equipment. With regard to the latter this word of advice may be given: The greater the number of plates in the distilling column, the less the coal consumed per gallon of alcohol produced. It must, however, be taken into account that a large number of plates in a column means a column of considerable height and that in turn means a correspondingly tall still house and increased first cost. Hence it is more economical to use the best forms of traps on the plates and fewer plates, and the best forms of these traps as pointed out in Chapter III, are those wherein the largest quantity of vapor in a finely divided state may come into contact with the greatest number of liquid particles.

In conclusion it may be said that dirt, neglect, carelessness and a too great desire for economy in first cost are all factors in lowering the economical productiveness as well in a distillery as in other manufacturing plants.
CHAPTER XIII.

De-natured Alcohol and De-naturing Formulæ

The uses of alcohol are very numerous and varied, the principal being, of course, for the production of all alcoholic liquors such as brandy, gin, rum, whiskey, liquors, etc.; that distilled from grain is almost entirely consumed in the manufacture of whiskey, gin, and British brandy. In the arts, strong alcohol is employed by the perfumers and makers of essences for dissolving essential oils, soaps, etc., and for extracting the odor of flowers and plants; by the varnish-makers for dissolving resins; by photographers in the preparation of collodion; by the pharmaceutists in the preparation of tinctures and other valuable medicaments; by chemists in many analytical operations, and in the manufacture of numerous preparations; by instrument makers in the manufacture of delicate thermometers; by the anatomist and naturalist as an antiseptic; and in medicine, both in a concentrated form (rectified spirit), and diluted (proof spirit, brandy, etc.), as a stimulant, tonic, or irritant, and for various applications as a remedy. It is largely consumed in the manufacture of vinegar; and in the form of methylated spirit 210
it is used in lamps for producing heat. It has, in fact, been employed for a multitude of purposes which it is almost impossible to enumerate.

The common form of alcohol known as "de-natured spirit" consists of alcohol to which one tenth of its volume of wood alcohol, or other de-naturizing agents has been added, for the purpose of rendering the mixture undrinkable through its offensive odor and taste. Methylated spirit being sold tax free, may be applied by chemical manufacturers, varnish makers, and many others, to a variety of uses, to which, from its greater cost, duty-paid spirit is commercially inapplicable. Its use, however, in the preparation of tinctures, sweet spirits of nitre, etc., has been prohibited by law. It has often been attempted to separate the wood spirit from the alcohol, and thus to obtain pure alcohol from the mixture, but always unsuccessfully, as, although the former boils at a lower temperature than the latter, when boiled they both distil over together, owing probably to the difference of their vapor densities.

It is Germany which has led the way in the manufacture and use of "de-natured" alcohol or "spiritus," as it is there known. Germany has no natural gas or oil wells, and gasoline and kerosene are not produced there, hence the necessity of using some other form of liquid fuel. This fuel—in many ways better than any petroleum product—was found in alcohol. The sandy plains of northern Germany, and indeed any agricultural
district of that empire, produce abundant crops of potatoes and beets.

From the first, alcohol can be so easily manufactured that the processes are within the understanding and ability of any farmer. The second is used in the manufacture of beet sugar,—one of the great German industries, and the crude molasses, from a refuse product,—still contains from 40 to 50 per cent. of sugar, from which alcohol can be made. Under these circumstances and the great demand for liquid fuel for motor carriages and gas engines, alcohol for "de-naturing" came rapidly to the front as one of the most important of agricultural products, as one of the most valuable "crops" which a farmer could raise. Potatoes are chiefly raised. The potatoes are grown by the farmers and manufactured into alcohol in individual farm distilleries and in cooperative distilleries.

While England and France were somewhat behind Germany in fostering this industry—yet they both were far ahead of the United States in this matter. De-natured alcohol could be readily gotten in these countries, for industrial purposes, while the United States continued to charge a high internal revenue tax on all but wood alcohol. This prevented the use of alcohol in competition with gasoline or kerosene, and limited its use in arts and manufactures.

On June 7, 1906, however, Congress passed the "De-naturing Act," as it is called, which provided in brief that alcohol, which had been mixed with
a certain proportion of de-naturing materials sufficient to prevent its use as a beverage should not be taxed.

