to wit: dirty mashing hogsheds, bad yeast, dirty stills and worms, and reducing with feints. That the flavour above alluded to is not the natural flavour of grain spirits, is abundantly proved by the superior taste of specimens of well distilled whiskey, which we occasionally meet with. Let those who doubt, or wish to be satisfied, try the following experiment, at a season of the year when they may calculate upon good and regular fermentation.

Prepare a sufficient quantity of perfectly sound grain, let the hogsheds be completely scalded, and if necessary, scraped; and just before using, well burnt or fumigated with oats straw; every thing used in the operation, to be perfectly clean; the yeast to be sweet and well hopped; then proceed to mashing in the usual way, taking care to keep every thing acid from the hogsheds. The mash, and (during the fermentation,) the wash, will be strongly impregnated by the hogshed, with the flavour of the fumigation; and the spirit, if distilled in a clean still, &c. will be perfectly free from the nauseous flavour so much complained of, and partake slightly of that of the cask, provided no feints are mixed with it.

The collection of verdigris in the worm, should be carefully guarded against, to do this, the worm should occasionally be filled with hot swill, and remain so for some time, after which it should be washed with cold water; this should always be done, when the still is stopped for any time exceeding twelve hours.
Miscellaneous Observations.

If the globe of a patent still be not frequently cleansed there will be found adhering to it an oily substance, which may be properly termed the concrete oil of rye and corn.

This certainly dissolves the copper, as may be seen by rubbing it with the finger, and is one great cause of the impurity of gin and whiskey. If suffered to collect for about three weeks, it will then be found coming through the worm with the singlings, and though not at all times perceptible, will be very evident if the singlings be run through a flannel strainer, a precaution very necessary to obtain good spirit. Even where the utmost attention is paid to cleanliness, a fine flannel strainer will separate and retain a portion of the essential oil. Clean tow will answer the same purpose.

It is not uncommon to hear distillers talk of letting their casks sour, instead of ferment; and indeed not to distil them, until they are sour, which however is the case very soon after the fermentation subsides; and is a sure evidence that something is wrong in the process, vessels, or materials. Such casks never yield much spirit. One of the causes is bad mashing. A sufficient quantity of saccharine matter, not being extracted in proportion to the water used, the wort is not sufficiently strong to keep up a regular vinous fermentation throughout, and the acetous takes place too soon. But where a regular and perfect vinous fermentation takes place, little or no acidity is perceptible, nor will it appear for several days, except in very warm weather.
Miscellaneous Observations.

The thermometer and hydrometer should always be at hand, and frequently resorted to.

No certainty can be attained without a notation of circumstances that alter the product occasionally, and this cannot be correctly made without reference to these instruments.

How frequently is a distiller prevented from making an experiment, or a slight alteration in his usual process, because he has no mode of ascertaining the product of a particular cask. And how often does he wish to know the produce of some one cask, and can only do it by guessing? It is true, he may measure precisely the quantity of singlings, but of their strength, he cannot judge. He cannot compare one with another, for a cask which yields twenty gallons of singlings will yield probably double as much spirit as is produced by only 13 or 14 gallons from another cask. This will be accurately shewn by the hydrometer. The produce of every doubling may also be ascertained before it is run.

The satisfaction arising from this is great, and still greater must it be, to have a correct account of his experiments or daily work, to which he may at any time refer.

The importance of these things will be made more evident from the following circumstance, which took place in my distillery.
In the spring of the year 1808, I had occasion to change my distiller, in consequence of which, a thorough cleansing took place of every thing in the house, the casks were burnt with straw, and fresh yeast made. Having other business to attend to, occasionally, I did not pay particular attention to the mashing, but I observed the fermentation to be very good. In four days were mashed, according to the directions in the twelfth chapter of this work, twenty hogsheads, containing twenty bushels of corn, ten bushels of rye, and between three and four of malt. The produce was one hundred and fifteen gallons of strong gin, above proof, which sold in Baltimore for one dollar a gallon.

Had a thermometer been used, and a due degree of attention paid to every part of the process, I would probably have discovered to what circumstance this increase was owing. To common observation, there was no perceptible departure from the usual mode of mashing, daily pursued. But I have not been able since to obtain a similar produce. Accurately estimated, it would have probably been equal to four gallons to the bushel, of such proof as is usually sold in Philadelphia.

