as it is easily conceived, it is sufficient to mention that each of the eggs is held in a frame, in which cavities are formed almost round to sustain them, so that the weight of the liquor shall not strain the frame. This frame work is supported at one side by the furnace, and at the other by the masonry which sustains the upper keeve. Only three eggs are represented here, but eight, ten, or as many as are thought proper may be added. The greater the number of the egg-shaped vessels used, the more complete will be the rectification.

The still communicates with the first egg by the tube I, which rises from the middle of the upper part of the head, and passes downward to the bottom of the egg, where it is enlarged into the form of the head of a watering-pot, pierced beneath with a number of small holes.

This tube is soldered to the egg, at the place where it enters this vessel, in order that the vapours may find no passage but that through which it is desired to direct them.

The first egg communicates with the second, and that with the third, and so on in succession, by the tube M which is soldered to the first egg at the point K, and proceeds from thence down to the bottom of the next, where it is enlarged into the form of a watering-pot head similar to the first pipe.

The last egg has a refrigerator N attached to it, by
means of which the upper part of the egg, in which the vapours collect, is surrounded by water to commence the condensation. This refrigerant is furnished with a cock \( O \), to draw off the water which it contains when it becomes too hot. When condensers are used, they are all furnished with refrigerators like this, or their lower parts are plunged into one common keeve full of water. This keeve is made of strong planks of beech, and has the form of a parallelopipedon.

The tube \( R \) serves to form a communication between the second egg and the worm, when only two eggs are used, which are sufficient to obtain brandy of 18 degrees. Then the cock of the tube \( M \) is stopped, which forms the communication between the second egg and the third, and the cock \( R \) is opened to establish a communication with the worm.

The tube \( S \) serves to form the communication of the third egg with the worm. When three eggs are used, then the cocks \( M \) and \( S \) are opened, and the cock \( R \) is closed.

The same is observed when a greater number of eggs is used; each has a tube of communication with the worm, and all these tubes are soldered to the spherical vessel \( T \), into which the vapours pass from some of the eggs, and proceed from thence to the worm contained in the keeve \( U \).
Of Steam Stills.

U is a keeve closely covered, which contains the first worm. It is filled with wine, which becomes warm by the passage of the vapours, which come over very hot from the first egg. It is likewise surmounted with a dome a, from whence departs a tube of communication b, which transports the alcoholic vapours, which escape from this keeve, either into the vessel T, into one of the eggs, or into the still, to pass from thence along with the other vapours into the worm. This small tube of communication is not represented here to prevent confusion in the figure, but it is easily conceived.

V is a great keeve below the first one, in which is enclosed the second worm, which is much larger than the first; it is full of water, which enters it cold through a pipe at the bottom of the keeve, while the hot water passes off above, and runs away beneath the distillery by the pipe e placed outside along the keeve, and supported by the three iron arms d d d.

It was not thought necessary to represent here the stone cistern, which serves as a reservoir to deposit the wine intended for distillation, and which a man raises into the keeve U by a forcing pump, through the conducting pipe f f f, which discharges it near the bottom of the keeve U, for the same reason stated in regard to the water which fills the keeve V.

g g g, a tube of communication between the keeve, the still, and the eggs.
h, i, k, cocks to establish, or close the communication of the eggs with the conducting tube g.

l, m, n, cocks to open, or close the communication of each egg, either with the still in order to empty them, or with the condensing keeve U to charge them.

o o o o, tubes into which the brandy is poured; which is passed into them by the tunnel p, when the eggs or the still are to be charged. It is soldered to the tube g, into which it passes, and it is fastened to the apparatus by two arms, one of which is nailed to the frame work P Q, and the other is attached to the first egg.

About the middle of each egg, a small projecting tube L is placed, of the thickness of the little finger, which remains open all the time the egg is charging, and which serves to indicate when the egg is sufficiently filled. As soon as the liquor runs out by this orifice, it is closely stopped with a cork; than which probably a cock would be better.
CHAPTER VII.

Of the construction of Furnaces, or manner of setting up Stills.