The passage of this Act was alcohol's new day, and is destined to have a wide influence upon the agricultural pursuits of the country.

In the matter of small engines and motors alone one estimate places the farm use of these at three hundred thousand with an annual increase of one hundred thousand. This means an economical displacing of horse and muscle power in farm work almost beyond comprehension. If now the farmer can make from surplus or cheaply grown crops the very alcohol which is to furnish the cheaper fuel for his motors, he is placed in a still more independent and commanding position in the industrial race.

As an illuminant the untaxed alcohol is bound to introduce some interesting as well as novel conditions. The general estimate of the value of alcohol for lighting gives it about double the power of kerosene, a gallon of alcohol lasting as two gallons of the oil. In Germany, where the use of alcohol in lamps is most fully developed, a mantle is used. Thus in a short time it may be expected that an entirely new industry will spring up to meet the demand for the illuminating lamps embodying the latest approved form of mantle. The adapting of the gasoline motors of automobiles to alcohol fuel will in itself create a vast new manufacturing undertaking. When this
is accomplished it is believed that we shall no more be troubled with the malodorous gasoline "auto" and "cycle" burners on our public streets and parkways.

De-natured alcohol is simply alcohol which has been so treated, as to spoil it for use as a beverage or medicine, and prevent its use in any manner except for industrial purposes.

De-naturing may be accomplished in many ways. In England a mixture suitable for industrial purposes, but unfit for any other use, is made by mixing 90 per cent. of ethyl alcohol (alcohol made from grain, potatoes, beets, etc.), with 10 per cent. of methyl or "wood alcohol." Under the new law the proportion of wood alcohol is cut to five per cent.

In Canada "methylated spirits," as it is known, is composed of from 25 per cent. to 50 per cent. of wood alcohol mixed with ethyl alcohol. This proportion of wood alcohol is far more than is required in any other country.

In Germany, the de-naturing law passed in 1887 was so framed as to maintain the high revenue tax on alcohol intended for drinking, but to exempt from taxation such as should be de-naturized and used for industrial purposes. De-naturing, is accomplished by mixing with the spirit a small proportion of some foreign substance, which, while not injuring its efficiency for technical uses, renders it unfit for consumption as a beverage. The de-naturing substances employed depend upon the
use to which the alcohol is to be subsequently applied. They include pyridin, picolin, benzol, toluol, and xylol, wood vinegar, and several other similar products. As a result of this system Germany produced and used last year 100,000,000 gallons of de-natured spirits, as compared with 10,302,630 gallons used in 1886, the last year before the enactment of the present law.

The following are some of the other de-naturants used in Germany: Camphor, oil of turpentine, sulphuric ether, animal oil, chloroform, iodoform, ethyl bromide, benzine, castor oil, lye.

In France the standard mixture consists of:
150 liters of Ethyl alcohol,
15 liters of wood alcohol,
½ liter of heavy benzine,
1 gram. Malachite green.

An illustration of de-naturing on a large scale is given by the methods and operations of a large London establishment. On the ground floor are four large iron tanks holding about 2500 gallons each. On the next floor are casks of spirit brought under seal from the bonded warehouse. On the third floor are the wood alcohol tanks, and on the fourth floor cans of methylating materials. On the fourth floor the covers to the wood alcohol tanks were removed (these tank covers were flush with that floor) and the contents gauged and tested. The quantity to be put into the tanks on the first floor was run off through pipes connecting
with the first-floor tanks and the upper tanks re-
locked. Then going to the second floor, each cask
of the grain spirit was gauged and tested and the
tank covers, which were flush with the floor, were
removed and the casks of the grain spirit were
run into the tanks below. The mixture was then
stirred with long-handled wooden paddles and the
tank covers replaced, and the material was ready
for sale free of tax. The mixture was 10 per cent.
wood alcohol and 90 per cent. ethyl alcohol made
from molasses, and was what is known as the ordi-
nary methylating spirit used for manufacturing
purposes only and used under bond. The com-
pletely de-natured spirit is made by adding to the
foregoing three-eighths of one per cent. of benzine.

