A PRACTICAL TREATISE

ON

BREWING;

SHOWING THE

CAUSE AND PREVENTION OF ACIDITY IN MALT LIQUORS.

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PREFACE.

BREWING is a science that in the present age may be considered as almost in its infancy, or at least understood but by few, notwithstanding many works have issued from the press on the subject. It is not the purpose of the author to detract from the merits of various publications; it will be sufficient to state, that none have been able to direct the practitioner how to produce that bright, sound, exhilirating beverage proposed when commencing business. The intent of this treatise is to supply that deficiency.

Acidity has been the stumbling-block to many an aspirant to public favour, and is still a great plague in the brewery. The writer of this therefore flatters himself, that in pointing out the cause and prevention of that plague, he is conferring a favour of no ordinary kind on the public brewer.

The system herein laid down is the result of many years' experience, and of numberless experiments; and is free from theory of all kind. It simply and plainly directs the operator in the manufacture of the malt, choice of hops, and shows the best means of making the most of his materials with unerring certainty.

The testimonials of a large number of gentlemen, whom he has instructed, will be a sufficient guarantee of the superiority of this system over all others, and may induce many more to adopt it; the author being certain that the result will be appreciated, at least, where a good article from malt and hops is desired.

That it has been a general belief that malt liquors cannot be produced to perfection, save only in the colder months of the year, the author is well aware; but he conceives it equally as easy to produce them in perfection in hot weather, as to make good bread. It is merely necessary to arrange the plant of the brewery properly, and to follow certain truths revealed by nature. Did we do so, we should not then hear of such nonsense as thunder and lightning turning beer sour, or of electricity producing ropiness.

Brewing is an art that from time immemorial has been considered simple; yet, simple as it is, our brew-

ers do not produce results that lead us to suppose it so very simple. Yet it is simple; its simplicity is shown in the following pages; and the author concludes, by stating that he attends the principals of establishments, for the purpose of fully carrying out the system herein laid down.

He also deems it not out of place here to state, that he discovered the means of preventing acidity in malt liquors so long ago as the year 1828, and that he advertised the discovery in the public newspapers of 1832, under the initials, T. H." He merely mentions this, as others have been supposed to be the discoverers thereof.

THOMAS HITCHCOCK,
Professor of Brewing and Malting.

16, Old Bailey, 14th March, 1842.

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ON BREWING.

THE primary object of every public brewer is a generally good article; to accomplish this end, it is necessary the plant be properly arranged. The site or situation of the brewery should be near a sufficient supply of good spring water. Erect a strong substantial building of brick or stone; place the liquor copper therein sufficiently high, that liquor may run therefrom to any desired part of the brewery. The setting of the coppers should be particularly attended to; the mash-tun may be a little below the tap of the liquor copper: the liquor is introduced at its bottom, beneath the perforated false bottom, and rises through there, saturating the malt. Two or more taps are necessary in the mash-tub, for the more ready discharge of the worts. Immediately below the mash-tun

is the underback, which should be built either round or square, of wood: when in use, it should be rendered quite air-tight, and free from any atmospheric current. On a level with the bottom of this utensil is the wort copper; the hopback placed a little below the tap of the wort copper; the coolers, if any, low enough that the worts may run therein from the hopback, yet sufficiently high as to allow the worts to run into the gyle-tuns. By arranging the plant in this manner, much time and labour is saved, which is the reverse with the old round about method. These few observations, together with the plate engraving, showing the arrangement of the utensils, and to which we would call particular attention, will be sufficient to guide a brewer in the arrangement of his plant. We will therefore proceed to treat of the different heads the system herein to be described is to be arranged.

Some individuals recommend the LIQUORBACK to occupy the place of a roof to a brewery. This is decidedly a bad plan, unless it be protected from the air and sun. But, be it placed where it may, it should have pipes leading therefrom to all parts of the brewery, where cold liquor is required. The refrigerator and attemperators are best filled from its source.

COPPERS need not be so thick as they are generally made. It is erroneous to suppose, that unless the sides possess considerable thickness, the action of the fire will cause the worts to burn. The reverse is the case; the thinner they are, the sooner their caloric is absorbed by the wort, or liquor; but a medium is to be observed. Do not have them so thin as to bend or give way in the least. Their dimensions are, depth equal to mean diameter.

Open coppers are superior to those with domes and pans, as the worts boiled therein are not so likely to rise over, and are sooner rendered pure; nor are they so apt to become high coloured, as is the case with close coppers.

The liquor copper should contain from three to four barrels of liquor, per quarter of malt; with two taps, one straight, with union joint on its end, for sparging.

The wort copper may contain little more than two-thirds the contents of the liquor copper. Round tuns are preferable to the square ones.

The MASH-TUN should be in proportion to the quantity of malt intended at first to be mashed. Always mash, if possible, the same quantity, and never have too large a utensil at first.

Commencing under an idea of increase of business,

the mash-tun can always be enlarged at a trifling expense. It is better to brew two quarters five times a week, than to brew ten quarters once a week. The utensils are then kept in use, and obtain no unpleasant taste consequent in having them little used.

The above applies to wooden mash-tuns, which are best made of English oak, at least two inches thick; and should have a moveable false bottom of cast iron, perforated with holes. The oblong form is superior to the round perforations; they should be about three quarters of an inch long and a sixteenth broad, made to cross each other in the shape of a star. These holes are not so likely to fill, as is the case with round ones, which often cause the malt to crack and sink in different places of the tun.

We would recommend, in lieu of a wooden mash-tun, a cast-iron round pan, with flat bottom and straight sides, surrounded with a nine-inch wall, of brick-work, six inches from the pan, lined inside with cement, and made water-tight round the bottom of the pan; with a partition from top to bottom. The hot or cold liquor passes in at the bottom, on one side of the partition, and is discharged from the other side at the top. The superiority of this over the common mash-tun is ob-

vious, as the mash may be maintained at any required heat, and at any time of the year, by passing either hot or cold liquor between the pan and brick-work. The machinery of the mash-tun can be applied as well to this as to the other kind.

The best way to mash with this mash-tun would be, to put the desired quantity of liquor therein at one hundred and thirty degrees, with the malt, and raise the heat to one hundred and fifty-seven. Mash all the time with the mash-tun covered. When that heat is attained, let it remain kept at that heat two hours. The most saccharine worts will be obtained by this means, which it would be impossible to obtain from any other.

HOP-BACK.—A square or oblong is best for this utensil, as deep as it is broad. Good Dantzic deal should be used; and it should be made sufficiently large to contain the whole boiling of wort at once, with cast iron false bottom, perforated, as described for the mash-tun, placed about ten or eleven inches from the top. The hops will then serve as a covering, to exclude the air. It should, when filled with wort, be covered with a lid. Pipes may run round the interior of this utensil, beneath the false bottom, and, being connected with the re-

frigerator, form a continuation of that machine; they may be charged at the bottom, and discharged at one side or end.