THIS is an important part of the distillery business, to which sufficient attention is seldom given. Stills or boilers for different purposes, are erected in all parts of the country; fuel is generally cheap, and good workmen are rare; little or no skill is thought to be requisite in setting a still; if it can only be done in such a way as that it can be made to boil, the quantity of fuel is not regarded; hence few people have thought it necessary to consider the principles by which they should be guided. Independently however of the price of fuel, which is becoming in many places a matter of importance, it is necessary that the furnace be so contrived that the distiller shall at all times have perfect command of the fire, to increase or abate the heat when he thinks proper. But the increasing price of fuel renders it very worthy of attention.

Count Rumford has stated, that in general, not less than seven-eighths of the heat generated, or which with proper management might be generated, from the fuel actually consumed, is carried off into the atmosphere and totally lost!
One of the most common defects is, that of having the fire place two large; in consequence of which the bars are not entirely covered with fuel, and the cold air rushing in between the uncovered bars, counteract in a great measure the effect of part of the burning fuel. Hence, it should be a general rule to have a fire place no larger than is actually necessary to contain the fuel requisite to produce the desired effect.

The fire place should not only be small, but so constructed if possible, that the whole of the bottom of the still be exposed to action of the fire, so that the flame and heated air impinge upon the bottom before they reach the sides of the still in their passage to the chimney; for the heat which is applied to the bottom of a still or boiler, will be infinitely more effective than the same portion of heat when applied to the sides; hence the advantage of a concave, instead of a convex surface, being exposed to the action of fire.

That the chimney be furnished with an iron plate or damper, placed horizontally, by which the diameter of the chimney can be diminished at the distiller's pleasure, so as to moderate the action of the fire, or even stifle it at once, by shutting the openings of the fire place, and the passage of the air or smoke into the chimney.

The doors* of closed fire places are generally im-

* For a still of 500 gallons, I found it necessary to have at the top and bottom of the door way, castings two inches thick, about 36 inches
properly made. They are usually made of the sheet iron, and very soon warp and become twisted, and never shut close. The mouth of the furnace should be guarded by good iron castings, with a cast iron door to fit very exactly; if the frame be set so as to incline a little inward, it will be better, as the door will not require a latch to keep it closed.

A good workman should always be employed, if possible; good materials are also requisite. Fire bricks should be used wherever the immediate action of the fire can be felt, and the advantage of using good bricks in the outer part of the structure is, that if it be necessary to take it down the same bricks can be used again.

The mortar which is exposed to the action of the fire, should have a very small portion of lime in it. Parkes, the celebrated chemist, advises as a cement in these cases the following mixture; good clay two parts, sharp washed sand eight parts, horse dung one part. These materials are to be intimately mixed, then beaten up with a little water, and afterwards the whole is to be thoroughly tempered like mortar, by treading it for a considerable time with the feet. This is mentioned as a suitable lute for an intense fire, and

long and 14 inches wide; these were supported in front by uprights half an inch in thickness, ten inches long and five inches wide, let into the top and bottom plates about half an inch; long thick straps of wrought iron were rivetted across the door to prevent it from warping.
therefore may be useful in other furnaces than under stools. *

With a due attention to these rules, the following is recommended as a good.

Plan for setting up a Still.

Commence the foundation sufficiently large for the circular flue round the still; build it twelve inches high, leaving in the centre an opening of fourteen inches in width, for the ash hole; then lay on cast iron pigs, so as to admit a sufficient current of air; though not of the passage of large coals; the sides of the furnaee are now built up to the height of twelve inches, leaving two small flues at the back part of the furnaee, two on one side and one on the other side, nearly central; the still is then set on with a good foundation of cast and clay, the flues being separated by a brick wall at the back of the furnaee, are now carried round, the one to the right and the other to the left, until they meet in front, where they are prevented from uniting by another brick wall, this flue being half the height of the still, is now covered in, except four holes in front of four inches square, through which the flame and smoke, &c. ascend to the second flue, by which it is carried.

* A little attention to the cement used in erecting stills, will enable the operator, in many instances to procure such a mixture of sand and clay as will become perfectly hard in a short time, from the influence of the fire.
round to the chimney, the whole to be covered in when at the height of the rivets, and well plaistered.

By this means the flame or heat is carried twice round the still.

The gratings are more particularly recommended for the wash still, the boiler and doubling still may be put up without.
CHAPTER VIII.

Of Hogsheads,* or vessels for Mashing.

