest on the money is (at six per cent.) \$15 per year, and the shrinkage on the poles (to last ten years) \$25 per year, making \$40 per year, for the yard with two poles to the hill.

For a tent yard the cost for poles and stakes ready to set is about \$50 per acre.

Interest on money,	\$3.00 per year.
Shrinkage on poles and stakes,	5.00 "
Cost for strings about	5.00 "
Making a total of \$13.00 for the tent yard.	

This makes a difference, in favor of the tent yard, of \$27 per year on each acre, as far as expense is concerned.

This is the advantage. The drawbacks are—

First. Bringing so many strings together at one point, tends to crowd the hops; and with a heavy crop some of the hops may be "light" both in weight and quality.

Second. A heavy wind or thunder storm is rather harder on a tent yard than on one with two poles to the hill, and if any breakage occurs it is harder to repair, and sometimes impossible.

When both these drawbacks operate in a single year as they sometimes do against a tent yard, the weight of hops lost, more than counterbalances the saving in poles.

Still the saving in original outlay is so considerable, that many of our best growers have a part of their yards set with tent poles.

(4). THE HALF-TENT YARD.

In this yard the outside row is double poled or a pole of ordinary size, and stake to each hill. The next row has one good pole to each hill and two or three vines to this pole. The next row is one of stakes; the next row one of poles, and so on through the yard. Each row of stakes has four vines to each stake and two strings; each leading two vines to the poles on opposite sides of the stakes as in the full tent yard. This brings only two strings to each tent pole on opposite sides of it, and is free from most of the danger of overloading and crowding which occurs in a full tent yard. But it requires double the poles of a full tent yard, and so where economy is the object, the growers go the whole figure to the full tent, and this half-tent yard is not very common.

But there is a yard which is a happy medium between the full string, or tent system, and the full pole, or two-poles-to-the-hill system. It has been tried by some of our best growers. It is much liked. It is being adopted by others. *There is no patent on it.* I shall take the liberty to call it, in my opinion—

(5). THE BEST POLE AND STRING YARD.

This yard has one pole to each hill, except that the outside rows, on two of the opposite sides, of the yard, have two poles to each hill. It thus has this advantage over a yard with two poles to the hill, that it practically saves half the poles, or a saving of expense at the outset of nearly \$125 per acre. But there being but one pole to the hill, renders it unnecessary to put the hills seven by eight feet. They can as well be put at equal distances; and I have the opinion of good growers, like Morris Terry for instance, that a yard set in this way with hills seven by seven or even eight by seven, will produce rather more hops of equally good quality, and with less risk of damage by wind, than a yard with two poles to the hill. But it must be remembered that hills seven by seven, with two outside rows, double poled, call for about 1,000 poles to the acre, so that the saving at first is not so very great: say about \$75 per acre for same style of poles. And even this saving is further reduced by the fact that the poles for this yard should all be good ones, not so large as full tent poles, but selected ones about twenty feet long and four inches at the butt. The extra cost of these poles will bring the saving down to about \$50 per acre at the start.

Then charging this yard with \$3 a year for string, and charging the yard of two poles to the hill with ten per cent. shrinkage on the extra \$50 worth of poles (\$5) and \$3 interest we have left in favor of this pole and string yard, a balance of only \$3, less in expense, per year, to each acre. This saving is not worth speaking of, and therefore I do not give it my preference as a *cheap* yard but as a *good* one.

It will bear every hop that the ground can produce. It will hold them up strong and well-spread apart, and exposed to the sun. Each pole is braced against wind, by strings to other poles, and there is less breaking of the tender "arms," less "whipping," in high winds, than there is with two poles to the hill.

Referring now to the diagram of this yard, (Fig. 8.) Beginning at the corner "A" with the yard to the front and right, we first set the outside row "A," "B," "C" and so on, two poles to the

BEST STRING AND POLE YARD.

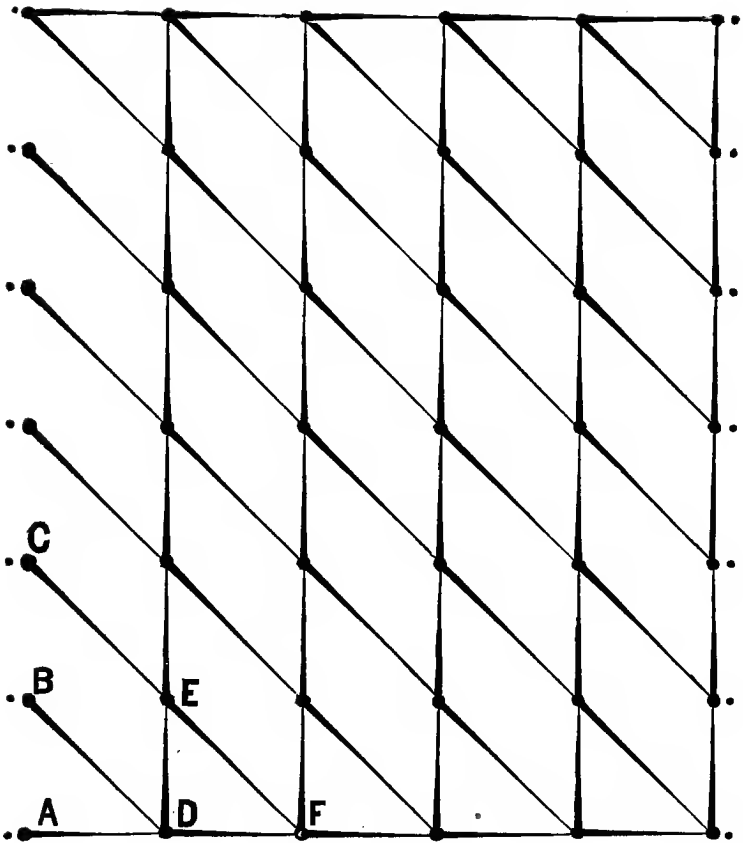


FIG. 8.—DIAGRAM.

hill (except the last corner-hill, *one* pole) as shown by the dots on the diagram where the dots represent the poles, and the lines the strings, the heavier part of the lines representing the bottom part of the strings.

The outside pole, of this outside row, in each hill may be a lighter pole than the rest of the yard, as it only carries two vines and no string. Having set this outside row we return to the hill D. I hardly need to say that the poles are supposed to be

already "laid" in the yard. With two balls of twine, we lay the ends of the twine together, and tie with a firm knot around the pole for D, about fourteen feet from the "sharpening," so that the top of these strings will come five or six feet below the tip of the pole, and at a point where the pole should be about one and one-quarter inches thick, for strength. We then raise and set the pole D, carry one of the strings to pole A (already set), cut, and tie about five feet from the ground. Carry the other string to pole B (already set), cut and tie about five feet from the ground. Then pass on to pole "E" tying on two top strings as to the previous pole, raise and set pole E and carry one of the strings back to pole D, cut, and tie about five feet from the ground. Carry the other string to pole C, cut, and tie about five feet from the ground; and so on through the row to the last hill where we carry the string which corresponds to the one from E, to "C," to the corner hill of the outside row. Returning, we begin at the hill "F," and so on through the yard.

Except the outside rows on two sides, each hill has now two strings, leading from a point on it, about five feet from the ground, each string to the top of a different pole. Two vines are trained up each of these strings, and two straight on up the pole to the top, making six vines to each hill throughout the yard. I have described the setting of this yard, more particularly, because there is only one way to do it, and one right place to begin.

So in picking; the best place to begin, other things being equal, is at the opposite or diagonal corner from where we began to set the poles.

(6). WIRE YARDS.

All wire yards that I know of are based on pretty much the same plan. Stout posts like telegraph poles on the outside of the field, between which posts, the wires are stretched along over the rows, or in the middle between the rows, at a height of about twelve feet. Strings are then run, from short stakes in the hills, up over these wires. They generally cost about \$100 per acre ready for the vines, and give good satisfaction. They are all patented, so far as I know, and therefore, I must leave them to be described and pushed by their proprietors.

CHAPTER XVIII.

CULTIVATION.

IT is customary to plant corn or potatoes between the hop-hills the first year, sometimes one row and sometimes two between the rows of hop-hills. The young vines are allowed to lie on the ground, as they produce no hops, but it will cost very little and I believe will pay, to set a small pole an inch or two thick and six or eight feet long "to show the vines what they have got to come to," as the English grower says, and I shall try it the coming season.

In the fall, as soon as the corn or potatoes are off, comes a good time to spread on manure and plough and cultivate it in; having first bunched the hop-vines by twining them around the stick used to mark the hill.

(1). GRUBBING.

Some set the poles before grubbing, others after. If a grower has a good many hops to look after, and is short of help, he can, in some seasons, get the poles set and out of the way before the ground is fit to grub. Otherwise, the usual way is to grub before setting the poles.

I have treated of the poles first, because every good grower looks out for his poles and has them all sharpened and stacked near the ground, during the preceding winter or certainly before the ground opens in the spring.

As soon as the frost is out and the ground fit to work, grubbing commences. Growers here use a "grub hook" with two stout steel prongs about an inch wide and flattened and sharpened at the points, and about eight inches long, with an inch space between them at the points and coming together at the handle, which is about the length of an ordinary hoe handle and a good deal stouter.

With these the dirt is pulled away from around the "crown" in the hill, the "runners" (which are few the second year) and the dead vines trimmed off with a knife and any grubs carefully looked for and killed.

The hills are now in good shape for setting the poles, if not already set, for you can see just where the "crown" is, out of which all the vines will start.

The poles are then set; the ground plowed; any runners or "roots" saved for planting or sale; and the dirt pulled up so as to cover the crown and lie even about the hill. It is now ready for the warm sun to start the vines out of the ground.

(2). TYING.

The hop vine climbs from right to left or round with the sun. Its top has a curious, revolving motion, and, if let alone, the chances are it will find the pole and begin to climb. Quite a number of shoots will start up in each hill, and from these, the best shoots must be selected and saved for the pole or poles, and as many as your system of poles requires to the hill, and one or two to spare, to provide for failure.

If there is pole room enough for six vines to the hill (as in the case of yard No. 5, Fig. 8), the question is whether six vines to the hill will produce more weight of hops than four vines to the hill. I have taken the views of both sides, on this point, and am inclined in favor of six vines, where there is pole, or string, or both, sufficient to hold and ripen them. It is *natural* to the hop to throw up many vines. If you let them *all* grow you will not injure the *root*: as witness the vine in the corner of the garden, which grows, untouched, so many years longer than the cultivated ones. If you cut a hill down to one vine, you *injure* the root, and if you allow no vines to grow you *kill* the root. The danger to the root, therefore, is in the direction of too few vines, instead of too many, and this leaves us free to use as many vines as will not get in each other's way, above the ground, and when loaded with hops.

The best vines for the poles are not the slender, "wiry" shoots (blue), even though they may be more forward and taller; but the stout, "thick-set," "stubbed" ones of the brightest-green.

By the time the tallest are two or three feet high, you will have a good number to select from and begin tying.

To break down those you do not want is better than to pull them up, as there is less injury to the root.

Eighteen inches to two feet above the ground is low enough for the first tying, and follow up the pole from time to time as needed, to near the top. The last tyings have to be done with a step-ladder, with a swing brace to support it; but some of our growers have steady and trained horses, from whose backs they can tie with much more speed and less labor. The first of the tying is done largely by women. The material for the strings, used in tying, is rushes, yarn, or, what is most preferred, burlaps, cut about a foot square, hung in front of the tyer, and each string unraveled as needed. The string is passed around the pole so as just to hold the vine without pinching it, and not tied, but twisted between the thumb and finger till it will hold. In "string" yards the vines are tied only to the poles or stakes but are twisted round the strings a little at the start and replaced on the string again with a shorter twist, when too loose or when blown off by the wind.

Before the end of the tying, the surplus shoots will have ceased to sprout from the root, and they can be twisted together without pulling them up and buried on the hill, under a shovelful or two of earth, to kill them.

(3). CULTIVATION AMONG THE HILLS OF THE GROWING CROP.

All the heavy manures, intended for the yard, have been carted on in the fall, after picking, and in the spring before the poles are set. The moment the ground is fit to work, among the poles, the best growers put in the plow and "cultivator," and keep them in the field till the hops are "in the burr."

Most of the large growers have several yards, and by the time the last one is plowed or "cultivated," the first one is ready for it again.

After the first plowing, (sometimes one way between the rows and the cultivator the other way, and sometimes the plow both ways, according to the stiffness of the ground), the "cultivator"

is now the chief implement. The best are now made of iron except the handles, and have the "duck foot" tooth, which works like a subsoil plow, below the surface while the sharp shank connecting the "duck foot" to the frame, cuts through the roots of grass, or quack very easily, and it does good work with very little wear on the team. Most of the large yards are, as I have said, laid out seven by eight, so that two horses can be used and a two-horse cultivator. To the rear teeth of the cultivator, a hiller can be attached, turning the soil up to the hills, when that is desired. Some of the best growers "hill-up" around the poles at the last of the plowing season, and others prefer to leave the whole yard nearly level. I should judge that the level yards would stand drought best, and in New York State, the sure forerunner of a light crop of hops is a drouth in July or August. This is the great object of this constant stirring up the soil with the cultivator; to get the ground fine and light so it will absorb the dews and light rains, which are about all the moisture our hops can expect, through July and August, just when the hop is fruiting and needs all the help it can get. It is to meet this sudden demand on the soil for the rich material needed for the manufacture of all these hops, that about the middle of July the roots send out thousands of fibres, almost like a web, all through the ground a little below the surface.

It is to spare these fibrous roots that the cultivator is stopped when the hop appears in the burr, though some keep up the cultivation much later. But if, by the cultivator, between the rows, and the hoe around the hills, the weeds have been completely kept out till then, they will do little damage afterwards; for the hop roots have now possession of every inch below the surface, and the surface is shaded by the vines.

Before the cultivator is run through for the last time, some of the best growers put on two, three, or four hundred pounds to the acre, of super-phosphate or some quick fertilizer, and it seems to make but little difference whether it is put around the hill or scattered broadcast. The roots are everywhere, and the feeding or fibrous roots are full as numerous away from the hill as in it. There are no weed seeds in this sort of manure, and it gives the vines something to make hops out of, just when they get to work

at this important job. This stimulant, sometimes preceded by another of about the same quantity, sprinkled round the hill just before it is covered in, after grubbing, to give the vines a start in the spring, covers the practice of the principal growers.



CHAPTER XIX.

PICKING.

TO engage the pickers for the coming harvest is the first thing to be looked after. Around Waterville, every man, woman and child that can be had, is secured long beforehand. We divide the pickers into two classes: "Home" and "Foreign" pickers. The "Home" pickers "board" themselves, but the grower goes around to their homes every morning and brings them to the yard in large wagons, and takes them home at night; some growers furnishing them a dinner at noon, while in other instances, they bring their own lunch. I mention this because it accounts in great measure for the various prices paid, per box, for picking. The "Foreign" pickers are those who are brought in from distant villages and cities, and lodged and fed by the grower himself.—"Their name is legion." It now keeps more than 50,000 persons busy for three weeks, in gathering the hop crop of New York State. The "Foreign" pickers, for the last crop, (that of 1882) received from thirty-five to forty cents per box (of about eight bushels) besides their "living." The "Home" pickers received from fifty to fifty-five cents and their dinner, or from fifty-five to sixty cents, besides being carried to and from their homes, they providing their own dinner.

As a box will generally make about twelve pounds of dried hops, it will be seen that the picking alone (not including box "tenders," teams and teamsters for carting the hops, and drying and baling, costs five cents per pound.

A fair day's work, for an experienced woman picker, is three boxes.

1. BOXES. Mr. Morris Terry, of Waterville, was the first who divided the old-fashioned, big box into four compartments, and each of these compartments is what we now mean by a "box" when we are speaking of prices and picking. On the following page is shown one of our modern boxes, with attachment for

leaning the poles upon, and also for an awning or shelter from the sun for the women and girls, as they stand all day long at the boxes. Any grower who looks well to his own interest will provide these shelters, for it is to his advantage to have his hops picked as fast and as well as possible, and any woman or girl, or man even, will pick faster and better when protected from the hot, midday sun of late August and early September, in New York State.

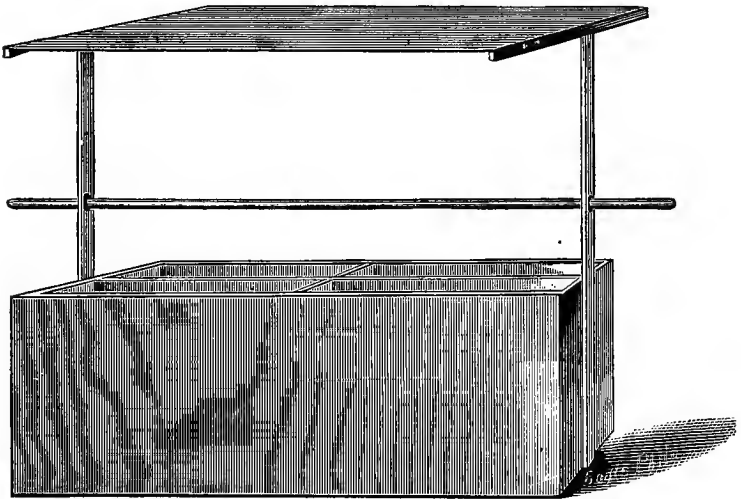


FIG. 9. HOP BOX, NEW YORK STANDARD, WITH AWNING.

Each of the compartments shown in the figure is what we call a "box." The prevailing size of these compartments, about here, is (inside measurement) thirty-six inches long, eighteen inches wide, and twenty-six inches deep. This gives 16,848 cubic inches capacity, which divided by 2,150 cubic inches to the bushel, gives about seven and six-sevenths bushels. But as the hops pack down a little while being picked into the box, it is fair to call it eight bushels, as is the custom. Through the holes represented in the uprights a light pole is thrust, so that its ends will project about two feet outside each upright, and on these projecting ends the poles, loaded with hops, are leaned convenient to the pickers. The boxes are usually made of planed, pine boards, and if under

cover when not in use will last many years. There are various methods of supporting the awning—one of them, at least, a patent and a good one, but as the use of the awning is now becoming universal, I will describe a cheap and easy method of construction which any grower can carry out for himself: Let the uprights, at the end of the box, be of inch board, eight inches wide and six feet high, from bottom of box. For the cover of the awning, take two pieces of hop-sacking, each six feet, ten inches long, and sew them together at the edge; cut two strips of inch board four inches wide and as long as the longest way of your cover, which will be across the seam. Place one of these strips of board across and outside each upright of the box, so that the top edge of the strip is “flush” or level with the top of the upright, and an equal length of each strip on each side of the upright. Bore two half-inch holes, three inches apart, through strip and upright, and fasten the strips to the uprights by hard-wood pegs, made a good fit in the holes, and outside, made large and long enough to pull out easily. Stretch the cover over these strips, the seam lengthwise of the box and over the centre, and tack the cover down on the outside of the strips so as to stretch it tight and make a fit. Then, by pulling out the pegs, you can take the awning off while you move the box, or by taking out one peg from each upright, the awning can be tipped down at one side and will go between the rows of poles when you move the box. If the cover, in time, is inclined to sag, a brace can be put across under the seam between the uprights, or a slight support be set up from near the centre of the box.

2. HOP SACKS. These are made to hold one box or eight bushels, with room for tying, are cylinder-shaped and are about four feet long and two feet in diameter. They are made of sacking, the same as for bales, or of still lighter burlaps, or of unbleached sheeting. I prefer the hop-sacking or burlaps as more porous, and the green hops are not quite so apt to sweat in the sacks, if there is any delay in the drying.

3. TIME FOR THE PICKING. About Waterville, we find, the Palmer Seedlings are usually ready for picking, about the 15th of August. The Humphrey Seedlings commence about the 22d of August. The English Cluster or “main crop,” about the last Monday in August.

This is a little early, all round, for the hops to be ripe, but the picking lasts three weeks, and a hop picked a little too green and not very rich, but bright and clean, finds a better sale than one which is ever so rich, but discolored by standing too long. I think this early picking injures the roots, not so much by the "bleeding" of the vine, but because it is against nature to cut off the vine and suddenly stop the action of the roots when they are in the full exercise of their proper functions—filling the hop with the rich "lupuline,"—the yellow gold dust—which makes the hop valuable to the brewer. This sudden "cut off," when the roots are in full blast, leaves fibrous ones to die and rot at once; the whole root receives an unnatural shock, and the result is that it enters the winter less tough, and comes out in the spring less vigorous, than if it had been allowed to do its natural work.