This benzine prevents re-distillation.

In the United States there are at present two gen-
eral formulas for de-natured alcohol in use, either
one of which may be used by any manufacturer,
who can use de-natured alcohol.

The first and most common one is made up as
follows:

Ethyl Alcohol 100 gallons.
Methyl " 10 "
Benzine $\frac{1}{2}$ "

Where such a formula as this is required in an
aqueous solution the benzine is of course thrown
out, giving the solution a milky appearance. In
this case the other general formula may be used.

Ethyl Alcohol 100 gallons.
Methyl " 2 "
Pyridine Bases $\frac{1}{2}$ "
DE-NATURED ALCOHOL.

In addition to these two general formulas for de-natured alcohol a number of special formulas have been authorized to be used in the manufacture of certain classes of goods. In order to buy these specially de-natured alcohols it is necessary, of course, to obtain a permit first from your Collector of Internal Revenue, a simple permit to use de-natured alcohol will not suffice. Some of the special formulas are as follows:

For use in the manufacture of sulphonmethane.

Ethyl Alcohol 100 gallons.
Pyridin Bases 1 gallon.
Coal Tar Benzol 1 “

For use in the manufacture of transparent soap.

Ethyl Alcohol 100 gallons.
Methyl 5 “
Castor Oil 1 “
36° Be. Caustic Soda Solution ½ “

For the manufacture of shellac varnishes.

Ethyl Alcohol 100 parts by volume
Methyl 5 “

For the manufacture of smoking and chewing tobacco.

Ethyl Alcohol 100 gallons.
A mixture made as follows: 1 “
Aqueous Solution containing 40%
Nicotine 12 gallons
Acid Yellow Dye 0.4 lb.
Tetrazo Brilliant Blue 12 B Conct. 0.4 lb.
Water to make 100 gallons.
For the manufacture of photo-engravings.

Ethyl Alcohol 100 gallons
Sulphuric Ether 65 lbs.
Cadmium Iodide 3 "
Ammonium " 3 "

For the manufacture of fulminate of mercury.

Ethyl Alcohol 100 gallons.
Methyl " 3 "
Pyridine Bases ½ "

The next formula may be used for the following purposes:
In the manufacture of photographic dry plates.
In the manufacture of embalming fluid.
In the manufacture of heliotropin.
In the manufacture of resin of podophyllum and similar products.
In the manufacture of lacquers from soluble cotton.
In the manufacture of thermometer and barometer tubes.

Ethyl Alcohol—100 gallons.
Methyl " 5 "

For use in the manufacture of photographic collodion.

Ethyl Alcohol 100 gallons.
Sulphuric Ether 10 lbs.
Cadmium Iodine 10 "
DE-NATURED ALCOHOL.

For use in the manufacture of pastes and varnishes from soluble cotton.

Ethyl Alcohol   100 gallons.
Methyl         \[ 2 \] “
Benzol         \[ 2 \] “

For use in the purification of rubber.

Ethyl Alcohol   100 gallons.
Acetone        \[ 10 \] “
Petroleum naptha \[ 2 \] “

Petroleum naptha must have a specific gravity of not less than \[ 0.650 \] nor more than \[ 0.720 \] at \( 60^\circ \text{F} \).

For use in the manufacture of watches.

Ethyl Alcohol   100 gallons
Methyl         \[ 5 \] “
Cyanide of Potassium \[ 1\frac{1}{2} \] lbs.
Patened Blue B  \[ \frac{1}{3} \] oz.

(Acid calcium, magnesium, or sodium salt of the disulpho-acids of meta-oxytetraethylidiamidotri-phenyl-carbidrids.)

The methyl alcohol must have a specific gravity of not more than \[ 0.810 \] at \( 60^\circ \text{F} \).

The de-naturing mixture is best prepared by dissolving the cyanide of potassium in a small quantity of water, and then adding this solution to the alcohol, with which the methyl alcohol, containing the dissolved color, has been previously mixed.
For the manufacture of celluloid, pyralin and similar products.

Ethyl Alcohol 100 parts by volume
Methyl   " 5 " " "
Camphor 7 lbs.