THE very erroneous opinion, that casks made of any kind of wood are suitable for mashing, is generally entertained, and there are even some distillers who have adopted it. I would observe, however, as well from reason as experience, that casks made of pine,

* Hogsheads, are mentioned here, as being most generally used. Some distillers in a large way make use of casks or large tubs of four hundred gallons each; these however are to be objected to on account of the inconvenience of moving them, the difficulty of scalding them perfectly, or turning them out in the fresh air, and the almost impossibility of mashing perfectly in them. It is asserted in their favour, that the greater the quantity of liquid the better the fermentation will be; this may be true in the winter season, but I rather think, that in the summer, so large a body once set to fermenting, unless cooled lower than can be done without the use of ice, which is injurious to fermentation, would proceed too rapidly for a complete vinous fermentation. I have known them tried and given up as unprofitable. Next to hogsheads, casks of 220 gallons, or sufficient to mash three bushels of grain, appear to me best, but I would not advise casks larger than this. I am of the opinion that vats,† merely for fermenting in, might be advantageously contrived, the mashing to be done as usual in hogsheads, and after cooling off to be let down into the vats. This however could only be of consequence in very large establishments. By being placed under ground, the fermentation would not be so much affected by the weather, as is the case at present.

† It appears by the publication of Mr. Wyatt, that vats for fermenting in were used in England some years ago. These, with the mashing machine mentioned in the following chapter, fully meet my idea in the preceding note.
Of Hogsheads.

Poplar, or any other soft porous wood, become so completely saturated with acid in warm weather, that it is almost impossible to sweeten them.

White oak therefore is recommended as the most suitable for making hogsheads, and the distiller commencing his operations, will find it considerably to his advantage to have casks made for the purpose; he will then have it in his power to have them perfectly smooth inside and outside, so that not a crevice shall remain to secrete any of the acid particles, at the time of scalding. They should be well hooped with iron, and made particularly strong about the chime. If however he finds it more convenient, or should be obliged to purchase casks, he must be very careful to have them well burnt or shaved inside, so that not a blister remain, for if any of these blisters should remain on the inside of the cask, a portion of the contents will insinuate itself under the blister, become acid or putrid, and cause the succeeding mash to run rapidly into the acetous or putrefactive, instead of the vinous fermentation; the produce will consequently be decreased, the quality of the spirit vitiated, and the cause will be looked for in vain.

Of washing Hogsheads.

As soon as the fermented wash is taken out of the hogsheads, they should be washed out with cold water, the scum which has settled around the surface of the
wash, carefully scraped off, and the hogshead turned out in the open air, when the number necessary for daily use, are thus washed, and boiling water ready, (or the water left in the doubling still may be used for the purpose) put into each hogshead three or four buckets of boiling water, and a shovel full of hot ashes, wash them round a few times, cover them close, and let them stand about twenty minutes, then wash them out clean, and let them remain out of doors all night. The exposure to the open air evaporates any remaining acid and prevents mustiness.

This is a daily operation, and a very important one, on which in a great measure depends the goodness of the fermentations, and consequently the quantity of spirit produced. The importance of cleanliness, and the necessity of it in every thing connected with the operation of mashing, cannot be too strongly enforced; on it depends every thing; in fact no cask should be used for mashing that is not perfectly sweet, and free from the least remaining acidity.

To this point the owner or superintendent of the distillery should direct his attention every day, it is the most laborious and disagreeable operation in the business of the house, and therefore most apt to be carelessly performed by negligent hands. Milk of lime or white wash is also very effectual in neutralizing acidity and destroying must.
An additional Purifier for Hogsheads.

During the summer months the above method will not be found sufficient, of itself, to keep the hogsheads perfectly sweet; it will therefore be necessary to burn them with straw; for this purpose then, a quantity of oat straw, must be provided after the hogsheads are cleaned as above directed; a large handful of straw is to be put in each, set it on fire, and then turn the hogshead over on its mouth, taking care to let in just enough air to keep the fire alive, until the straw is entirely consumed. This will render the hogsheads perfectly sweet, and if repeated every time they are used, and a proper care paid to cleanliness in the other parts of the process, it will be found to improve, not only the quantity but the quality of the spirit.

If oat straw cannot be obtained, rye or wheat straw may be used, but the former is far preferable, as may be seen by making the experiment.
CHAPTER IX.

Of a Mashing Machine.