But the brewers are "the doctors" in this matter, and not the growers. The brewers buy the hops and the goods must be made to suit the buyer.

If most of the brewers prefer "color" to richness, and get a greener, leaner, lighter hop, and we have lighter crops, year by year, to the acre and higher prices in consequences, it is the look-out of the buyers and not of the sellers. But the lucky grower is he who has three good varieties of hops (such as I have already referred to under the head of "Roots and their varieties here," Chapter XV, Section 2), so that he can pick his first hops fairly ripe and heavy, and his last will stand well against rust or mould till he reaches them. The appearance of a hop, when it is fit to pick, cannot be exactly described. It is known only by practice. But in general we may say they should have a good supply of yellow lupuline around the seeds, the seeds should be hard and brown, or black when dried, the small leaves at the "tip" drawn together, a slight shade of brown on some of the outer leaves; the hops should slightly rustle when shaken together on the poles, and when crushed between the fingers, should have an agreeable "ripe" smell instead of the "grass" smell they have when too green.

4. **SETTING THE BOXES.** This is done a day or two before the pickers are brought on. Commencing at the ripest part of the field, or where there is most danger from lice or rust, each box is

set four rows deep into the field, and with four rows on each side of it so as to bring it in the centre of sixty-four hills.

The next box takes its eight rows to the right or left, and so, as the picking goes on, the boxes move forward into the field, each with its own eight rows wide and taking eight rows deep to each set of the boxes.

5. **MANAGING THE PICKING.** If the hops are heavy and the progress through the yard slow, one stout man, called here a "pole-puller" is assigned to each two boxes or eight pickers. His business is to cut the vines about three feet above the ground, pull up the poles as fast as they are required by the pickers, and no faster, or they will wilt and disgust the pickers; and lean the loaded poles against the cross pole of the box very gently or he will "jar" down the hops already picked in the boxes and have four women in his hair at once. He has also to clear the vines off the poles when cleaned of hops, pile or stack the poles, keep the vines and twigs and arms away from the pickers' feet, pile the vines in heaps, and "change" works with another pole puller in setting the boxes when a new "set" of hills is required. He sometimes has an implement called a "dog," arranged on the principle of a pair of ice tongs and attached to a strap over his shoulder, so that by applying the dog to the pole he gets a good hold and a good "purchase" for pulling up the pole. With all this to attend to, the pole puller is not likely to go to sleep, and if the hops are light he cannot tend two boxes. He gets now about \$1.50, \$1.75, or \$2.00 per day, according to his ability, and he boards himself. To about every fifty pickers there must also be a "sacker" or "box emptier," who in response to the cry of—"Hop-sack!" from any direction must be ready to pull the hops out of the full box into the sack, and give the picker a "ticket" good for the pay for picking one box of hops. These tickets are usually colored pieces of pasteboard with "one box," and the grower's name printed on them, and exchangeable for others of larger denominations when they get too numerous. Some are also made of tin, stamped with initials, etc. With teams and men to cart the hops to the kiln, and with the grower himself in the field to see that there is no "fooling" and that the hops are picked carefully and clean, the organization is complete and will go on smooth, with good weather, through the picking.

CHAPTER XX.

DRYING.

AS soon as we reach the hop kiln, we have left the proper field and occupation of farming, and have gone into manufacturing. In New York State, every hop kiln is not only a drying-house, but it is also a bleachery; a preserving and curing-house, and a packing-house, all in one.

There are hundreds of good farmers who can raise hops excellently well, where there is one who can dry them well. In Germany there are thousands of small hop growers who substantially dry their hops in the sun, and then hand them over to dryers and dealers in the towns who make a business of preparing and putting them on the market. But these hops can never compete in color with those bleached at once on the kiln, and with our American brewers, the standard of color is so high that practically no man can raise hops to advantage in the United States, who is not able both to own and manage a hop kiln.

This fact keeps many out of the business, and causes the failure of many who go into it. This tends all the time to keep the business of hop growing in comparatively few hands, but at the same time it has created a class of skilled and experienced men in the great hop-growing regions, who have brought up the quality and standing of American hops in the market of the world, so that one year ago in London, for the first time, the quotations for Americans, stood side by side with those of choice Kent and Bavarian hops. A few years ago American hops were bought in England, only as a last resort, only when they were cheap, and were used only for the cheap grades of beer. But our hops, as they leave the poles now, are no better than they were twenty years ago; in fact not so good. The improvement has been made in the drying, and in that alone.

It would be interesting and profitable to trace the history of this improvement, the methods of curing, which have been tried

and found deficient, some in one respect and some in another, but there is not room in this volume.

We must confine ourselves to what is now considered by our experienced growers, to be the best general method of curing hops, now in use, in the State of New York.

(1). THE HOP KILN.

Referring to Fig. 10, we have the following measurements :

Each hop kiln, eighteen by eighteen feet, outside measurement, and seventeen by seventeen feet, inside measurement, that is, size of kiln cloth. Fuel room for coal or wood (between two kilns), eighteen by eighteen feet, with roof as represented, to receive the sacks of hops from the field, the sacks to be taken from this roof on to the kiln cloth through doors as shown in right hand kiln. Store-room for dried hops, as shown, fifty-four feet long by twenty-four feet wide, with two floors. The sill of the ground floor, two feet lower than the level of the sill of the kilns ; and the second floor two feet lower than the level of the kiln cloth.

The posts of this hop store-house are eighteen feet. First floor room, twelve feet high ; second floor room, six feet high to "plate." The outside of the store-house is simply a shell of matched boards, with board windows or blinds, sufficient to admit air occasionally and to admit no more light than is needed to see to work while handling the hops and baling. The kilns are usually commenced with a stone or brick foundation wall, about four feet high, above the ground, with at least four draft holes in this wall, say two on each weather side, and the nearer the ground the better, each hole about three and one-half, by two feet, for plenty of air, and with swing doors to shut off draft when required.

Posts of kilns sixteen feet ; from bottom of sill to kiln cloth, twelve feet ; from kiln cloth to "plate," four feet ; perpendicular height of roof, eighteen feet above plate ; perpendicular height of cowl, eight feet ; hole three feet square to be left for cowl ; cowl stands leaning as shown, to keep out rain, and has board wind-vane to turn the cowl, with opening always away from the wind.

With us, at Waterville, cowls are bought "ready-made" at a factory.

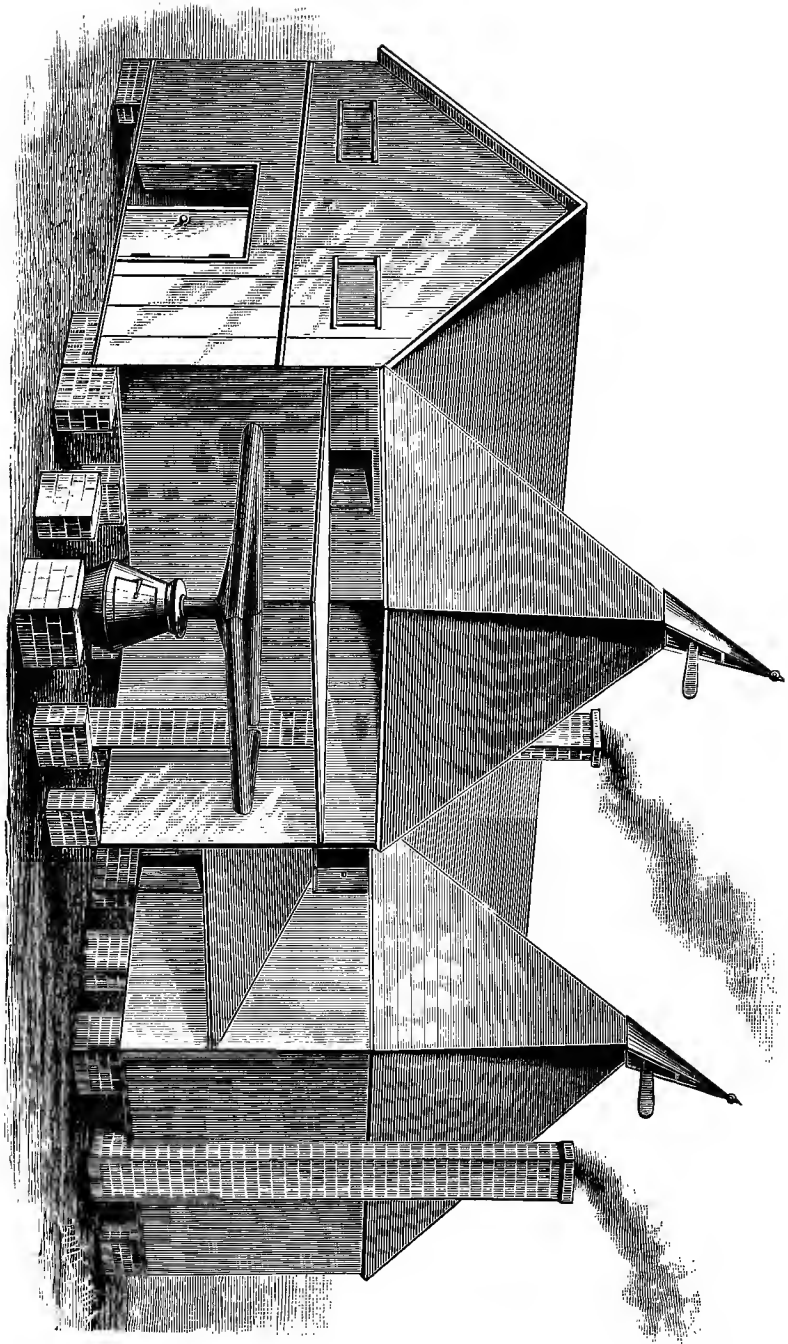


FIG. 10.—MODERN APPROVED NEW YORK STATE HOP KILN.

(J. P. Neilson, Designer, Waterville, N. Y.)

The stove is best set with the fire-grate at least as high as the top of the draft holes in the wall. The stove-pipe leads from the stove into a "tee," and thence each way, as shown, so as to form a square around the inside of the kiln, about three feet from the wall, with a gradual rise from the "tee," of about a foot to where the pipe enters the chimney, five feet below the kiln cloth; ten-inch pipe is the common size. The kiln, inside, has a tight roof, is "ceiled" from kiln cloth to plate with boarding, and is lathed and plastered in stove-room, so as to be perfectly tight from ground sill to cowl, when the doors and windows are closed. The cowl lets in light enough for the kiln-cloth floor; and the stove-room is sufficiently lighted by a single glass window. A pane or two of glass is sometimes let into the store-room side of the stove-room, so that the night dryer, from a cot in the store-room, can by a lantern hung inside, see the thermometer in the stove-room, and watch the heat, without entering the kiln too often, to do so.

The stove-room is entered from the coal-room, and the coal-room is entered as shown; and also communicates with the hop store-house. Until recently the stove-room has been built open from the ground to the kiln cloth; but now some kilns have a planed and matched board floor on the sill level or below it, and the air is admitted from beneath the floor, only under and around the stove, the floor allowing what hop dust sifts down through the kiln cloth, to be swept up and saved. The stove and pipe should be protected from this dust by suspended sheets of tin, or by boards, or else the dust falling on the surface, may give to the next kiln a scorched odor to the hops, unless carefully brushed off.

Hop stoves are made in Waterville, especially for the purpose, and cost about \$40. The kiln-cloth floor is made of slats, laid on cross pieces, sixteen inches apart, to support the weight of the hops and dryer. The slats are made from inch lumber planed on both sides, leaving it about seven-eighths of an inch thick. They are cut inch and a quarter, and set on edge, leaving three-fourths or seven-eighths of an inch, between. The kiln cloth is hard twisted and fine meshed, like what is known as "strainer" cloth.

The two kilns and store-house described, will cost altogether from \$1,500 to \$2,000, according to cost of materials and labor:

Of course, if a grower needs but one kiln, he can follow practically the same plan by omitting one kiln, and about one-half the length of the store-house. A single kiln of the size described, will dry, when well managed, a flooring of fifty boxes of hops in twelve hours, making about 600 pounds of dried hops. Thus two floorings, during each twenty-four hours, (a good dryer, with some assistance, will dry, night and day), will give us 1200 pounds of dried hops per day, or 20,000 pounds (over 100 bales), during a three weeks' season of picking. But this is the *most* than can be done when everything favors, and if a crop is expected to be over 15,000 pounds, it is best to provide two kilns as shown in Fig. 9, to be prepared for accidents and delays; for the sooner the hops are dried, after they are picked, the better sample they will make, and forty boxes is better than fifty for a kiln of this size.

(2). THE DRYING PROCESS.

A fire is built in the stove, and the dampness taken out of the kiln, by several hours' heat, before the first flooring of hops is put on. The hops are then dumped from the hop-sacks on to the kiln cloth to a depth of one to two feet, according to the number of boxes. Great care is to be taken to have the hops lay light and even on the kiln, so as to avoid thin or open spots through which the air escapes too fast, and thus wastes the heat, or thick and hard spots which result in lumps of slack-dried hops, in a kiln of hops otherwise sufficiently cured.

The heat from the stove is kept low at first, the thermometer registering about 120 degrees, Fahrenheit, and gradually raised to 125 and 130 degrees, during the main time of drying. Some bring it to 140 degrees toward the last, (and some even higher, though rarely above 150 among the best growers). The thermometer usually is hung near the store-house side of the kiln, on a level with, or a little above the level of the stove-pipe.

Before applying sulphur, some prefer to wait till the hops are well warmed and steaming; but most apply the first batch of sulphur at the same time as the heat, and while the hops are still cold. The hop stoves have a flange, making a receptacle for the sulphur on the top of the stove; but the heat of the stove is apt

to burn the sulphur too fast. This is avoided by using any old pan placed near the stove, and igniting the sulphur with a few coals from the stove or a red hot spike thrust in under the pieces or rolls of sulphur. Some also close the air drafts in the side of the kiln, for a few minutes, while the first sulphur is burning so as to economize the fumes; but the ruling custom is, to burn it as slowly as possible, and carry it along with the drying, so as to have at least a few minutes of sulphur on the hops after they are turned. At the expiration of eight or ten hours, when the hops are done steaming and are all partially dried, it will still be found that the bottom hops are a great deal dryer than those at the top. The flooring of hops is then turned bottom up, with large, light, wooden "scoop" shovels or forks, made for the purpose. A small reserve of sulphur is then burned by some, and the drying goes on till the hops are done to suit the dryer. The point of proper dryness can only be determined by practice. The leading test is by the brittleness of the stem of the hop flower or cone. But only an experienced hop dryer can determine the exact point, and all attempts to describe will be apt to mislead. Those who have no reliable man as a dryer, can only keep on the safer side by making sure the hops are dry enough; for, if not dry enough, they will spoil, but if too dry they will absorb some moisture before baling, and get back again into fair condition for baling, if handled carefully. The hops, when dry, are shoved off the kiln through the door into the store-room to cool on the second, or "cooling" floor.

The process described, is that where it is required to dry two floorings of hops within twenty-four hours, to keep ahead of the pickers. Where the dryer has twenty-four hours for a kiln of hops, or all the time he wishes, he will dry slower, at a lower heat, and some will "bunch" the hops in a pile, toward the last, to get an even dryness, or sometimes he will allow the hops to cool on the kiln so that they will break up less than if handled while hot. If, however, the hops are not very clean picked, then handling, while hot, will break up the now very brittle vine leaves so that they show less in the sample, than when allowed to toughen by cooling, and remain whole. So the dryer has to use his judgment whether it is best or not to break up a few hops and

a good many vine leaves, by stirring while hot, or to let all cool and toughen together.

In regard to the quantity of sulphur to be used, or the best manner of using it, it is difficult to find any fixed standard or usage. Even the best growers differ in opinion and practice. One kiln of green-picked, or discolored, or mouldy, or "redded" hops, will require double the sulphur to bleach it, that another one will which is of well-ripened hops and not mouldy, or rusty and "redded" on the vines. In general, however, after comparing the experience of many growers, I think we may put down fifteen pounds of sulphur to a fifty-box kiln, or one pound of sulphur to 160 pounds, green, or forty pounds of dried hops, as the ordinary usage of our best growers. I reserve some discussion of disputed points in drying, and especially of the use of sulphur, to a point a little later on, under the head of "Observations on drying."

(3). AFTER DRYING AND BEFORE BALING.

The desirability of so large a store-house for the hops when dried, and not yet baled, lies in the fact that a grower cannot bale as fast as he dries, without getting the early-picked hops in the first bales, and the late-picked in the last, so that no single sample can fairly represent his growth. But as some large growers sell their hops in different lots, so they also commence baling before the drying is very far advanced; sometimes reserving a few of the early kilns to mix with the late, and then going on to bale the rest, allowing each kiln three or four days to cool and toughen.

But the general plan of the large store-house and its two floors, is to enable the dryer to shove the hops off the kiln on to the top floor, and there let them cool thoroughly, and then shove them to the rear of the room where they fall through trap doors, in a heap or bin on the ground floor. Thus one kiln of hops falls on the one before it, forming layers; horizontally.

Then by commencing at one end of the pile or bin, and taking the hops off in perpendicular sections and bringing them to the press, in baskets, the early and late pickings are thoroughly and evenly mixed together, and a sample taken from any bale will represent one "straight" growth.

(4). OBSERVATIONS ON DRYING.

It is a chemical process from the start. In every pound of green hops we have three-fourths of a pound of water, which must be expelled by the chemical process of distillation or evaporation by artificial heat. We have also a dull, green color which we are required to change to a bright yellow by the chemical process of bleaching. We must so regulate our drying and bleaching as not to cause chemical decomposition and loss of the valuable lupuline or "flour" of the hop, and we must not leave the hops so dry as to crumble all to pieces in baling; and at the same time we must have them dry enough to avoid fermentation or "heating" in the bale, or their sale is spoiled. We must therefore carefully apply to our task the natural laws which are within our reach. These are—

1 (a). Air, when heated, expands and becomes lighter, and therefore rises above the cold air surrounding it.

(b). The hotter it is, the lighter it is, and the faster it will rise.

2 (a). Air, when heated, will absorb and hold more moisture than when cold.

(b). Its capacity for moisture is doubled with every increase of heat amounting to twenty degrees, Fahrenheit.

We take advantage of both these two laws and their effects when we build a fire beneath our hops. The heated air rises from the hot surface of the stove and pipe, and starts toward the top of the kiln. Passing into the hops, it absorbs all it can catch and hold of their moisture, and goes on up toward the top of the kiln, followed and pushed along by more hot air constantly rising, and thus forming a current or "draft" of hot air; that part of the current above the hops being hot and wet, and that below the hops hot and dry; and the whole column being lifted by the expansive power of the heat, followed by the pressure of the cold air from beneath, hastening through the lower draft holes to fill the gap. Now, with a given and fixed heat from the stove and pipe, the narrower and taller (within practical limits) our kiln is, the stronger and faster will be the current of air, and the better will be our draft, and the faster will be our drying of a certain fixed depth of hops. The narrower the kiln the better the draft,

because the column of air in a tall kiln has time to gather momentum and force, in an upward direction. But to build up an eighteen by eighteen feet kiln, fifty or seventy-five feet high, like a factory chimney, would be expensive and impracticable.

We, therefore, practically accomplish the same purpose by narrowing the roof in at the top so that the column of hot air is concentrated at the cowl, just as a four-inch, fire-engine hose is contracted to an inch nozzle, that it may "squirt" the water much farther than it would reach without the nozzle. Thus the converging roof and small cowl opening, concentrate the force of the uprising column of hot air, and give it such impetus as carries it clear of the building and out of the way, and at the same time offers less chance for cold air outside at the top, to overbear it and come in at the top, and cause a "smudge" or "sweat" of the hops, by cooling off the hot air, and causing it to drop its moisture like a dew. Losing sight of the concentrating effect of this small cowl opening, many an enterprising grower has attempted to improve the draft of his kiln by enlarging the cowl, and has found himself worse off instead of better. Others, when the shape of the roof would admit, have put on two cowls to one kiln, thus splitting the stream of air and actually injuring the draft. Others, again, have put up a kiln with a kiln cloth, twenty-four by twenty-four feet, (which is just twice the size of seventeen by seventeen), with an enlarged cowl and two stoves. This again was not a success, because the converging roof was not made high in proportion, and was too flat; so that the column of uprising air was too blunt at the top to allow it to pass easily out of the cowl. Others, again, have let in cold air under the kiln cloth from windows or draft holes as high as the top of the stove, thus shortening and baffling the upward current of hot air. All these attempts to improve upon the kiln selected as a model (and given in Fig. 10), have been failures, because the proportions of that kiln are the result of hundreds of trials, till little by little the practically true proportions have been found and retained. The kiln is not right because it is the standard, but it has become the standard because it is in accordance with the natural laws of heat, and its effects, which I have mentioned.