Alternative special de-naturant for the manufacture of celluloid, pyralin and similar products
Ethyl Alcohol 100 gallons.
Methyl   " 2 "
Benzol   " 2 "

The strongest alcohol of commerce in the United States is usually 95 per cent. alcohol, and the price varies from $2.30 to $2.50 per gallon, showing that the greater part of the cost is due to the revenue levied by the government. The greater part of the 60,000,000 gallons of alcohol consumed in the United States is used in the manufacture of whiskey and other beverages. The revenue tax prevents the use of alcohol to any great extent in the industries of the country. The bill passed by Congress in 1906, designed to promote the use of untaxed alcohol in the arts and as fuel, took effect January 1, 1907. The first effect of free alcohol would, it was said, supplant the 12,000,000 gallons of wood alcohol which are used in the manufacture of paint, varnishes, shellacs, and other purposes. Another use that is expected of de-natured alcohol is in the manufacture of certain products, such as dyestuffs and chemicals, which can not now be manufactured commercially in this country because of the high cost of alcohol, and
which are imported largely from Europe. A very rapid development of the industry of manufacturing chemicals as a result of free alcohol is looked for. In the production of alcohol there is always formed as a by-product a certain amount of fusel oil, which is very useful in manufacturing lacquers which are used on metallic substances, fine hardware, gas fixtures, and similar articles. The industries manufacturing these wares will undoubtedly receive a great stimulus as a result of cheaper fusel oil caused by the increased production of alcohol.

A Safe Fuel. The use of de-natured alcohol as a fuel has yet to be fully developed. Although alcohol has only about half the heating power of kerosene or gasoline, gallon for gallon, yet it has many valuable properties which may enable it to compete successfully in spite of its lower fuel value. In the first place it is very much safer. Alcohol has a tendency to simply heat the surrounding vapors and produce currents of hot gases which are not usually brought to high enough temperature to inflame articles at a distance. It can be easily diluted with water, and when it is diluted to more than one-half it ceases to be inflammable. Hence it may be readily extinguished; while burning gasoline, by floating on the water, simply spreads its flame when water is applied to it. Although alcohol has far less heating capacity than gasoline, the best experts believe that it will develop a much higher percentage of effi-
iciency in motors than does gasoline. Since gasoline represents only about two per cent. of the petroleum which is refined, its supply is limited and its price must constantly rise, in view of the enormous demand made for it for automobiles and gasoline engines in general. This will open a new opportunity for de-natured alcohol. Industrial alcohol is now used in Germany in small portable lamps, which give it all the effects of a mantel burner heated by gas. The expense for alcohol is only about two-thirds as much per candle-power as is the cost of kerosene. Even at 25 or 30 cents a gallon, de-natured alcohol can successfully compete with kerosene as a means of lighting.

Objection has been made to the use of alcohol in automobiles and other internal-explosive engines, that it resulted in a corrosion of the metal. This is vigorously denied by the advocate of alcohol fuel and the denial is backed by proofs of the use of alcohol in German engines for a number of years without any bad results.

A recent exhibition in Germany gave a good illustration of the broad field in which de-natured alcohol may be used.

Here were shown alcohol engines of a large number of different makes, alcohol boat motors as devised for the Russian navy, and motors for threshing, grinding, wood-cutting, and other agricultural purposes.

The department of lighting apparatus included a large and varied display of lamps, chandeliers,
and street and corridor lights, in which alcohol vapor is burned like gas in a hooded flame covered by a Welsbach mantle. Under such conditions alcohol vapor burns with an incandescent flame which rivals the arc light in brilliancy and requires to be shaded to adopt it to the endurance of the human eye. There has been each year a great improvement in the artistic models and finish of lamps and chandeliers for alcohol lighting. At the beginning they were simple and of rather ordinary appearance, but now they are up to the best standard of modern fixtures for gas and electricity, with which alcohol lighting is now competing with increasing success in that country.

Similarly attractive and interesting was the large display of alcohol heating stoves, which, for warming corridors, sleeping rooms, and certain other locations, are highly esteemed. They are made of japanned-iron plate in decorative forms, with concave copper reflectors, are readily portable, and, when provided with chimney connections for the escape of the gases of combustion, furnish a clean, odorless, and convenient heating apparatus.