Coolers.—With a proper refrigerator, such as is herein recommended, coolers may entirely be dispensed with. If any are used, do not place them in a current of air; and especially avoid exposure to easterly winds.

Refrigerators have become, through increased and increasing competition, indispensible in a public brewery. The expense of these utensils, it is true, is a great barrier to their more general adoption. This is owing to the ignorance of the persons employed to furnish them. Like their coppers, they contain too much metal, and are thus rendered cumbersome; and on that account, in removing, are soon out of repair. A refrigerator properly made is not more expensive than coolers, and will last a person's life-time. Without one in a brewery, it is impossible to produce a good sound beverage. The best refrigerators, undoubtedly, are those which cool the greatest quantity of wort with the least portion of liquor. Such a one is here recommended; and as we write for the instruction of the public brewer, we will endeavour to describe its construction.

A number of pipes, about ten, are placed in a per-

pendicular position, united at each end with semicircular pipes or elbows, with unions. These pipes, without the bends, are eight feet in length and four inches in diameter. When put together, they have a serpentine form. The large pipes contain each eight small ones, half an inch in diameter, tinned inside. These small pipes lead into the bends at each end of the large pipes. They are brazed to a plate, and made fast and air-tight at each end of the large pipes, just below the unions. The wort passes through these small pipes into the bends or elbows; and so continuously through the whole machine. Just below the plate to which the small pipes are made fast, is a straight piece of pipe, joining, by means of unions, the large pipes. Through the large, and among the small pipes, the cold liquor passes. The liquor is allowed to enter the refrigerator at the contrary end at which the wort enters. At the top of each bend or elbow, and cross pipe, a small tap is inserted, to enable the instrument to be charged, by letting out the air, and for drawing out its contents after the worts are all cooled; or it may be filled by means of an air-pump.

At the wort discharge a tap is inserted, to regulate the flow of wort through the refrigerator, and one at

the water-charge, to regulate that also. The instrument, when in use, is placed against a wall, and made fast in frame-work.

GYLE-TUNS.—Round upright bell-shaped casks make the best gyle-tuns. Some persons, however, prefer square ones. If so, they are best made of oak, two inches thick, or more. They should be large enough, if skimming is adopted, to hold the head of yeast. But skimming is a bad plan. More than seven barrels of wort should not be fermented at once in one tun. Squares should have a lid placed just as high as the wort (seven barrels) will reach; with a man-hole, and a rim eight or ten inches deep round it. When in use, this man-hole is covered with a moveable lid, containing a hole about four inches diameter, to allow the yeast to rise and be retained on the lid. A valve should be inserted in the lid, to let the beer settled from the yeast run into the square, and to admit other beer, to keep the square full. This lid is made not moveable. The top covering the yeast should be made air-tight, when in use.

When rounds are used, they should be permitted to discharge the yeast at top, by means of bent pipes, and should be kept full for that purpose.

The best way to fill gyle-tuns is from the bottom.—An attemperator is indispensible in each. Worts, when fermenting, should lie deeper than they are broad, this state being more favourable to a low fermentation. Worts should remain in the gyle-tuns until quite cleansed. Stillions are not then required.

ATTEMPERATORS are variously made; but the following is the most approved plan: Two flat cylinders, about twelve inches diameter and two inches deep, are connected with each other by means of half-inch pipes, eighteen inches long, and twelve or more in number. It stands perpendicularly in the gyle-tun, and is connected with the charge and discharge pipes by unions. The discharge pipes run along the top of the gyle-tuns, and the charge pipe at bottom, underneath.

VATS, or STORE CASKS, should not contain less than thirty barrels, and are best filled at the bottom. They should be of good thickness, well made, with good English oak, and strongly bound with iron hoops. The sooner vats are emptied after being tapped the better. When a vat or cask is a considerable time on tap, the top of the contents is likely to become mouldy. This in time sinks, and produces what is commonly termed mothery beer. It is in fact nothing but mould floating

in the beer. This is often the case even in a quick draught; the cause of which will be explained hereafter, when we come to speak of the impurities of ales, &c. Vats, in fact all utensils, should be perfectly sweet, dry, and clean, previous to being used. As soon as vats are emptied, they should be made air-tight, if not to be used again immediately: if so, admit the air freely, that the carbonic acid gas may escape; and never allow any person to enter them until a lighted candle will burn freely in their interior. Many lives have been lost by men entering them before this gas has escaped. Two or three pails-full of hot liquor thrown into them, from the man-hole, will tend to disperse this gas, and render the task of cleaning them less dangerous. If very foul, vats should be well scraped, especially the top.

It sometimes happens, that notwithstanding the greatest care to prevent it, vats will become mouldy. They may be effectually cured, by suspending an iron dish from the man-hole, containing a few pieces of sulphur and rags, or paper. Set fire to the rags or paper, and when well lighted, make the vat air-tight, and allow the brimstone to remain burning; keep the sulphur smoke in it twelve hours; then unstop the vat,

to admit the air; throw in some hot liquor, and scald it well; when dry, it is fit for use, if properly done. The vat must be well cleaned and perfectly dry before the sulphur is burned therein, or it will be of no avail using it. Should the vat become acid, a few rincings with bright strong lime-water will destroy the acidity. Scald it well, before using it.

Casks may be effectually cured in the same way. If a vat is to be used immediately after being emptied unless a long time on draught, it may be filled without being cleaned. But it is best to err on the right side, and have it well cleaned before using it.

Having dwelt sufficiently on the utensils necessary for the production of a good article, we will proceed to show how that is produced.

MASHING

Is the first operation malt undergoes in a brewery, after being ground, and is one of great consequence to the brewer, as it is here that his property is at great risk; for by improper or imperfect mashing, the starch and gluten of the malt may, in a greater or less degree,

be left unconverted into sugar; thereby causing an irreparable loss. Proper mashing prevents this loss.

The principal component parts of malt, as stated by scientific men, and which appears to be correct—at least sufficiently so for our purpose—are gum, gluten, sugar, and starch. The object of the brewer is not only to extract the sugar already formed in the malt by mashing, but to convert the other component parts into the like substance. Various methods, in the adoption of varied heats, &c. have been had recourse to by different individuals, to obtain this desideratum. The greater the quantity of saccharine obtained from a given portion of malt, by any one system of mashing, is unquestionably the best. We will endeavour to supply the best.

Too high heats in mashing set the goods; or, if that is not the case, little saccharine is obtained; the gum and starch being rendered a kind of paste; worts from which have a thinness on the palate. Too low heats produce rawness, as well as causing impurities and acidity.