Referring now to the facts that heated air will hold more

moisture than cold air ; that the hotter it is the faster it will rise ; and that its capacity for absorbing moisture, is doubled by every twenty degrees, Fahrenheit, increase of heat ; we see that when we raise our heat from 120 degrees, to a heat of 140 degrees, we have more than doubled our speed of drying, for we have also increased our draft. How great, then, is the temptation to rush on the heat and dry the hops too fast !

For it must not be forgotten, that "haste makes waste." *All chemical processes require a certain amount of time ; and if you crowd the time, you injure the product.* By the use of hot liquor, our tanners now tan a hide sometimes in three weeks. In old times they used to take a year. Does the rotten, heat-killed leather now-a-days wear like the old-fashioned slow tanned ? It is precisely so with hurrying up the drying of hops. Twelve hours is little enough time in which to bring about so great a change. A low heat of 120 degrees, and eighteen to twenty-four hours' time would give us better hops.

The "Fan Blast," which uses a low heat, and makes up for it by increasing the current of air, by forcing it, already warmed, into the bottom of the kiln, is fully described in the main part of this work, (page 55), by Mr. Meeker, who uses it in drying his immense crop. It deserves the careful attention of our large growers in New York State.

THE USE OF SULPHUR IN DRYING.

Sulphur has three effects on the hops in the kiln : *First.* To bleach ; *Second.* To dry ; *Third.* To prevent fermentation or "heat," in the bale. As a bleaching agent, the effect of the sulphur is *greatest* at the beginning of the drying, and *finest* near the end of the drying. If we wished simply to take the green color out of the hops and make them pale, then all the sulphur could be used at first, so far as the bleach is concerned. But we wish to leave the hops of a bright and permanent yellow, and to do this the sulphur should follow the hops all through the process ; but practically it is fairly accomplished, and more conveniently by sulphuring at the beginning, up to the middle, and again near the end, that is when the hops are turned. Quite at the end

would be all right, except that it is well to let the hot air pass through the hops for some little time after the last batch of sulphur, in order to carry off the fumes of sulphur still entangled in the hops.

As a dryer, sulphur performs a most important part, though it is not generally appreciated by the grower. The sulphurous-acid fumes have a very strong affinity or fondness for water or moisture, and the sulphurous cloud as it passes up among the hops, is like a great sponge, taking up the moisture of the hops, and as it works itself into every part of the hop, it departs loaded with moisture. It is thus that the middle, and especially the last batch of sulphur does good work in penetrating and drying *the inside* of the hops, that has been more out of the reach of the air current.

As a prevention of "heat" or fermentation in the bale, sulphur is very valuable; and indeed in these days of early-picked and unripe hops, dried, when full of green sap, sulphur is almost indispensable.

Every grower knows how quick the hops commence to "heat" in the hop-sack, and this "heat" is a fermentation to which the sap of the hop is peculiarly liable. Sulphur is the enemy of fermentation, and the sulphur used in drying hops, not only helps to remove a good deal of the sap altogether out of the hop, but it also renders what is left, less liable to ferment in the bale, and there is less danger of "heated" bales.

This very fact, that sulphur is death to fermentation, constitutes the great objection to the use of such extravagant quantities of sulphur as will injure the fermentation of the beer in which hops, drenched with sulphur, are used. But the ordinary practice of fifteen pounds or even twenty pounds, (though the average use is much less than that), has not been observed to injure the fermentation of the beer. What the brewer most objects to, is the sulphuring of old hops, by hop speculators, so as to make them look like new. Prof. Thausing, of Germany, in his great work on *The Fabrication of Beer*, which is edited and endorsed by A. Schwarz and Dr. A. H. Bauer, of New York, making it the latest and highest authority on Beer, says:

"Hops, discolored by too long storing, faulty drying, or some

"other injurious influences, receive, again, a beautiful, light color
 "by smoking with sulphur, thus destroying an important sign
 "which marks the hops as being of little value. The brewer has
 "good cause for being on his guard if the smoking with sulphur
 "is done for this purpose, but not so when fresh, young hops are
 "so smoked, for in that case it is a decided advantage. * * * It
 "would, therefore, seem advisable from what has been said, to be
 "doubly cautious with hops smoked with sulphur, and to exam-
 "ine them with the greatest care, so as to determine whether the
 "smoking was done for a good purpose or whether it only serves
 "to conceal certain faults. In the United States the hops are
 "already smoked by the grower. All American hops are smoked
 "with sulphur, and this process has had no disturbing influence
 "upon the excellence of the article."

It seems, then, that it is not the use, but the abuse of sulphur,
 that the brewer complains of; and besides I have good reason to
 believe that in drying our hops, the moderate or standard amount
 of fifteen pounds to a kiln, when well managed, will do as much
 good as more sulphur, and the extra quantity is simply wasted,
 or worse.



CHAPTER XXI.

BALING.

THE press used, almost universally, in New York State, and indeed I may say in the United States, is the Harris press. It was invented by Lewis W. Harris, of Waterville, N.Y., about twenty-five years ago, and it remains the same press to-day in its main features, though Mr. B. A. Beardsley, who now manufactures these presses in Waterville, (and presents our readers with cuts and description of his presses, on page 36), has added some valuable improvements in strength, and in speed of working. The McCabe press, also made by Mr. Beardsley, has a "follower" by which the hops are repeatedly pressed down, with little breakage of the hops, instead of being trodden down by a workman's feet, as in the Harris press. However, the Harris press is the simplest and cheapest, and is perfectly satisfactory to our largest and best growers.

The press turns out a rectangular bale, $4\frac{1}{2}$ by $2\frac{1}{2}$ by $1\frac{1}{2}$ feet, in length, breadth, and thickness, very neat in appearance and convenient to handle. I cannot but feel a little proud of our bales as specimens of American workmanship, when compared with the bungling bags of English "pockets," and the heavy, clumsy cylinders weighing 300 to 400 pounds, put up in Germany. Their hops may be excellent in quality, but I cannot see that they are any better for being put up in bad shape; by which, I mean, a shape which makes it harder work to bale them in the first place and harder work to handle them afterwards.

In baling hops in America, we lay a breadth of hop-sacking (which is woven forty-four inches wide), cut about four feet, nine inches, to two yards long, lengthwise, along the level "bed-piece" or bottom of the press, taking care to have the centre of this breadth come in the centre of the bed-piece, both ways, and the sides of the sacking parallel with the sides of the bed-piece. The press is provided with side and end boards, and these are now set up, and the hops filled in from baskets and tramped down firmly

with the feet (not *stamped* down, which breaks the hops, but *pressed* down with all the weight thrown on one foot) with a special care being taken to fill out the corners firmly and squarely, and more hops filled in continually till there should be from 175 to 200 pounds of hops in the press, according to the weight and compactness of the hops. 180 pounds is the natural weight of a bale of this American size, that is, the hops being of average richness and solidity, 180 pounds of them, compressed into this size, will not press them so hard as to crush the hops and lupuline into a mass, as in the case of hard-pressed bales of over 200 pounds, nor leave them loose and baggy, as in bales of less than 170 pounds. In fact a thousand bales of New York State hops, taken as they come, will be found to average, almost exactly 180 pounds to the bale.

Having sufficient hops in the press, a piece of sacking exactly corresponding to the bottom piece in size, and position over it, is now put on the top of the hops, and the "follower" of the press worked down by the levers till the bale is brought down to a point a little less than two and one-half feet from the bottom, so that when the sides and ends of the press are all removed, which may now be done, the "selvage" edges of the top and bottom pieces of sacking will meet along the middle of the sides of the bale, horizontally, and be held in place by "scratch-awls," temporarily. These side seams are now sewed up with a sail needle and strong twine. The sacking which projects over the ends, is turned under and lapped, so to make square corners and is confined at each end with four or more small wooden pins, driven through the end sacking into the now compact hops of the bale. The pressure on the top is now relieved, and the elasticity of the hops stretches the cloth, so that the bale will easily be two and one-half feet wide. The bale is then taken from the press, and the ends capped or covered neatly with pieces of sacking cut to fit, and sewed to the turned-under edges of the main strips, and covering their lapped ends.

The regulation sacking is "Dundee" bagging, forty-four inches wide, and weighing one and one-half pounds to the yard, in length. Five yards in length of this forty-four inches, one and one-half-pound sacking is quite commonly allowed for a bale, but

the fact is, a bale can be put up with four and one-third yards; though it is a rather inconveniently small pattern. But four and one-half linear yards, weighing six and three-quarter pounds, are amply sufficient, making with one-quarter pound of pins, a tare of seven pounds to the bale. Moreover, as I have ventured to boast a little of our American bales, I must here acknowledge a defect, of which we ought to be ashamed, and which should be removed from our bales at once—and that is, *the pins*. There is no wood driven into the English and German bales. They do not need them, to be sure, and neither do we. The lapped ends can be held in place by a stitch, taken in less time than it takes to make a wooden peg. The ends can be prevented from “bulging,” by a very simple and easy method, which is practiced by Morris Terry and C. L. Terry, two of the best of our Waterville growers, and by others, to my knowledge. Commencing at the end to sew up the main seams, and having made the twine fast with a knot, holding the two edges together, at the end; then instead of proceeding with that seam, the twine is carried straight across the end of the bale, and made fast to the edges of the other main seam, and that seam sewed up. When the other end of the bale is reached in sewing, the twine is carried across that end in the same way, so that both ends are securely prevented from bulging when the bale is removed from the press. This does away with all need of pins, and the practice cannot be too highly recommended, because, in the first place, it is honest, and again, with no pins and with no more sacking than is needed, (if seven pounds is to be allowed as tare, then fourteen feet in length, of one and one-half-pound sacking, weighs just seven pounds), we may challenge the world to produce a bale equal in workmanship to the American bale of hops. •



CHAPTER XXII.

COST OF RAISING—PRICES.

IN the winter of 1878-79, the Waterville Grange appointed three committees to ascertain and report independently the actual cost of raising hops, per acre and per pound. Mr. C. H. Curtis, chairman of one of the committees, made the following report:

“Actual cost of raising one acre of hops, 778 hills, seven by eight feet apart, yielding 1,000 pounds:

1,556 poles at 11 cents each, \$171.16.	
Interest on same at 7 per cent.,	\$11 98
Depreciation of poles, 10 per cent.,	17 12
Interest on land, \$100 per acre,	7 00
Taxes, \$1.00, fertilizers and cartage, \$7.00,	8 00
	\$44 10
18 days' work, man or team, cultivating, hoeing and grubbing,	\$18 00
Picking 83½ boxes, at 50 cents per box,	\$41 67
Tending box,	8 34
Emptying boxes and superintending yard,	2 25
Teaming,	2 50
Dryer and assistant, two kilns per day,	4 00
Coal, \$2.00, brimstone, 30 pounds, at \$1.05.	3 05
Pressing five bales,	1 25
Depreciation of kiln, cloth and sacks,	80— 63 86
Use of hop-house costing \$800,	5 33
Insurance on hop-house and hops, 30 days (hops being 10 cents per pound),	1 50
35 pounds sacking, at 8½ cents per pound,	2 98— 9 81
	\$135 77

Making the actual cost of growing, \$135.77 per acre of 1,000 pounds, or a little more than thirteen and one-half cents per pound.

Mr. A. G. Havens, chairman of another committee, on the basis of 800 pounds per acre, found the actual cost in his case to be

twelve and one-fifth cents per pound, without the items of insurance or sacking. Mr. G. N. Locke, chairman of the third committee, in estimating his land at \$80 per acre, and with no charges for fertilizers, reports the actual cost of his hops at twelve and one-quarter cents per pound. The committees were composed of prominent hop growers, men of sound judgment, and their reports are based entirely upon their experience during the last year or two."

This, it must be remembered, was four years ago. Since then, there has been a decided advance in the cost of poles, land, labor, and fertilizers. Now, in 1883, the cost of these four items has increased, on an average, fifty per cent., and by making the proper additions to the foregoing estimate, we find the cost of producing a pound of hops in New York State, ready for sale, to be between fourteen and one-half and fifteen cents, when the yield is 1,000 pounds to the acre.

This also appears to be the correct figure, from the following record of actual expenses, made by a grower, near Waterville, on his crop of 1882, with a yield of 1,200 pounds to the acre.

Manuring,	\$25 00
Setting poles and grubbing,	8 00
Plowing,	2 00
Tying,	5 00
Picking, 1,200 pounds,	60 00
Field help, picking,	16 00
Drying, 1,200 pounds,	9 00
Baling,	3 00
Baling cloth,	3 60
Twine,	30
Interest on \$500 capital in land and poles,	30 00
Shrinkage on poles,	7 50
Rent of buildings,	9 00
Total,	<u>\$178 40</u>

Or, a fraction less than fifteen cents per pound.

PRICES.

I can give no more accurate statement of prices obtained by the best New York State growers, than to give a table of the actual

sales of Perry S. Risley, Esq., of Waterville, obtained from him by Prof. George R. Cutting, and published in the *Utica Morning Herald*, under date of August 21st, 1882:

<i>Years.</i>	<i>Selling Price.</i>
Crop of 1865,	50 cents.
" 1866,	55 "
" 1867,	60 "
" 1868,	20 "
" 1869,	25 $\frac{1}{4}$ "
" 1870,	17 $\frac{3}{4}$ "
" 1871,	55 "
" 1872,	45 "
" 1873,	42 $\frac{1}{2}$ "
" 1874,	45 "
" 1875,	13 "
" 1876,	36 "
" 1877,	11 "
" 1878,	12 $\frac{1}{2}$ "
" 1879,	40 $\frac{1}{4}$ "
" 1880,	25 $\frac{3}{4}$ "
" 1881,	30 $\frac{1}{4}$ "

General average for seventeen years, thirty-four and one-eight cents, nearly.

Mr. Risley's figures make a very good representative table of those large growers, of this section, who always put on the market a prime quality of hops. The sales do not run down to the five cent sales, that many a hop-grower remembers, nor up to the extreme sixty-five and seventy cents sales, of which some love to tell.

Mr. Risley sold his 1882 crop early, at fifty cents, which brings his average price, for the past eighteen years, at a little over thirty-five cents per pound. Most of our growers sell their hops soon after they are baled, and find that in the long run of one year with another, they get better prices than the "holders," who raise hops "to keep."

The past ten years, compared with the previous ten, show an advance in prices. For comparison, I will take the first ten years previous to the war of 1861, and compare the prices of *best* hops for that period, with those obtained during the first ten years,

ending 1880. The month of February in each year, is allowed by all hop men to be the best medium or average month for prices. We find that the highest price in New York city, in February of each year, for these two periods of ten years each, was as follows, for best hops:

1853,	23 cents.	1871,	12 cents.
1854,	45 "	1872,	65 "
1855,	33 "	1873,	45 "
1856,	10 "	1874,	40 "
1857,	10 "	1875,	43 "
1858,	10 "	1876,	17 "
1859,	18 "	1877,	20 "
1860,	16 "	1878,	13 "
1861,	32 "	1879,	15 "
1862,	23 "	1880,	35 "
Average price for the ten		Average price for the ten	
years,	22 "	years,	30½ "

Here we have the average from the crop of 1870 up to that of 1880, eight and one-half cents per pound more than the returns, from the crop of 1851 up to that of 1861, or an advance of forty per cent. in favor of the prices obtained during the late ten years.

EXTENSIVE HOP GROWERS IN NEW YORK STATE, 1883.

William P. Locke, Waterville,	168 acres in bearing.
John J. Bennett "	125 " "
Hanover Farm, (T. W. Conger & Co.) Waterville, 75	" "
Ira & A. J. Luce & Co., Oneida, (150 acres in	
Canada),	173 " "
A. W. Ferguson & Son, Malone,	125 " "
E. Meeker & Co., Puyallup, Washington Territory, 186	" "



CHAPTER XXIII.

THE PRESERVATION OF THE HOP IN WATERVILLE, NEW YORK.

HAVING been advised by Mr. Meeker that any account of the hop industry in New York State, would be incomplete without a statement of the means employed for the preservation of the hop by the New York Hop Extract Company, at Waterville, I present the following facts:

The object of preserving the hop for a term of years, is to carry the surplus of a good crop over to meet the deficiency of a bad crop, and to carry over this surplus *in good condition*. It will be carried over any how, either in good condition or bad. No hops are ever thrown away. The surplus stands around, as long as hops are low, year after year, kicked and despised by everybody; but whenever we reach a year or two of high prices, then every bale of old hops is brought out and used. To-day, March 15th, 1883, there is scarcely a bale of old hops to be bought in the United States. The brewer does not like to throw all these old stems and leaves in his beer, but in a year of scarcity he has to take what he can get.

Now, by going in and preserving the surplus hops when they are plenty and low, we make it then the better for the grower; for the price, low as it may be, is the better for the fact that we are buyers. When hops are low, our buying hops favors the grower when he needs it, and the brewer is getting all the hops he can use at a very low price, already.

When hops go high, then this stock of hops, kept fresh by us, favors the brewer by doing its share towards keeping down extravagantly high prices.

But these extravagantly high prices are just what hurts the regular grower in the end, worse than it does the brewer.

When hops go very high, everybody who can, rushes into raising hops. A large surplus is produced. The brewer can use but

so many each year, no matter how cheap. The surplus is spoiling, and goes begging for a buyer. Down go the prices below the cost of raising. The grower has to plow up his hops, or become bankrupt. The acreage is reduced. A failure of the crop occurs. The grower gets a good price, but generally has but few hops. The brewer has to pay a great price, and use up all the old hops at that.

So it goes, with everybody dissatisfied and wishing hops would be more regular in price. It tends strongly to make the price more regular, to preserve the hops when there is a surplus.

All attempts to preserve the hop in bales, have failed to succeed to any practical extent, because the hops are so bulky, that without too much expense and trouble, it is impossible to get the air out of the bales in the first place, and to prevent more getting in; and it is the oxygen of the air which oxidizes and injures the aromatic oil and hop resin—the lupuline or “flour” of the hop—which is its valuable part. Now by taking out this lupuline, and putting it up in air-tight tin cans, we get the whole value of the hops into small bulk, and into such compact shape, that it cannot possibly contain any air, and no air can by any possibility penetrate into it, and it keeps perfectly fresh for years. Thirteen years is as long as we can swear to, for that is as long as we have been making it. After this extract is taken out of the hops, the spent hops are thrown out and sold for manure, and we have left the whole practical virtue and value of the hops in about one-twentieth the bulk, and one-twelfth the weight of the raw hops, with all their stems, seeds and leaves.

In this way we have extracted and preserved over 2,000,000 pounds of hops, mostly in the low years of 1877 and 1878, when we ran our works night and day, but our capacity was too small to meet our subsequent sales; and the licensee, J. R. Whiting, has just now erected, in Waterville, the third factory we have been obliged to build, from time to time, to meet the increasing demand. The new works have a capacity for extracting and preserving 20,000 pounds of hops per day. We consider this very slow progress for a record of thirteen years. But whether our business is built on solid foundation or not, will be best judged by the statements of disinterested witnesses.

The English *Country Brewers' Gazette*, of August 2d, 1882, has the following item; under the head of "Notes on Hops":

"Although hop extract has not been very extensively used, it is making its way in public favor. It would be an inestimable advantage to brewers, and put an end to the uncertainty of the hop trade if some practical way could be found for preserving hops so that they might be kept for some years."

In Prof. Julius E. Thausing's great work on "The Fabrication of Beer," (edited by Dr. A. Schwarz and Dr. A. H. Bauer, respectively, the Director and Superintendent of the First Scientific Station, for Brewing in the United States, at New York city), appears the following passage under the head of "The Storing and Preservation of Hops," page 247:

"*W. A. Lawrence*, of Waterville, New York, prepares an extract of hops which is successfully used by many brewers. One pound of this extract is equal to twelve pounds of best hops. If a practical method for preserving hops could be found, a method by which hops could be kept unchanged for some years, the fluctuations in the price would not be so great, and this would be an inestimable advantage to the brewer, as it would put an end to the uncertainty of the hop trade, and would make fraud less possible."

