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OBSERVATIONS
ON THE
VINOUS FERMENTATION;

WITH A DESCRIPTION

OF

A PATENT APPARATUS

TO IMPROVE THE SAME.

ALSO

**A STATEMENT OF THE ADVANTAGES TO BE DERIVED
FROM THIS SYSTEM WHEN APPLIED TO**

THE

Process of Brewing,

AS

**CONFIRMED BY THE TESTIMONY OF
MESSRS. GRAY AND CO., BREWERS,
OF WESTHAM,
IN THE COUNTY OF ESSEX.**

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OBSERVATIONS,

&c. &c.

THERE is scarcely a single production of the earth, which, when appropriated to the use of man, is not so modified or changed by various preparations, as to possess a different property from that it contained in its primitive state.

Fruit and grain undergo decomposition, and a new recomposition, before he uses them as food ; and until he applied art to the juice of the grapes, they were suffered to decay on the vines—but which the ingenuity of man converted into a pleasant, wholesome, and lasting beverage.

In those climates where the only substitutes for wine were milk or water, the inhabitants are in-

debted to his invention for malt liquor, a beverage which, although inferior to wine, is not destitute of some of those qualities that render it so great a desideratum.

The phenomenon by which these new properties are produced, is termed the vinous fermentation ; it might, perhaps, with more propriety be called the alcoholic or spiritous fermentation, since it is a process by means of which all saccharine matters, whether they proceed from grapes, sugar cane, or malt, are decomposed and recombine to form alcohol. But however wrong this denomination may be, we shall make use of it in the following observations, as being well understood by all classes.

A vinous fermentation, to be perfect, requires very exact proportions of mucilage and saccharine matter, so as to have the one just sufficient to destroy or attenuate the other ; in which case the result would be, if the operation had been properly conducted, a mixture of alcohol and water, differently flavoured according to the materials from which it was produced, as grapes, pears, apples, or malt and hops ; but such accuracy in the proportions cannot be expected, either from nature working at large, and varying in every climate, soil, and situation ; or from short-sighted man

acting mechanically, and frequently in ignorance of what he is doing.

A perfect fermentation, therefore, has been considered an object almost impossible to be obtained; and all we wish to show is, that the errors of the mixture may be corrected, and the whole process improved, by good management.

The common practice, until a few years back, has been to ferment in open vessels; and though it was a circumstance well known among chemists, that a certain portion of spirit and flavour escaped in the form of vapour during the process, yet no one had an idea that the condensatory system could be applied; as it appeared impossible to effect the fermentation in air-tight vessels, being unable to surmount the great difficulty which existed, of keeping down and managing that enormous bulk of non-condensable gases, which are emitted during the decomposition of the saccharine matter, and which acquire greater expansive force by the gradual increase of heat.

The idea, however, occurred to Madame Gervais, a proprietor of considerable vineyards near Montpellier, who has founded a system on the following principle: that what is termed the vinous fermentation, is a mild, calm, and natural distillation; which, according to the usual acceptation of

the word, has proved a correct system, since not a single drop of spirit is formed before it commences, nor after it is over. Having first laid down this ground-work, she proceeded to obtain an apparatus that would operate in such manner as to return into the vessel the spirit and flavour that was evolved from the fermenting gyle, and let out the non-condensable gases, which might, by the increasing heat, acquire too great an expansive force, and burst the working-tun; a short description of this apparatus will be a fresh proof that the greatest advantages are often derived from the most simple means.

It consists of a vessel resembling the head of the ancient still, and constructed of such form as to be capable of being placed securely on the back or vat, in which the process of fermentation is to be carried on; the back or vat must be closed airtight, with a hole in the top, communicating with that part of the apparatus called the cone or condenser. This cone is surrounded by a cylinder or reservoir, which is to be filled with cold water, so that the alcoholic vapour or steam, evolved during the process, may be condensed as it comes in contact with the cold interior surface of the cone; and being thereby converted into liquid, trickles down the inside of the condenser, and through a long pipe is returned into the fermenting liquor.

By the application of this apparatus, a considerable portion of alcohol, which has been hitherto suffered to escape in the form of vapour, along with the non-condensable gases, is condensed and returned into the liquor; and the non-condensable gases are carried off by a pipe, which, proceeding from the interior lower part of the cone, and running up the inside of the cylinder in the cold water, passes out through the side, and the end is immersed some depth below the surface of water contained in a separate vessel, permitting the gases to escape, but still under a certain degree of pressure, the object of which is, to confine the alcoholic steam and gas within the cone, and allow them a sufficient time to cool and condense.