Mashing then has for its object, not merely to dissolve the sugar and gum that is already formed in the malt, but also to convert into a sweet mucilage the

starch which had remained unchanged during the germination of the grain on the malt floor. Starch and gluten digested with hot liquor a sufficient time, become a kind of sugar. This is accomplished in the mash-tun. Diastase and gluten are present in the malt in sufficient proportions to convert the starch into sugar. To obtain this end, the temperature of the liquor must be maintained during the mashing and standing on the goods at one hundred and fifty-seven to one hundred and sixty degrees. The best and soundest extract is obtained by beginning at the lowest and concluding at the highest of these heats; unless a mash-tun, such as is herein recommended, is used; when the malt and liquor must be introduced into the mash-tun cold, and gradually raised to 157 degrees.

When such is not the case, observe the following: Mash with portions of the liquor to be used, at intervals of twenty minutes. The first portion is applied for the purpose of equally penetrating the crushed malt, and of extracting its already formed saccharine. The subsequent portion for finishing the sugar fermentation, by means of the diastase.

As soon as the heat of the liquor in the copper has reached 147 degrees in the summer, or 167 in the winter,

part of it is to be run into the mash-tun, in the proportion of forty-five gallons, per quarter of malt. The malt is then gradually added, and well stirred, that no lumps may remain. Continue mashing about twenty minutes, or until the liquor in the copper has attained two hundred degrees, or more. The like quantity may then be let into the mash-tun, under the false bottom; but care must be taken to add such a quantity of liquor, and at such heat, the second time, as to increase the heat of the mash to 157 degrees. Mash for twenty minutes; cover the mash-tun close, that its caloric may be maintained; let the grist stand two hours and a half; set tap; and when the surface of the goods has become the least dry, sparge on at intervals of four or five minutes, with liquor, at two hundred degrees, or boiling, until the required length is obtained, not once stopping the taps of the mash-tun. When the length of the first wort is obtained, the after-sparges will do for returns, or inferior ales.

By these means, great gravities are obtained, varying from ninety to one hundred and ten pounds weight, per quarter of malt.

When the above method of mashing is impracticable, the following may be substituted:—The heat of

liquor for the first, 147 to 150 degrees, forty-five gallons of water per quarter of malt, mashed well, and infused for three hours in winter, and in summer two and a half.

Uniformity of heat is requisite in the mash-tun. Two barrels per quarter at the above heats are most convenient for that. But if a thicker or thinner mash is made, vary the above heats, so as to ensure the same temperature of the wort, when running from the tap, as if two barrels of liquor had been used at the above heats. It is impossible to give any fixed rules on this head; experience is the safest guide. Let the wort, when coming from the mash-tun, be as near 147 degrees as possible.

Second mash liquor, two hundred degrees, in sufficient quantity to make up the length of the first wort; infuse one hour and a half.

The Third mash, two hundred degrees, infuse half an hour, to make up the length of the succeeding worts, or sparge with cold liquor for that purpose.

BOILING.

As the wort runs from the mash-tun into the underback, it should be introduced into the copper. Worts are very prone naturally to ascescence, especially at a medium temperature; and if left any length of time in the underback, would become either sour or blinked, for which no remedy has been discovered. Therefore get the worts to boil as soon as possible.

The object of boiling is two-fold; first, the concentration of the worts by evaporation; secondly, the clarification of them. For, let worts be ever so bright when drawn from the mash-tun, they are never so clear as they should be when drawn from the copper; a certain degree of dullness and want of transparency is perceptible, which proper boiling will remove. If wort is examined at different times during the boiling, by taking a portion in a small vessel, and allowing it to stand a few minutes, it will appear cloudy, owing to the coagulation of the vegetable albumen * into light flakes. When worts have boiled sufficiently, the flakes

* Called mucilage by brewers; but, being coagulated by heat, it cannot be such. It is the vegetable albumen of the barley.

separate more easily, and in greater quantity. This is called the breaking pure of the wort. Being thus boiled, if left quiet a short time, they become perfectly bright, owing to these flakes subsiding.

The greater length of time that worts are boiled, the larger these flakes become. Long boiling is injurious—it is prejudicial to colour; therefore, as soon as the worts break pure, draw them from the copper.

HOPPING.

From four to six pounds, per quarter of malt, is sufficient;—if for ales, the sweetest hops should be used. Boil half the quantity of hops with the first wort twenty minutes, before drawing from the copper; the other half in like manner, with the second wort, without those boiled with the first wort. The third wort, if any, may have the whole hops of the two former worts boiled with it the same length of time. By boiling the hops in this manner, their aroma and fine bitter are retained, which are lost by long boiling; nor does long boiling appear to produce more bitter.

When a particularly fine bitter is desired, the whole

of the hops may be placed in the hopback, (such as is herein recommended,) on the false bottom, and the boiling wort run on them, and allowed to remain a quarter of an hour, keeping the hopback covered close. This is decidedly the best way of extracting the finer qualities of the hops.

COOLING.

As soon as the worts have been sufficiently boiled, or their concentration and evaporation completed, they are run into the hopback, and are permitted to remain a short time to settle, and should be covered close, immediately they have left the copper. After having settled, if coolers are used, they are run into them to cool, to the depth of not more than an inch; the object being to allow the heat to escape freely and quickly.

Coolers are the greatest curse possible in a brewery; for in them worts are inoculated by the atmosphere, through the absorption of its oxygen; and the fermentation of the worts so cooled is either rendered languid, and much attenuated saccharine is left in the beer, which in time becomes ropy, sour, and putrid, or it is

so rapid as to leave the beer flat and almost tasteless, and runs into the acetous fermentation frequently before it leaves the gyle-tun. Therefore, to ensure a good fermentation, and consequently a good article, avoid coolers, and use an efficient refrigerator, and never allow the worts, under any circumstances, to be more than an hour cooling. The quicker worts are cooled after they are drawn from the copper and settled, the more manageable and complete will be the fermentation. The object of cooling, under all circumstances, is to prevent the acidifying of the worts, which would soon take place at even a high temperature, if left to cool of their own accord. To cool quickly, then, should be the purpose of every one who aims at popularity; the first germ of the acetic acid is not then formed, or, as is most generally understood, foxing is prevented. It will be needless to add, that if it once take place, no matter where or when, all subsequent endeavours to remedy the evil will be unavailing.

The absorption of oxygen takes place most rapidly in warm weather, when the worts are between sixty and one hundred and twenty degrees; or when their evaporation is not sufficiently strong to prevent the atmos-

phere coming in contact with them, which generally takes place at or about one hundred and twenty degrees. After the heat has so far subsided, the absorption of oxygen is very rapid.

When the worts have cooled to sixty degrees in winter, less in summer, they may be run into the gyle-tun; which, in the first place, if the quantity be fifteen barrels, or more, should be large enough to contain the whole worts, to be there excited to a vigorous fermentation, previous to their being divided into the seven-barrel gyle-tuns.

This leads us to the consideration of

FERMENTATION.