Lest any one should question whether this hop extract is mixed, or in any way a substitute for the hop, I will add that for many years we have made, and still make, a standing offer of \$1,000 for an ounce of anything but the pure hop that shall be found in any quantity of it, as sent out under our trade-mark, from our works. I hope I may be excused for making this statement, for I wish it distinctly understood that we do not make hops, or any substitutes for them. We simply preserve them. In this light our success in preserving the hop, is a matter of interest to all who produce or consume hops, and I have stated the above facts, by request, for the information of many who might otherwise be misinformed.

ACKNOWLEDGMENTS.

In concluding this treatise on Hop Culture, in New York State, I beg to express my obligations and thanks to the following gentle-

men, and well-known hop-growers of Waterville: Morris Terry, William P. Locke, C. B. Terry, John J. Bennett, A. R. Eastman, H. W. Tower, Daniel Mix, Sylvester Gridley, James P. Neison, I. D. Brainard, A. I. King. These gentlemen and others have furnished me with information, valuable and reliable, because it comes from men generally, whose fathers and grandfathers were hop growers, and they have themselves grown up in the midst of hop fields, and in the cultivation and handling of hops from their boyhood.

W. A. LAWRENCE.



CHAPTER XXIV.

STATISTICS—HOPS IN ALL PARTS OF THE WORLD.

THE old adage, "Figures won't lie," will not apply to figures on hops. Frequently the most wild and reckless statements are circulated through this country, in regard to the yield and consumption of hops, with a view to influence the market; sometimes in the interest of the "bulls" to raise the price, and sometimes to help the "bears" depress it. As a general thing, no reliable authority is given for the truth of such figures, and oftener no authority at all, but they are introduced by some such phrase as "It is estimated," or "It is admitted," or "It is believed." The question is, *by whom* is it estimated or admitted, or believed? Many hop growers "take stock" in some of these statements and find, when it is too late, that the stock is good for nothing. The fact is, that accurate and reliable figures of the hop trade are hard to obtain, and in regard to some points, it is impossible. But some figures which have been carefully gathered and compared are often useful to enable one to detect the truth or falsity of the statements circulated from time to time. For this purpose, therefore, the following tables have been obtained directly from the Bureau of Statistics, at Washington, and are so designated, and others are selected from a mass of statistics, gathered as they appeared, for many years, in census, agricultural and department reports, and in the various trade periodicals, with some evidence of being either strictly or else substantially and practically correct.

In this respect, acknowledgments are here due to the English *Brewers' Guardian*, *Country Brewers' Gazette*, *London Brewers' Journal*, *Maidstone Hop Growers' Journal*, *Allgemeine Hopfen Zeitung*, the American *Western Brewer*, *Wing's Brewers' Handbook*, *The Amerikanische Bierbrauer*, *Wells' Weekly Hop Circular*, *The American Brewers' Gazette*, *The American Hop Grower* (up to 1863), *The Waterville Times and Hop Reporter*, and the *Utica Morning Herald*. Tables are also taken from the English work, *Hops; From the Set to the Skylights*, by Charles Whitehead.

(TABLE 1.)

HOPS IN THE UNITED STATES.

HOPS PRODUCED IN THE UNITED STATES, as returned by the Census of 1850, 1860, 1870 and 1880, representing the crop of the preceding year. Table obtained for this work direct from the the Bureau of Statistics at Washington, D. C.

STATES AND TERRITORIES.	Pounds, 1850.	Pounds, 1860.	Pounds, 1870.	Pounds, 1880.	Acres in 1880.
Total . . .	3,497,029	10,991,996	25,456,669	26,546,378	46,800
Alabama	276	507	32		
Arizona					
Arkansas	157	146	25		
California		80	625,064	1,444,077	1,119
Colorado					
Connecticut	554	959	1,004		
Dakota					
Delaware	348	414	800		
Dist. of Columbia	15	15			
Florida	14				
Georgia	261	199	2		
Idaho			21		
Illinois	3,551	7,254	104,032	7,788	21
Indiana	92,796	27,884	63,884	21,236	69
Iowa	8,242	2,078	171,113	16,915	51
Kansas		197	396	500	1
Kentucky	4,309	5,899	947		
Louisiana	125	27			
Maine	40,120	102,987	296,850	48,214	219
Maryland	1,870	2,943	2,800		
Massachusetts	121,595	111,301	81,910	9,895	23
Michigan	10,663	60,602	628,269	266,010	491
Minnesota		132	222,065	10,928	30
Mississippi	473	248			
Missouri	4,130	2,265	19,297		
Montana					
Nebraska		41	100		
Nevada					
New Hampshire	257,174	130,428	99,469	23,955	59
New Jersey	2,133	3,722	19,033		
New Mexico					
New York	2,536,299	9,671,931	17,558,681	21,628,931	39,072
North Carolina	9,246	1,767	238		
Ohio	63,731	27,533	101,236	5,510	9
Oregon	8	493	9,745	244,371	304
Pennsylvania	22,088	43,191	90,688	36,995	83
Rhode Island	277	50	249		
South Carolina	26	122	1,507		
Tennessee	1,032	1,581	565		
Texas	7	123	51		
Utah	50	545	322		
Vermont	288,023	638,677	527,927	109,350	264
Virginia	11,506	10,024	10,999	1,599	12
Washington		44	6,162	703,277	534
West Virginia			1,031		
Wisconsin	15,930	135,587	4,630,155	1,966,827	4,439
Wyoming					

(TABLE 2.)

Annual Receipts, Imports and Exports, for New York City, from September 1st, 1868, to April 1st, 1883, showing the amount sold each year for domestic consumption.

YEARS.	Domestic Receipts.	Imports Reduced to American Bales.*	TOTALS.	Less Exports.	For Domestic Consumption
1868-69	166,920	*418	167,756	69,463	98,293
1869-70	102,027		102,027	56,453	45,574
1870-71	67,799		67,799	24,577	43,222
1871-72	29,121	5,800	40,721	6,095	34,626
1872-73	23,781	20,885	65,551	9,315	56,236
1873-74	24,550	13,444	51,438	1,638	49,800
1874-75	44,086		44,086	15,995	28,091
1875-76	84,138		84,138	46,116	38,022
1876-77	84,358		84,358	44,493	39,865
1877-78	138,160		138,160	78,949	59,211
1878-79	93,480		93,480	34,749	58,731
1879-80	82,608	2,772	88,152	43,954	44,198
1880-81	96,988	2,094	101,176	43,027	58,149
1881-82	93,605	2,708	99,021	30,015	69,006
1882-83*	57,808	7,297	72,402	35,606	36,796

* Each imported bale counted as two of American weight, in making up the totals.

† March 31st.

(TABLE 3.)

Exports of Hops from the United States, for sixty-two years, previous to 1882, from official reports.

YEARS.	Pounds.	Dollars.	YEARS.	Pounds.	Dollars.
1820-21	319,501	\$18,498	1851-52	238,008	\$69,042
1821-22	283,200	23,025	1852-53	245,647	40,054
1822-23	249,927	27,124	1854	260,026	63,673
1823-24	389,788	81,810	1855	4,021,816	1,310,720
1824-25	117,623	13,865	1856	1,048,515	146,066
1825-26	388,718	100,668	1857	924,538	84,852
1826-27	88,460	8,284	1858	458,889	41,704
1827-28	375,058	25,432	1859	587,953	53,016
1828-29	128,482	6,917	1860	273,257	32,866
1829-30	383,060	30,312	1861	8,835,837	2,006,053
1830-31	265,043	26,664	1862		
1831-32	184,729	25,448	1863	4,415,400	
1832-33	468,798	92,963	1864	5,081,800	
1833-34	917,600	164,577	1865		
1834-35	625,684	90,720	1866		
1835-36	207,548	25,886	1867		
1836-37	1,096,428	89,705	1868		
1837-38	854,106	53,602	1869		1,627,248
1838-39	747,164	72,425	1870		2,515,734
1839-40	82,086	11,235	1871		316,288
1840-41	176,619	28,823	1872		408,305
				Bales.	
1841-42	339,181	36,547	1873	8,637	272,403
1842-43	1,182,565	123,745	1874	15,115	27,973
1843-44	664,363	51,550	1875	30,466	1,286,501
1844-45	902,072	90,341	1876	51,074	1,348,521
1845-46	287,754	41,692	1877	87,613	2,305,355
1846-47	1,227,453	150,654	1878	63,790	2,152,873
1847-48	257,016	17,671	1879	68,022	701,095
1848-49	411,164	29,123	1880		2,573,292
1849-50	1,275,455	142,692	1881		2,016,970
1850-51	110,360	11,636	1882		1,456,786

(TABLE 4.)

Showing in Bales, the Receipts, Exports to foreign countries and Imports from foreign countries, at New York City, for each month in the year, from 1869 to 1883.—(Compiled from *Emmet Wells' Hop Circular*.)

	1869-70		1870-1		1871-2		
	Domestic Receipts.	Imports.	Exports.	Domestic Receipts.	Imports.	Exports.	
September	2,307		4,860	5,761		3,417	1,471
October	19,916		10,096	5,309		11,020	49
November	34,597		13,732	16,442	80	4,168	406
December	22,160		8,644	12,455		2,908	13
January	2,973		4,441	3,697		1,418	33
February	4,799		5,437	1,902		1,750	839
March	3,661		2,866	3,620		870	638
April	3,706		3,708	4,997		852	258
May	919		248	5,042		620	609
June	1,213		46	3,749		795	792
July	1,241		410	4,803		598	466
August	1,318			6,042		593	586
TOTAL	100,510		54,708	67,891	80	20,944	5,802
						29,310	6,100
	1872-3		1873-4		1874-5		
	Domestic Receipts.	Imports.	Exports.	Domestic Receipts.	Imports.	Exports.	
September	3,1977	152	311	1,075		2,028	700
October	4,639	737	127	4,950	3,748	17,522	5,373
November	3,898	2,057	610	3,255	4,738	7,893	3,038
December	3,321	5,992	853	2,904	1,459	6,395	3,325
January	2,732	8,759	1,418	2,388	1,133	3,435	1,366
February	1,565	1,970	1,876	2,844	1,069	1,564	918
March	677	494	12	1,524	929	1,437	543
April	910	80	1,072	1,109	229	1,320	405
May	826	439	2,156	659	159	655	
June	380	187	371	1,606	86	624	
July	739	187	665	947		759	
August	315	17	4	1,283	20	727	427
TOTAL	23,979	20,887	9,475	24,550	13,587	44,359	16,105

	1875-6		1876-7		1877-8	
September	3,593	689	4,237	2,121	5,709	1,600
October	14,338	5,290	18,079	7,176	21,267	10,570
November	15,319	8,476	18,997	4,669	36,265	18,133
December	8,929	3,737	11,342	6,472	19,695	10,871
January	10,956	4,995	7,456	6,494	12,989	9,681
February	10,694	5,549	8,622	4,859	13,474	11,241
March	9,721	7,704	6,877	4,800	9,638	9,474
April	2,775	3,666	4,144	2,216	3,553	902
May	1,845	1,213	4,001	2,123	3,371	3,273
June	2,027	1,929	5,070	2,474	3,092	2,029
July	1,728	1,681	2,014	1,826	3,440	1,024
August	2,049	1,290	3,136	1,701	2,069	1,020
TOTAL	84,024	44,225	77,075	44,731	135,913	78,949
	1878-9		1879-80		1880-81	
September	2,262	140	8,341	9,691	2,315	513
October	7,225	1,352	36,955	22,242	11,240	8,776
November	18,570	5,141	17,212	550	17,319	8,15
December	9,782	6,107	5,908	409	19,714	504
January	10,078	5,908	2,897	93	9,404	109
February	9,181	3,541	1,458	28	10,326	6,350
March	5,849	1,708	1,366	348	6,843	15
April	2,721	1,305	1,583	175	4,292	3,169
May	4,938	1,039	1,452	41	4,146	2,319
June	3,212	1,291	2,276	142	3,309	1,392
July	8,040	3,429	1,376	200	2,730	5
August	7,888	3,058	1,415	637	3,734	1,117
TOTAL	90,346	33,819	82,240	2,772	94,508	251
	1881-2		1882-3		1883-4	
September	5,369	145	6,112	3,896	3,896	
October	28,358	223	26,124	17,574	17,574	
November	9,428	544	16,904	10,002	10,002	
December	*24,525	*900	5,583	3,413	3,413	
January			2,110	487	487	
February			975	174	174	
March	3,244	142	1,342	101	101	
April	2,733	33				
May	3,739	134				
June	3,170	90				
July	3,100	285				
August	4,909	120				
TOTAL	90,685	2,605	59,150	7,312	35,707	

*Aggregate for 15 weeks—Circular suspended.

(TABLE 5.)

Showing the quantity and value of imported Hops, entered for consumption in the United States, each year ending June 30, from 1872 to 1882, inclusive.

YEAR ENDING JUNE 30th.	QUANTITIES.	VALUES.
	Pounds.	Dollars.
1872	1,999,457, $\frac{1}{2}$	785,535 01
1873	5,608,902	1 310,627 27
1874	4,337,886	1,303,636 99
1875	1,170,13	51,746 20
1876	83,243	25,628 00
1877	20,177	10,393 00
1878	52,878	17,173 00
1879	112,537	35,494 00
1880	357,273	151,792 00
1881	475,428	111,903 00
1882	874,558	288,344 00

Treasury Department, Bureau of Statistics, }
 Washington, D. C., January 25, 1883. }

JOSEPH NIMMO, JR.,
Chief of Bureau.

(TABLE 6.)

OLD TIME PRICES

Obtained for Hops raised and sold in New England, from 1806 to 1853.

YEARS.	Bales.	Pounds.	Average Price in Cents.	Value.
1806	910	378,221	15	\$41,733 15
1807	1,167	369,496	11	40,644 56
1808	1,071	322,976	10	32,297 60
1809	993	280,063	10	28,066 30
1810	1,124	299,500	27	80,865 00
1811	1,519	416,050	7 $\frac{1}{2}$	31,203 75
1812	1,267	322,913	11 $\frac{1}{2}$	40,364 12
1813	967	243,242	22	53,513 24
1814	767	179,640	25	44,910 00
1815	1,434	331,673	30	99,501 90
1816	1,336	286,374	32	91,957 68
1817	3,087	729,862	34	248,153 08
1818	2,709	616,366	14	86,291 24
1819	2,834	656,902	5	32,845 10
1820	3,555	782,663	6 $\frac{1}{2}$	50,873 09
1821	2,659	561,063	7 $\frac{1}{2}$	42,079 72
1822	2,810	548,709	10 $\frac{1}{2}$	57,614 44
1823	2,936	618,444	20	123,688 80
1824	2,720	575,030	10 $\frac{1}{2}$	60,378 15
1825	3,054	621,241	15	93,186 15
1826	2,134	409,007	15	61,351 05
1827	3,766	752,140	7	52,649 80
1828	3,391	678,410	6	40,704 60
1829	3,179	632,806	5 $\frac{1}{2}$	53,788 51
1830	3,874	769,456	11	84,640 16
1831	3,691	730,736	10 $\frac{1}{2}$	73,439 46
1832	3,179	606,602	23 $\frac{1}{2}$	142,551 47
1833	5,839	1,136,134	16	181,781 44
1834	6,151	1,174,599	14	164,423 86
1835	4,936	963,238	9 $\frac{1}{2}$	91,507 31
1836	7,608	1,441,936	7 $\frac{1}{2}$	108,145 20
1837	5,197	940,857	6	56,451 42
1838	3,562	663,766	15	99,564 90
1839	2,390	452,225	15	67,833 07
1840	2,892	534,404	30	160,321 20
1841	2,948	564,917	12 $\frac{1}{2}$	70,614 62
1842	4,543	922,932	8	73,834 56
1843	3,329	640,085	6	38,405 10
1844	4,060	773,362	9 $\frac{1}{2}$	73,469 39
1845	3,158	603,763	15	90,564 40
1846	5,625	911,768	8	72,941 44
1847	3,528	697,439	6	41,846 34
1848	3,680	745,916	7	52,214 12
1849	4,320	707,856	12 $\frac{1}{2}$	88,482 00
1850	2,777	528,685	25	107,164 50
1851	2,678	537,668	25	109,417 00
1852	4,388	839,723	20	167,964 60
1853	3,496	640,076	30	192,022 80
	149,238	30,941,902		\$3,998,224 02

The average price of hops, per pound, for the forty-eight years is 12 $\frac{1}{2}$ c.

The whole amount of hops grown in the United

States, for the year 1849, as computed in the cen-

sus returns of 1850, is. 3,497,029 pounds.

New England raised 707,743 pounds.

New York raised 2,536,299 "

3,244,042 "

Balance for other States 252,987

(TABLE 7.)

A Table showing the average value of Hops in the New York Market, each year, with lowest and highest price, 1817 to 1867.

YEAR.	LOWEST PRICE.		HIGHEST PRICE.		AVERAGES.
	Cents.	Month.	Cents.	Month.	
1817	20	November	40	July	31 1/2 @ 35
1825	13	February	25	November	17 3/4 " 18 1/4
1826	10	October	25	January	16 1/2 " 17
1827	8	November	18	January	13 " 14
1828	5	May	10	November	6 1/6 " 6 3/8
1829	4	August	11	October	7 1/4 " 7 3/8
1830	10	January	15	February	12 " 14
1831	8	August	17	March	11 " 12
1832	12	January	37	December	17 " 20
1833	17	October	38	June	27 " 29 1/2
1834	10	May	20	January	14 1/2 " 15 1/8
1835	11	February	19	May	14 " 15
1836	9	December	17	August	12 1/8 " 14 1/2
1837	5	August	9	March	7 " 8
1838	4	April	17	December	7 1/4 " 9 1/4
1839	15	June	18	December	15 1/8 " 16 1/2
1840	18	January	62	July	36 " 39
1841	12	July	40	February	22 3/4 " 26
1842	12	November	16	January	13 " 14
1843	6	November	12	January	8 1/2 " 11
1844	7	January	15	December	8 " 9 1/4
1845	12	June	33	December	13 3/4 " 16 1/2
1846	11	November	35	January	17 " 22 1/8
1847	9	January	15	September	8 3/4 " 11
1848	3	November	7	April	4 1/2 " 5 3/8
1849	6	October	17	December	8 " 9 3/4
1850	8	November	19	April	12 3/8 " 15
1851	24	May	63	July	35 " 40
1852	17	November	47	August	29 " 32 1/4
1853	17	July	50	December	24 " 29
1854	22	August	46	January	32 1/4 " 35
1855	5	December	27	July	16 3/4 " 21 1/2
1856	6	July	13	January	6 1/2 " 9
1857	5	December	12	April	6 1/2 " 10 1/2
1858	4	June	10	January	5 " 8
1859	8	December	18	April	9 " 14 3/4
1860	6	July	38	November	10 " 21
1861	13	November	32	March	17 " 24
1862	12	May	23	February	14 " 19
1863	15	August	30	December	19 " 25
1864	20		52		
1865	30		40		
1866	50		60		
1867	40		65		

From *American Hop Grower*.

(TABLE 8.)
FLUCTUATIONS FOR TEN YEARS.

Market Quotations in New York, for Hops of the latest growth, on the first of each month, for ten years.

YEAR.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.
1852-3 . . .	22 @ 30	22 @ 25	25 @ 25	22 @ 25	20 @ 23	20 @ 21	20 @ 22	19 @ 21	18 @ 21	17 @ 20	30 @ 35	30 @ 35
1853-4 . . .	36 " 40	35 " 40	45 " 50	44 " 45	43 " 45	40 " 44	30 " 35	30 " 33	28 " 33	26 " 30	25 " 27	40 " 45
1854-5 . . .	37½ " 40	36 " 40	34 " 36	32 " 36	27 " 33	20 " 25	15 " 21	15 " 21	15 " 20	24 " 27	23 " 25	13 " 15
1855-6 . . .	13 " 16	10 " 14	8 " 13	7 " 12	7 " 10	7 " 10	7 " 10	6 " 9	6 " 9	7½ " 10	10 " 13	15 " 16
2856-7 . . .	8½ " 11	9 " 11	8 " 10½	7 " 10	7 " 10	7 " 10	8 " 12	6 " 11	8 " 12	9 " 12	9 " 12	20 " 25
1857-8 . . .	8 " 11	5 " 8	5 " 9	5 " 10	5 " 10	5 " 8	5 " 8	5 " 8	4 " 6	6 " 8	6 " 6	8 " 10
1858-9 . . .	12 " 17	10 " 16	10 " 15	10 " 17	12 " 18	8 " 18	9 " 18	9 " 14	9 " 16	8 " 16	8 " 14	13 " 13
1859-60 . . .	12 " 17	12 " 17	12 " 18	12 " 18	10 " 16	6 " 15	6 " 14	6 " 14	6 " 14	6 " 14	14 " 14	8 " 13
1860-1 . . .	28 " 33	30 " 38	30 " 36	25 " 32	25 " 32	28 " 32	18 " 26	15 " 23	14 " 23	16 " 23	17 " 26	18 " 24
1861-2 . . .	18 " 24	13 " 19	14 " 22	16 " 23	15 " 23	15 " 20	14 " 19	8 " 15	12 " 18	14 " 20	14 " 21	15 " 20
1862-3 . . .	13 " 16	15 " 25	16 " 25	15 " 25	15 " 24	20 " 28	20 " 27	16 " 25	17 " 25	16 " 22	14 " 20	18 " 23

(TABLE 9.)