In making gin or whiskey ready for market, the hydrometer is useful. Indeed, to the distiller whose whiskey or gin may be subjected to inspection, it is indispensable, and he will find that the advantage derived from its use will soon repay the expense and trouble.
Miscellaneous Observation.

The casks in which the gin or whiskey is put, also deserve attention, for it will sometimes be found that when, after great care and attention a spirit is made, which is of fine flavour, after standing a few weeks it is quite altered, and becomes disagreeable; this must be from the cask, and shews the necessity of preventing a similar accident in future.

It is said that Holland gin never tastes of the cask, and, that something is put into the cask to prevent it from imparting any colour to the gin; and this is also a secret! Let us examine the fact. It is well known that oak wood contains a colouring matter and what is called an acrid principle; the former of which gives colour, the latter taste, but both of these can be extracted, or evaporated by seasoning; consequently if staves are sufficiently seasoned, before they are made up, the cask cannot give either colour or taste to any thing which may be put into it. But it is too frequently the case in our country, that half seasoned wood is used, and the consequence must inevitably be, that when the casks are filled with spirit, it gradually extracts the colouring matter and acrid principle, and the latter injures the flavour of the spirit. Hence the necessity of making new casks of perfectly seasoned staves, as they do in Holland. As the casks always partakes of the flavour of the spirit put into it, this must be attended to in using casks of second hand; therefore, gin should not be put into wine or brandy pipes, or rum puncheons, as well on account of flavour, as of the colour which it will certainly re-
Of Accidents which may occur in distillation.

It may not be improper here to observe that accidents sometimes occur, the least consequence of which is the failure of the operation and the loss of the ingredients, or charge in the still.

In a grain distillery and with a patent still, the stirrers sometimes get out of order, which may be easily discovered by the difference in turning, or cessation of the noise made by the chains; if this is not noticed in time, the wash adheres to the bottom of the still and burns; a strong disagreeable smell now becomes very evident and the bottom of the still where burnt, appears perfectly white outside. Whenever this is discovered, the fire should be put out, the still discharged and filled with cold water; when sufficiently cool the still must be examined, and a black crust will be found sticking to the still; this must be carefully scraped off, and the still rubbed until perfectly bright; if this precaution is not used, a hole will be made in the still in a few hours.
Miscellaneous Observations.

If the fire be too violent, particularly when the still first comes round, the wash rises into the head, runs foul and sometimes chokes the worm. This is to be avoided by careful attention to the fire, at all times and by damping when too great. If this is not done in time the head will burst, as it cannot fly off; the consequence of which would be terrible to any one unfortunately within reach of the wash.

But it is from the doubling still that the greatest danger is to be apprehended, as the spirits may take fire, and if a remedy be not applied in time, burn down the distillery.

These accidents are only to be prevented by constant care and attention, and where they occur, great presence of mind, and caution, are necessary to ascertain the cause, and manner of prevention, and so to apply a remedy that the life of the distiller may not be endangered; a wet sheet to throw over the doubling still, would always be proper.
PART II.

HAVING in the preceding pages given such directions as appeared necessary for the establishment of a grain distillery, and for conducting all the operations thereof, we now proceed to the consideration of the cider distillery and notice of some articles of the growth of the United States, which may be converted into spirit; a notice of the process of rectification necessary to the production of alcohol from grain and cider spirit, and to prepare a pure and neutral spirit for compound waters or the operations of the cordial distillery. Upon each of these subjects we shall offer such remarks as occur, when they come under consideration.

For the insertion of the other articles which will be found added, we shall offer no other apology than the general connection of some of them with the distilling business, and the evident advantage which must result to the distiller from a knowledge of the method of making all kinds of beverage.
CHAPTER I.

Of the situation for a Cider Distillery.

THE situation for a common cider distillery, is not difficult to be fixed on; nothing further is necessary than a sufficient quantity and fall of water for the worm tub. If, however, an extensive establishment is contemplated, care should be taken to get into a good cider country; and in fixing the works, there will be great advantage in having the press in a situation so elevated that the cider should run from it to the fermenting vats, and from them, if possible, into the stills.

The vats should be undergrounds, and of size sufficient to hold one day's pressing each; two days' pressing should not be put together.

Hogsheads will be found very troublesome and expensive for a large cider distillery.
CHAPTER II.

Of the various products of the United States which afford ardent spirits, by distillation.

THE United States abound in fruits, roots, and vegetables, which will yield spirit upon distillation; an enumeration of these, however, with the various methods of treating them to the best advantage, would be as tedious as unnecessary.