To persons in the least acquainted with chemical operations, it would be useless to dwell on the merits of this apparatus; they will at once see how beneficial it would prove to any liquid that has to undergo the vinous fermentation in any stage of its manufacture; but to those who are not so conversant in the principles and causes of these operations, we shall proceed to point them out.

To obtain a good fermentation, as complete a decomposition of the must or wort, and as perfect a recomposition of alcohol as possible, are the great objects to be obtained. To acquire the

former, three requisites are necessary; fluidity, heat, and motion. The latter; density, coolness, and tranquillity.

- Let us examine each of these separately; first, of fluidity.

The specific gravity of the liquid, most eligible to produce a good fermentation, is between 1.020, and 1.140, or eighteen; and one hundred and thirty-two pounds by Dicas's improved saccharometer, made by Joseph Long, No. 20, Little Tower street, London. Below eighteen pounds of real extract per barrel, the liquid is too thin to produce a proper fermentation, and above one hundred and thirty-two pounds it is too thick; but supposing the specific gravity of the must or wort to be correct, it may be carried beyond a proper dilatation by too much heat, or congealed to too great a consistency by excessive cold; consequently either a thunder-storm or hard frost will derange the operation, and are equally injurious to fermentation. Any method, therefore, that will insure an even temperature must be of great importance; and such a method is obtained by applying the apparatus already described, since, by preventing the access of atmospheric air, the sudden changes of the external temperature can have no effect upon the fermenting gyle; and if it has been PITCHED at a proper heat, (which is

between sixty-five and eighty,¹) will proceed through its different stages, as well during the hottest days of summer, as in the selected months of autumn and spring.

With respect to motion, we are indebted to Monsieur Gay Lussac, an able French chemist, for a beautiful and important experiment, proving that must, possessed of all the requisites to produce a good fermentation, will not begin to ferment unless excited by a foreign agent. He placed the must in a close vessel, from which the atmospheric air had been exhausted, where it remained several days without giving any signs of fermentation, from which he concluded some power was wanting to break the union of its constituent principles; he therefore introduced a small quantity of oxygen, which immediately caused the must to ferment, evidently proving the necessity of a small portion of atmospheric air (which contains oxygen), to allow the fermentation to commence. But it at the same time proves, that, after performing that office, this great enemy to all fermented liquors may be dispensed with, without impeding the process; as the small quantity of oxygen, introduced by Monsieur Gay Lussac, was soon absorbed by the carbon to form carbonic acid gas, and he found no occasion for any further supply.

¹ Fermentation will take place from forty-eight to one hundred and thirty-eight degrees.

This discovery is of the greatest importance, since it enables us, without the least detriment or inconvenience to the process, to exclude the oxygen of the atmospheric air, which, by constantly supplying the gyle with the principle that causes and promotes acidity, casts on it from the first that roughness and disagreeable flavour which spoil most of our common beverages.

Here again the new apparatus proves of infinite benefit; for as soon as carbonic acid gas is evolved from the fermenting gyle, the atmospheric air being lighter, is driven out from the upper part of the working-tun; and as no air is permitted to enter afterwards, all the subsequent carbonic acid gas emitted diminishes the quantity of oxygen contained in the gyle, by the oxygen uniting with the carbon as fast as it disunites from the saccharine matter during its decomposition, and thereby secures a soundness and peculiar mildness not to be procured by any other mode.

Having stated the necessary conditions for a complete decomposition of the saccharine matter, we shall proceed to notice those required for a good production of alcohol.

The first already mentioned is a certain density, in order to allow the several principles which are disunited to recombine. It is doubtful whether

such a combination will in any case take place, until the temperature of the gyle having attained its greatest heat, is afterwards cooled a few degrees; a fact confirming which is, that a portion of the liquid taken out when at its greatest heat, and tried by distillation, produced little or no spirit; but such refrigeration must not be effected too suddenly, as it might coagulate the yet undecomposed mucilage, and check its further action on the remaining saccharine matter; and by arresting that natural operation which ought to be pursued a longer or shorter period, according to the specific gravity of the fermentable matter, might produce that result termed ROPYNESS, by holding in solution the coagulated mucilage.

