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FOURTH EDITION.

THE
—
THEORY AND PRACTICE
OF
BREWING

ILLUSTRATED:

CONTAINING

THE CHEMISTRY, HISTORY, AND RIGHT APPLICATION OF
ALL BREWING INGREDIENTS AND PRODUCTS;

A FULL EXPOSITION OF THE NEWLY DISCOVERED PRINCIPLES OF CONVERSION
AND EXTRACTION IN THE MASH-TUN;

THE PHILOSOPHY OF CLIMATE, SEASON, AND SITE;

CRITIQUES ON THE *MODUS OPERANDI* OF FERMENTATION, AND
THE EFFECTUAL PREVENTION OF ACIDITY:

ALSO,

Many new Practical Observations

ON BREWING

LONDON AND DUBLIN PORTER, EAST INDIA PALE ALE,
EXPORT STOUT, &c. &c.

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CHAPTER XVIII.

EXPORTS.

ESSENTIAL QUALITIES OF STOUT—RECTIFICATION—AUSTRALIAN AND CANADIAN TASTE AND CLIMATE—BITTER ALE—QUANTITY AND QUALITY OF ITS HOPS—ORIGINAL AND CORRECT MODE OF FERMENTING IT—PROGRESS OF ATTENUATION—HOME CONSUMPTION—MEDICINAL VIRTUES—ULTIMATE STRENGTH AND BRIGHTNESS—SPECIMENS—CALCUTTA MARKET, AND MALT LIQUOR IMPORTS.

THE materials and manipulation necessary for the production of porter in general, have been somewhat fully enlarged upon in the foregoing chapter; therefore a brief review of a few principal points more particularly bearing upon the subject which now presents itself for re-inspection, viz. the chief features of porter or stout designed for exportation, may now suffice.

Of the various productions of the British brewery sent abroad to the many nations and climes with which our merchants hold intercourse, the principal are those exported to our Australian, Canadian, Indian, and West Indian settlements; and these, in consequence of the diversity of climate subsisting between those colonies and states, and not a little from the constitutional habits and taste of the several classes of consumers, are required to vary a little in composition. For the uniform mildness of Australia, and the changeable seasons of North America, a good fair article of porter, called stout, of about 28 lbs. *per* barrel, or something less than three barrels to the quarter, will suit, to obtain the

drawback of duty on materials. The grist from which such export beer is drawn, as well as the hops intended to flavour and preserve it, should be somewhat better than a good medium quality; and it is found necessary to use only one description of malt, except the colouring preparation, and neither under nor over-dried, but of the purest *amber*. A winter's vatting seasons it for the voyage, and renders it fitter for exportation than if shipped immediately after it is brewed, however fine and spirituous it may be in its maiden state; but the stout intended for the East or West Indies, should be more alcoholic from the commencement, and requires from 10 to 15 *per cent.* more bitter. About 14 lbs. may be sufficient for the Australian market, and 15 or 16 lbs. for the Canadian; but the Indian will require 20 lbs.

The custom of mixing a native thin-brewed beer of inferior quality, and not unfrequently a mere compound of water and molasses, with the imported stout, is a common fraud with some of the Australian and American dealers, who, by thus impairing the strength and flavour of the genuine import, and thereby increasing the quantity in their stock, enlarge their profits accordingly; by which misconduct they not only rob the consumer, but sometimes heap odium upon the innocent brewer, particularly if an honest and emulant man, his name and fame going hand in hand, and the former being usually labelled upon the vessels containing his stock. He may, in some instances, have been ordered by the exporter to make the colour of his produce some shades darker than usual, as a false token of strength, by an additional allowance of patent malt, although it may conspire to shield the anticipated deception at the expense of his individual reputation. The consumption cannot be increased by this time-

servicing and mercenary trickery; but an exposure and a good brisk competition may do much towards abolishing it, since the latter course remedied an evil in the market of Calcutta, now some years back.