Which is the change vegetable or animal matter undergoes, and which terminates in the production of a vinous and alcoholic liquor, or an acid liquor of a disagreeable, yet surprising fetor. These different results are produced by a change or alteration of the first component parts of the liquor, or matter, occasioned by some foreign agent, or is the result of spontaneous

reaction. Of these, the vinous fermentation is of most importance for our purpose.

Some liquids, as the grape juice, will ferment of themselves; others require an agent to induce this change: and wort, or extracts from malt and hops, are of this kind in a great degree; yet they will ferment of themselves, and sometimes a fine article, in every respect, is the result. But such fermentation most generally runs into the acetous, and ends in putridity. Yeast therefore is added in certain proportions, varying with the temperature of the gyle-room, the heat of the wort when the yeast is about to be added, and the specific gravity of such wort. From half a pound to two pounds, sometimes more, of good yeast, per barrel, is mixed with a portion of the wort, to be fermented at eighty degrees, and hung in the gyle-tun, to permit the yeast to boil; and when added to the wort, it should be moderately agitated.

The precise quantity of yeast to be used cannot be exactly stated; it depends greatly on the water used, as well as on circumstances before stated. The harder water is, the more yeast is necessary to carry the fermentation to a successful issue. Experience will soon enable the practitioner to arrive at the exact quantity.

Observing that the less the quantity used to bring the fermentation to the desired point, the brighter, sounder, and more sparkling will be the beverage.

Soon after the yeast and wort are well incorporated, succeeding rings are visible, leaving the sides of the tun, and progressing towards the centre; the whole surface of the wort soon becomes covered with a thin creamy froth; this rises again into abrupt altitudes, very much resembling the head of a cauliflower—these are generally termed rocks.

The heat now begins to increase; an incipient effervescence is perceived, with a slight hissing noise, and the gravity decreases. These are owing to the ebullition of carbonic acid gas, and are the results of the vinous fermentation.

The wort should now be divided, after being well roused, into seven-barrel gyle-tuns, containing an attemperator.

The greatest attention to this part of the process is necessary, for, on the fermentation depends greatly the good or bad qualities of the beverage. Try the heat and gravity twice a day; keep the heat as near sixty-five degrees as possible; and when the gravity has reached the desired point, reduce the heat gradually to

about fifty-six. Let the beverage remain two or three days in the gyle-tun, having the yeast discharge wholly or partially closed. The article will then recover its liveliness, and be quite cleansed. It may then be drawn into casks, or stored in vats, and bunged up tight.

ATTENUATION.

It is of consequence to the brewer, that he watch closely the progress of the attenuation of his gyles, so that when it has arrived at the desired point, he may be enabled to retard its further progress. To obtain this end, the best guide is the saccharometer, which should be a very correct one.

Wort is of greater specific gravity than its bulk of water; it will consequently become less every hour during its fermentation. This may be easily accounted for. Worts, it must be remembered, contain the saccharine of the malt held in solution; this saccharine, in a good vinous fermentation, is converted into alcohol. Sugar is of greater gravity than its bulk of water, which is the reverse of alcohol. If we mix a quantity of sugar with a portion of water, say one gallon, this mixture

will be heavier than it was prior to the sugar being added. If, instead, we had mingled alcohol with the water, a pint of such mixture would be lighter than the same quantity of the former. It follows, therefore, that if all the saccharine in the water is destroyed, it produces alcohol; and it is plain the liquor will now be lighter than prior to its fermentation, and lighter than pure water. One would from that be induced to suppose that worts, after being attenuated, would weigh less than water: such, however, is not the case; besides the saccharine, worts contain the other solutions of the malt, together with the extract of the hops. Therefore, were the whole of the saccharine of the malt destroyed or converted into alcohol, which is not the brewer's object, the worts, owing to their holding other matter in solution, would be heavier than their bulk of water; by attenuating them, they should become but very gradually lighter than they were previous to the commencement of the vinous fermentation.

Worts should not be attenuated too low. If, by uncontrouled circumstances, such a mishap should occur, time must be allowed them to recover their flatness, consequent on a too low attenuation. The greater quantity of saccharine that is converted into alcohol,

providing the attenuation is not carried on so far as to produce great flatness, the stronger and better will be the ales.

Ale attenuated too low should be put into clean dry casks, in which it is intended to be sent to the consumer, with a few spent hops, or, what is better, a little boiled wort from the copper, rather warm, and bunged down immediately. A quart per barrel will be sufficient. In a short time, such ale will be very brisk and good, providing the fermentation had been conducted properly. The following will show the practitioner when the attenuation should be stopped:—

Ales from 20 to 24 lbs. gravity, should be reduced to 10 or 12 lbs.

24 to 30 lbs.....should be reduced to 9 or 11 lbs.

30, 35, and 40 lbs. ..... to 6, 8, and 10 ...

Worts of 20 lbs. gravity should be reduced about 1 lb. in 12 hours.

From 20 to 25 lbs. ..... 3 lbs. in 12 hours.

... 25 to 30 ..... 3½ .....

... 30 to 35 ..... 4 .....

... 35 to 40 ..... 4½ ..... .

... 40 to 45 ..... 5 .....

Table beer under sixteen pounds gravity may be pitched at sixty-four degrees, with a pound of good yeast per barrel, well roused and cleansed immediately the fermentation has commenced, without regard to attenuation.

A gyle of wort containing eight hundred and ten pounds of saccharine, or showing that weight by the saccharometer, will be much heavier than the same bulk of water. It is then sufficiently evident, that there cannot be the same quantity of liquid, when saccharine is held in solution, as there is in the same bulk of water. This wort, for instance, would show that at thirty pounds per barrel, there would be twenty-seven barrels of wort. But if the sugar and other solutions were to be taken from the twenty-seven barrels, we should find a decrease of the original bulk to the extent of one-sixth, nearly, taking water as unity. The saccharine being converted into alcohol, causes, with the escape of its carbonic gas, a decrease of its previous weight, and also a diminution of its previous quantity, as they will neither be so heavy, or of so great a quantity as previous to fermentation.

Close tuns should be used, that the carbonic acid gas may not be allowed to escape.

This gas is supposed by many to be a preventative of acidity; and a practice exists in some breweries of forcing it into the vats when filled, under that idea. The way to accomplish this, is to place a strong leaden retort on the top of the vat, to be charged with gas, with a pipe running down the outside of the vat, and connected with the small pipe that enters the bottom of the vat, and which has a stop-cock attached thereto. Chalk, water, and sulphuric acid, are put into the retort in certain proportions; and as the gas is generated, it is forced into the vat, and retained in the ale. This is undoubtedly a good plan to restore flat beer, but is not a preventative of acidity.

BURTON AND SCOTCH ALES.

BURTON ALE.

The characteristics of Burton Ale are, great strength, paleness of colour, and fulness of flavour. It must be as pale as a straw, or it will not pass as genuine with connoisseurs of that article; consequently the palest malt and hops must be used.