Here again the apparatus will be found of great service; for by frequently renewing the cold water in its reservoir, the internal temperature will gradually diminish by the heat of the gyle coming in contact with the cold interior of the cone; but in order to effect this, the tranquillity above-mentioned is necessary, since the continual motion is caused by the oxygen soliciting new combinations with the carbon, and thereby constantly giving rise to a fresh supply of heat.

Besides the advantages already mentioned, which are common to all fermented liquors, there

are others peculiar to each, that we must be allowed further to explain.

The apparatus being applied to ferment the must of grapes, has been found to procure an increase of quantity, amounting in some instances to ten or twelve per cent., and which necessarily varies according to situation, season, or former management; but in no instance has it been found less than from five to six per cent.

When applied to the fermentation of beer, this saving has constantly been between four and a half and five per cent., a quantity certainly inferior to that obtained from wine; but which will not appear unimportant when we consider this saving is a spirit congenial to the nature of the beer, and an essential oil necessary to its preservation; which, added to the peculiar mildness and superior flavour, will, we trust, leave no room for hesitation in the minds of the brewers. Still we must not quit this part of the subject without mentioning the principal objections which have hitherto been offered against a general adoption of the system, and application of the apparatus to the fermentation of beer; and although we feel convinced that at a period not far remote it will be considered an absurdity to propose any, since the process will speak for itself, yet some allowance must in all cases

be made for prejudice and early habits ; nor do we think it proper that any one, until convinced of their errors, should be urged to relinquish those plans they have been accustomed to consider right, or incur fresh expences without being fully convinced of the advantages to be derived from them. We are far then from being vexed at any objections which may be advanced against the system ; but anticipate with pleasure the refutation of them all, either by explanation or experiment.

The first objection raised against the system was in consequence of the whole process being performed in the same vessel, as fears were entertained of the beer being YEAST-BITTEN ; but the first experiment soon dispelled all doubts respecting that event, as the beer was tasted by at least fifty of the best judges in London, and pronounced not to be in the least affected by the yeast, which has been fully proved by every succeeding experiment : and if we examine that question more attentively, we shall find beer is never kept in any vessel, whether working-tun, cleansing-casks, or keeping-vats, without being in contact with yeast ; therefore, if it were to communicate any unpleasant or bitter taste by long contact, it would do the same equally on the old system as on the new. But yeast does not impart a bad flavour, unless it has contracted it by long exposure to the atmospheric air, which can never be the case with the apparatus, since as there

are NO DRAWINGS OFF, neither the yeast or beer come in contact with the atmosphere.

Another objection was, that the yeast, by so protracted a fermentation, must be spent and incapable of producing a second fermentation. If such were the case, brewers, by adopting the new system, would be left in a most awkward situation, since eight or ten days would be the longest period they could continue their operations. But Lavoisier, one of the most celebrated chemists, in an experiment he made on fermentation, found that only one seventy-second part of a pound of yeast had been destroyed in fermenting five hundred pounds of wort. Besides, experience teaches us that yeast does not lose its power by remaining long in the beer; for when a barrel of beer is moved, that has remained stationary six months or a year, a fresh fermentation takes place, and more particularly if the temperature is at a certain degree of heat: however, as the objection was made by one of the great brewers in London, who we considered ought to be well acquainted with the subject, we felt it incumbent on us to refute it by immediate experiment. The yeast made use of on that occasion proceeded from pale ale, fermented under the apparatus fifteen days, and was kept eight days; it had not, we confess, so quick an effect as the other yeast had, tried at the same time, which was only kept one day, and proceeded from

porter brewed according to the old plan, as the latter began to move about two hours after it was set, and the former did not act until ten hours later; but they both produced an equally good fermentation.

The brewer who attended this experiment, a man of great experience, attributed the slowness of its action to its proceeding from pale ale, and more particularly to having been kept so long; at the same time admitting, he never would himself use yeast of such an age. However, another experiment was made, in order to ascertain if that was the real cause; it was tried at Messrs. Gray and Dacre's brewery, and found to be perfectly correct; for yeast from table beer, which had been fermenting under the apparatus eight days, even after it was kept three days, produced a perfectly good fermentation.

Some brewers have objected to the length of time it requires to ferment in close vessels; but although the process appears to proceed slower in them than in open ones, yet the beer is brought much earlier to perfection; for with respect to strong beers, as porter or ale, we can with confidence assert they are as far attenuated, and as fit to drink, six weeks after they are brewed, as any fermented in the general way after three months.

