XVII. On malting

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[To be continued.]

XVII. On Malting. By JOHN CARR, Esq.

[Continued from p. 50.]

Weight of Malt.

SEVERAL erroneous opinions are delivered in the evidence given before the committee respecting the goodness of malt being determined by its weight. Abstractedly considered, weight indeed does not afford any certain data for estimating the worth of malt, because bad malt may be either heavier or lighter than that which is good. If the vegetation of the grain has been imperfect, or not carried sufficiently far, the product will be part malt and part barley, and of course heavier than good malt: but if on the other hand the vegetation has been carried too far, too much of the substance, and of course weight, of the grain will have been driven out, and the malt will be light in proportion as the injuring cause has been allowed to operate: in this way malt may be rendered light and unproductive to any extent at the discretion of the maltster.

But notwithstanding all this, in every instance where the grain has been perfectly malted, weight is the only certain standard now known for determining the value of malt; and this is now so well understood in the markets, that it is not unusual for the buyer of malt to be provided with a pair of scales and a small measure, and to govern his opinion of the price by the weight which his measure of the sample yields. In all malt, therefore, which has been perfectly malted, there can be no question of the heaviest being the best,

best, and in this respect the Hertfordshire malt preserves a distinguished superiority over all watered malt.

Varieties of Malt.

Strictly speaking, there are only three varieties of malt, viz. brown, amber, and pale malt. The first two are peculiar to porter, and have special reference to its flavour and colour; the third is the general basis as well of all porter as of every other species of malt liquor; and it is the only one which merits any consideration in the general question of malting. Brown malt receives all its peculiar qualities in the kiln, by an operation called blowing: it is spread there very thin, and a very quick and active heat is passed through it from flaming faggots: the sudden application of the heat converts the moisture in the grain into vapour, which blows up the husk, and the heat catching it in its distended state hardens and prevents it from collapsing; hence the grains of such malt are large and hollow, and increase the measure from one to two bushels in a quarter. The saccharine of this malt is nearly all destroyed by the operation of the fire, and its sole object in porter is to communicate flavour and colour; but as these qualities are probably to be obtained from other materials than malt, some porter-brewers are not using it at all, and the making of it is very rapidly declining. Amber malt is a species between brown and pale, and is also made on the kiln by giving it less fire than the former, and more than the latter; it is still generally used in porter along with pale malt, but the quantity made is inconsiderable.

As bad flavour in malt subtracts from its value, and the charge of producing was strongly shifted by the watering party from themselves to the Hertfordshire maltsters, the present portion of the subject is material in the inquiry; and from what has been said it may be readily understood that flavouring, when applied to the working floors, can only mean manufacturing the different steepings there as sweet and clean as possible, and thereby not giving but guarding against any peculiar flavour.

Varieties of Barley.

In the evidence given before the committee, the agents of the

the watering party have set up a very material distinction between what they call heavy and light land barleys, and they appear to have laid much stress on this distinction, and to have considered it as one of the chief supports of their case: to me, however, it seems no other than one of those artful subterfuges so commonly resorted to by artful and interested traders in revenue questions, merely to obscure and disguise the true state of the matter at issue.

On all the numerous gradations of soil, from the lightest down to clay itself, barleys are produced, varying in every degree; chiefly as to colour and thickness of skin; but this variety is not, as is attempted to be set up, a local circumstance. It abounds every where, because light and heavy soils do every where abound; and it is only to the extremes, and not to the multitude of intermediate gradations, that any thing advanced before the committee can fairly be referred. Certainly to mix the very coarsest with the very finest barleys in the same cistern would be improper; but each sort can be well malted separately without any aid from watering on the floors, which is in no respect more necessary for what is called the heavy than it is for the light land corn.