This ale is of great gravity, from one mash chiefly. The wort from the first mash is seldom or never mixed with the subsequent. These are generally used for a return or inferior ales. Therefore the liquor of the first mash must be in such proportions as to make the gravity of the wort, when boiled, from thirty-six to forty-one pounds per barrel.

The best heat to produce such a mucilaginous wort as Burton ale requires, is one hundred and sixty-six degrees, infused from two and a half to three hours The heat of the grist should be maintained at one hun-

dred and fifty-seven degrees. Sparge for the subsequent mashes at two hundred degrees.

As long boiling is prejudicial to colour, the worts should not be boiled much longer than until they break pure. Three-quarters of an hour is generally sufficient for that purpose; but that is scarcely long enough to concentrate them sufficiently. We recommend them to be boiled one hour and a quarter; and, should they become high coloured, a little powdered charcoal may be thrown in the worts when boiling. This will destroy the colour, and impart no unpleasant flavour. Or, a double copper may be substituted for the ordinary one, the inner one made rather thin. Six or eight inches space may be left between the inner and outer coppers, at the bottom and sides: this space being filled with liquor, and made to boil, causes the wort in the inner copper to boil; it acts on the same principle as a glue pot. The inner copper may be supported by straps of iron running under the bottom and up the sides.

Ales boiled in this way will possess very little colour; and, were distillers to adopt this method in boiling their wash, their spirits would be nearly tasteless. It is true, a little longer time is required, ere the worts

boil; but when a very pale beverage is required, no other method can well supply its place. Charcoal is used sometimes as a substitute.

Burton ales are not attenuated so low as ales generally are; but, as the gravity is so great, more unattenuated saccharine may, with greater safety, be left in this ale, than would be prudent to leave in ales of low gravity. There is not much risk of souring, if the cooling of the worts have been quick, and the fermentation properly managed. The great quantity of alcohol will prevent acidity, and the saccharine left will create fulness of flavour. Most generally, a quarter of an ounce of powdered orange-pea per barrel, is added in the copper, a quarter of an hour before drawing off, to heighten the flavour.

The fermentation will be best conducted, as before stated under that head.

Owing to the great gravity of this ale, not less than two or three pounds of yeast must be used. The heat during fermentation may be allowed to reach sixty-eight degrees, but not more: the attenuation not reduced so low, by three pounds, as is stated under the head of attenuation. The fermentation in some breweries is allowed to be rather rapid: such may be permitted,

if the ale is for immediate consumption; but if it is to be kept, the attenuation must be slow. Four pounds decrease in gravity every twenty-four hours, produces the richest flavoured, most potent, brilliant, and sparkling article. In fact. the slower the fermentation of ales is, the more superior the article will be, in every respect. When the article is intended for long keeping, the air must be sedulously kept from it during fermentation.

A small tap should be inserted about the middle of the gyle-tun, to fill the essay jar.

The pitching heat of this ale is about fifty-four degrees, or even less in summer, unless the gyle-tuns are beneath the surface of the ground.

SCOTCH ALE.

This ale, like that of Burton, is made from pale malt and hops. The brewing of Scotch ale is generally confined to the winter months. This is on account of the extremely low heat at which the worts are pitched, and their lengthened fermentation. The method of making Scotch ale is very similar to that of Burton, the principal difference being a higher heat in the first

mash, which is about one hundred and seventy or one hundred and seventy-five degrees.

The mashing is continued until the malt is well mixed, and is very stiff. The tun is then covered close. The time of infusion is three hours or more. The heat of the grist should be kept at one hundred and fifty-seven degrees.

When the first wort has run from the grist, it is sparged on at intervals of twenty minutes with liquor, (about a barrel,) at two hundred degrees or more, until the length of the first wort is obtained, the gravity of which varies from thirty-five to forty pounds per barrel. The latter sparges are used for a return.

The boiling of Scotch ale is little different from that of other ales; one hour is the maximum of time. One pound of honey per barrel of wort is added in the copper, twenty minutes before drawing off. The pitching heat is generally fifty degrees, but is sometimes as low as forty-three.

From two to three pounds of yeast per barrel, will mostly be sufficient to bring the fermentation to a successful issue. If the fermentation should become languid, a little more is then added, and the gyle well roused.

The attenuation continues from twelve to twenty days, and is reduced to about one-quarter or one-third of its original gravity. A quarter of an ounce of pulverized carraway or coriander seeds are added, to heighten the flavour: these are used in the gyle-tun an hour before cleansing. The yeast is seldom removed from the wort which is drawn from the gyle-tun, leaving the yeast therein until the whole wort is drawn out. It is then swept into a shallow vessel, and allowed to settle, when the settled ale is removed, and put into the next gyle of wort.

These observations will be sufficient to enable a person with little practice to produce Scotch ale.

PORTER.

This liquor is different both in colour and flavour from all other extracts of malt and hops, yet, like them, has been subject to a variety of changes, owing to the capriciousness of the public taste; but, of these changes we need not enquire, our purpose being to show the means of producing, in remote parts, a beverage in every respect like that made at the colossal houses of the metropolis.

This liquor appears to have derived its name from the porters of London, by whom, when first made, it was principally drank.

The qualities of the porter at present admired are, perfect brilliancy, a dark brown colour approaching to black, considerable bitterness, with a fine empyreumatic flavour, and close creamy head. Without these requisites, porter is little valued.

The general grist for porter is two-thirds of pale, one-third of brown, and one-twentieth of the whole of patent malt. But the best grist, and that mostly used

by the London brewers, is from one-eighth to one-sixth of patent, the rest pale.

If the method of mashing before recommended is not adopted, the following heats may be successfully applied:—

First mash, one hundred and sixty to one hundred and sixty-three degrees; the object being to go so low as to prevent acidity in the wort, a portion of the grist only being pale malt. The heat may with some degree of safety be lower than that used for ales. The infusion may be from one and a half to two hours; depending on the atmosphere: the hotter the weather, the shorter the time of the infusion.

The heat of the second mash, from one hundred and seventy to one hundred and eighty degrees. Infuse the same time.

Third mash, heat one hundred and eighty-four degrees to one hundred and eighty-six. Infuse three quarters of an hour.

Boil the first and second worts together, with six or eight pounds of hops per quarter of malt. And, in order that the rank bitter of the hops may be extracted, and a fine empyreumatic flavour produced, the wort

must be boiled with them from two to three hours. Boil the third wort in like manner.

Conduct the fermentation as before stated, bringing the attenuation lower. The gravity at the time of cleansing should not be above eight or nine pounds. A short time before cleansing, a quarter of an ounce of salt of steel, per barrel of wort, is generally added, for the purpose of giving a frothy head; but we do not hold with the practice. A good fermentation produces the best and most lasting head. When, however, such is used, it is first mixed in a bucket with some beer, and agitated until thoroughly dissolved; and when added, the gyle is well roused. Some persons add it in the cask, previous to sending out.