With respect to table beer, we think it will require from fifteen to twenty days to bring it into perfect condition ; but we are informed the table beer brewers will exclaim against a three weeks' fermentation, since forty-eight hours is a sufficient time by the present mode, their object being a quick return : still we cannot persuade ourselves they are serious in their exclamations, knowing the impossibility of accomplishing any fermentation in that period.

The operations of nature are neither violent or precipitate, but gentle and slow ; if urged by too great a desire to obtain quick returns, imperfect and bad results will be produced, and they are to be obtained much more easily without than with the apparatus. We shall not attempt to justify it on that head ; the only observation we have to make is, that we do not consider a boiled solution of hops in unfermented wort constitutes beer ; the one produces drowsiness, and disorders the stomach, whilst the other, on the contrary, exhilarates the spirits, and promotes digestion. We are aware that individual caprice may raise objections, and contending interests create opposition ; still we anticipate what the public choice eventually will be.

Having so far endeavoured to point out the use and advantages of the new system to the brewers,

we shall venture to explain to the distillers and vinegar-makers the benefits they may derive from the same process.

The chief object of these manufacturers, during the vinous fermentation, is to arrive in the shortest time at as complete a decomposition of the saccharine matter and production of the alcohol as possible, since upon these depend the strength and quality of the product. The way to effect this is by HIGH FERMENTATIONS; but if there is access for atmospheric air when the wash is in that high state of dilatation, it will rush in and furnish the batch with fresh oxygen, and thereby accelerate one portion of the wash into the acid fermentation before the whole of the alcohol has had time to combine; so that distillers and vinegar-makers are obliged either to stop the process before it is complete, or to suffer a certain portion of alcohol to be destroyed by the commencement of the acid fermentation: in both of which cases their loss is unavoidable. The apparatus will not only prevent this, but condense a certain portion of spirit, as in every other case of the vinous fermentation.

We ought, perhaps, in deference to our readers, to stop here, having already engrossed too much of their attention; but in so doing, the British wine and cyder-makers might reproach us for having forgotten their interests; so far from that being

the case, we, on the contrary, cherish the hope of improving their manufacture so as to make it superior to many of the foreign wines; cyder and perry in particular, are capable of being greatly benefited by it, as an experiment which we have made upon the former, leaves us no room to doubt of the great advantages to be derived from the application of the apparatus.

Apples, and indeed almost every fruit, contain the principle of a very pungent acid, called the malic acid. This, when the oxygen of the atmospheric air is allowed to combine with it, produces a roughness, which is often so predominant in cyder as to cause it to be scarcely drinkable; but all access of the atmospheric air being precluded during its fermentation, cyder becomes a mild and pleasant beverage, which some persons have assured us they preferred to any of the best wines. The same, we have no doubt, will be the case with perry, which, when perfect, will bear as near a resemblance to champagne, as any two liquids produced from fruits so different in their external appearance can have; however, wine, in its most perfect state, is the criterion of all fermented liquors; every imitation is rated according as it more or less possesses the same properties. The characteristic qualities of wine are alcohol and flavour; the one may be obtained from any vegetable substance, containing sac-

charine matter and mucilage, and is the principle of strength and durability. We are not so well acquainted with the nature of the other, being of so volatile and subtle a disposition as to have hitherto baffled all analysis, and only to be detected by the most perfect sense of taste; and though some palates can discover its presence with tolerable accuracy, yet they are unequal to point out the means of increasing or improving it. We know some of the causes which occasion its escape, the principal of which is, heat; every additional mixture of good, for the purpose of improving a bad flavoured liquor, any adulteration or disease, will equally destroy it; and it lies concealed until fermentation is nearly completed, when it is developed, and manifests itself as a last and crowning perfection.

This circumstance may have given rise to the opinion, that the principle of flavour is resinous, since it becomes more prevalent as alcohol, (which is the best dissolvent of resin,) becomes more predominant; be this as it will, the apparatus may some day serve to ascertain the fact, since the spirit condensed by its means is strongly impregnated with that principle, and if resinous, may be easily separated by simply mixing it with pure water; when the spirit, by having a greater affinity for the water, will disengage itself from, and allow the resin to precipitate.

We shall conclude by observing that the most approved wine is not always produced from the best must, but frequently derives its superiority from fermentation and good management. In like manner will beer and other fermented liquors acquire their greatest perfection from the same source, which, for that reason, ought to claim and engross the attention of every brewer, or other person engaged in the manufacture of fermented liquors.