Various attempts have been made in England to perfect a machine for the purpose of saving manual labour in mashing grain, both for the brewery and distillery; none however appear to be successful.

A very complete one was in operation in the distillery of Mr. A. Anderson in Philadelphia, a short time since; it was worked by horse power, and the mashing at all times appeared to me to be very completely effected.

The following letter respecting a steam mashing machine, invented by Mr. Beatty, needs no comment. It is from a respectable house in New York, and the writers appear to have given it a sufficient trial to ascertain the facts stated by them.

In Mr. Anderson's distillery the mash was cooled off in the mashing tub and then let down into large fermenting tubs placed in the cellar.

New York, July 1.

"Dear Sir,

"In justice to you we conceive it our duty to state our complete conviction of the vast utility of your patent steam mashing machine, which we have now had in operation for six months, a period embracing all the possible contingencies which may naturally be expected to occur in the process of mashing; judging from this, and having had an opportunity of making
trial of the usual mode of mashing here as well as seeing the most improved mashing machines in Great Britain and Ireland, we have no hesitation in declaring that it is the best mode hitherto invented for producing the greatest possible extract from grain, independently of the reduction of expense necessarily resulting from it.—With regard to the former we are quite safe in stating, from minute observations, that the extract is greater by one and a half to two quarts per bushel than that produced by manual labour: and with regard to the latter, the reduction of expense arising from men's wages alone is a consideration of great weight indeed, as will manifestly appear when we mention that, previous to the erection of the machine, we were necessitated to employ three men for the operation of mashing, now we only require one. There is a great saving of fuel attending it: the same boiler which generates steam for the stills, serving also, by means of a stop cock and steam pipe for the mash tub. As the mashing requires only the steam for about two and a half hours, it is evident the consumption of wood cannot be so great during that time as to heat a separate boiler. Upon the whole, we are decidedly of opinion that the machine will completely answer the purpose either for distillers or brewers, to whom we shall be at all times ready to give every information in our power. Wishing you therefore, all success, we remain, dear sir, your most obedient servants,

MILLER, FALCONER & Co.
Distillers, 37 Fourth-street, New York.

Mr. Leonard Beatty.
CHAPTER X.

The various Technical Terms used in the distillery, explained in a short account of the daily work of the house.

The first operation preparatory to mashing is to charge (or fill) the boiler and bring the water to a boil; then set the hogsheads—(put them in their proper places) a certain quantity of meal and water are now to be put in and mixed by means of the masher or mashing oar; this is made of iron bars, crossed like a gridiron, its shape round about ten inches in diameter, with a handle about five feet long; this is called soaking the corn; a quantity of boiling water is then to be added and stirred well, this is scalding the corn; then add the rye, and stir it well, that is mash in the rye.

The whole mixture is now called the mash, after it has stood some time it is cooled off; which is done by the addition of quantity of cold water,* then yeast the hogsheads, or put in the yeast. This is the operation of mashing. The liquid is now ready to work or ferment; and in this state as indeed in every part of the operation after scalding, it is called stuff.

During the fermentation it is called stuff or beer, when the fermentation is over it is said to be ripe, or fit to put into the still; it is now bailed out, (i.e.) lifted up in buckets, and poured into troughs communicating with the

* See directions for mashing.
stand cask, a hogshod in which the pump stands, to pump up the wash (as it is now called) into the condenser or condensing tub; the tub full, constitutes a charge, or sufficient quantity to put into the still; you then charge the still, put a fire under it, and keep constantly stirring until it boils; the still, is then to be pasted, the joints to be stopped with paste to prevent it from blowing—the evaporation of the steam. As soon as the still boils, she is said to have come round; the liquor coming from the worm is called singlings, and according to the quantity, the still is said to run too slow or too fast; if the latter, there is danger of her running foul, that is the wash running out of the worm; to prevent this, damp or put out the fire, by means of a damper, a piece of sheet iron fixed in the chimney to stop the flue. When the singlings will no longer burn, (to be tried by throwing a little on the still head and applying a lighted candle, or any flame,) the still is then run off, and must be discharged—the contents let out into a cistern out of doors, when it is now termed swill or pot ale. The top or thin part of this after settling, is pumped up into another cistern and called returns, the still is then to be charged and run as before. The singlings are now put into the doubling still, the first running of which is termed first shot, and must be thrown again into the singlings; you then run spirit until the proof is off; this is, when no bubbles remain in the bucket or receiver on the top of the liquor, the remainder is run as long as it will burn, and is called feints, and must be run over again in the next doubling.
CHAPTER XI.