Best London Stout is twenty-eight pounds gravity; inferior, twenty-four; and common porter, from eighteen to twenty-one pounds.

The following table shows the increase of gravity, per barrel of worts, after boiling one hour and cooling, with an efficient refrigerator; by referring to which, the exact gravity that raw worts should be, before being boiled, to produce the required gravity in the gyle-tun, will be seen:

Gravity, per barrel, in copper, before boiling.	Increase of gravity, per barrel, after boiling one hour.	Gravity, when in gyle-tun.	Gravity, per barrel, in copper, before boiling.	Increase of gravity, per barrel, after boiling one hour.	Gravity when in gyle-tun.
lbs.	lbs.	lbs.	lbs.	lbs.	lbs
6	1 2/5	8	23 1/2	5 2/5	29
7	1 3/4	9	24	5 1/2	30
8	1 7/8	10	25	5 3/4	31
9	2	11 1/4	26	5 9/10	32 1/4
9 1/2	2 1/4	12	27	6	33 1/2
10	2 1/2	13	28	6 1/4	34 1/2
11	2 7/8	14	28 1/2	6 2/5	35
12	3	15 1/2	29	6 1/2	36
12 1/2	3 1/4	16	30	6 3/4	37
13	3 2/5	17	31	6 9/10	38 1/4
14	3 1/2	18	32	7	39
15	3 7/8	19	33	7 1/8	40 1/2
16	3 7/8	20	34	7 1/6	41 1/2
17	3 7/8	21	35	7 1/4	42 1/2
18	4	22 1/2	36	7 2/5	43 1/2
19	4 1/4	23 1/2	36 1/2	7 1/2	44
20	4 2/5	24 1/2	37	7 3/4	45
21	4 1/2	25 3/4	38	7 9/10	46
21 1/2	4 7/8	26 1/4	39	8	47
22	5	27 1/4	40	8 1/8	48 1/4
23	5 1/4	28 1/2			

MALTING OF BARLEY.

As most breweries have a malt-house attached thereto, it may not be out of place here to say a few words on the subject.

If we wish to produce malt of the best quality, we must be particularly careful in the choice of the barley to be used. The chevalier barleys are unquestionably the best, both as regards weight and quality. But these are not at all times to be met with; when they can be, we would recommend their use, in preference to any other kind. The next best is the early ripe; its thinness of skin and mellowness of nature, recommend it to the favourable notice of the malster

The cultivation of barley need not be considered here; that subject belongs more properly to works on agriculture. In the choice of barley for malting purposes, prefer such as were grown on light soils, and which have been well got in, being fully ripe and mellow, of bright colour, thin skin, and of round, plump, and full kernel;—the heavier the barley, the more

saccharine will the malt contain, and consequently the heavier it will be. The barley should be quite dry when stacked, or fermentation will proceed in the mow, in proportion as it is wet or dry. Barley stacked damp generates heat to such an extent as to destroy the germ, the result of which is the destruction of vegetation. Such will rot or vegetate imperfectly, either if malted or sown in the earth. Barley should be well screened before it is put into the cistern of the malt-house, that the dust and small grains may be separated therefrom. Two different barleys should not be mixed, but each sample steeped separately. If two different barleys are wetted together, some grains will, ere they arrive at the kiln, have germinated too much, others not enough. Mixing barleys therefore is fraught with evil.

The process of malting is divided into four stages, viz., steeping, couching, flooring, and kiln-drying: these we will consider separately.

STEEPING.

Steeping is nothing more than well saturating the barley with water; for that purpose it is put into the cistern, and water poured on it in sufficient quantity, that five or six inches rise above it. It is then well shired, that the light grains may float. These should be carefully removed, being useless for malting. As the water is absorbed by the barley, more is added. In the course of time, a yellow bitter matter is extracted from the husk of the grain; such liquor is let off, and fresh added. But this is allowed to be done only once. It would be a good practice to leave the drainage plug of the cistern out, after the coloured water has drained, and to let fresh run through the barley, until it leaves the cistern colourless. This would render the malt more pale.

The object of steeping is to saturate the grain thoroughly. This may be ascertained by taking a kernel from the middle of the steep, and squeezing it; if it readily break into a pulpy state between the fingers, farther steeping would be injurious, as the barley would

be robbed by the water more or less, according to the time it remained in steep, after being sufficiently saturated.

On arriving at this pulpy state, (from forty-five to sixty hours is sufficient for this end,) the water is well drained from it.

COUCHING.

The grain is then removed to the couch, where it remains until it sweats, or becomes moist, and until the rootlets, or radicals, as they are termed in the malt-house, are just perceptible. These changes generally take place in two or three days after removal from the cistern. As soon as the rootlets show themselves, it is time to have recourse to the third stage,—

FLOORING.

When the grain is removed from the couch to the floor, it should be well mixed, to equalize the temperature. After that is done, it is spread, either

thick or thin, as the weather is cold or hot; observing, the colder the atmosphere, the thicker must be the strata on the floor. When particularly cold weather, sacks are placed on the grain, to protect it from the cold. When the grain first leaves the couch, its thickness varies from six to twelve inches; it is sometimes necessary to lay it even thicker; if so, great care must be taken to turn and mix it frequently; for, as germination proceeds, heat is generated, especially in the middle and thickest part of the bulk; the natural results of which are, the total destruction of the saccharine in one part of the strata of grain, by the excessive rapidity of its germination, at the same time saccharine is scarcely formed in the other part, consequent on its not having germinated sufficiently, the malt so produced would be almost useless. Should the grain be over-heated the malt would be bitter. To avoid this it is laid out in thinner strata, and frequently turned; thus the heat will be moderated, as well as equalized. The hotter the weather, the oftener must different surfaces of the grain be exposed to the air. The germination must be carefully attended to, so as to render it equal in every grain, or the future malt will not be equal in nature, nor have its saccharine fully deve-

loped; and, it is needless to add, the beer made therefrom will be minus of flavour, strength, and purity. The heat of the grain whilst on the floor must seldom exceed sixty degrees. If the heat during germination is kept below sixty degrees, say fifty-six, the first ten or twelve days, the richer will be the saccharine of the malt. The heat may then be permitted to rise gradually to sixty degrees, or in very cold weather to sixty-four, but never more.

Keep the length of the rootlets within half an inch, if possible, for, if they are allowed to grow to any extent beyond this, it is at the expense of the saccharine of the grain.

The rootlets during their growth require nourishment; and, as no earth is present, the farina of the grain supplies its place; hence a less saccharine malt. Frequent turning will check their growth. It would be as well if those persons who are employed in turning the grain were to wear soft-soled shoes, when so engaged. Much damage is frequently done to the grain on the floor, by its being crushed; its vegetation is destroyed; it becomes mouldy, and dies. In fact, it is then a species of vegetable mould.