Cooking stoves of all sizes, forms, and capacities, from the complete range, with baking and roasting ovens, broilers, etc., to the simple tea and coffee lamp, were also displayed in endless variety.

Enough has been said to give an idea of the capabilities and values of this new form of fuel,—at least, and as far as the United States is concerned.
With its advent not only will American genius perfect the machinery for its use, but the American farmer is given a new market for his crops.

Distilleries, big and little, are likely to be set up all over the country, and the time is not far distant when the farmer will be able to carry his corn to his local distillery, and either return with the money in his pocket, or with fuel for farm engines, machinery, and perchance his automobile.

When our government shall have become as far-sighted as the German government in this matter, every farmer will be able to manufacture his own de-natured spirits. The wisdom of the German system established by the law of 1887 has long ceased to be a question of debate. For every reichsmark of revenue sacrificed by exempting de-natured spirits from taxation the empire and its people have profited ten-fold by the stimulus which has been thereby given to agriculture and the industrial arts.
CHAPTER XIV.

THE FREE ALCOHOL ACT OF 1906, THE AMENDMENT OF 1907 AND INTERNAL REVENUE REGULATIONS.

PUBLIC—No. 201.

An Act for the withdrawal from bond, tax free, of domestic alcohol when rendered unfit for beverage or liquid medicinal uses by mixture with suitable de-naturing materials.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after January first, nineteen hundred and seven, domestic alcohol of such degree of proof as may be prescribed by the Commissioner of Internal Revenue, and approved by the Secretary of the Treasury, may be withdrawn from bond without the payment of internal-revenue tax, for use in the arts and industries, and for fuel, light, and power, provided said alcohol shall have been mixed in the presence and under the direction of an authorized Government officer, after withdrawal from the distillery warehouse, with methyl alcohol or other de-naturing material or materials, or admixture of the same, suitable to the use for which the alcohol is withdrawn,
but which destroys its character as a beverage and renders it unfit for liquid medicinal purposes; such de-naturing to be done upon the application of any registered distillery in de-naturing bonded warehouses specially designated or set apart for de-naturing purposes only, and under conditions prescribed by the Commissioner of Internal Revenue with the approval of the Secretary of the Treasury.

The character and quantity of the said de-naturing material and the conditions upon which said alcohol may be withdrawn free of tax shall be prescribed by the Commissioner of Internal Revenue, who shall, with the approval of the Secretary of the Treasury, make all necessary regulations for carrying into effect the provisions of this Act.

Distillers, manufacturers, dealers and all other persons furnishing, handling or using alcohol withdrawn from bond under the provisions of this Act shall keep such books and records, execute such bonds and render such returns as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, may by regulation require. Such books and records shall be open at all times to the inspection of any internal-revenue officer or agent.

Sec. 2. That any person who withdraws alcohol free of tax under the provisions of this Act and regulations made in pursuance thereof, and who removes or conceals same, or is concerned in remov-
ing, depositing or concealing same for the purpose of preventing the same from being de-natured under governmental supervision, and any person who uses alcohol withdrawn from bond under the provision of section one of this Act for manufacturing any beverage or liquid medicinal preparation, or knowingly sells any beverage or liquid medicinal preparation made in whole or in part from such alcohol, or knowingly violates any of the provisions of this Act, or who shall recover or attempt to recover by redistillation or by any other process or means, any alcohol rendered unfit for beverage or liquid medicinal purposes under the provisions of this Act, or who knowingly uses, sells, conceals, or otherwise disposes of alcohol so recovered or redistilled, shall on conviction of each offense be fined not more than five thousand dollars, or be imprisoned not more than five years, or both, and shall, in addition, forfeit to the United States all personal property used in connection with his business, together with the buildings and lots or parcels of ground constituting the premises on which said unlawful acts are performed or permitted to be performed: Provided, That manufacturers employing processes in which alcohol, used free of tax under the provisions of this Act, is expressed or evaporated from the articles manufactured, shall be permitted to recover such alcohol and to have such alcohol restored to a condition suitable solely for reuse in manufacturing processes under such regulations as the Com-
missioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall prescribe.