Of Yeast.

THAT yeast is a necessary ingredient in commencing the process of fermentation, and of primary importance in the production of spirit from grain, affecting as well the quality as quantity, is acknowledged by all distillers both practical and theoretical, though its nature and the cause and manner of its operation, are imperfectly understood. Yet there are men, pretending to great knowledge on this subject, who will describe the various appearances which take place in fermentation, and attempt to account for them by the different kinds of yeast, and different proportions; the manner of making and of using which, is an important secret, known only to themselves, there is a particular drug or root, which only they know where to procure, or an abracadabra made use of in mixing the ingredients. By these means imposing upon the credulity of some and upon the purses of others desirous of obtaining information on the subject; retailing their secret, which many have the art of doing without detection.

Such men are not to be believed, and he who has listened with astonishment to the wonderful display of their knowledge, will be astonished at himself when he
comes to know, that the grand secret in the art of having good yeast is cleanliness! let a man make yeast according to the most approved receipts, in a dirty vessel, and he will find the produce of fermentation resulting from such yeast, far short of what it ought to be.

The importance of cleanliness in this operation cannot be too strongly enforced, nothing acid should be allowed to get into fresh yeast; and to render this easy the distiller should be provided with three small glazed earthen or tin vessels, of two or three gallons each, besides a wooden one for daily use of six or eight gallons, and two yeast sticks; with these he may proceed to make yeast by either of the following receipts, for the number of which an apology might be necessary, but that I wish to give a variety of methods, and because, notwithstanding each may occasionally prove the best, each may sometimes fail, and all together cannot give too much information on this important branch of the business of the distillery.

It is proper to observe that the attainment of a good stock of yeast is not so difficult as to preserve it sweet for daily use; it is therefore in the making of daily yeast that particular care is necessary; and although "feeling with a clean finger," is mentioned as a criterion to judge of heat in one of the following receipts, I would caution the distiller against putting even a finger into yeast, much less the whole hand as is sometimes done. For it frequently happens that the man who is attending the stills will put his hands covered with sour
wash, into the yeast. The certain consequence of which is, to sour the yeast and spoil the fermentation.

The disadvantages of sour yeast are incalculable and there is no doubt but it alone may cause a decrease in the produce of four or five quarts per bushel; even when the mashing is well done.

In summer there will be frequently aceticous tendency, scarcely perceptible however, which must be regulated by the plentiful use of hops.

The same stock continued long in one distillery will degenerate. Hence frequent renewals are necessary, and a charge with a distant distiller will be of advantage.

1. Of Stock Yeast.

(From McHarry's distiller.)

Of the following receipt the author observes, "that it will be assuredly found to contain the essence and spirit of the ways and art of making that composition, a knowledge of which I have acquired, by purchases, by consultations with the most eminent brewers, bakers and distillers in the commonwealth, and above all from a long practice and experience, proving its utility and superior merits to my most perfect satisfaction; and which I with pleasure offer to my fellow
citizens, as meriting a preference notwithstanding the proud and scientific chymist, and flowery declarations or treatises of the profound theorist, may disapprove this simple mode, and offer those which they presume to be better, though they never soiled a finger in making a practical experiment, or perhaps witnessed a process of any description."

**Receipt for Stock Yeast.**

For a stock yeast vessel of two gallons, the size best adapted for that purpose.

Take one gallon of good barley malt, of good quality, put it into a clean, well scalded vessel, (which take care shall be perfectly sweet) pour thereon four gallons scalding water, (be careful your water be clean) stir the malt and water with a well scalded stick, until thoroughly mixed together, then cover the vessel close with a clean cloth, for half an hour; then uncover it and set it in some convenient place to settle, after three or four hours, or when you are sure the sediment of the malt is settled to the bottom, then pour off the top or thin part that remains on the top, into a clean well scoured iron pot (be careful not to disturb the thick sediment in the bottom, and that none goes into the pot,) then add four ounces good hops, and cover the pot close with a clean scalded iron cover, and set it on a hot fire of coals to boil, boil it down one third, or rather more, then strain all that is in the pot through a thin hair sieve