AVERAGE MARKET VALUE FOR HOPS

Of the highest grade, in New York, for fourteen years, from 1869 to 1883, showing the average, each month, for the series of years.—Compiled from *Emmett Wells' Weekly Hop Circular*.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1869 . . . . .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870	\$0.23.50	\$0.23.50	\$0.21.50	\$0.21.50	\$0.21.65	\$0.23.75	\$0.21.50	\$0.21.50	\$0.17.25	\$0.18.60	\$0.23.50	\$0.23.50
1871 . . . . .	.11.50	.09.75	.10	.10.25	.10	.11	.12	.19.80	.50	.50	.48.40	.48
1872 . . . . .	.45.37	.44.50	.45	.45	.45	.45	.45	.53	.38.08	.29.50	.35.87	.47
1873 . . . . .	.50	.48.25	.47.50	.46.25	.45	.44.37	.42.50	.40.75	.46	.47.60	.42	.35
1874 . . . . .	.34.50	.35	.33.12	.28.90	.27.50	.27.50	.25.50	.22.50	.43.75	.42.10	.39.25	.43.70
1875 . . . . .	.45	.40.25	.37.62	.36.70	.37.50	.33.25	.29.20	.20	.17.75	.12.80	.14.63	.12.80
1876 . . . . .	.12.87	.14.50	.15.60	.15	.14	.13.50	.13.50	.13.37	.28	.35.75	.33.25	.26.30
1877 . . . . .	.22.87	.16.75	.12.90	.16.13	.16.50	.14.60	.11.25	.10	.12.25	.12	.12	.12
1878 . . . . .	.11.75	.10.75	.09.60	.09	.09	.10	.11	.11	.15.50	.14	.14	.13.50
1879 . . . . .	.13.50	.12.37	.11.50	.11	.11	.11	.12.75	.14.50	.32	.38.10	.45.87	.39.25
1880 . . . . .	.36.40	.34	.34	.34	.34	.34	.31.20	.27.25	.29	.23.70	.22.25	.22.20
1881 . . . . .	.22	.22	.23	.22	.22	.22	.22	.22	.22.70	.29	.29	. . .
1882 . . . . .	.....	.....	.24	.24	.25.50	.32.40	.40.63	.48.87	.56.90	.72.12	1.05.50	.93
1883 . . . . .	.92.50	.88.75	.85	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average for 14 years	.27.44	.25.97	.25.11	.24.64	.24.43	.24.16	.23.11	.22.84	.28.76	.28.37	.28.36	.28.15

HOPS IN ENGLAND.

Account of Hops grown and imported, with Estimates of annual consumption of Sugar, Malt and Hops in England.
From Hops: From the Set to the Sky-lights.

YEAR.	Acres.	Old duty of 10s. 8 $\frac{1}{2}$ d. per cwt.	Foreign Hops Imported. cwt.s.	English average prices per cwt.	Foreign average prices on de- clared value. s. d.	Lbs. in Sugar equal to Qrs. in Malt.	Qrs. Malt.	Sugar and Malt equal to Qrs. in Malt.	Hops used yearly in Eng- land, reckoning 10 lbs. to the Qr of Malt. cwt.s.
1855	57,757	398,635	24,662	145 0	106 6	8,846,515 = 42,126	4,946,027	4,988,153	445,370
1856	54,527	266,899	15,987	50 0	111 6	9,365,681 = 44,598	5,066,914	5,111,512	456,385
1857	50,975	228,294	18,711	58 6	105 6	5,274,746 = 25,118	5,481,006	5,506,124	491,618
1858	47,661	254,001	13,000	56 6	109 6	5,246,027 = 24,981	5,899,557	5,924,538	528,976
1859	45,065	328,070	2,220	45 0	137 6	10,340,882 = 49,142	6,380,336	6,422,458	574,629
1860	46,272	53,485	68,918	200	130 6	41,134,012 = 95,876	5,960,367	6,156,043	543,664
1861	47,941	14,701	149,176	160	65 6	3,761,100 = 79,100	6,027,902	6,207,000	554,106
		Estimated			67 6	41,980,944 = 99,909	6,077,145	6,277,054	566,481
1862	No returns†	160,000	133,791	120	67 6	29,017,227 = 38,177	6,209,118	6,347,225	567,322
1863	"	150,000	147,281	140	82 0	32,500,765 = 54,765	6,453,175	6,601,928	588,994
1864	"	180,000	98,656	147	0	29,398,957 = 39,995	6,192,763	7,067,928	631,038
1865	"	300,000	82,479	140	0	63,111,222 = 100,529	7,155,717	7,456,246	665,736
1866	56,576	180,000	85,687	160	0	86,018,397 = 109,616	7,257,969	7,667,520	684,600
1867	04,284	180,000	290,117	160	0	99,756,808 = 147,503	7,278,562	7,753,590	692,285
1868	04,488	280,000	231,720	95	0	98,143,733 = 167,351	7,602,514	8,106,986	720,523
1869	61,790	95,000	322,515	100	0	90,509,444 = 39,997	7,456,250	7,997,247	714,039
1870	61,594	380,000	127,853	100	0	125,441,199 = 597,342	7,423,613	8,020,955	716,156
1871	60,030	130,000	218,664	82 0	0	116,927,107 = 556,795	6,884,973	7,444,176	664,443
1872	61,927	320,000	133,965	126	0	32,500,765 = 54,765	6,453,175	6,601,928	588,994
1873	63,278	230,000	122,729	127	0	29,398,957 = 39,995	6,192,763	7,067,928	631,038
1874	65,805	150,000	145,994	126	0	63,111,222 = 100,529	7,155,717	7,456,246	665,736
1875	69,801	350,000	256,444	92 6	0	99,756,808 = 147,503	7,278,562	7,753,590	692,285
1876	69,999	220,000	167,366	150	0	98,143,733 = 167,351	7,602,514	8,106,986	720,523
1877	71,239	240,000	250,039	100	6	90,509,444 = 39,997	7,456,250	7,997,247	714,039
1878	71,789	320,000	168,834	84	6	125,441,199 = 597,342	7,423,613	8,020,955	716,156
1879	67,671	80,000	262,765	168	6	116,927,107 = 556,795	6,884,973	7,444,176	664,443
1880	66,703	235,000	..	95	..	..	..	..	..
1881	64,943	..	..	..	..	..	..	..	..

* The duty on English Hops was abolished in this year, and that on foreign hops was repealed.

† After the duty was taken off, there were no means of ascertaining the average until 1866, when it was given in the Agricultural Returns.

(TABLE II.)

The Acreage of Hop-land and Average Yield, in England, from 1808 to 1861.—From *Hops, from the Set to the Skylights*.

Year.	Acres.	Old Duty.	Average yield per acre.	Year.	Acres.	Old Duty.	Average yield per acre.
1808	38,436	£ 231,089	13 2 2¾	1836	55,422	£ 200,332	7 1 26¼
1809	38,357	63,952	3 1 17¼	1837	56,323	178,578	6 2 6¾
1810	38,265	73,514	3 3 25¾	1838	55,045	171,556	6 1 22
1811	38,401	157,085	8 1 24½	1839	52,305	205,556	8 0 15
1812	38,700	30,561	1 2 15	1840	44,085	34,091	1 2 8
1813	39,521	131,482	6 3 15½	1841	45,769	146,159	6 2 11
1814	40,575	140,292	7 0 17¾	1842	43,720	169,776	8 0 4
1815	42,150	123,878	6 0 9½	1843	43,156	133,508	6 1 16
1816	44,219	46,302	2 0 19¼	1844	44,485	140,322	6 2 3
1817	46,293	66,522	2 3 25½	1845	48,058	158,003	6 3 6
1818	48,593	199,465	8 1 27¾	1846	51,948	242,929	9 2 20
1819	51,014	242,076	9 3 8¼	1847	52,328	215,805	8 2 6
1820	50,048	138,330	5 3 25	1848	49,232	212,416	8 3 20
1821	45,662	154,609	7 0 1¼	1849	42,798	79,791	3 3 12
1822	43,776	203,724	9 2 15¼	1850	43,127	232,576	11 0 18
1823	41,458	26,057	1 1 5¾	1851	43,244	129,580	6 0 22
1824	43,419	148,832	7 0 11	1852	46,157	244,866	9 3 15
1825	46,718	24,317	11 0 8¾	1853	49,367	152,677	5 2 1
1826	50,471	269,331	1 0 5½	1854	53,825	47,369	1 2 15
1827	49,485	140,848	5 3 14¾	1855	57,757	398,635	12 3 12
1828	48,365	172,027	7 1 12¾	1856	54,527	266,899	9 0 16
1829	46,135	39,866	1 1 25	1857	50,974	228,294	8 1 12
1830	46,726	88,047	3 3 17	1858	47,601	254,001	9 3 19
1831	47,129	174,864	7 2 20	1859	45,665	328,070	13 1 15
1832	47,101	139,018	6 0 12½	1860	46,271	53,485	2 0 17
1833	49,187	156,905	6 2 11¾	1861	47,941	114,701	4 1 23
1834	51,263	189,713	7 2 18	..	..	..	..
1835	53,816	235,207	9 0 5¾	..	..	..	..

Total growth per acre during 14 years, 87 cwts. 2 qrs. 11 lbs.; annual average, 6 cwts. 1 qr. 0 lbs.

Total growth per acre, during 14 years, 85 cwts. 3 qrs. 15 lbs.; annual average, 6 cwts. 0 qrs. 15½ lbs.

Total growth per acre during 14 years, 95 cwts. 2 qrs. 8 lbs.; annual average, 6 cwts. 3 qrs. 8½ lbs.

Total growth per acre during 12 years, 94 cwts. 3 qrs. 17 lbs.; annual average, 7 cwts. 3 qrs. 17 lbs.

Annual average growth per acre during the 54 years, from 1808 to 1861, 6 cwts. 2 qrs. 26¾ lbs.

(TABLE 12.)

The amount of Old Duty paid in England, from 1714 to 1807.

YEAR.	Acres.	Old Duty.	Old Duty Average.	YEAR.	Acres.	Old Duty.	Old Duty Average.				
		£				£					
1714	}	14,457	Average Duty during 14 years, £41,903. Equal to an average growth of 77,391 cwts. per ann.	1760	}	117,992	Average duty during 14 years, £74,594. Equal to an average growth of 138,790 cwts. per ann.				
1715		44,975		1761		79,776					
1716		20,354		1762		79,495					
1717		54,669		1763		86,315					
1718		15,005		1764		17,178					
1719		90,317		1765		73,778					
1720		38,169									
1721		61,362		1766		116,445					
1722		49,443		1767		25,997					
1723		30,279		1768		114,002					
								1769	10,201		
1724		}		61,271		Average Duty during 14 years, £47,536. Equal to average growth of 88,174 cwts. per ann.		1770	}	101,131	Average Duty during 14 years, £80,955. Average growth 142,757 cwts. per ann.
1725				6,526				1771		33,143	
1726				85,013				1772		102,653	
1727	69,409		1773	13,455							
1728	41,494		1774	13,627							
1729	46,441		1775	41,597							
1730	44,419		1776	125,691							
1731	22,600		1777	43,581							
1732	35,135		1778	159,801							
1733	70,000		1779	55,800							
1734	37,416										
1735	42,745		1780	122,724							
1736	46,462		1781	120,218							
1737	56,492		1782	14,895							
		1783	75,716								
1738	}	86,575	Average Duty during 14 years, £93,261. Average growth 174,112 cwts. per ann.	1784	}	94,359	Average Duty during 14 years, £93,261. Average growth 174,112 cwts. per ann.				
1739		70,742		1785		112,634					
1740		37,875		1786		95,973					
1741		65,222		1787		42,227					
1742		45,550		1788		143,168					
1743		61,072		1789		104,063					
1744		46,708		1790		106,811					
1745		34,635		1791		60,039					
1746		91,879		1792		162,112					
1747		60,000		1793		22,619					
1748		87,000									
1749		36,305		1794		203,663					
1750		65,000		1795		82,342					
1751		73,954		1796		75,233					
		1797	157,458								
1752	}	79,000	Average Duty during 14 years, £17,179. Average growth 224,658 cwts. per ann.	1798	}	56,032	Average Duty during 14 years, £17,179. Average growth 224,658 cwts. per ann.				
1753		81,000		1799		73,279					
1754		112,000		1800		72,928					
1755		82,157		1801		241,227					
1756		48,106		1802		15,463					
1757		69,713		1803		199,205					
1758		72,896		1804		177,617					
1759		42,115		1805		32,904					
				1806		153,102					
				1807		100,071					

(TABLE 13.)

Imports of Foreign Hops into England, with Values.

YEAR.	Cwts.	Value.	YEAR.	Cwts.	Value.
1840	107		1861	149,176	£657,763
1841	34		1862	133,791	723,034
1842			1863	147,281	626,660
1843	28		1864	98,656	549,863
1844	267		1865	82,479	459,157
1845	726		1866	85,687	567,760
1846	3,283		1867	296,117	1,626,941
1847	1,471		1868	231,720	689,383
1848	385		1869	322,515	1,098,475
1849	5,265		1870	127,853	428,525
1850	6,479		1871	218,664	895,895
1851	462		1872	135,965	679,276
1852	309		1873	122,729	602,914
1853	42,344		1874	145,994	920,641
1854	119,040	£1,133,644	1875	256,444	1,188,054
1855	24,662	171,955	1876	167,366	763,440
1856	15,987	39,967	1877	250,039	1,170,621
1857	18,711	54,965	1878	168,834	631,567
1858	13,000	36,618	1879	262,765	4,217,938
1859	2,220	4,991	1880	196,688	1,217,938
1860	68,918	568,901			

(TABLE 14.)

A Return, showing the various countries from which hops have been imported, during the five years ending with 1879, and the quantities from each country.

Name of Country.	1875.	1876.	1877.	1878.	1879.	Annual Average Amount from each Country.	Total Annual Average Amount for five years.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	
America	42,405	67,752	116,888	96,603	108,306	86,391	
France	3,862	2,021	3,404	4,161	9,234	4,536	
Belgium	95,557	46,543	58,991	29,124	63,485	58,740	
Holland	22,598	9,541	11,801	15,954	26,796	17,338	
Germany	91,752	40,761	55,821	21,866	50,567	52,153	
Other Countries, including British N. America	270	748	3,134	1,126	4,377	1,931	
Total of each year,	256,444	167,366	250,039	168,834	262,765		221,039

(TABLE 15.)

AVERAGE COST OF RAISING AN ACRE OF HOP-LAND IN
ENGLAND.

	£	s.	d.
Plowing, subsoiling, and preparing the land,	3	5	0
Manure, 30 loads, at 5s. 6d.,	8	5	0
Setting out hills and digging holes,	1	5	0
2,400 sets, at 4s.,	4	16	0
Planting,	0	8	0
Nidgetting and summer cultivation,	2	0	0
Stakes, or poles, and putting up,	1	10	0
One year's rent, tithes, and taxes,	5	0	0
Total cost of raising an acre of hop-land,	£26	9	0

(TABLE 16.)

The expense per annum, in connection with an acre of hop-land in full plant—that is, after the second year, is given in the following table:

SHOWING THE ORDINARY OUTLAY UPON AN ACRE OF HOP-
LAND IN FULL PLANT, AND PROPERLY FARMED.

	£	s.	d.
Manure, carting and spreading,	8	0	0
Digging, or plowing and digging,	1	1	0
Dressing,	0	6	0
Poling,	0	15	0
Tying,	0	14	0
Pulling bines, earthing, &c.,	0	4	0
Ladder tying,	0	8	0
Keeping land clean round hills,	0	8	0
Nidgetting and harrowing,	1	17	6
Annual average supply of poles,	5	5	0
Stripping, stacking poles,	0	9	6
All expenses of picking, drying, selling an average crop of, say, 7 cwts. per acre,	12	15	0
Rent, rates, tithes, taxes, and repairs of oast, &c.,	5	5	0
Interest on capital, say,	3	0	0
Total,	£40	8	0

If sulphuring is done, from 30s. to 40s. extra must be charged per acre. If washing is done, from £3 to £4. 10s. should be put to the annual cost.

Mr. Buckland, in 1845, estimated the cost of cultivating an acre of hop-land in Kent, and of getting to market a crop of 10 cwt. per acre, at £43. 17s. 10d. Mr. Smith, stated in 1864, that the cost of cultivating an acre of hop-land in Worcester, was £22. 10s.; not including rents, rates, taxes, interest of money, picking, drying, packing and selling, and since that time expenses have increased.

It may fairly be assumed that an average crop of hops, of 7 cwt. per acre, cannot be produced much under £40 per acre, taking the country throughout. Those persons who are wholly ignorant of hops and their culture, will wonder at the exceeding cost of producing hops. Many hop-planters also will be surprised to see in black and white that they have to pay so much, for, like many other farmers, they are not, as a class, in the habit of keeping very elaborate accounts. Indeed, some hop-planters say, "It does not do to count the cost."

(TABLE 17.)

CURRENT PRICES IN LONDON, FEBRUARY, 1883.

Kents,	£18	to	£25	per cwt.
Sussex,	18	to	25	"
Farnhams,	19	to	25	"
Country do.,	19	to	25	"
Worcesters,	19	to	25	"
Americans,	18	10 to	22	"
Bavarians,	16	to	19	"
Belgians,	12	to	14	"
Yearlings,	16	to	20	"
Old hops—various dates and kinds,	4	to	8 8	"

NOTE.—A convenient and practically accurate rule for reducing English quotations to corresponding value on this side, in American money, is to multiply the pounds by 4. For example, Americans above £18½ to £22 equals seventy-four to eighty-eight cents per pound, gross weight, in New York City. The exporter from the United States to England, has to deduct from this, the tare on sacking, loss in weight, freight, insurance, etc., amounting, (according to various circumstances) to from two to three cents per pound. Therefore, the above quotations of Americans in England may be taken as equal to seventy-three to eighty-five cents value for export in New York City, not allowing the exporter any profit. Allowing him three to five cents per pound profit, and margin for risk he takes, then hops quoted in London, at £18. 10s. to £22 should be bought in New York for seventy to eighty cents. As an illustration of some of the expenses of exporting, take the following from the *Utica Morning Herald*, of December 6th, 1881.

"Take 100 bales of American hops which must be delivered in England at 120 shillings per cwt., and give the charges which

must come out of this in order to show the net price at which they must be bought in this country.

100 bales—18,000 pounds less tare 8 pounds=17,200 pounds divided by 112=153 cwts. 2 qrs. 8 lbs. 153.28 @ 120s., . . .	<u>£921.8.0</u>
Freight ½d. to ¾d. and 10 per c. primage, say, ½d. 18,000 lbs.,	£41.5.0
Insurance 1½ per cent.,	14.0.0
Loss, 3 lbs. per bale in weight, (too low), @ 120s.,	16.2.6
Sampling, 6d. per bale,	4.10.0
London commission, 3 to 5 s., say, 4s. per cwt.,	<u>30.14.0</u>
	<u>£106.11.6</u>
Gross amount as above,	£921.8.0
Less charges,	<u>£106.11.6</u>
Net at highest,	<u>£814.16.6</u>

At exchange at highest, \$4.81 to £1, \$3,919.30

Result—Net proceeds, 100 bales hops, \$3,919.30 divided by 18,000=21 13-18 cents per pound.

These expenses are all placed very low, and exchange correspondingly high, in order to avoid any possible charge of exaggeration. There are, beside, several pestiferous charges which help to reduce the price received for hops on the other side, and which would easily do away with the odd 13-18 of a cent, although it is allowed to stand in our table."

(TABLE 18.)