The several witnesses who have spoken to the case have advanced that more water is required for the coarse than the fine skinned grain, but the fact is probably the contrary. The thin skinned barley, being the largest and plumpest corn, will certainly require the most water for its vegetation, but on account of its more pervious husk, it will sooner imbibe its proportion of the fluid. Hence it is that thick skinned grain does not actually require a larger proportion of water but only of time in the cistern to absorb its proportion; and having accomplished that, it is equally, and perhaps better, fitted for going through the subsequent process of malting without a further supply, as its thick husk is more likely to retain the moisture which it has got.

If, however, the reason of the thing did not sufficiently prove it, the testimony of Messrs. Clough and King fully establishes that better malt can be made from coarse barleys without than with watering upon the floors; and in every place

place where I have been, except giving the thick skinned corn a few hours more of time in the cistern, no further attention is paid as to treating them differently from others.

It has long been a pretty generally received opinion amongst farmers and others, that barleys grown on heavy lands contain a larger proportion of earthy matter than those produced from light lands; but from the chemical analysis of both kinds it has been found that there is no truth in this opinion, and that the proportion of calcareous and other earths is the same in light as in heavy land barley, and that the real difference between the two lies merely in the husk: all therefore that we are authorised to conclude on the subject is, that in equal weights or measures, the coarser skinned grain contains a large proportion of waste, and on that account only is less proper for the purpose of malting.

There is another distinction of barleys which the agents of the watering party have advanced in support of their case, and that is, that though the large fine barleys of Hertfordshire and in the southern parts of the kingdom are malted without watering upon the floors, yet that the inferior corn more northwards does require and cannot be malted without sprinkling: now I am well convinced the case is directly contrary to their statement. It is a well-known fact that the thinner, lighter, and more inferior the barleys are, the more apt are they to run themselves out in a too quick vegetation; and having of themselves but little substance, the less of it can be parted with in the process of malting; whereas the large fine plump barleys of Hertfordshire both require more water to malt them, and could much better admit a portion of their substance to be wasted in the process; and such barleys actually having a less aptitude to run out in vegetating, they would require and would stand watering much better than the others: the conclusion therefore is just, and the fact really is, that as the finest barleys in the kingdom are actually best malted by not being watered on the floors, so the inferior kinds would be benefited in a higher proportion by being restricted to the same process, for which they are naturally better adapted.

Frauds

Frauds of Watering on the Floors.

There are no frauds of any extent practicable at a malt-house except those which are immediately connected with and entirely depend on the practice of watering on the floors. These last are three in number, viz. draining the cistern before the time prescribed by law, in order to keep down the gauges in the couch; wholly emptying the cistern to be fraudulently worked as a distinct floor; and privately plundering the cistern of parts of the corn in order to be mixed with the youngest floor; as the grain in each of these frauds is short wet in the cistern, it would be impracticable to carry it forward in a sufficiently malted state to the kiln without watering it upon the floors. Of the first I shall say nothing, as it explains itself. Instances of both the others I have myself detected; and what is more, an instance of the second was in a foot walk, and had been practised to a great extent. But it is in rides where it can be pursued almost with impunity, from the officer's visits at the malt-house being only two or three times a week, and I am inclined to believe that it is followed in such situations to a degree much beyond what has yet been discovered or even suspected. It requires indeed the use of a large kiln; and where that has been provided it is only necessary to get the oldest floor there immediately before the cistern is fraudulently emptied: and though it must, like every other fraud, at particular stages of its practice, afford indication of what is doing to a vigilant and intelligent officer; yet, for the most part, an officer may survey in the usual manner for a length of time without observing any thing to call forth his suspicions. I can even readily believe that a cautious and artful maltster may defraud the revenue of half the duty which he ought to pay, by means of this fraud, and yet incur in the practice of it but very little risk, provided he is indulged with watering the short wet corn on the floors.

The third fraud of robbing (or as it is called in trade gelding) the cistern, and mixing the plundered corn with the youngest floor, certainly has been, and there is reason to fear it is yet, practised to a most injurious degree, as the present restriction against watering on the floors does not

extend to a period sufficiently late to exclude its practicability, and which indeed may be equally said of the preceding fraud. The one, however, of which I am now speaking is too well known at the board, from the numerous detections which have been made of it, to require any particular description or comment from me.