The ultimate attenuation of the export stout should vary according to the climate it will have to encounter; the Indian supply may have about 4 lbs. unattenuated; that for the milder and uniform climate of Australia, about 5 lbs.; and the stock intended for the more fluctuating, and often extremely hot or rigidly cold seasons of Canada, may have 6 lbs. unattenuated; and it is imperatively necessary that all extraneous vegetable matter, which forms the yeast, lees, &c., be removed; because the agitation during the voyage would otherwise provoke extreme fretting, leakage, and premature acidity. If the rumbling of a carriage in a gateway will acetify the beer stored in a cellar underneath, much more so will the rocking at sea, if due precaution have not been taken. Also, the nature of the materials employed, in order to supply a greater quantity of carbonic acid gas than can be generated by paler beer, demands an adequate number of vent-plugs, which should be made of a peculiar red oak, almost as porous as cane; and from four to six will not be too many, if the pores be partly choked up by yeast or other ejected matter. This plan is greatly superior to the iron vent nail, which indeed is now but rarely seen in any establishment professing to have embraced improved principles.

BITTER ALE.—After the explanations and intelligence that have been given within the body of this work, on the subjects of boiling, mashing, fermenting, and the rest, no more can be required in further elucidation of the practice of brewing, than that which is directly applicable to the best available means of obtaining the

necessary properties and peculiar characteristics that distinguish a malt liquor made for exportation, and used as a medicine at home, from that which is manufactured for ordinary and general home consumption. In the foregoing chapter, allusion has been made to the introduction of pale beer by the faculty as a medicinal cordial. This practice has induced brewers to prepare an article that may be exclusively appropriated to domestic consumption, now commonly known as *Bitter Ale*, which differs from other ale only in the quantity of material engaged in its production, that for the home market being somewhat less bitter and spirituous, than such as is exported to India. The bitter of the hop appears to have all the properties of the coriander in its pungency and flavour, and also to possess, like some other exotics of the umbelliferous tribe, a stomachic and carminative power, without having the torminal attributes of senna and other drugs of pharmacoplists. According to a brewing writer who lived in the hop country, the spirit of that flower is "truly cordial and warm, exciting in the third degree, aperitive, abstersive, subastringent, digestive, discussive, diuretic, stomachic, and sudorific;" so that it has more real good qualities than have even been ascribed by Nicholas Culpeper, the prince of quacks, to his favourite wormwood: at all events, the hop acts as a tonic, antispasmodic, and cathartic medicine; and its aromatic bitter, when properly administered, restores the abused appetite. Hence the medicamentous properties of this beer of physicians may be in part attributed to the absence of saccharine, mucilaginous, and general amylaceous superfluity, but principally to the highly tonic property derived from the quantity and quality of its hop, which corrects unwholesome nutriment, promotes digestion, and, in a singularly powerful manner, increases the

nutritive virtue of all food united with it, without undergoing any perceptible change while thus officiating in its passage through the animal system. It is particularly successful as a stimulating remedy for the deranged functions of the stomach, and acts upon the sympathetic organisation, so as to restore the debilitated system in general, and ultimately to give strength and vigour to the mental faculties and physical powers.

Like all other worts, those intended to form this unique medicine require speedy cooling, which will prevent too voluminous an absorption of oxygen; and hence the imperative necessity of an efficient refrigerator. They do not require more yeast than other worts of the same gravity, but it would be almost futile to attempt their fermentation without an attemperator, during the warm season; for it is absolutely necessary to conduct this process with the nicest regularity, since the ultimate purification and brightness will otherwise never be perfected.

The malt should be of first-rate quality, perfectly dried, and very pale, colour being the first consideration in point of importance; and the hops should therefore be of the palest growth; and in selecting those that impart the least colour, their maturity should not be overlooked. The quantity must vary inversely with the quality; but as the flavour of this kind of ale emanates more from the aroma and bitter of this flower than from any other material, from the ultimate extreme decay of the malt extract, it is advisable that the hops should be of the description which contains the greatest share of condition in the smallest bulk; reasons for which qualification have already been assigned (*vide* p. 222). Such as those designated *Goldings*, *Farnhams*, and the very best *East Kents*, may be used with advan-

tage, and seldom less than 22 lbs. to the quarter will suffice.