For whilst our farmers raise such superabundant quantities of grain, and orchards continue to be cultivated, few other subjects will be worthy of the attention of the distiller, excepting merely for the gratification of his curiosity, or of his pride in displaying a variety of liquors.

To such as are actuated by these motives, we trust, that the remarks and directions contained in the work, will afford a sufficient clue to guide them in any experiment, they may wish to undertake; similar substances requiring similar modes of treatment.

I shall content myself with noticing such as appear generally useful.
Of Apple Brandy, or Cider Spirits.

The great quantities of apples raised in different parts of the United States, which cannot be disposed of in any other way, render them an object to the distiller. In many places, farmers are provided with stills merely for the distillation of their own fruit, and that of a few neighbours.

In the state of New Jersey, it has become so great an object, that large works are erected for the purpose, with stills of upwards of 1000 gallons.

The custom generally at those works is, for the farmer to carry his apples to the distillery, where he receives one gallon of brandy for every five bushels. The apples after being assorted, so as to work the ripest first, are then ground, either in the common way, with nuts, or in a mill, constructed similar to the tanner's bark mill; after which it is pressed in a large powerful screw press, as long as any juice can be obtained. The cider is then put into large cisterns, or vats, prepared for the purpose; where it undergoes a fermentation, and is fit for the still, in from six to twelve days, according to the weather. Some distillers preserve the pomage after pressing, put it into casks, and cover it with water, until it undergoes a fermentation, when it is again pressed out, and the cider distilled. This however requires so much work
and so many casks, that in a busy season it is not worth attending to. Throughout Lancaster county, and indeed in many other places, it is customary, after grinding the apples to throw them into casks, where they undergo a fermentation, after which the whole mass is committed to the still. This is very subject to empy, reuma and the spirit obtained is of a very inferior quality; though it is said a greater quantity can be obtained in this than in any other way. From the tediousness of the operation, I am inclined to think it will be eventually found the least profitable, if an experiment were fairly and properly made. To judge of the progress of the fermentation, run a stick down in the centre of the cask; if upon drawing it out it is accompanied with a bubbling hissing noise, the fermentation is not over, but if no such noise is observable, it is then fit for the still. One of the great advantages stated in favour of steam stills is the distillation of pome, by which a considerably greater quantity of spirits may be obtained.

To those who are desirous of following this plan, I would advise, as the best method of avoiding an empyreuma, the filling the still one third, or one half with water, which must be made to boil before putting in the pome.

This is properly termed apple brandy, and the former, cider spirits; a distinction, which it is to be regretted is not more generally made, as it would give to cider spirits its just value in the public opinion. The
two kinds however are too generally blended together at market, under the name of apple whiskey.

Of Peaches.

This fruit, which is equal if not superior in point of flavour to any in the world, grows abundantly in different parts of the United States, and yields upon distillation a spirit of remarkably fine flavour, principally valued, for the purpose of forming agreeable mixtures.

The method of treating peaches and apples are similar. By some, the fruit is thrown into a large trough, where it is pounded with large pestles until completely mashed; it is then pressed out, and a hogshead of pure peach juice obtained in this way, will yield from ten to twelve gallons of the best brandy; as the pomage cannot be completely pressed, it is then thrown into casks, diluted with water, and after sufficient fermentation again pressed, and immediately distilled.

Another method, and the best, where a large quantity of peaches are to be distilled, is to grind them with iron nuts; which by mashing the stone and kernel, is said to impart an agreeable bitter to the spirit; in this state it is fermented, and with the addition of a small quantity of water committed to the still. Others press it after the manner of pressing apples, which is preferable.
Of Cherries.

Cherries may be treated in the same way as peaches and yield an agreeable spirit; the better method, however is to make what is called cherry-bounce or cherry-brandy, as follows: Fill a cask with cherries, sound and fresh picked, two thirds morello, and one third black cherries; then fill up the cask with brandy, or pure rectified whiskey; after standing about a month, it may be drawn off, and by the addition of a small quantity of sugar and spices, a fine cordial is obtained; or it may be used without this addition.

The cask must then be again filled with whiskey, and in a few weeks it will be fit for use; and though not so pleasant as the former, it affords an agreeable beverage when mixed with water. When this second filling is drawn off, the cask may be filled with water, which extracts all the spirit from the cherries.