Sec. 3. That for the employment of such additional force of chemists, internal-revenue agents, inspectors, deputy collectors, clerks, laborers, and other assistants as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, may deem proper and necessary to the prompt and efficient operation and enforcement of this law, and for the purchase of locks, seals, weighing beams, gauging instruments, and for all necessary expenses incident to the proper execution of this law, the sum of two hundred and fifty thousand dollars, or so much thereof as may be required, is hereby appropriated out of any money in the Treasury not otherwise appropriated, said appropriation to be immediately available.

For a period of two years from and after the passage of this Act the force authorized by this section of this Act shall be appointed by the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, and without compliance with the conditions prescribed by the Act entitled "An Act to regulate and improve the civil service," approved January sixteenth, eighteen hundred and eighty-three, and amendments thereof and with such compensation as the Commissioner of Internal Revenue may fix, with the approval of the Secretary of the Treasury.

Sec. 4. That the Secretary of the Treasury shall make full report to Congress at its next ses-
sion of all appointments made under the provisions of this Act, and the compensation paid thereunder, and of all regulations prescribed under the provisions hereof, and shall further report what, if any, additional legislation is necessary, in his opinion, to fully safeguard the revenue and to secure a proper enforcement of this Act.

Approved June 7, 1906.

DE-NATURING REGULATIONS
UNDER THE ACT OF JUNE 7, 1906.

Under the Act quoted above, the Commissioner of Internal Revenue was empowered to make regulations whereby the law might be carried into effect.

In the first place it may be said that those who are permitted by this Act to manufacture de-natured alcohol must be distillers; in other words, those who have regularly licensed and registered distilleries. This does not mean that the plant must be large or costly—as witness the numerous little "stills" to be found throughout the South; but that the still, whatever its size, must be under constant supervision, and regularly licensed to manufacture alcohol. The requirements to this end can be had from the Commissioner of Internal Revenue, Treasury Department, Washington.

Pursuant to the law regarding de-naturing, rules and regulations have been drawn up of which the following is a synopsis with extracts where deemed advisable.
De-naturing Bonded Warehouses.

"Sec. 2. The proprietor of any registered distillery may withdraw from his distillery warehouse, free of tax, alcohol of not less than 180 degrees proof or strength, to be de-natured in the manner hereinafter prescribed.

A distiller desiring to withdraw alcohol from bond for de-naturing purposes under the provisions of this act shall, at his own expense, provide a de-naturing bonded warehouse, to be situated on and constituting a part of the distillery premises. It shall be separated from the distillery and the distillery bonded warehouse and all other buildings, and no windows or doors or other openings shall be permitted in the walls of the de-naturing bonded warehouse leading into the distillery, the distillery bonded warehouse or other room or building, except as hereinafter provided. It must be constructed in the same manner as distillery bonded warehouses are now constructed, with view to the safe and secure storage of the alcohol removed thereto for de-naturing purposes and the de-naturing agents to be stored therein. It must be approved by the Commission of Internal Revenue. It shall be provided with closed mixing tanks of sufficient capacity. The capacity in wine gallons of each tank must be ascertained and marked thereon in legible letters, and each tank must be supplied with a graduated glass gauge whereon the contents will be at all times correctly
indicated. All openings must be so arranged that they can be securely locked. Suitable office accommodation for the officer on duty must be provided.

Sec. 3. The de-naturing bonded warehouse shall be used for de-naturing alcohol, and for no other purpose, and nothing shall be stored or kept therein except the alcohol to be de-natured, the materials used as de-naturants, the de-natured product, and the weighing and gauging instruments and other appliances necessary in the work of de-naturing, measuring, and gauging the alcohol and de-naturing materials.

These bonded warehouses must be numbered serially in each collection district, and the words "De-naturing bonded warehouse No. —, district of —," must be in plain letters in a conspicuous place on the outside of the building.

In case the distiller's bond has been executed before the erection of such warehouse the consent of the sureties to the establishment of the de-naturing warehouse must be secured and entry duly signed made on the bond."