MESSRS. GRAY and DACRE, of Westham, in the county of Essex, brewers, certify, that having witnessed the results of an experiment made by Messieurs Deurbroucq and Nichols, under the sanction of His Majesty's letters patent, of an apparatus to improve the fermentation of beer; and considering justice had not been done to their process, on account of the great difficulties they were under in procuring wort and proper utensils to show the experiment fairly; offered to renew the same at their establishment: and on the twentieth of June, 1822, a gyle of porter was brewed and fermented, one half with the apparatus, and the other half on the old system; that which was fermented on the new principle, was shipped to a port in the Mediterranean, where it has created a great demand, and was considered by all who tasted it to be at least ten shillings a barrel better than that fermented on the old system. On the twenty-ninth of July following, a gyle of pale ale, likewise for exportation, was brewed and fermented

according to the new process, which turned out so well, not only by yielding the promised five per cent., but such a superiority of quality and flavour, that Messrs. Gray and Dacre were induced immediately to adopt the system, and are now, as far as the alterations to be made to their working-tuns will permit, fermenting on no other plan.

Messrs. Deurbroucq and Nichols, having testified their satisfaction at the zeal and management of their system by Messrs. Gray and Dacre, have appointed them agents for England; in consequence of which appointment, they beg to inform the brewers, they shall be happy to afford them every information in their power, relating to the new system, at their brewery, where the apparatus may be inspected every day between the hours of ten o'clock in the morning, and three in the afternoon; and in order to extend the use of the new patent apparatus, offer the following remarks and information, being the result of their observations and experience in the new process:—

Messrs. Deurbroucq and Nichols's improved system of fermentation is conducted in close vessels, of any form and size, but made perfectly air-tight; the preparation of the wort for this system in no way differs from the already well established mode, but merely in the management when in the working-tun.

On the heads of the working-tuns, are fixed one apparatus or several, according to their contents, similar to the annexed sketches, for the condensation of the alcoholic vapour and essential oil, and for the exclusion of the atmospheric air, but so constructed as to allow the fixed air, which is generated during fermentation, to escape.

The size of the working-tuns must be adapted as nearly as possible to the quantity brewed, and GRAVITY of the wort, as there will require from three to four feet space between the wort and the head of the working-tun, for the yeast to rise without entering the cone of the apparatus.

It will be necessary to have a succession of working-tuns, according to the strength of the beer to be fermented in them: table beer will require to remain about seven or eight days in the working-tun; porter from ten to twelve; and ale about fifteen, before they will be fit to draw off; when they may either be racked into small casks for immediate use, or into vats for further attenuation: upon the heads of which we should recommend a similar apparatus to be fixed, the utility of which is fully explained in the annexed pamphlet.

The process conducts itself, and the management of the apparatus may be taught in ten minutes; a licence for the use of which, for the term

of the patent, will be granted in the ratio of eight pounds for every hundred barrels of strong beer, and three pounds twelve shillings for every hundred barrels of table beer, brewed by the parties the year preceding, ending the fifth of July, being four per cent. upon the whole quantity so brewed; and they will be required to pay for their licences, agreeably to the stated terms, at the time of entering into their contracts to Messrs. Gray and Dacre.

The apparatus may be purchased at Messrs. James Shears and Sons, copper-smiths, Fleet Market; but any person, being licensed, will be at liberty to employ whom they please, by giving notice of their intention so to do, in order that the apparatus may be examined by the patentees or their agents.

The great advantages to be derived from this system are, excluding the atmospheric air, by which the acid principle, which beer absorbs from the air during fermentation, is prevented entering into combination with it, and thereby insuring the brewer the certainty of making as sound beer during the hot weather as in winter: also the essential oil of the hops and the spirit, which escapes on the old principle, are condensed and returned immediately into the beer, thereby preserving an uniform flavour at all times.

In addition to the preservation of flavour, strength, and soundness, and enabling the brewer to insure his beer, an increase of five per cent. is gained in the quantity, not only by condensing the alcoholic vapour, but by the yeast settling in a solid body at the bottom of the tun, so that the beer may be drawn off clear to the last, and the yeast will be left in good condition for PITCHING with; likewise the waste occasioned by the old system of cleansing will be prevented, and the beer will retain the fixed air in it according to the resistance placed at the end of the escape-pipe, and a considerable saving of labour attend it.