Present Restriction against Sprinkling.

When the present restriction against watering on the floors was established, a very material circumstance, intimately connected with it, was probably in some degree overlooked, or at least not sufficiently adverted to. This circumstance is, that in every instance where short wet corn is fraudulently laid upon the floors, it does not take the true age when it was actually removed out of the cistern, but a false age of the same date of the preceding steeping. This arises from its being either mixed with and of course becoming part of the youngest floor, or taking its place in the officer's account, and passing for it through all the subsequent stages of malting. The regulation of this false age is very much within the power of the fraudulent maltster; for, as he steeps when he pleases, he can determine the day and hour when he will empty privately the cistern, and he can keep back the youngest floor from growing by spreading it very thin. In this way three days of false age can be readily gained, and such corn will come in course to be watered on the seventh, instead of the tenth day, as intended by the restriction: but had the maltster a discretionary power of watering, he would not do it sooner than about the sixth day: hence the present restriction against watering, as far as regards fraud, cannot be considered as operating to any very useful purpose; and even in cases where no fraud is practised its operation is very feeble indeed, and the great extent to which watering upon the floors is still followed, sufficiently proves the inutility of the present restricted period.

The former restriction of twelve days was much more effectual, as short wet corn could not be worked up to that period, even with the false age already spoken of, without watering it; and by watering it illegally, the penalty for doing so was
not

not only risked, but, what is much more, great hazard was incurred of disclosing the fraud itself, the very circumstance of watering being matter of suspicion sufficient to direct specially the officer's attention to the state and condition of the particular steeping which he found illegally watered.

The restriction of twelve days also took away from the interested maltster the mischievous means of wasting the substance of the corn, by throwing out too much vegetation, and making that light unproductive malt which actually is at this time so abundant in the market. I would therefore humbly submit it as a matter of much importance, and as a case resting upon grounds which cannot fairly be controverted, that the revenue on malt can only be protected from very extensive depredation, and the quality of the commodity manufactured in the greater part of the kingdom preserved from a most improvident waste, by the restriction against watering the grain upon the floors being extended from its present period of nine to its former of twelve days.

What has hitherto been stated in this report is the result of my own previous experience and knowledge in the survey and manufacture of malt; but I have now to detail the various practical facts and circumstances collected on my journey through many of the most considerable malting places, and from which I am but just returned.

My first progress was into Hertfordshire, and into the north-eastern and western directions from London, where the practice of malting prevails without watering upon the floors. I visited 115 different malt-houses of this description, all in full work. The periods of steeping were generally twice a week, and the time of keeping the corn under water varied from 48 to 56 hours. This period was shorter than had usually been employed, owing to the barleys of the last year being lighter and thinner than in former years, from a want of rain at a particular period of the crop. As the barleys, however, were hardening by longer keeping, they would take more water in the cistern.

In my inspection of the numerous maltings, I paid every attention to the state of the corn in its progress through every stage. The same process uniformly prevailed at all, and the

only discoverable difference was readily to be traced in the conduct of the workmen; for where the most industrious and steady men were employed, the corn was in the best condition; but the management and object of the process were at every individual house the same.

The system of malting pursued through this part of the country is simple and obvious, and contains nothing of secrecy or difficulty that can form an obstacle to its adoption in any other part of the kingdom. It consists, in the first instance, in giving the corn a due proportion of water in the cistern, according to its condition. The thinner and lighter the grain is, the shorter is its period of steeping; and the larger, drier, and bolder the barley is, the longer it is continued under water. When thrown out of the cistern it remains in the couch from 26 to 30 hours, and it is kept a day longer at a depth of from 10 to 16 inches, varying with the state of the weather. In this situation a very moderate rise of temperature comes on, which is carefully watched, and checked by turning the grain. By the fourth day the root has come freely out, and the corn is spread abroad in the floor very thin. At this time its temperature is very little above that of the air in the malt-house, and the steeping is continued to be worked in this cool state up to the eighth or ninth day, and during this cool part of the process, the root, which at first shot out straight from the corn, curls back upon it, forming a little bushy knot of curled fibres, which does not afterwards grow any longer, and rarely exceeds half an inch in length. By the eighth day the acrospire has advanced about one-third up the grain, and to promote its further progress, the grain after this period is laid a little deeper, and so gradually increased up to the kiln. The completion of the process is judged of by the acrospire having reached two-thirds, or at most three-fourths up the grain. The circumstance therefore which chiefly distinguishes this process of malting, is that of working the steepings as cool as possible during the first half of the period of operation, and gradually increasing the heat during the other half up to the kiln.