FORMER HIGH PRICES IN LONDON, COMPARED WITH THE PRESENT.

In 1787, hops were worth in London, fifty cents per pound; in 1793, fifty-two cents; in 1800, ninety-two cents; in 1802, sixty cents; in 1812, eighty cents; in 1815, fifty-two cents; in 1816, seventy-seven cents; in 1817, \$1.65; in 1823, fifty cents; in 1825, \$1.15; in 1830, fifty-two cents; in 1840, sixty-seven cents; in 1853, fifty-seven cents; in 1854, seventy-nine cents; and in 1860, fifty cents.



CHAPTER XXV.

HOP AND BEER STATISTICS OF THE WORLD.

HOPS can now be transported from one part of the world to another, with such speed and cheapness of freight, that, in hops, all the world is practically one country.

A failure of the crop in England, advances the price of hops in New York and Nuremberg, on the same day as in London.

A surplus of hops in America and Germany, keeps down the price of hops in London as well as in New York and Nuremberg.

As the price of hops depends so strictly on this law of supply and demand, it is natural for all who produce or distribute or consume hops, to wish to know as much as possible in regard to the supply and demand as each year comes round.

How is the yield in Germany? How in England? How in America? How in Belgium? What is the stock on hand, unsold to brewers, from the crop of previous years? What is the stock on hand in the lofts of brewers? Will brewers use as many hops to the barrel of beer, this year, as usual? Has the acreage of hop-land increased or decreased in England, Germany or America? Are any new hop-raising states coming in to increase the supply? Is the general consumption of hops, in beer, increasing or decreasing throughout the world?

All these questions, and more, must be answered, and offset one against the other, and a general result arrived at, before we can give even a good guess at the price, which most hops will bring, in any given year; and even then some unforeseen circumstances will sometimes thrust themselves in at the last moment, and upset the best calculations.

It is fortunate for the hop grower that the trouble and risk of this uncertainty in the hop trade, comes mostly, not on the grower, but on the dealer. If the dealers have made up their minds, generally, that hops will be scarce, the hop grower will soon find out that fact, by a lively bidding for his hops. He has only to take the best offer he can get, as the price becomes established, and, in nine cases out of ten, and, in nine years out of ten, he has sold his hops well. On the contrary, the grower who gets hold of some hop figures of supply and demand, and thinks that thereby he has the key to the whole situation, and sees a terrible famine in hops, just at hand—this man, in nine cases out of ten and nine years out of ten, will “get left,” and his hops also, to sell at lower figures than when the market was first established, in October and November. A glance at our monthly tables of prices, in New York, will show this.

Why, then, should the hop-grower pay any attention to the figures bearing on the supply and demand of hops? There is, indeed, very little need of it, but for the fact that figures are brought to him, by newspapers and circulars, which in most cases really mean no harm, but which do him harm all the same, when the figures are wide of the mark.

The following information and tables are therefore presented as being the best extant upon the production and consumption of hops, and warn the reader that even the best are deficient in some respects, and are only to be used as giving a general view, and useful to correct other statements which are glaringly incorrect, of which an example is given further on.

In explanation of the tables, it is sufficient for all practical purposes to reckon :

The Hectoliter, $26\frac{1}{2}$ gallons, (of 231 cubic inches.)

The American Barrel, 31 “ “ “

The English Barrel, 36 “

The Kilogram, $2\frac{1}{2}$ pounds.

The Centner, 110 “

The Cwt., 112 “

The American bale of hops, 180 pounds average.

The German bale of hops, averages twice the weight of the American bale.

(TABLE 19.)

THE WORLD'S PRODUCTION AND CONSUMPTION OF HOPS IN ALL THE PRINCIPAL COUNTRIES

COUNTRIES.	Estimate of full Crop.	CROPS.															13 year average crop 1890—
		1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.			
Bavaria	Center (about) 300,000	Center (about) 275,000	Center (about) 90,000	Center (about) 150,000	Center (about) 209,000	Center (about) 115,000	Center (about) 240,000	Center (about) 76,000	Center (about) 218,000	Center (about) 102,000	Center (about) 106,000	Center (about) 155,000	Center (about) 186,000	Center (about) 155,000	Center (about) 164,000		
Belgium	250,000	110,000	44,000	150,000	120,000	67,000	180,000	80,000	240,000	85,000	105,000	125,000	135,000	25,000	113,000		
Holland	175,000	175,000	56,000	100,000	115,000	60,000	135,000	21,000	142,000	90,000	79,000	96,000	72,000	110,000	96,000		
Bohemia	150,000	95,000	42,000	82,000	88,000	62,000	130,000	50,000	110,000	75,000	49,000	75,000	68,000	68,000	77,000		
Lorraine	100,000	72,000	36,000	60,000	74,000	53,000	96,000	30,000	89,000	60,000	42,000	53,000	48,000	45,000	58,000		
Burgundy	60,000	50,000	22,000	36,000	42,000	24,000	45,000	17,000	44,000	30,000	20,000	32,000	22,000	23,000	31,000		
Wurttemberg	50,000	50,000	15,000	25,000	40,000	10,000	43,000	7,000	36,000	22,000	25,000	38,000	27,000	24,000	28,000		
Upp. Austria	50,000	30,000	15,000	32,000	38,000	33,000	40,000	16,000	40,000	28,000	10,000	25,000	32,000	18,000	28,000		
Styria	40,000	33,000	13,000	26,000	34,000	13,000	30,000	13,000	34,000	27,000	18,000	20,000	16,000	23,000	23,000		
Galicia	80,000	80,000	40,000	50,000	45,000	32,000	60,000	16,000	60,000	40,000	20,000	38,000	35,000	17,000	41,000		
Hungary	1,255,000	970,000	378,000	711,000	805,000	469,000	999,000	326,000	1,013,000	619,000	480,000	657,000	641,000	508,000	659,000		
Posen	800,000	500,000	225,000	550,000	400,000	250,000	550,000	400,000	550,000	650,000	140,000	450,000	480,000	125,000	405,000		
Baden	1,470,000	1,470,000	598,000	1,261,000	1,205,000	719,000	1,549,000	726,000	1,563,000	1,269,000	620,000	1,107,000	1,121,000	633,000	1,064,000		
Altmark	2,055,000	1,470,000	598,000	1,261,000	1,205,000	719,000	1,549,000	726,000	1,563,000	1,269,000	620,000	1,107,000	1,121,000	633,000	1,064,000		
Brunswick	80,000	80,000	40,000	50,000	45,000	32,000	60,000	16,000	60,000	40,000	20,000	38,000	35,000	17,000	41,000		
Hanover	80,000	80,000	40,000	50,000	45,000	32,000	60,000	16,000	60,000	40,000	20,000	38,000	35,000	17,000	41,000		
Other Districts	80,000	80,000	40,000	50,000	45,000	32,000	60,000	16,000	60,000	40,000	20,000	38,000	35,000	17,000	41,000		
Continent	1,255,000	970,000	378,000	711,000	805,000	469,000	999,000	326,000	1,013,000	619,000	480,000	657,000	641,000	508,000	659,000		
England	800,000	500,000	225,000	550,000	400,000	250,000	550,000	400,000	550,000	650,000	140,000	450,000	480,000	125,000	405,000		
Europe	2,055,000	1,470,000	598,000	1,261,000	1,205,000	719,000	1,549,000	726,000	1,563,000	1,269,000	620,000	1,107,000	1,121,000	633,000	1,064,000		
America	2,055,000	1,470,000	598,000	1,261,000	1,205,000	719,000	1,549,000	726,000	1,563,000	1,269,000	620,000	1,107,000	1,121,000	633,000	1,064,000		
Total	2,055,000	1,470,000	598,000	1,261,000	1,205,000	719,000	1,549,000	726,000	1,563,000	1,269,000	620,000	1,107,000	1,121,000	633,000	1,064,000		

(TABLE 19.—Continued.)

COUNTRIES.	Hop Consumption.	Annual Beer Production.	Annual Beer Consumption.
	Centner.	Hectoliter.	Per Capita.
North Germany	150,000	21,136,000	61
Bavaria	112,000	12,153,000	426
Austria-Hungary	98,000	12,212,000	30
Belgium	65,000	7,866,000	154
France	53,000	7,125,000	24
Wurtemberg	31,000	4,197,000	212
Russia	25,000	2,863,000	4
Netherlands	10,000	1,452,000	40
Denmark	9,000	1,140,000	60
Baden	8,000	1,086,000	67
Sweden	7,000	930,000	21
Alsace-Lorraine	6,000	789,000	48
Norway	5,000	615,000	28
Switzerland	5,000	724,000	30
Other States	4,000	533,000	1
Continent	588,000	74,821,000	
England	600,000	39,250,000	118
Europe	1,188,000	114,071,000	
America	200,000	14,261,000	19
	1,388,000	128,332,000	

[NOTE—The above Table was compiled in Europe, and is more correct for Europe than for America. By the Census we now know that the United States Crop of 1879, was 241,330 Centners instead of 155,000, as given in the above Table. Our consumption, also, is larger than that given in the Table. Correcting the Table for America, by the Census, the following figures are presented, as agreeing more closely with our production and consumption for the years named.]

UNITED STATES.

PRODUCTION		CONSUMPTION.	
Crop of 1879	271,330 Centner.	Year ending June 30, 1879,	218,000 Centner.
" 1880	290,000 "	" " " 1880,	234,000 "
" 1881	290,000 "	" " " 1881,	250,000 "
" 1882	260,000 "	" " " 1882,	230,000 "
		(Increased beer production, but hops economized on account of very high prices.)	

According to the estimate of Carl and Homann, the world's acreage of hops is about 250,000 acres, with an average yield of about 600 pounds to the acre.

(TABLE 20.)

SALES OF BEER IN THE UNITED STATES.

For the Brewers' year, ending May 1, 1882, and for the seven previous years, showing the Brewing in each State, in each year, and that THE PRODUCTION OF ALE AND BEER IN THE UNITED STATES HAS DOUBLED IN THESE EIGHT YEARS.—Compiled from

Wing's Brewers' Hand Book, and published as a supplement to *The Western Brewer*, Chicago and

New York, June 15, 1882.

States and Territories.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.*	Increase 1882, compared with 1881.	Decrease 1882, compared with 1881.	Total increase, eight years.	Total decrease, eight years.
Alabama . . .	402	603	263	. . . . .	. . . . .	80	4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	401
Arizona . . .	527	726	804	713	720	1,461	5,065	3,806	. . . . .	741	. . . . .	3,279	. . . . .
Arkansas . .	95	160	129	119	72	37	411,509	424,486	. . . . .	12,977	. . . . .	122,199	. . . . .
California . .	302,287	336,094	365,243	377,768	385,150	376,374	69,715	84,434	. . . . .	14,719	. . . . .	60,918	. . . . .
Colorado . . .	23,516	23,046	22,747	23,900	21,186	50,048	72,464	99,376	. . . . .	26,912	. . . . .	46,873	. . . . .
Connecticut . .	52,503	61,943	61,527	53,528	51,988	64,572	7,750	14,846	. . . . .	7,096	. . . . .	13,023	. . . . .
Dakota	1,823	2,761	4,834	4,616	4,531	6,013	11,734	14,282	. . . . .	2,548	. . . . .	8,163	. . . . .
Delaware . . .	5,646	6,373	4,897	7,841	9,553	9,388	34,536	39,496	. . . . .	4,960	. . . . .	17,923	. . . . .
Dist. of Colum.	21,573	26,569	34,037	27,506	29,126	42,030	34,536	39,496	. . . . .	4,960	. . . . .	17,923	. . . . .
Georgia	5,330	5,360	7,710	7,330	7,710	11,720	9,826	2,870	. . . . .	. . . . .	6,956	. . . . .	2,660
Idaho	915	967	779	936	1,504	1,926	1,979	2,747	. . . . .	768	. . . . .	1,832	. . . . .
Illinois	536,619	569,954	569,768	579,858	608,627	766,730	870,175	1,004,789	. . . . .	134,614	. . . . .	468,170	. . . . .
Indiana	181,053	184,538	187,640	182,358	193,259	247,930	276,854	335,804	. . . . .	58,958	. . . . .	154,751	. . . . .
Iowa	180,653	184,218	179,988	185,276	169,039	223,713	247,993	292,391	. . . . .	44,408	. . . . .	111,738	. . . . .

Kansas	23,592	23,504	29,718	20,995	24,706	32,437	28,926	23,133	5,793	43,382	111,057	459
Kentucky	114,070	106,642	103,491	127,416	144,972	174,534	181,745	225,127		5,360	26,282	
Louisiana	30,910	36,352	45,581	36,352	47,407	57,352	51,832	57,192				11,527
Maine	11,527	11,389	11,030									
Maryland	191,548	193,947	205,376	208,228	195,048	214,432	253,711	301,507		47,796	109,959	
Massachusetts	179,597	189,899	206,367	602,062	561,872	649,062	735,533	816,783		80,250	337,186	
Michigan	91,274	201,804	210,713	200,324	212,231	272,694	278,230	330,740		52,510	139,466	
Minnesota	88,567	94,255	102,313	101,904	113,529	142,334	173,334	211,704		38,320	123,137	
Mississippi	7											7
Missouri	397,033	418,081	476,391	447,686	582,400	737,869	803,427	1,017,446		214,019	620,413	
Montana	22,867	23,364	22,858	27,100	5,516	7,088	9,006	12,449		3,353	8,482	
Nebraska	12,990	13,417	14,595	12,116	29,270	40,903	45,270	53,933		8,663	31,066	
Nevada	139,482	137,549	131,794	132,213	108,203	135,151	203,497	246,130		42,633	106,648	1,330
New Hampshire	485,600	516,446	503,708	502,574	519,867	612,389	665,537	783,931		118,394	298,331	
New Jersey	1,190	1,197	750	110	1,191	283	387	1,220		417	1,220	
New Mexico	2,289,777	3,034,551	3,354,439	3,564,778	3,846,569	4,445,140	4,855,429	5,535,594		680,165	2,645,817	
New York	480,114	873,176	895,740	988,315	955,644	1,194,382	1,291,293	1,556,451		275,246	1,086,337	55
North Carolina	7,257	9,183	10,229	13,362	16,159	20,307	24,893	24,263			17,006	
Ohio	964,634	1,023,710	1,095,997	1,036,295	1,030,584	1,284,807	1,398,154	1,689,714	630	291,560	725,080	
Oregon	18,975	21,502	22,665	25,210	27,831	50,260	57,842	68,600		10,758	49,625	
Pennsylvania	1,835	1,272	1,938	1,778	372	1,253	8,052	10,154		2,102	8,319	
Rhode Island	1,541	800	1,207	6,980	7,107	7,808	8,735	11,044		2,309	9,503	
South Carolina	14,057	16,806	16,306	10,081	7,176	3,812	2,918	3,117		1,147	1,186	10,940
Texas	6,829	7,993	8,754	9,490	11,476	13,123	15,138	18,015		2,877	11,186	
Utah	1,195	1,256	304	4,858	8,605	17,187	26,110	25,470		5,360	10,592	
Vermont	14,878	17,256	17,013	10,694	15,694	17,187	11,335	13,375		2,040	8,122	
Virginia	3,253	6,608	7,647	7,965	7,231	8,666	11,335	13,375		10,938	20,702	
Washington	26,826	25,726	25,555	23,122	24,158	31,517	36,200	47,228		10,938	20,702	
West Virginia	440,614	450,568	472,309	509,544	584,673	791,783	926,237	1,185,097		258,800	744,483	
Wisconsin	2,792	3,489	4,794	4,060	4,505	5,122	6,038	5,547			2,735	
Wyoming												
TOTALS	8,383,720	9,159,654	9,752,930	10,181,158	10,589,937	12,800,900	14,125,466	16,616,364		2,506,594	15,686	28,669

Net Increase, 1882 over 1881, 2,490,898. Net Increase, 1882 over 1875, 8,232,644.

*The production of beer for the ten months ending March 1st, 1883, was 14,720,082 barrels. The average percentage of production for March and April, for five years, has been 1 5/8 per cent, for each year. Taking this ratio for March and April, 1883, the production for the year ending May 1st, 1883, will be 16,939,870 barrels, being an increase over that of last year of 323,506 barrels.

(TABLE 21.)

PRODUCTION OF BEER IN THE UNITED STATES.

The following statement shows, by fiscal years, the aggregate production of fermented liquors in the United States from September 1st, 1862, to June 30th, 1874:

Fiscal years ended June 30th.	Barrels of not more than 31 gall. each.
1863,	1,765,827
1864,	3,459,119
1865,	3,657,181
1866,	6,270,401
1867,	6,291,184
1868,	6,149,663
1869,	6,342,055
1870,	6,574,616
1871,	7,740,260
1872,	8,659,427
1873,	9,633,323
1874,	9,600,897

The Commissioner says: "The foreign demand for American malt liquors is still increasing, the applications for drawback, during the fiscal year ending June 30th, 1880, upon exports made to foreign ports, having more than quadrupled those made for the fiscal year which ended June 30th, 1879."

GERMAN BEER STATISTICS.

The Augsburg *Allgemeine Zeitung* contains some interesting particulars concerning the production and consumption of beer in Germany. It appears that the amount produced in the years 1877-8 was, in Prussia, 14,192,890 hectoliters; Saxony, 3,059,758 hectoliters; Hesse, 757,377 hectoliters; Mecklenberg, 279,702 hectoliters; small Saxon Duchies, etc., 1,528,268 hectoliters; Oldenburg, 107,443 hectoliters; Brunswick, 246,052 hectoliters; Anhalt, 209,001 hectoliters. These eight groups of States (which coincide with the former North-German Confederation) are united for fiscal purposes in a brewing excise union, the total pro-

duction within which was 20,360,401 hectoliters. For the South-German States, the figures stand thus: Bavaria (right bank of the Rhine), 12,205,377 hectoliters; Rhine Palatinate, 600,000 hectoliters; Wurtemberg, 3,879,006 hectoliters; Baden, 1,098,500 hectoliters; Alsace-Lorraine, 803,106 hectoliters. This gives a total production for the whole German Empire, of 38,946,510 hectoliters (856,823,220 gallons). During the years 1874-5-6 the production was something over 390,000,000 hectoliters. But since 1876 it has been almost stationary, and the present year shows a falling off of nearly half a million.

THE PROPORTION OF HOPS USED IN ALE AND BEER.

In America, up to 1883, or a little before that year, it has been customary to allow a consumption of hops, in beer, of about one bale, (180 pounds average) of hops to every 100 barrels of ale and beer, stamped and sold. This, at first thought, would seem to require the ale and beer to be hopped in the proportion of one and eight-tenths pounds to the barrel, but the fact is, there is a very large amount of hopped beer, retained in the boiled hops, a shrinkage of ten per cent. between the boiling kettle and the fermenting tub, a shrinkage of five per cent. during fermentation and barreling (Thausing, pages 479 and 600), a large amount spoiled and thrown away, drunk in the breweries, etc., and hops used otherwise than in beer, so that the standard of one bale consumption to every 100 barrels of ale and beer, stamped and sold, in the United States, was a fair one and gave correct results when tested. But a reference to the article on "The Influence of Fashion on the Consumption of Hops," will show what is recently going on in England, and the same process is at work in the United States, and reducing the quantity of hops used in beer.

Ale requires more hops than beer, and while there is more ale manufactured in the United States than formerly, yet the great increase has been almost altogether in the use of the "lager beer."

This has tended to require a less quantity of hops to the barrel, than when ale was the leading drink. Again, before the great improvement in ice-houses and cold-air machines, lager beer brewers used to lay in a large supply, in the winter, of "stock"

lager, which required twice the amount of hops that is needed for beer brewed in spring and summer. Now they lay in only so much "stock" lager as will help them through the summer, by using it with fresh beer, and then brew all they possibly can in the summer. This requires less capital, less risk, less malt, less hops, and the people like this light, fresh, creamy beer better than the old strong "stock" lager.

Thus it comes about that though we now use twice the beer in the United States, that we did in 1875, we by no means use twice the amount of hops. Again, as in this year, 1883, when hops are extravagantly high, brewers will use hops more economically. Thausing, (edited by Drs. Schwarz and Bauer, New York, 1882), says:

"Leaving out of account the strongly hopped English beers,* and some very strong local beers, the amount of hops added to our modern beers varies between $\frac{44}{100}$ pound to $1\frac{87}{100}$ pounds per hectoliter, and amounts, on an average to $\frac{88}{100}$ pound per hectoliter."