Fox Grapes

Grows so abundantly in many parts of the United States as to render them an object worthy of the attention of the distiller. From their richness, there is little doubt but that a fine wine might be made from them, and a spirit little inferior to the best Cogniac brandy. Let them be mashed, and after standing two
or three days, the juice must be expressed and fermented, as with peaches. The spirit produced upon distillation will be very good, of itself, and serviceable in imitating Cogniac brandy.

Concerning Potatoes.

Potatoes afford a good crop to the agriculturalist, yield a quantity of fine pure spirit, and afterwards are useful as food for hogs, cows, and sheep. It is a crop not always successful; but where a farmer can, as is frequently the case, raise upwards of two hundred bushels from an acre of ground, there are few things will be found so profitable. Being well worthy the attention of the distiller, three recipes are given for extracting spirit from them. They are very different, but each may succeed. It is worthy of remark, that Dr. Anderson's experiment was made in the spring of the year, when it is probable the potatoes were somewhat sprouted. His plan has been tried in the month of August, without success, but this may have been owing to other causes.

The steam of the boiler in a distillery might be used to boil them, without any expense, other than keeping up the boiling heat for the necessary time, which will be trifling.
Concerning Potatoes.

Method of extracting Spirit from Potatoes, practised by Mons. Bertrand, at Metz.*

Take six hundred pounds of potatoes, and boil them in steam about three quarters of an hour; till they will fall to pieces on being touched. The vessel in which they are boiled consists of a tub, somewhat inclined; in the lower part of it are two holes, one for the purpose of bringing in the steam produced in another vessel, over a coal fire, and the other made to carry off occasionally the condensed water. After the potatoes are boiled, they are crushed and diluted with hot water till they are of a liquid consistence; then add twenty-five pounds of ground malt, and two quarts of yeast; the mixture is to be stirred, covered with a cloth, and kept to the temperature of fifteen degrees Reaumer, or sixty-six degrees Fahrenheit. After fermentation, and the exhalation of the carbonic acid, the matter sinks down and is fit for distillation; by means of two stills, this mass may be rectified in one day, and it will produce about forty-four quarts of spirit, worth a guinea and a half, while the whole cost, including coals and labour, is about twenty-three shillings and six pence. The residuum is good food for hogs.

* The Countess de N. ..... near Vienna, has a distillery of potatoes. This is rather a singular occupation for a titled lady. The process appears to be very correct.
Method of preparing Potatoes for Distilling.
(By Samuel M'Harry, Esq.)

"Wash them clean, and grind them in an apple mill, and if there be no apple mill convenient, they may be scalded and then pounded; then put two or three bushels into a hogshead and fill the hogshead nearly full of boiling water, and stir it well for half an hour; then cover it close until the potatoes are scalded quite soft; then stir them often until they are quite cold; then put into each hogshead about two quarts of good yeast, and let them ferment, which will require eight or ten days; the beer then may be drawn off, and distilled, or put the pulp and all into the still as you do apples. I have known potatoes distilled in this way to yield upward of three gallons to the bushel."

Another Method.

Dr. Anderson of Scotland gives an account of a very fine spirit which he procured from potatoes; he says, "It was somewhat like very fine brandy, but milder, and had a kind of coolness on the palate peculiar to itself. Its flavour was still more peculiar, and resembled brandy impregnated with the odour of violets and raspberries."

In February, he boiled to a soft pulpy state, a bushel of them, weighing seventy-two pounds; then bruised and passed them through a straight riddle along with spring water, keeping the skins back in the riddle and
throwing them away. Cold water was added to the pulp and mixed up till the whole mixture was twenty gallons. It stood until sufficiently cool, when yeast was mixed with it as if it was malt wort.

In ten or twelve hours a fermentation began, which continued very briskly ten or twelve hours; and then began sensibly to abate. It was now briskly stirred, and the fermentation was thereby renewed. The same operation was renewed every day, and the fermentation thus continued for two weeks. It could not then be further kept up. It was now distilled, taking care to stir it to prevent empyreuma.

Of Beets.

On the subject of making sugar from beets, various experiments have been made in Prussia, France, and Austria, for some years past; and so confident was the Emperor Napoleon of success, that he ordered the planting of 32000 acres of land in beets, for the purpose of supplying the necessary quantity of sugar, and prohibited the importation of that article, after the first of January, 1812.

It appears by calculation, that 300 acres will produce 133,200 kilogrammes (266,400 pounds, American,) of crude sugar, which will not loose more than one-eighth in refining. As this may become of importance to the American farmer and distiller, and the process for making spirit is the same, I have introduced the following:
Account of the process used by Mr. Achard, for extracting Sugar from Beet-roots.