The numerous floors which I examined in every stage of operation,

operation, bore the most unequivocal appearance of no water having been employed in working them, and yet the vegetation was regularly and steadily kept up to the kiln. I examined specially all the old floors in the last stages of the process, and even on the kiln, and found them fresh, sweet, and in an evident state of healthy vegetation ; and in some instances where the grain had been some time on the kiln, the quantity of moisture, which was flying off in a thick dense vapour, afforded satisfactory testimony, that barley, when properly treated through the working process, can carry along with it a sufficiency of the cistern water for all the necessary purposes of malting. .

So very evident indeed was this, that it would only have been requisite to allow the oldest floors to have lain for a proper time undisturbed, in order to their springing up into a thick green bed of living plants. I was especially attentive to this circumstance, and can now confidently declare, that the statement of Mr. Reynoldson before the committee, wherein he affirms, in such express terms, that the putrefactive fermentation formed a part of the Ware process of malting, has, in fact, no foundation whatsoever.

I conversed with a gentleman who examined the same three floors on the following day after Mr. Reynoldson's inspection of them, and who declared, that though the corn was not in good condition, owing to the warm state of the weather, and advanced season, (they were the last steepings,) yet that the vegetation was completely alive on all of the floors, and that there did not exist a single fact or circumstance in the case, which could authorise the strange account given of them. All the maltsters also with whom I conversed on the subject, ridiculed the notion that putrescence could have any share in their process, and expressed their surprise, that so wild an opinion could have been advanced or encouraged by any one.

Most of the malt-houses consist of a range of building three stories in height, of which the two uppermost are commonly boarded, and the lower one plaster. Each steeping is divided into three parts, and worked on a separate floor. The boards are warmer than the plaster, but being

higher, the grain is situated cooler on them. This, however, contrary to what is stated against it in the evidence by the watering party, produced no irregularity in the vegetation, for the corn situated the coolest is worked the deepest; and in this way, the workmen, from practice, can keep the pieces very nearly at the same temperature. I paid particular regard to this fact, and being provided with a thermometer, it enabled me to determine it very exactly.

The malting rooms were kept remarkably open and airy, by throwing all the doors and windows open, and allowing the wind freely to blow over the corn. In several houses even flocks of sparrows were feeding upon the floors, and so tamely as to show that they were familiar with the place, and visited it without interruption. I was already well aware of the great importance of fresh air in malting, but did not imagine that it could be so freely admitted in the process where watering upon the floors was not practised, without inducing a too great expenditure of the cistern water by evaporation.

[To be continued.]

XVIII. *On Oxalic Acid.* By THOMAS THOMSON, M.D.
F.R.S. Ed. Communicated by CHARLES HATCHETT,
Esq., F.R.S.*

OXALIC acid, from the united testimony of Ehrhart, Hermstadt, and Westrumb, appears to have been discovered by Scheele; but it is to Bergman that we are indebted for the first account of its properties. He published his dissertation on it in 1776, and since that time very little has been added to the facts contained in his valuable treatise. Chemists have chiefly directed their attention to the formation of that acid, and much curious and important information has resulted from the experiments of Hermstadt, Westrumb, Berthollet, Fourcroy, and Vauquelin, &c.; but the properties of the acid itself have been rather neglected. My object in the following pages is not to give a complete

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