In boiling liquids that contain vegetable matter, the colour of the liquor will not only heighten in proportion to the time of continuing the heat, but also according to the amount of solid present to be affected by the fire; in all cases, therefore, it would be profitable, as has been observed, to steep the hops in water of any temperature between 140° and 170° , for eight or ten hours, where such a heat can be conveniently preserved so long. In consequence of the extraordinary quantity of hops required for the ale, a rather considerable allowance must be made in the quantity of the raw wort, because of the great absorption in the hop-back; and although some little increase of density is gained from the hops, yet they retain possession of much of their original bitterness. Hence, when the business of the day is over, they will be found to have sustained their strength with but little exhaustion, of which condition advantage can be taken by reboiling them in the raw wort of the following day; and in this case, it will be better to brew porter next, as here the absence of the aroma in the half-spent hops is not so deeply felt, and a smaller quantity of new ones, by 25 or 50 *per cent.*, will suffice, according as circumstances may demand. It may be well to caution the inexperienced brewer against the impropriety of leaving these partially spent hops in the hop-back over night, or even more than three hours, before their bitter is extracted or engaged for future appropriation; because during delay they undergo a partial decomposition, by which the efficacy of the bitter is diminished in proportion to the time that they are exposed to the air, when unable to maintain their acquired temperature; and the loss is still greater where the water contains carbonate of lime, the

disengagement of which by boiling, and its deposition amongst the hops by filtration, accelerate the decaying process in the same manner as when applied artificially to manure and animal matter, to hasten putrefaction; but it is better to make two or three worts, and to boil all the hops moderately in each. Where, however, the hop-convector is used, the exhaustion of the hops by one process is so perfect, that nothing remains in them to be of the least advantage by another operation.

The pitching temperature may be from about 56° to 60° , and the exciting yeast may be diluted with some of the wort, to which more may be added occasionally, as the worts are flowing into the square. The materials forming the extract, not being over-dried, or carbonised, on the kiln or in the copper, will immediately evince symptoms of decomposition; and in order that the elements which aid the fermentation may be preserved as long as necessary, the heat of the gyle should occasionally be curbed by the attemperator, particularly soon after the commencement, and when the attenuation becomes rapid; with which resolution it should be constantly watched, or inspected at least every 4 or 5 hours, by night and by day, during the first forty-eight hours, at the expiration of which period the heat ought not to be found to have increased more than 2° or 3° , and the saccharometer should indicate a diminution of 7 or 8 lbs. gravity. Should the attenuation and the heat not keep pace at this rate, as it probably may not if the water is of a quality to be termed hard, a little indulgence may be extended to the accumulation of a degree or two, or, which is preferable, rousing oftener; and the exercise of a little more patience may be introduced, and less frequent inspection will suffice as an equivalent for the extension of time. By the period when the

attenuation has prograded to within one-half of the original density, the heat should not be allowed to rise above 62°. The remainder of the process will require very close attention ; for as the attenuation approaches the crisis for its cleansing and purification from excrementitious matter, three-fourths of its saccharum being converted, the thermometer appearing rather below than above 64°, about one-half of the yeasty head may be skimmed away, and at the same time the tap of the attemperator may be turned off. When 2 lbs. more have disappeared, the skimming may be resumed, and about three-fourths of the head may be removed. The density will now be 6 lbs., and at least 2 lbs. more should be attenuated before the fermentation can be considered complete, and which, it is presumed, the previous skimming will not prevent. If any obstinacy is experienced on this account, so much early skimming must be afterwards avoided. When, however, only 4 lbs. remain undecomposed, the gyle should be skimmed quite clean, and the cooling powers of the attemperator should be appealed to.

The stream of water and the heat of the gyle must continue to pass gently away ; and the cleansing skimmer should be put into requisition whenever the light head thickens to within an inch deep.

All that now remains to be done, is to expedite the clarification ; and as we know that heat, or calorific repulsion, is a power opposed to aggregation, being as such repellant, a separator of particles, the attemperator should now be put in requisition to extract the caloric, and thereby encourage the natural affinity of each remaining azotised particle for the others, that through their gravitation, and combination, and ultimate quiescence, a speedy precipitation may take place, so that by remaining in this cool state a few days, it may be fit for

its destination. To make this peculiar process the more perspicuous to the inexperienced, the author subjoins a few figures from the end of a brewing of his own, which may be taken as an example and tested as a guide. The square contains 200 barrels of wort, the *gravity* at pitching (commonly called *density*) was 24 lbs. per barrel, and the hop employed was East Kent.