This is $1\frac{1}{2}$ pounds to the barrel. After making allowance for waste and for the several million barrels brewed in the United States, all requiring more hops, we may safely say that one and one-half pounds to the stamped barrel, will cover our United States consumption of hops, at present. The present consumption of England, we may put roughly and rather high, but not far out of the way, at two and one-half pounds hops to the barrel (of thirty-six gallons). The consumption of Germany and the continent generally, some ale, but mostly light beers, I should say is well put, as per Thausing (above, and in Table 19), at $1\frac{1}{2}$ pounds to the American barrel of thirty-one gallons of 231 cubic inches, each gallon.

* "2 $\frac{2}{10}$ pounds to 2 $\frac{86}{100}$ pounds per hectoliter, are used in England for dark porter and ale, and so much as, and even more than $6\frac{6}{10}$ pounds per hectoliter for the "India" ale, for transport across the ocean." (Great Britain exported in 1881,—502,918 barrels.)

(TABLE 22.)

From statistics recently published, we learn that the quantity of beer produced, in the countries named, was as follows :

	BARRELS, (36 GALS.)
Great Britain and Ireland,	27,500,000
German Empire,	24,483,000
Austria,	7,311,000
Belgium,	4,918,000
France,	4,583,000
Russia,	1,353,000
Holland,	934,000
Denmark,	733,000
Switzerland,	568,000
Sweden,	568,000
Norway,	366,000

The statistics refer to the year 1874, but there is good reason to believe that the beer production of the respective countries has not materially altered since that date. Only in the United States is there a large annual increase.

(TABLE 23.)

BEER STATISTICS OF THE WORLD.

Professor Thausing has compiled the following statistics of beer production for the year 1879:

COUNTRIES.	QUANTITIES BREWED.
German Empire,	38,946,510 hect.
Great Britain,	36,597,550 "
United States,	15,400,000 "
Austria-Hungary,	11,184,681 "
France,	8,721,000 "
Belgium,	7,854,000 "
Russia,	2,300,000 "
Holland,	1,600,000 "
Denmark,	1,100,000 "
Sweden,	960,000 "
Italy,	870,000 "
Switzerland,	724,000 "
Norway,	615,000 "

In all, 120,842,741 hectoliters (2,660,000,000 imp. gallons), among 332,000,000 people. The average consumption was largest in Belgium, 147 liters per head; and smallest in Russia, 3 liters per head.

(TABLE 24.)

HOP AND BEER STATISTICS.

The following interesting statistics relating to the hop crop, and the consumption of beer, are taken from Messrs. J. Barth & Son's recent report:

	Beer Consump. Cwts.	Annual Beer Production Hectoliter.	Annual Beer Consump. per Head. Liter.
Northern Germany,	146,000	19,473,000	61
Bavaria,	123,000	12,340,000	246 (Munich 566)
Austria-Hungary,	91,000	12,212,000	35
Belgium,	65,000	7,866,000	154
France,	53,000	7,125,000	24
Wurtemberg,	28,000	3,796,000	212
Russia,	17,000	2,214,000	3
Netherlands,	10,000	1,452,000	40
Denmark,	2,000	1,140,000	60
Baden,	8,000	1,078,000	67
Reichsland,	7,000	890,000	48
Sweden,	7,000	930,000	21
Norway,	5,000	615,000	28
Switzerland,	5,400	724,000	30
The remaining states,	4,000	533,000	1
Continent,	578,000	72,388,000	
England,	600,000	39,250,000	118
Europe,	1,178,000	111,638,000	
America,	200,000	14,261,000	19
	1,378,000	125,899,000	

(TABLE 25.)

The following table exhibits the consumption of hops in the countries named, during the year 1880:

	No bales.
England,	370,000
Germany,	190,000
France,	31,000
Other parts of the continent,	140,000
South American States and Islands,	10,000
British possessions of America,	10,000
United States,	150,000
Total,	901,000

THE FUTURE OF HOPS.

Especial attention is called to these facts now, to illustrate by a practical example, the use of the preceding tables, in correcting the sensational and bogus statements which are sometimes thrust upon the attention of those interested in hops. Here is one of them as found now going the rounds in print:

“The London *Brewers' Journal* states: that in 1881-82 (twelve months) there were brewed, or produced in the various beer-brewing countries, 146,500,000 barrels of beer. As it is supposed that each barrel requires two and one-half pounds of hops, it would necessitate 1,831,450 bales, of 200 pounds each, to supply brewers for the quantity of barrels named. This statement, if correct, will naturally set some folks inquiring where all the hops come from to furnish the demand and leave a surplus of stock on hand for carrying over. As beer making is on the increase in every part of the civilized world (as malt liquor is fast superseding the use of alcoholic drinks) growers of hops need not entertain much fear that the demand will cease, but on the contrary must probably increase.”

	BARRELS.
Great Britain,	42,000,000
German Empire,	33,000,000
Prussia and North Germany,	18,000,000
United States,	16,000,000
Bavaria,	11,000,000
Austria,	8,000,000
France,	5,500,000
Wurtemberg,	3,500,000
Netherlands,	1,750,000
Denmark,	1,250,000
Baden,	1,250,000
Alsace,	1,000,000
Lorraine,	1,000,000
Switzerland,	1,000,000
Sweden,	1,000,000
Norway,	750,000
Hungary,	500,000
Total,	146,500,000

Now, as an example, let us test these figures a little and see where they come out. England's largest brewing year, and which she has not equalled since, and shows no signs of exceeding for a long time, was in 1876. Turning now to table 10, we find the hops consumed in England (or Great Britain, which the table covers) estimated at 720,523 cwts. This is a high figure, and more than twenty per cent. higher than the present highest figure for England's consumption at the present time, as see table 19. But, still taking the above as Britain's present consumption, 720,523 cwts., 80,698,576 pounds of hops, while the humbug calls for 42,000,000 barrels (the official returns for the year ending December 31st, 1881, show a brewing of only 27,469,267 barrels) at two and one-half pounds of hops to the barrel, or 105,000,000 pounds of hops. Here, in the first item of Great Britain, is an over estimate, therefore, of over 24,000,000 pounds of hops as going into consumption, which never did.

The second item, the German Empire, 33,000,000 *barrels* at two and one-half pounds to the barrel, calls for 82,500,000 pounds of hops. This we must throw out altogether, *for the German Empire is added in twice*; once as an Empire, and again in the four great brewing divisions of the Empire—Prussia and North Germany, Bavaria, Wurtemberg and Baden. So this 82,500,000 pounds of "double entry" hops was never called for in this or any other year for consumption. Adding to this the 24,000,000 error in Great Britain, we have in these two first items alone a call for 106,000,000 pounds of hops, which could never be needed. This will answer for a beginning. 588,000 bales of American size, (more than the whole production of the United States for the past three years) here in the first two items, must be thrown out. Looking further down the list, we observe another double entry in the case of Alsace and Lorraine. Taking off the surplus down the whole column, by the aid of the facts laid down in the preceding pages, we bring the whole consumption of hops called for in 1881-82 (twelve months) down to 937,950 bales of 180 pounds each, which agrees closely with table 19 and with table 25, and is undoubtedly somewhere near the truth.

If by this example of the way to test false figures by those approximately true, and by furnishing at least some tolerable aids

with which to do it hereafter, we shall be of any assistance to those interested in getting at the truth, then the trouble taken in compiling and comparing these statistics will be well rewarded.

INFLUENCE OF FASHION ON THE USE OF HOPS.

The brewing industry is not exempt from the influence of fashion. A careful survey of the types and descriptions of beers in vogue at different times, will show that fashion has had something to do with our trade. Without going back to the olden days, when our Saxon forefathers imbibed freely of ale and metheglin made from barley and honey, without any admixture of flavoring herbs, we may refer to the period when the introduction of hops into this country gave quite a different character to the national beverage; instead of the sweet and mawkish ale, a true beer, flavored with the aromatic essence of the hop, came into fashion. This took place in the sixteenth century, since when, hopped beers have been more or less in fashion. Towards the end of the eighteenth century, there was a great rage for black beers, and so great was it that our metropolitan brewers found their trade rapidly increased by the production of this article; porter was consumed in enormous quantities, and it seemed at one time as if light-colored beers would become things of the past. We now know that the fashion for porter and stout is on the decline. Large breweries, at one time engaged solely in the production of these specialties, are now producing pale ale as well, and many brewers have altogether discontinued the brewing of black beers. Towards the end of last century and at the beginning of this, the taste of the public inclined to very strong ales. The old-fashioned stingoos and strong stock ales were consumed in large quantities and with thorough relish at this period, probably because the habits of life which then prevailed, caused the physiques of the people to be stronger then than at the present time. In those days, beer was brewed regardless of cost in many a household, and the modern private trade brewer had scarcely started into existence. Gradually the taste for lighter and cheaper beers grew, until the year 1851, when the great Exhibition marked an era in brewing, as it has done in many other industries. The

splendid productions of Messrs. Bass & Allsopp, then attracted much attention, and from that time the taste for highly-hopped beers has gone on increasing until lately, when there has been an evident tendency to fall back again upon milder and less bitter beers. During the last two or three years, brewers have experienced a demand for beers of very low gravity, and containing less of the flavor of the hop than was the fashion some twenty years since, and of course it is their bounden duty to comply with the dictates of fashion in this respect. We will not further refer to the threatened introduction of lager beer into this country, than to say that fashion takes strange freaks, and it will be well for brewers to be prepared for all eventualities.



CHAPTER XXVI.

GERMAN METHODS AND STATISTICS.

ALTHOUGH Germany is the most important hop-producing country in the world, yet, information as to their methods, has been most difficult to obtain with any degree of accuracy.

Nothing in print is found to inform the American reader, as to the cost of producing hops in the German Empire, or their methods; we have to rely upon the oral statements of intelligent Germans, and that of travelers who have investigated these questions, but neglected to make a record of them.

While the following description is known to be imperfect, yet care has been taken to procure reliable information, and sufficient to give the hop grower, of the United States, a faint idea of the formidable rival they have to contend with, for possession of the great English markets.

In England, it has been found practicable to ascertain and reduce to actual figures, the cost of producing hops, and which has been found to exceed twenty-five cents per pound; not so with Germany. There the German farmer, or more accurately speaking, gardener, does his own labor, within himself and family, from the beginning of the cultivation to the end of the harvest season. Like the American housewife, with her poultry, who neither counts or knows the cost of the eggs sent to market, or of the chickens raised, cared for as they are by the loving hands of the children, and slyly gathering their living off the indulgent farmer's crib; no account is made or thought of the grain that goes to making up the food of the noisy pets in the barn-yard. We all know what an immense aggregate is obtained from this source, and which has baffled competition. So it is with a large aggregate of the German hops, where the nimble fingers of the children tie up the vines; where the cultivation is carried on simultaneously

with other garden work, and where, when harvest time comes as shown in the illustration, the family and friends pick the hops with merry making similar to the apple parings, quilting bees, or log rollings of the frontier life.

The hops are usually trained on poles, though not in every case. Where poles are used, they are very much longer than in the United States, and present, when covered with the vine, a beautiful appearance, the little hop yards dotting the landscape frequently as far as the eye can reach. In other places these present an unbroken appearance, and look in the distance as one vast hop field for miles in extent. The cultivation is almost universally done by hand on account of the small area of each yard, the owner digging the whole surface over, and never putting a plow or harrow near the yard for the whole season. The cultivation however, is thorough and continuous.

Harvest begins on the early varieties about the middle of August, but picking is not general, as with us, until the first week of September, and continues for from fifteen to twenty days. On account of the numerous ownership, and the great extent of the acreage it is always difficult to ascertain, and uncertain to the last, as to what the yield will be, what the condition of the crop or the quality of the hops. Like the American farmer with his hay, the German hop gardener is dependent upon the weather during harvest time to a great extent, as to the condition he can secure the crop. Frequently the vines are taken under shelter and there picked, but when there is wet weather the hops will not cure without heat, or at least very slow and not without injury. The German farmer is entirely unprepared to apply artificial heat only in exceptional cases.

The hop houses or kilns, of which mention is made elsewhere are the property of dealers, and are used to complete the process of drying. These are of such great extent, that as many as twenty thousand bales have been cured, in one group of buildings, and under one management and ownership, in a single year. This is always done after the hops have passed out of the control and ownership of the grower

Like all other older hop districts in the world, the German hops are subject to numerous enemies which frequently cause

partial failure of the crop, and in exceptional cases almost total, shown by the statistics, 660 pounds per acre for a full crop, while as low as only 167 pounds per acre has been harvested. These variations in yield, in their turn cause violent fluctuations, from the excessive price of 550 marks down to 10 per cwt., or in round numbers from two and a half cents to one dollar and thirty cents per pound, our weight. Like as in England, no certain remedy has been found or applied against these enemies that is effectual, and doubtless the soil, if critically examined, as has recently been done in England, would be found, as there, swarming with lice and the germs of other disease.

Hops are sold in Germany by net weight, the same as they are in England, the weight of the baling cloth or bagging being allowed as tare.

The following statement has been kindly furnished by an intelligent German, who is familiar with the subject, but whose modesty forbids the use of his name, in print. He says:

“Although most hops which come to this country from the continent of Europe are sold as Bavarian or Bohemians, it is a fact that they are raised in many other states of the continent. The principle producing section however, is the Kingdom of Bavaria, where fully one-third of the continental crop is grown. Next to this in importance is Bohemia, in Austria. Alsatia is also quite a prominent producing country. Wurtemberg, Baden, Galicia and Posen, (Prussia Poland) all contribute quite an amount to the total. Belgium is a very important and large producing country, but as the system there differs from the other hop countries of the continent, it is better to treat this country separately. Russia also produces a few hops, but the quantity is so small as hardly to be worth mentioning. The same may be said of Styria in Austria, Rhenish Prussia, Burgundy in France, and a few other so-called out-lying, hop-growing sections.

“Although the land is worth much more than here, hops can be raised in Germany and Austria at a smaller cost than they can be in New York State, for the reason that they are cultivated in very small gardens, the average of each grower being below two acres, and the work being done by the grower and his

“ family. This even applies to the picking, for when picking time comes the growers of a village or hamlet will meet together and assist one another until the hops are all harvested; grand-parents and babies are all enlisted in service. If the weather is in any way unpropitious, the vines are cut and the hops taken indoors and picked.

“ The grower does not cure his hops with the use of brimstone or artificial heat. This is left to be done by the dealer. The grower simply spreads the hops very thinly on a barn floor, allowing plenty of ventilation, and turning them on the floor several times each day, until they are sufficiently dried to be loosely put in sacks. In this shape they are bought by the dealers, who own large kilns, and when brought to the kilns the dealer selects all hops which are uniform as to color and strength, and which are thoroughly mixed, and when intended for export are cured with brimstone, using charcoal for fuel. The impression prevails in Germany that charcoal is an absorbant of any impurities that may exist, and therefore is preferred to any other fuel. This system accounts for the reason why such large, straight lots of German hops can be delivered on a single sample. It is only proper here to state, that a great deal of chicanery is practiced by many of the merchants. They will use a certain proportion of fine hops from well-known sections; mix them with inferior sorts, raised hundreds of miles from the section where the hops are said to be grown, and they have this system of mixing down to such a science that it is almost impossible to detect them.

“ There are several sections in Germany where hops never undergo the brimstone process, but are shipped direct from the producer to the consumer, in the original packages. The principal places where this is done are Spalt, (Bavaria) and Saaz, (Bohemia). These hops always command an exceedingly high price, (from fifty to one hundred per cent. in excess of any others), and are really the best grown. No deception can be practiced here, because when a package is baled it is immediately sealed by the City Inspector, and a certificate given of the details and marks on the bales accompanies them, and no bale is accepted unless accompanied with the certificate.

“These hops never come to this country for the reason that they would heat if subjected to ocean transportation, in not being cured with brimstone which is necessary for export articles.

“The general system in Austria is the same as in Germany, except that there are many instances of large yards owned by the nobility and large landed proprietors, who have them worked on the landlord and tenant system, or who hire their work done. As regards Belgium; its hops may be put down as the cheapest and poorest produced in the world. They are usually a large thin hop which grows very prolific, and contains a smaller per cent. of essential oil than any other. The system of curing (in our judgment) does much to detract from their usefulness, peat or turf being used as fuel, the smell of which is absorbed by the hops and is never lost. This is the only country where hops are graded and sold by marks; therefore, large lots change hands before harvest and even after, without any samples being submitted. Most of these hops find their way across the channel to England, where they are used in connection with English, German and American hops, for cheap ales and porter.

“The annual production of the continent on a good average crop, may be called about 700,000 cwts., which is over 360,000 of our bales. The system of marketing hops differs from this country very slightly. The dealer buys the hops from the farmer while they are on the barn floor; sacks them after purchase, usually furnishing the sacks himself, which are weighed beforehand, and the weight allowed as tare. Many hops are bought by small intermediate dealers, which find their way to the Nuremberg market, and are there sold by commission merchants to exporters and such dealers as have a brewers trade. In this manner the business done at Nuremberg is very large during the season, and the prices are there established for nearly all grades of continental hops.”

HOPS IN GERMANY.

Among all hop-cultivating countries of the world, the German Empire takes the most prominent place, not only in regard to the quantity of its products, but also in regard to their quality. The

German Empire produces, at the present time on about 38,000 hect. (1 h.=400 sq. rods) 478,000 cwts. England is the next following, producing on about 28,000 hect., on an average, 385,000 cwts.; Austria, 7,800 hect., and 93,000 cwts.; the rest of Europe, 12,000 hect., and 160,000 cwts.; Australasia, 250 hect., and 3,000 cwts.

All the species of hops cultivated on the European continent, may be classified, as regards their price and quality, in ten different kinds, as follows:

- I. Hops of the towns of Saaz and of Spalt, and the nearest situated principal villages.
- II. Adjoining domain of Spalt, Kind, and Saaz lands.
- III. Wolzsch, Au, and smaller sites of the Spalt land.
- IV. Hallertan, Auscha red-land, Styria, and principal portions of Wurtemberg and Baden.
- V. Finest mountain hops, Aisch-ground, finest Polish, Alsatian, and Burgundian hops.
- VI. Common, Middle and Upper Franconian hops, Wurtembergian, Baden, Polish, Alsatian, and Burgundian, and finest Galician hops.
- VII. Upper Austrian, Auscha Greenland, Lothringian, and Kannebeck land.
- VIII. Brunswick, Altmark, and the remaining parts of Northern Germany.
- IX. Northern France, Belgium, and Holland.
- X. Russia and the rest of Europe.

These kinds reached in the last four years on the largest hop market of the world, Nuremberg, the following prices:*

Class.	1873-4	1874-5	1875-6	1876-7
I.	295-320	375-380	170-180	600-650
II.	270-300	360-380	160-175	580-630
III.	170-180	230-280	70-90	520-540
IV.	150-170	250-265	60-70	450-500
V.	125-150	220-235	50-70	420-450
VI.	115-125	200-220	48-54	360-380
VII.	100-115	190-215	36-48	350-360
VIII.	70-90	100-120	22-30	200-240
IX.	60-70	80-90	20-25	160-200
X.	30-40	50-60	. . . .	100-120

*In Marks.

(TABLE 26.

PRICES OF HOPS, AT NUREMBERG, FOR EIGHTY YEARS.

We are in receipt from John Barth & Son, of Nuremberg, through the kindness of Conrad Seipp, Esq., of Chicago, who visited that city last season, of some most valuable charts, from which we obtain the following prices of hops in that market for the crops of each year, since 1798, a period of nearly a century, or back to the days when the United States were yet in their very infancy. The following were the highest and lowest prices for the crops of the years named, in German marks: The table represents the purchasing prices, per fifty kilogrammes, for the best Bavarian hops, without seal or certificate:

YEAR.	Highest Price.	Lowest Price.	YEAR.	Highest Price.	Lowest Price.
1798	138	138	1838	152	47
1799	101	101	1839	56	31
1800	390	305	1840	91	75
1801	66	66	1841	90	75
1802	268	268	1842	183	105
1803	50	50	1843	113	45
1804	33	33	1844	228	138
1805	382	382	1845	91	30
1806	152	107	1846	140	30
1807	101	66	1847	30	23
1808	58	39	1848	88	43
1809	145	106	1849	52	75
1810	230	159	1850	76	57
1811	122	77	1851	306	172
1812	58	40	1852	85	45
1813	91	51	1853	167	53
1814	101	69	1854	306	238
1815	238	151	1855	95	44
1816	269	138	1856	113	69
1817	121	46	1857	100	60
1818	151	78	1858	230	92
1819	115	33	1859	152	121
1820	330	154	1860	485	205
1821	137	79	1861	152	84
1822	79	52	1862	153	69
1823	78	30	1863	167	107
1824	40	22	1864	160	122
1825	115	62	1865	238	91
1826	31	24	1866	203	150
1827	26	15	1867	168	62
1828	31	10	1868	95	43
1829	360	183	1869	226	115
1830	100	63	1870	85	45
1831	101	78	1871	258	139
1832	374	109	1872	240	85
1833	243	57	1873	232	87
1834	152	39	1874	259	138
1835	60	38	1875	154	60
1836	92	35	1876	550	250
1837	53	45	1877	300	67

It will be readily seen from these most interesting figures, that no commodity known to the world's commerce, fluctuates so constantly, or varies so much in price, year by year, as hops. The above table shows that the highest price for hops in Nuremberg, for the past eighty years, was 550 marks in 1876, and the lowest price 10 marks, in 1828, per fifty kilogrammes.