Such grains should be removed, for, should the root-

lets of other grains strike into such, their germ would sprout with twice the rapidity of those not so situated, and would soon exhaust their saccharine. Nor should the rootlets be broken off: if such be the case, new ones will supply their place, and exhaust the malt.

Soon after the rootlets have appeared, the acrospire, so called by malsters, begins to shoot; it springs from the same end of the grain as the rootlets, but grows in a contrary direction; for, as the rootlets grow downwards, the germs shoot upwards. The growth of the latter is much slower than that of the former; its growth may be seen or traced underneath the skin, or between the husk and kernel, on the back of the grain. It causes a slight elevation as its growth proceeds.

When the acrospire has grown to about seven-eighths of the extent of the grain, its further germination must be prevented. For this purpose it is placed on a kiln. Never permit the acrospire to exude from the grain, for, in proportion as its length is permitted to extend beyond the given point, so is the destruction of the already formed sugar; it will have been absorbed, to supply an unnecessary growth. The liquor made from such malt will be thin, spiritless, poor, and flat,

and will ultimately run into acidity. The acrospire must have grown to seven-eighths, or nearly so; or a part of the farina will be unconverted; hence a deficiency of saccharine, consequent on the imperfect growth of the germ. In proportion to the extent of the growth of the germ, saccharine matter is invariably formed.

When the acrospire has arrived at the point above mentioned, if the germination has been properly managed, the grain will have become nearly dry, resulting from the continued evaporation by the heat, and constant turning.

The latter part of the process on the floor has for its purpose the evaporation of as much of the moisture of the grain as possible. This is done by increasing its thickness, and frequent turning.

KILN-DRYING.

All the moisture possible of the grain being evaporated on the floor, it is transferred to the kiln, there to undergo its final process. The grain is subjected on

the kiln to such heat as totally to destroy vegetation; The heat is applied slowly, commencing at a few degrees higher than the heat of the grain to be dried, and gradually raised to the desired point. If the heat be quickly applied, the husk of the grain would become hard, and suppress the evaporation; the interior of the grain would contain moisture. Such dried malt may take fire in store, occasioned by its heating, or the moisture may be so great as to cause the acrospire to grow anew. A beverage produced from such malt will have a raw taste, a musty flavour, and would not keep sound. Good malt mixed therewith will become contaminated.

The lower the heat at which the evaporation and total destruction of vegetation are accomplished, the paler, sweeter, and better will be the malt. High drying heats produce high coloured malt; the colour is obtained at the expense of the saccharine. Such malt will neither be so heavy nor fit for brewing fine ales, and of less value in the market.

The thickness of the grain on the kiln should not exceed three or four inches; the thinner its strata the sooner its evaporation is finished.

Expose fresh surfaces to the heated floor every three

hours at first; every four hours, towards the close of drying.

To be properly dried, malt should be from twenty to thirty hours on the kiln. The time from steeping the barley to that of the removal from the kiln, varies from twelve to sixteen days.

When the evaporation is completed, which is known by breaking a kernel, (if its interior be quite dry, it is proof that farther drying is unnecessary,) the heat of the kiln is withdrawn, and the now converted barley is well trampled on, to free it from the rootlets, which, being now dry and brittle, will easily dislodge therefrom. The malt is then laid out to cool gradually, and then screened, to remove the rootlets, which, if used with the malt, would produce a disagreeable flavour in the liquors made therefrom.

The following is a correct rule for the guidance of malsters in the heats of the kiln, for producing different coloured malt:—

	Degr.		Degrees.
Pale, commencing at	60	and finished at	85 to 90.
Amber, ...	60	.....	100 ...120.
Brown, ...	60	130,	135 ...140.

Black, or patent malt, is roasted in a cylinder the same way as coffee.

The characteristics of good malt are, richness of flavour, fulness and brightness of kernel, thinness of skin, of mealy nature inside, and of fragrant smell.

CONSTRUCTION OF THE MALT-HOUSE.

A malt-house, like a brewery, should be near a sufficient supply of good spring water, with every convenience for proper and efficient drainage. The size or dimensions must be in proportion to the quantity of grain to be steeped at one time. Thus a seven-quarter malt-house requires the following dimensions :—

The cistern, containing nearly ninety cubical feet, of an oblong or square form, built of stone or brick, lined with cement an inch thick, with a slight declivity to the drain.

The couch, not quite so large as the cistern, and is thirty inches deep, with three permanent sides. The front side is moveable, being oaken or deal planks, of such thickness, that when in contact with the grain, they do not curve or give way in the least.

The floor, twelve feet broad and ninety feet long, sunk six or eight feet in the ground. The temperature will be more regular, and will enable the malster to continue making of malt a much longer time than when two or more floors are used. An arch thrown over the floor makes the best roof. The floor of the malt-house must be well looked to. Having raised the wall, and thrown the arch, make the ground for the floor as level as possible, and lay large flag stones thereon, well jointed; and on this stone floor spread a coat of Roman cement, about an inch thick.

The walls on the inside of the malt-house should be cemented as high as the ground outside. This will, if properly done, keep the floor dry. Some floors are made of coal-ashes, brick-dust, and quick-lime, mixed well together, and well rammed when laid down; but, unless the exact proportions are used, the floor sinks in places, cracks, and chips up. Cemented floors are much the best.

The kiln for the before-mentioned quantity to be wetted, is about fourteen feet square. The ordinary kilns are not well adapted for the drying of malt; the fuel, no matter what kind is used, imparts colour to the malt, and not unfrequently flavour. We would recom-

mend in lieu thereof, our improved plan. The floor of the kiln may be half-way between the malt-floor and malt-room, or store above it.

Make this floor level, and place flag-stones thereon; lay on these stones cast-iron pipes, of two or three inches bore, connected at each end by bends. When so united, it is like a common refrigerator. The pipes are two or three inches asunder, and one end is connected to a common steam-boiler. On these pipes is laid the floor of the kiln on which the malt is to be dried: this floor is of thin cast-iron plates, well jointed, and laid firm. Steam is generated in the boiler, and passes through these pipes; the discharge of which may be led anywhere. The malt is laid on the iron plates, and so dried by the continual heat given out to them by the steam. The heat is regulated by a tap at the discharge end of the machine; the boiler has a loaded valve, to carry off the superabundant steam.

The expense of erecting a kiln of this kind is not so great as that of the ordinary kind; its advantages are easily discernible: any fuel will do to heat the boiler; the malt so dried is perfectly pale, and free from any unpleasant smell or flavour.

Hops may be dried in the same manner.

The barley loft is near the cistern, the malt store near the kiln; the walls should be cemented inside, to prevent vermin, and the roof well ceiled. When the malt-house is not in use, it should be frequently whitewashed, with hot quick-lime.

REGISTRY OF BREWINGS.