Hours in Square.	Heat of Gyle.	Attemperat- tap.	Attenua- tion.	REMARKS.
0	57°	off	0	With the aid of finings, this ale became quite bright just 10 days after racking. Much admired by all. Self not pleased with the hop. Try Farnham.
10	57½°	on		
22	58°	on	19·1	
36	59½°	off	17·5	
48	60°	on	16·	
55	60°	on	15·3	
62	61°	on	14·	
72	61½°	on	13·	
78	61°	on	12·2	
83	62°	off	11·2	
90	63°	on	10·	Partially skimmed. Skimmed closer. Do. quite close. Do. do. clean. Do. do. do. Do. do. do. Vatted one-half. Sent half out.
96	64½°	on	8·5	
102	64½°	on	7·6	
113	65°	off	5·	
120	66°	off	4·3	
134	60°	on	4·	
150	52°	on	3·9	
160	50°	on	3·9	
190	50°	on	3·8	

This precise time of fermentation is impracticable with such waters as are termed "hard," or such as the Burton brewers use. In these cases higher pitching heats and a higher fermentation are necessary for general practice, or where it is desirable to complete the attenuation without vating, on account, as before observed, of the obstinacy with which worts ferment when so constituted; but with soft or medium water, the above Table may be followed with confidence and accuracy.

If found desirable, the attenuation may be carried a pound or two lower, as before suggested ; and by proper management, the trial may be made with safety. To avoid premature acidity after its arrival at the place of its destination, all matter tending to its turbidity should be removed by attraction and precipitation, and it should not be racked for exportation until it has become perfectly bright. About two pounds of new hops *per* barrel might now be added. The very small quantity of unattenuated matter yet remaining, should be no more than just sufficient to supply enough of carbonic acid gas for the requisite effervescence during its limited decay, without causing the slightest turbidity at any time ; and to prevent its accumulating in excess after shipping, and endangering the safety of the cask, a porous plug or two should be inserted into the shive or near it, through which the surplus gas may escape.

As regards the Indian market, it is presumed that the following information, given by a commercial firm of great respectability and experience in Calcutta, will be found as acceptable to the reader as it has been to the transcriber, as much from its novelty as from its undoubted correctness.

“Great Britain must always be the source whence British India is to be supplied with good wholesome malt liquor. Attempts have been made by the French, Americans, and Germans, to supply it, but it has proved to be quite unsuited to the Indian palate : in fact, very bad. There is nothing to be dreaded from them ; and although it is not impossible to brew good table beer in Upper India, yet it is not likely to succeed permanently, for various reasons. No person of capital would run the risk of losing it, as it is only whilst prices are high

that he could be handsomely repaid ; and in that case, the English brewer would be in the market, and upon equal terms at least. The cost of apparatus, materials, labour, and interest on capital, added to the expense of transportation from Muttrah, or any other of the colder stations, to the principal towns of the central and lower provinces of Bengal, would be much greater than the English brewer's charges to accomplish the same object.

“ Previous to the years 1816 and 1817, the demand for beer in India was nothing, compared with what it has become during the last seven or eight years. The pressing calls in 1821 for an increased supply, led Hodgson, of London, to enlarge his brewery, and induced some to enter into arrangements for monopolising the market : this, as usual in such cases, ended in severe losses to all concerned. Beer has for many years been an article of extensive consumption in Bengal, and it is highly probable that a greater increase would take place, were it not for the very high price to which it has frequently risen : this, however, could not be guarded against, as long as Hodgson exclusively had the supplying of the market ; but now that other brewers can furnish equally good beer, there is no fear of a short supply, or of being subject to monopolies, such as were tried some few years ago. The great fluctuation in the price of this article has been caused entirely by the irregularity of the supply, and the plans laid down by Hodgson, and some of his moneyed neighbours, to keep the others out of the market. So entirely dependent were the public upon this brewer, that he in a great degree regulated the price and the quantity imported. Others who attempted to introduce their beer into the market were compelled to withdraw, having lost very considerably by their speculations ; for Hodgson, when he