(From the Annales de Chemie.)

The species of beet proper for making sugar is the Beta vulgaris of Linnaeus; but all the varieties of that species of root are not all equally proper.

That of which the inside is white, the skin pale red, and the root long and spindle shaped, is the best.

Boil the root (with the skin, as it is taken out of the ground, and without any other preparation than that of carefully taking away the leaves and heart) in water till it is so soft that it may be penetrated by a straw; a short boiling is sufficient to produce this degree of softness, which is very well known to confectioners, and is given to several sorts of fruits before they are preserved.

The beet root, after cooling, is divided, and cut into slices, by means of a machine made use of by husbandmen for dividing potatoes for the use of cattle. This machine is described, in Burch's publication, entitled, Uebersicht der fortschritte in wissenhaf-ten, kunsten, manufacturer, und handeverken; von Ostern 1799, bis ostern 1797, Erfurt 1799.
Concerning Persimons.

Two men, with the assistance of the machine can cut nearly 100 pounds of roots in very thin slices in three minutes.

In order to extract the juice from the roots, after being sliced, they are submitted to the action of a press, which ought to act very strongly, that as much juice as possible may be drawn from them. The pulp remaining in the press still contains a considerable portion of sugar, to extract which, add a sufficient quantity of water, and after twelve hours press it out. After the second extraction, there still remains in the pulp a sufficient quantity of saccharine matter, to furnish advantageously, by means of fermentation, either brandy or vinegar. Mr. Archard states that he has on his estate in Silesia, a manufactory capable of furnishing 400 pounds of sugar per diem, for six months.

Concerning Persimons.

Several years ago, Mr. Isaac Bartram was requested by the American Philosophical Society to make some experiments of the distillation of persimons. The lateness of the season prevented him from making more than one trial, which was done with half a bushel of the fruit, in the month of December, when it was much damaged by the frost and rain. The success of this experiment, however, was such as to leave no doubt but that it was a matter well worthy the attention
Concerning Persimons.

of the farmer and distiller, and he recommends the following process:

Let a number of empty hogsheads, in proportion to the quantity of fruit, be provided; take out one of the heads of each, and in the other let a hole be bored, at about four inches from the chimb, into which fix a plug, which may be occasionally taken out from the lower end, when the casks are fixed upon trusses, at a small distance from the ground. In these casks, over the holes, lay a number of small sticks, covered with straw, about two or three inches thick, to prevent the pulp from choking them.

Four hogsheads being thus prepared, fill one of them half full with persimons, which have been well mashed; add water until it arise within one third of the top; then cover the cask with the head that has been taken out, and let it stand about nine days; by this time the pulpy or feculent part of the fruit will be separated by the act of fermentation; you are then to draw off the liquor, by the hole in the bottom of the hogshead, and put it in a tight cask, closely bunged up, to prevent a second fermentation, whereby your liquor would become acid, and be rendered unfit for the still.

Having thus extracted the more vinous parts from the first hogshead, let as much water be added as before, which must be well stirred, and mixed with the pulp, thereby to procure the whole strength of the fruit.
Concerning Persimons.

A second hogshead is then to be charged half full of fruit, well mashed as the first, and instead of pure water, fill it two thirds full with the second extract of the first hogshead, leaving it to ferment as before directed. This fermentation being perfected, draw off the liquor and let it be bunged up close. The third hogshead is to be treated as the second, and in the like manner every succeeding cask. After you have, in this manner, converted all your fruit into a fermented liquor, let it be kept at least one month before it is distilled, if it can be preserved without danger of becoming sour; for I have observed that vinous spirits drawn from new fermented liquors are not equal in flavour to those which have been meliorated by age.
CHAPTER III.

Of Colouring Liquors.

THIS is a part of the business of no use to the manufacturer of merely gin and whiskey. Those however who make brandy and spirits, will colour with brown sugar highly burnt or boiled in an iron pot over the fire; or they will probably find it easier and cheaper to purchase colouring matter, which may be had in all cities; the quantity necessary, depends upon the quality; here the person using it, must act according to his own discretion.

A double handful of parched, or burnt wheat, will give an agreeable colour to a barrel of whiskey, and will improve the flavour.

A quantity of oak shavings digested for some time in spirits of wine, will form a dilute tincture of oak, which is in reality the cause of the colour of French brandy; this may be added to colour spirits instead of burnt sugar.