Date. 1842.	Number of Brewings	Quarters Malt.	Pounds Hops.	Time of beginning to Brew.	Temperature of Atmosphere.	MASHING, RUNNING ON, AND SPARGING.										Gravity per Quarter Malt.	Time Cooling.	Pounds Yeast.				FERMENTATION.														OBSERVATIONS.
						First Mash.		Running on Goods.		Second Mash, or Sparge.		Third Mash, or Sparge.		Washing Goods.								1st Day.		2nd Day.		3rd Day.		4th Day.		5th Day.		6th Day.		7th Day.		
						Heat.	Barrels.	Heat.	Barrels.	Heat.	Barrels.	Heat.	Barrels.	Heat.	Barrels.				Heat.	Gravity.	Number of Barrels.	Heat.	Gravity.	Heat.	Gravity.	Heat.	Gravity.	Heat.	Gravity.	Heat.	Gravity.	Heat.	Gravity.	Heat.	Gravity.	
Feb.	1	10	50	5	50	140	12½	200	8	200	10	200	14	200	10	96	2	30	58	33	29	59	31	61	28	62	25	64	20	65	16	65	12	66	10	

The first mash to stand two hours and a half after finished mashing.—The heat of working-tun must be regulated by an attemperator; the cooling from the copper to be effected by a powerful refrigerator.

OBSERVATIONS.

THE causes of acidity and other impurities in malt liquors, are numerous; the following are the principal: Malt improperly made will produce sometimes a flat and almost tasteless beverage; at other times, ropiness and acidity are the result. Musty hops give a similar flavour to worts boiled therewith; improper heats in mashing produce acidity and ropiness, as well as causing loss by leaving saccharine unextracted; worts remaining any length of time in the underback become blinked, and, after fermentation, run into acidity; non-sufficient concentration of worts, by boiling, creates thinness on the palate, causes an unmanageable and imperfect fermentation, ending, unless soon consumed, in acidity. The exposing of worts to the atmosphere in the coolers, induces a great absorption of oxygen,

the fermentation of which worts is either languid, leaving much unattenuated saccharine in them, or is so rapid as to destroy too much or all of the saccharine; in the one case the beverage is impure, having a sweet sickly taste; is very heady and unwholesome, and, if kept, will become ropy and sour: on the other hand, the saccharine being too much destroyed, renders the beverage thin, poor, flat, and almost tasteless; such immediately runs into acidity. An imperfect fermentation and attenuation will cause many impurities, as ropiness, irrecoverable flatness, mould, and acidity.

Open fermenting tuns tend to induce the worts fermented in them to run into the acetous fermentation. A high fermenting heat induces the same end.

Sour or bad yeast produces acidity in worts fermented therewith. Wet and foul vats and casks being filled, cause flatness, mould, and acidity. Beer exposed to the air after fermentation, or at any time, will tend to produce acidity, as well as flatness.

Foul utensils give the beer a disagreeable taste, commonly called foxy.

The above being the causes of impurities and acidity in malt liquors, their prevention will be found in the following observations:—

Use well water, if possible; rain or river water contains a considerable quantity of vegetable matter, consequently tend to induce acidity, by more readily imbibing oxygen during cooling and fermenting. Purchase the best malt and sweetest hops; apply proper heats in mashing; get the worts boiling immediately on their leaving the mash-tub; boil worts until well concentrated; avoid as much as possible, especially in warm weather, exposing worts to the atmosphere after being boiled; in fact, at all times cool with an efficient refrigerator, as quick as possible.

Close fermenting tuns, under ground, are superior to all others; good attemperators are indispensable.

Use good fresh yeast; and when it ceases to induce a lively and free fermentation, change it. Keep yeast in a cool place, unexposed.

Be careful to keep all utensils clean and sweet; well scald them immediately after use, and, if not again wanted within three or four days, wash them well with strong bright lime-water, and scald them afterwards.

Keep the heat of the gyle during fermentation as near sixty-five degrees as possible, and not reduce it until the attenuation is finished, the object being to induce a cool, vigorous fermentation.

Rack beer as unfrequently as possible; frequent racking causes flatness, by the escape of the carbonic; and acidity, by exposure to and absorption of the oxygen of the air.

HOPS

Should be free from dust, and quite sweet. It is not absolutely necessary that hops be new when used, so long as they are in good condition. October is the best time for laying in a stock.

Hops are generally supposed to be a preventative of acidity; such, however, is not the case. By analysis, their components are tannin, extractive, a bitter matter, a resin, a little wax, and woody fibre, besides a considerable portion of volatile oil. Of all these components, not one, except the tannin, has any preservative quality whatever; and that part being very trifling, can have little, if any effect, in counteracting the acetous fermentation.

We have in our experiments used twelve and fourteen pounds of the best hops, per quarter of malt, and have made our ale of great gravity, with the view of

testing the preservatives of the hops, and have never found them to be sufficient to keep the beverage sound, as such has been often as sour as vinegar, and as bitter as gall. One would suppose that if hops really were a preventative of acidity, ale so hopped would not have turned sour, except under great length of time, and not in a month or two.

It is therefore quite evident, that hops do not and cannot prevent acidity. Their use is merely to destroy the sweet sickly flavour ales would have, if made without them, and to impart a flavour that has become habitual to most palates hy long usage. The resin and bitter principle produce this end, in conjunction with the volatile oil. Resin produces the narcotic power, the oil its peculiar aroma; it is therefore of consequence that these be preserved.

Sour Ales are best restored by putting them in a vat, with three times their quantity of new, attenuated from thirty-two to eight pounds, with some spent hops, and one pound per barrel of coarse marble-dust. But acidity can never be totally destroyed.

Rousing of ale when fermenting, should be avoided as much as possible. A small hand-pump, acting on

the same principle as a syringe, is best adapted for agitating wort, and inducing a lively fermentation.

Do not charge the copper until just before kindling the fire, and do not boil of more than six worts without cleaning it; always wipe the copper dry after cleaning, with a cloth; it should, when not in use, be kept perfectly bright, as well as dry; verdigris is not then formed. A little vitriol, diluted with water or sour beer, is necessary to brighten it.

When ale is made for store, its gravity must be reduced to one-fourth. Machines are best for mashing, as is recommended in this work; for the common method, oars are best, unless the quantity be more than fifteen quarters.

Get rid of badly-managed ales as quickly as possible; the longer they are kept the worse they become. It is the reverse with well-managed ales; they improve by keeping.

Isinglass should be steeped in sufficient old ale to dissolve it, and when used, should be well stirred, strained through a hair sieve, and diluted to the consistency of cream with some of the liquor to be fined. about a pint per barrel is sufficient. Keep finings in a cool place, and free from mould.

About half a peck of beans, per quarter, steeped, and malted with barley, produces a full rich flavour in ales made therefrom. Peas have a similar power.

*** *Superior Refrigerators, Attemperators, Saccharometers, Thermometers, &c., are supplied by the Author at reasonable charges.*

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