knew that other brewers were shipping, sent out large quantities, and thereby reduced prices to such low rates as to frighten his rivals from making second shipments; and having effected this, the following year he had the market to himself, and the prices rose occasionally under the short supply to 180 Rs., and even 200 Rs., a hogshead. He thereby made up for the sacrifice of the previous year, and effectually deterred others from prosecuting their speculations in this market. Another thing in his favour, and which operated for a long time, was the high repute in which *his name* stood for beer; so much so, that no other even of a good quality, was bought by the retailers, as they could not dispose of it. The commanders and officers were, up till 1824, Hodgson's best customers; his beer formed one of the principal articles in their investments, and it was customary for him to give them credit for twelve or eighteen months, if not for the whole amount of their purchase, at least for one-half of it; but about this time he not only raised his price from £20 to £24, but refused to sell on any terms except for cash, even to parties of unexceptionable credit. This naturally drove many of his best customers to other brewers, but Hodgson and Co., confident of the power they had in the market, sent the beer out for sale on their own account; and thus they in a short time became Brewers, Shippers or Merchants, and even Retailers. These proceedings naturally and justly excited hostile feelings in those engaged in the India trade at home, whilst the public here, seeing the complete control which Hodgson endeavoured to maintain over the market, turned their faces against him, and gave encouragement to other brewers, who fortunately sent out excellent beer.

“ In 1825 and 26, several brewers tried the market, and as the spell had been broken, met with liberal and

fair encouragement. The most successful of them were Allsop and Son, Bass and Ratcliff, Ind and Smith, and Charrington, with a few others. It being therefore clear that England must furnish the supply, and it being the interest of the brewers to keep the market steadily supplied, we shall now give some data to guide the brewer or shipper.

“It will be perceived that since 1830-31, (the 30th of April terminating the Indian Commercial Year,) the imports of Beer and Porter into Calcutta have increased nearly 100 *per cent.*: this in a great measure arises from the moderate rate and little fluctuation there has been in prices, whereby a taste for beer has been more generally diffused throughout the poorer classes of British inhabitants, which having once acquired, they will continue to indulge as long as prices remain moderate.

“Imports of Beer and Porter into Calcutta.

Year ending April 30.	Butts.	Hogsheads.	Dozens.
1830-1.....	418	5,556	2,105
1831-2.....	111	5,946	1,167
1832-3.....	252	7,916	2,293
1833-4.....	322	7,193	2,028
1834-5.....	244	6,282	2,632
1835-6.....	140	4,519	1,392
1836-7.....	404	9,544	3,241
1837-8.....	841	11,356	2,102
1838-9.....	606	8,937	719
1839-40....	391	10,779	671
1840-41....	824	11,808	2,989
1841-42....	669	11,035	6,457
Total in 12 } years.... }	5,222	100,871	27,796

“The beers now most saleable, and which command the highest quotations, are those of Messrs. Allsop and

Son, Bass and Co., and Ind and Smith, especially the former, on account of the superior lightness and brilliancy of their shipments: there is, however, a wide field for competition, and we have little doubt that by caution and care, one of the most lucrative and extensive businesses might be opened with the port. The first point for consideration is, quality, a few remarks on which may not, we trust, prove uninteresting. The ale adapted for this market should be a *clear, light, bitter, pale* ale, of a moderate strength, and by no means what is termed in Calcutta 'heady;' it should be shipped in hogsheads, which we need scarcely observe should be most carefully coopered, and small shipments and frequent, in preference to consigning heavily at one time; as the natives, who frequently purchase on the invoice (which by the by should always be made out at an advance of prime cost of 50%, as invoices are sold taking the rupee at 2s. 6d., and generally at a discount of from 5 to 10%), cannot often raise funds to take off the same. Another point is, that by frequent consignments you acquire a *name*, which, as you may be aware, is every thing in India."

This highly interesting and instructive commercial letter says so much on this subject of *British Pale Ale*, that the author of this work would be deficient in common politeness, were he to offer any other commentary upon it, than to repeat his best thanks to the intelligent writer of it; and with this simple observation he is contented to leave the subject in the hands of his readers, while he attends to some other matters.