NOTE.—Fifty kilogrammes or a centner is 110½ lbs. The German mark is about twenty-five cents, United States money.

From *The Western Brewer*.

In Germany, the culture of hops has, at present, taken larger dimensions in Bavaria, Wurtemberg, Alsatia, Baden, German, Lotharingia, Saxony, Hesse-Darmstadt, and Brunswick. Bavaria produces, of all the German countries cultivating hops, the largest; Brunswick, the smallest quantities. In several other minor German states not mentioned, hops are cultivated, but scattered to such an extent, that we may justly omit them, as they do not rank as hop producers. The whole area of Germany cultivating hops, as mentioned above, is about 38,000 hect., the annual production in the last few years, on an average, 478,000 cwts., or about sixty-seven per cent. of the whole production on the European continent, forty-six per cent. of the whole production of Europe, or thirty-nine per cent. of the whole production of all hop-cultivating countries in the world.

The annual consumption of hops, in the last few years, may be estimated on an average at about 322,000 cwt., so that there remain, in the aggregate, annually about 156,000 cwt., for exportation. The hop trade of Germany has, therefore, for years grown to a large extent, and as to exportation, embraces all the leading countries of the world, viz.: Great Britain, France, Belgium, Austria, Hungary, Russia, Sweden, Norway, Denmark, South America, and the United States. The value of hops exported to Great Britain, amounted in the last four years, on an annual average to about 4,000,000 *Marks*. France received from Germany, in the last ten years, on an average annually 900^t, amounting to nearly 3,000,000 *M*. Belgium, during the same time, annually, 8,900,000 *M*. Austria-Hungary, nearly 300,000 *M*., on an average in the last five years.

Russia, over	15,000 cwt. of hops, averaging,	. . .	2,200,000 <i>M</i> .
Sweden, about	4,000 " " "	. . .	500,000 "
Norway, "	3,000 " " "	. . .	400,000 "
Denmark, "	6,000 " " "	. . .	800,000 "
U. States, "	9,000 " " "	. . .	1,300,000 "

Summing up the foregoing average values, to get an approximate idea of the amount of money flowing annually from foreign countries to Germany, through the exportation of hops, an amount of 16,000,000 *M*. results, which might rather be advanced, as the production of beer in the above-mentioned countries is steadily increasing, and with it the consumption of hops.

The returns, furnished by the German Imperial Government, show an average, yearly export, for the ten years, 1868 to 1877, inclusive, of 13,949,962 pounds, or more than half as much as is annually produced in the United States.—*Allgemeine Hopfen Zeitung*.

COMPARISON OF GERMAN AND AMERICAN HOPS.

BY A GERMAN AUTHORITY.

The annual report of the Chamber of Commerce, for Middle Franconia, for 1879, speaking of the extension of Hop Culture in the United States, says :

“There is no doubt that Hops can be produced there under more favorable circumstances than with us. In addition to this, American Hops (we have to admit this, though unwillingly) are greatly preferred in England to ours, and have decidedly taken precedence of us in that market. Taking the excellent qualities of our produce into consideration, such a result would be quite inexplicable, if it were not that the system of German commerce, unfortunately, has itself to blame, in part, for this defeat. American Hops, no matter whether of better or inferior quality, almost always appear in foreign markets in their original state, whereas, with us, parties are not ashamed to make up for exportation, hops of all countries and of all qualities, mixed together, often marked with the best brands on the outside of the bales, but containing the poorest kind of goods. This manipulation may bring larger profits for a time, but sooner or later the reaction must come, as, indeed, it has, and it is attended with most disastrous results, not only for those who have been guilty of such practice, but, what is still more to be regretted, for the trade in general; for German hops are treated in England with the greatest suspicion. Take as a proof of this, that in the season of 1880, up to the beginning of April, 45,000 bales of American hops were imported into England, against 15,000 bales of German hops.

“Both the trader and producer should take a lesson from the present situation; the former should convince himself that he can only make lasting customers of foreign countries, by serving them in a strictly honest manner,* and that, in this respect, the practice of the American is worthy of being imitated in German commerce, whilst the producer should learn that through American competition, and through improved systems of preservation, a barrier is placed against the indefinite extension of our hop plantations, unless, indeed, he wants to bring ruinous prices upon himself. Furthermore, it is absolutely necessary in many districts to improve the plant, and to give more attention to its better handling, both in picking and in drying, in order that it may retain its power of competing with others.”

*The American hop-grower, who reads the above, will see the point of the remarks (under the head of “Baling”) in regard to superfluous sacking, and pins in American bales.

TRICKS OF THE GERMAN HOP TRADE.

A brewer in England, a short time ago, bought a bale of hops in Nuremberg, and thought he got the genuine Bavarian article. But when he opened the bale, a slip of paper with the name of a hop-grower in Eastern Prussia on it, was found. The hops had been sold at Allenstein, Eastern Prussia, and from there found their way to Nuremberg. Being of good quality, the Englishman sent the grower, in Prussia, an order for more hops. A still more striking instance of such dealings happened in Wurtemberg, Prussia. A brewer, of that place, was prejudiced against the hops of his own country. He refused to buy hops in the Allenstein market. He wanted the genuine article from Southern Germany. He bought all he needed at Furth. But what did he find one day in a bale of Bavarian hops? A business card with the name of his next neighbor, a hop grower, whose hops he had declined to buy at any price. Unwittingly, he had taken them many a time at a fair premium, when they were sent by some Bavarian hop dealer.

ACREAGE AND YIELD OF HOPS IN GERMANY.

According to the agricultural statistics of the German Empire, for the year 1880, there were 96,451 acres of land devoted to the culture of hops. Of these, 53,172 acres belonged to the kingdom of Bavaria; 15,551 acres to Wurtemberg; 11,100 acres in Alsace; 10,092 acres to Prussia; and 6,051 acres to Baden. The remainder is scattered in small plantations through various other States.

In Bavaria, 25,935 acres was the aggregate in 1850; 58,045 in 1870; and 56,810 acres in 1880. In Wurtemberg the area in 1850 was 1,729, while in 1880 it was 15,561. In Baden, 2,470 acres comprises the total area in 1860, and 5,828 in 1880. In Alsace, only 494 acres were cultivated to hops in 1850, while the area thus planted had increased to 10,621 acres in 1880. The highest average yield, per acre in Bavaria, for the ten years between 1870 and 1880, was 660 pounds in 1875, and 572 pounds in 1878; the lowest yields were 167 pounds in 1876; 220 pounds in 1871; 308 pounds in 1879; and 413 pounds per acre in 1880. In Wurtemberg, for the same period, the highest yields were 774 pounds in

1875; 668 pounds in 1878; while the lowest yields were 237 pounds in 1876, and 325 pounds per acre in 1879. In Baden the average per acre runs higher, the highest average yields being 959 pounds in 1875; 968 pounds in 1877, and 950 pounds in 1873, the lowest yields being 352 pounds in 1871; 369 pounds in 1876; and 466 pounds per acre in 1879.

The average yield, per acre, for the whole ten years, was, for Bavaria, 411 pounds; Wurtemberg, 529.7 pounds; Baden, 707.6 pounds.

(TABLE 27.)

Value of hops exported from Nuremberg to the United States, for eleven years, ending September 30th, 1881.

Years.	
1871,	\$86,668
1872,	267,571
1873,	502,568
1874,	572,989
1875,	11,571
1876,	12,448
1877,	1,975
1878,	4,536
1879,	7,948
1880,	89,480
1881,	88,063

(TABLE 28.)

HOPS IN FRANCE.

Hops are cultivated in three districts of France—the North, the North-East, and the East. The following are the acres under cultivation, and the amount of the crops in the three districts in 1877:

	Acres.	Quantity.
North,	4,200	42,500
North-East,	3,540	28,700
East,	3,610	29,300
	<hr/>	<hr/>
Total,	11,350	100,500

Most of the above crops was obtained from the following five departments :

	Cwts.
Nord,	34,000
Moselle,	21,000
Meurthe,	6,900
Aisne,	5,400
Cote d'Or,	28,700



CHAPTER XXVII.

HOP RULES OF THE NEW YORK PRODUCE EXCHANGE.

FULLY three-fifths of the trade of the United States, and more than nine-tenths of the imports and exports of hops, is done in New York. That city bears practically the same relation to the hop trade, in this country, as does London to England, or Nuremberg to the continent of Europe, hence, any action of the hop dealers, of New York city, towards establishing rules for governing the trade, ought to have great weight in the minds of all intimately connected with the trade, either as growers, dealers, or consumers.

The following rules, just adopted by the New York Produce Exchange, though only binding as between members of the Exchange, will, if continued in force, eventually be referred to as precedents, and sooner or later, even without legal enactments, will undoubtedly be adopted by the trade, generally, and complied with by growers and brewers. Already, several brewers' associations have endorsed them, and it is believed that the National Brewers' Association, of the United States, will take the same course at their next annual meeting.

The extraordinary high price, for the years 1882-83, has attracted great attention to the question of tare on hops. An article costing but nine cents per pound, as hop bagging does, and selling for \$1.00, has called out a vigorous protest from brewers, who point to the fact that in no other country of the world, but the United States, are hops sold gross weight. The adoption of Rule VI, which covers this point, has in turn elicited a strong opposition among growers, who point to the fact, that in preceding years, they have paid ten cents per pound and sold for five.

The facts are submitted for the information of all connected with the hop interest, with the remark that this, like all other

kindred questions, will be settled without referring to single individual opinions, but rather as based upon the final judgment of the majority interests at stake. The following are the rules referred to:

RULE I. At the first meeting of the Board of Managers after their election, the President shall (subject to the approval of the Board) appoint a Committee on Hops, five members of the New York Produce Exchange, who are known to be dealing in Hops, to consist of two brewers and three dealers. It shall be the duty of this committee to properly discharge the obligations imposed upon them by these rules, and also to consider and decide all disputes arising between members dealing in, consuming, or exporting Hops, which may be submitted to them.

A majority of the committee shall constitute a quorum, but the committee shall fill temporary vacancies, if requested by either party, by some member or members representing the same interest as the absent member, or members, and a decision of a majority of those present at any meeting shall be final. They shall keep a record of their proceedings, and a fee of (\$15) fifteen dollars shall be paid to the committee for each reference case heard by them, to be paid by the party adjudged to be in fault, unless otherwise ordered by the committee—provided, however, that nothing herein shall prevent a settlement of question of difference by private arbitrations, or, as provided by the by-laws.

RULE II. All transactions in American Hops only, between members of the Produce Exchange, shall be governed by the following rules, but nothing here shall be construed as interfering in any way with the right of members to make such special contracts or conditions as they may desire.

RULE III. All Hops shall be deliverable in merchantable bales. When a certain number of pounds are sold, number of bales not specified, net weight shall be understood.

RULE IV. When specific lots are sold by sample, or otherwise, and are ready for immediate delivery, any bale weighing not less than 170 pounds nor more than 205 pounds, shall be considered a good delivery.

RULE V. When Hops are sold for future delivery, and the weights of the bales have not been ascertained at the time of sale, a good delivery shall be a sufficient number of bales to effect a delivery of the number of bales sold, at an average of not less than 185 pounds, nor more than 190 pounds gross weight.

RULE VI. On all Hops, an allowance of seven pounds per bale shall be made as tare.

RULE VII. In the absence of any specific agreement, the seller shall have the right to demand payment at the time of passing the title.

RULE VIII. Whenever sales are made between members of the Pro-

duce Exchange, through a broker who is not a member of the Exchange, a written memorandum of the transaction, is to be exchanged by the principles before the sale is binding.

RULE IX. Hops sold for immediate delivery must be inspected on the day succeeding the sale. Hops sold for future delivery must be inspected on the day succeeding the notice of delivery.

RULE X. If, upon inspection, it shall be found that any lot, or part of a lot, of Hops sold, shall not conform to the contract, the buyer shall take all that do conform with the contract, and the seller shall replace the lot, or part of a lot rejected, with other Hops of as good quality, and for this purpose the seller shall have ten days to replace and tender Hops to fill the original contract; but if a specific lot is sold by sample, the buyer shall take all which are up to the sample, and he shall have the privilege of taking the rejections at a reduction to be agreed upon between seller and buyer, or to be settled by arbitration.

RULE XI. Hops shall be weighed (unless otherwise agreed upon) by a city weigher, whose return shall be taken as the correct weights of bales; weigher's fees to be divided by buyer and seller equally.

RULE XII. All Hops shall be removed at the buyer's expense within two days after receiving the invoice (weather permitting), and until then the seller is to hold the same, fully covered by insurance, at invoice value.

RULE XIII. When Hops are sold to arrive and to be inspected on dock, the buyer shall, after inspection and order for delivery being given, assume the same relations towards the transportation line by which the Hops arrive, as the seller previously held as regards their removal from the place of delivery, within the time granted by such lines, for that purpose.

RULE XIV. Rules III, IV, V and VI, shall only apply to the crop of 1883, and subsequent crops.

RULE XV. A car load of Hops shall be understood to contain not less than 10,000 or more than 13,000 pounds.

NEW YORK, March 1, 1883.



CHAPTER XXVIII.

REMINISCENCES OF PIONEER LIFE IN WASHINGTON TERRITORY.

SINCE the beginning of this work, and during its progress through the press, the writer has realized more than ever before, how little is known of the great region now coming forward so rapidly in the production of hops. To answer the many questions which have been asked, as to the motives which impelled the early settlers to seek that far-off region, how they got there, how they lived after they were there, and how those early days compare with the present, the author has felt constrained to add some personal experience and memories of this great and growing Territory which is soon destined to become the State of Washington, bearing the proud name of the Father of our common country.

Thirty-one years ago, the great flood of immigration set in for Oregon, of which, at that time, Washington Territory was a part. That section of Oregon, now forming Washington Territory, was the extreme north-western portion of the United States. Curious as the statement may appear, yet it nevertheless is true, that since that time the territory has become, and is to-day, the geographical centre of the United States.

No more startling method can be adopted to impress upon us the vast extent of this great country, than by this simple statement. Let the reader place his finger on the extreme point of Alaska, on the map, and then on the peninsula of Florida, and cast his eye on Washington Territory, and he will quickly see that the statement is substantially and almost exactly true.

If we, of Washington Territory, from the steady stream of immigration westward, are now relatively so much nearer the great centre of population than then, how much more so, practically, one can never realize, without going over the ground, as the pioneers of 1852, did.

When the writer crossed the Missouri River near where Omaha

now stands, nothing but a deep solitude existed, except where broken by the roving bands of Indians or the trains of immigrant wagons. We had cows and oxen for teams, and were six months on the way, toiling the whole summer, carrying provisions for the entire trip; now, one is carried substantially over the same ground by cars in five days. Then, when the immigrant arrived on Puget Sound, he had literally to "paddle his own canoe," for there was no other means of travel. The dense forest and absence of roads, forbade traveling by land along the shore line of Puget Sound, and then, as now, the principal travel was by water. Now, however, there are over fifty steamers plying on that great inland sea, so unknown to the eastern public. Then, we could get back to the old home only by sail to San Francisco and by the isthmus steamers. Now there are a fleet of steamers, eight or more in number, aggregating nearly twenty thousand tons burthen, plying from Puget Sound to the southern coast. Then, only a stray vessel came to the sound for a cargo of square timber, hewn out with the axe, or for piles as cut from the stump. Now no less than two ships, for every day of the year, enter the Straits of Fuca, for coal, lumber, or grain. Then, to travel parallel to the coast to and through Oregon, the worst roads on earth were surely encountered; we first could go by saddle train; then the mud wagon, and afterwards the stage-coach, taking nearly fifteen years to accomplish this much change; now one can ride in a palace car almost all the way from Puget Sound to San Francisco and within twelve months, can the whole distance.

Then if one wished to journey directly eastwardly, he was compelled, in many cases to follow the bridle paths or trails with the pack-horse and saddle. Now the great trunk line of the Northern Pacific is fast approaching completion, and before this reaches the eye of many readers, will be an accomplished fact, so that by September, of the present year (1883), a passenger can take the cars in New York City or elsewhere, and secure a through and continuous passage to New Tacoma, the western terminus of the road, and to and through the hop regions of the Puyallup and adjacent valleys.

The writer has often been asked what impelled him to undertake so hazardous a journey at that early date. In common with

thousands of others, the attractions of free lands, glowing accounts of a mild climate, the known value of near location to the sea-board, were all questions that weighed in the scale to make up a part of the sum total. These attractions still exist. Still the government gives the bona-fida settler the land; still we have the admirable location of the finest shipping facilities in the world, and still that wonderful, mild climate, that although in latitude 48° N. and fully five hundred miles north of New York City, yet admits frequently of plowing in mid-winter, and sowing wheat in almost every month of the year.

The climate varies greatly in different sections of the territory, that near Puget Sound and the sea-board being mild and equable, wet in winter, with enough moisture in summer to always insure crops, neither cold in winter or hot in summer. There, we have near by a range of mountains averaging fully a mile in height, with some bold peaks running up three miles above the level of tide-water, as shown in the illustration, which is true to nature. Of course all kinds of climates can be found on these mountain slopes, up to the point of perpetual snow and ice of the vast glaciers still at work. Easterly from this range, the climate is drier, somewhat colder in winter and warmer in summer, but not to either extreme.

The pioneer life is not that cheerless state of existence as pictured by many, or that of constant fear and trembling as imagined by others.

The question has often been asked if there was not constant danger from the Indians or wild beasts, roaming through the forest. If it were not for the sincerity of these questions, they would naturally excite a smile from the pioneers, who neither thinks of or dreads the danger, remote and unusual as it is, no more than our eastern friends do of constant dangers that surround them every day of their life. True we have bears that are not caged, cougars at large, and other beasts of prey not desirable for close companionship, that go where they will, and that make themselves very uncomfortably familiar in the barn-yard and pig-sty, yet, as in other walks of life, the pioneer never attempts to climb a mountain until he comes to it, and in common with the race, his courage rises with the occasion and danger apparent or

actual, met without fear. As a matter of fact, however, there is scarcely any danger from either at the present time.

The resources of Washington Territory are varied and great; hops are incidently only one of the many. As stated elsewhere, coal and lumber form two great staples for export or for home consumption, yet wheat is abundantly produced and largely exported, and at this writing the building of great grain elevators is to begin at once at Tacoma, on Puget Sound, to accommodate this rapidly increasing interest.

The manufacture of beet sugar is likely to be soon inaugurated, as from repeated tests, it has been demonstrated to be more practicable than further south on the Pacific coast, where this business has been firmly established. Fully five thousand car loads of salmon are canned annually, on the Columbia River, divided between Oregon and Washington Territory.

The valley land of Washington Territory, suited for hop raising is great in the aggregate, though widely distributed. It can never be all utilized, for the production would be more than the world's present supply, and for the further reason that it would be utterly impossible to pick anything near like the amount that could be produced.

That the hop interest there will assume much larger proportions than at present, there is no doubt; that the increase will be rapid, is equally certain; that the supply will be regular, judging from the past, is unquestionable; that the quality has improved and will continue to improve is sure; hence, that Washington Territory is destined to become an important factor in the world's supply of hops is a fact so well established, that all who are interested in the production, trade or consumption of hops, will do well to remember.

CONCLUSION.

If, in the preceding pages, a lesson is taught that will lead to the production of a better article of hops; or that will point out the danger to new beginners, and enable them to avoid loss; or that will lead to better methods of preserving and a more intelligent way of marketing; that eventually will result in a steadier market, then will the author be satisfied with his work, which is here submitted to the public.

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