Upon the new system, the fermentation may be brought to a perfect state at any period, according to the degree of heat made use of for fermentation; for as long as there remain any particles of saccharine matter in solution undecomposed, so long will the beer continue to increase in strength, arising from the decomposition of these particles, and which can only be promoted by their dilatation with a high fermentation heat; but when the whole of the saccharine matter is decomposed, and as perfect a fermentation as possible obtained, attenuation will be complete, and the beer will precipitate perfectly bright, there being no longer any carbonic acid gas generated to stir up the grosser particles of the fermented matter.

Upon the old system of fermentation, beer can seldom be kept until it has attained a perfect state of attenuation; for as the decomposed particles of saccharine matter yield the basis of spirit, so also they yield the basis of acidity; and the beer having already absorbed too large a portion of that principle, an increase of attenuation is generally accompanied with a great increase of acidity.

The flavour of beer, on the old system, depends upon the fermentation-heat; as the greater the heat in the tun, the larger is the quantity of essential oil evaporated, with a consequent loss of flavour; therefore to insure a good flavour, a low fermentation is necessary, and the lower the fermentation, the longer the saccharine matter is before it decomposes; whereas, on the new system, the whole flavour and strength are preserved, and any degree of heat may be employed to accelerate the fermentation, and bring the beer to an early attenuation.

MR. GRAY avails himself of this opportunity to inform the brewers, that in consequence of him and his partner being appointed to act as sole agents for England, and after fermenting two brewings upon the improved system, he immediately went to France to gather further information respecting this new process, which he soon learnt had claimed the attention of all the best chemists and most enlightened men in that country, where a company had been formed, consisting of—

The **DUC OF BELLUNE**, Minister of War, .
COUNT CHAPTAL,
VISCOUNT CHAPTAL,
COUNT DULLAU DALLEMANS,
COUNT DE BRISSAC,
MONS. FROIDFOND DE BELLISLE,
MONS. GASTON DEURBROUCQ,
MONS. BODIN, Senr. } Bankers,
MONS. BODIN, Junr. }
MONS. COMYNET,
MONS. LOISELET, &c.,

who purchased **Madame Gervais**' patent, in order to propagate the utility of her discovery ; and that those gentlemen composing the society were all thought to be well acquainted with practical

chemistry, [but most particularly Count Chaptal, whose philosophical elucidations furnished, in a great measure, the committee of the English House of Commons with the necessary information on vegetating barley during the process of malting, investigated about sixteen years ago.

Mr. Gray also found the improved principle of fermentation had been successfully practised at one of the most respectable breweries in Paris, belonging to [Mons. Chappellet, a very intelligent, communicative man, void of cunning and secret notions, who kindly invited him and a large party to come and taste the beer, having his chemist present, so that every different process might be fully and properly explained, which had been applied in fermenting each vat of beer then tapped and tasted : it was all about six months old, and judged of as follows :

ANSWERS.

- 1st. That which was fermented and cleansed upon the usual plan, *Middling.*
- 2nd. That which was fermented upon the improved plan, and cleansed upon the usual plan within an hour after the ceasing of the bubbling, . . . *Better.*
- 3d. That which was fermented and cleansed wholly upon the improved plan, *by far the Best.*

At an interview with the British Ambassador, his Excellency was pleased to express himself a great admirer of Madame Gervais' new system of fermentation, and earnestly hoped his own country would not remain long without being benefited by so valuable a discovery.

Mr. Gray is happy in saying he returned entirely satisfied with the real utility of the invention, and feeling convinced by his own practical knowledge that it is the only method yet known by which wort can possibly be properly decomposed and good and sound beer ever produced; he therefore, with the assistance of his partner, hastened to convert all the store vats suitable for the adoption of the process, by placing an apparatus upon each, which is intended also to be done to all the squares.

The above alterations have been executed by the workmen of Mr. Robert Back, Compton-street, Clerkenwell, London, who have in one instance completely altered a working-tun in two days; but round vessels take longer than square ones.

Mr. Gray wishes further to observe, that the bottled-beer merchants will experience great savings, both in the soundness of the new beer, and in its having a much less tendency to break the bottles, although a greater quantity of pure fixed air is preserved in it.

The publican will also find this beer afford him more profit by being retailed, than any he has been accustomed to sell; for it has no, or hardly any, sediment at the bottom of the casks.

Beer which has been fermented in the usual manner often leaves two or three distinct tastes upon the palate, discernible by connoisseurs, which is never the case with that fermented upon the improved plan.

As a further consequence which may arise from the adoption of this system of fermentation, a reasonable ground of expectation may be indulged, that in a few years this country will be enabled to produce spirituous liquors not inferior to the best productions of foreign climates.

THE END.