De-naturing Material Room.

"Sec. 4. There shall be provided within the de-naturing bonded warehouse a room to be designated as the de-naturing material room. This room is to be used alone for the storage of de-naturing materials prior to the de-naturing process. It
must be perfectly secure, and must be so constructed as to render it impossible for anyone to enter during the absence of the officer in charge without the same being detected.

The ceiling, inside walls, and floor of said room must be constructed of brick, stone, or tongue-and-groove planks. If there are windows in the room the same must be secured by gratings or iron bars, and to each window must be affixed solid shutters of wood or iron, constructed in such manner that they may be securely barred and fastened on the inside. The door must be substantial, and must be so constructed that it can be securely locked and fastened.

SEC. 5. At least two sets of tanks or receptacles for storing de-naturing material must be provided, and each set of tanks must be of sufficient capacity in the aggregate to hold the de-naturing material which it is estimated the distiller will use for thirty days. A set of tanks shall consist of one or more tanks for storing methyl alcohol, and one or more tanks of smaller capacity for storing other de-naturing materials. The capacity of each tank must be ascertained and marked in legible figures on the outside.

The tanks must not be connected with each other, and must be so constructed as to leave at least 18 inches of open space between the top of the tank and ceiling, the bottom of the tank and the floor, and the sides of the tank and walls of the de-naturing material room. Each tank shall
be given a number, and this number must be marked upon it. There shall be no opening at the top except such as may be necessary for dumping the de-naturing material into the tank and thoroughly plunging or mixing the same. Said opening must be covered so that it may be locked. Likewise the faucet through which the de-naturing material is drawn must be so arranged that it can be locked. Each tank must be supplied with a graduated glass gauge whereby the contents of the tank will always be shown."

Custody of De-naturing Bonded Warehouse.

"Sec. 6. The de-naturing bonded warehouse shall be under the control of the collector of the district and shall be in the joint custody of a storekeeper, storekeeper-gauger, or other designated official and the distiller.

No one shall be permitted to enter the warehouse except in the presence of said officer, and the warehouse and room shall be kept closed and the doors, exterior and interior, securely locked except when some work incidental to the process of de-naturing and storing material is being carried on. Standard Sleight locks shall be used for locking the de-naturing bonded ware-house and the de-naturing material room, and they shall be sealed in the same manner and with the same kind of seals as distillery bonded warehouses and cistern rooms are now sealed. Miller locks shall be
used in securing the faucets and openings of the mixing tanks and the de-naturing material tanks.

The officer in charge of the de-naturing bonded warehouse, material room, and tanks shall carry the keys to same, and under no circumstances are said keys to be intrusted to anyone except another officer who is duly authorized to receive them."

**Application for Approval of De-naturing Bonded Warehouse.**

"Sec. 7. Whenever a distiller wishes to commence the business of de-naturing alcohol he must make written application to the collector of the district in which the distillery is located for the approval of a de-naturing bonded warehouse.

Such application must give the name or names of the person, firm, or corporation operating the distillery, the number of the distillery, the location of the same, the material of which the warehouse is constructed, the size of same, width, length, and height, the size of the de-naturing material room therein, and the manner of its construction, the capacity in gallons of each tank to be used for de-naturing alcohol or for holding the de-naturing agents, and the material of which said tanks are constructed.

Such application must be accompanied by a diagram correctly representing the warehouse, the mixing tanks, de-naturing material room, and de-naturing material tanks, with all openings and sur-
roundings. It must show the distillery and all the distillery bonded warehouses on the premises, with dimensions of each."

Sections 9 and 10 of the regulations deal with the examination and approval of the de-naturing warehouse and plant by the Internal Revenue officers.

**De-naturing Warehouse Bond to be Given.**

"Sec. 11. After receipt of notice of the approval of said warehouse the distiller may withdraw from his distillery warehouse, free of tax, alcohol of not less than 180 degrees proof or strength, and may de-nature same in said de-naturing warehouse in the manner hereinafter indicated, provided he shall first execute a bond in the form prescribed by the Commissioner of Internal Revenue, with at least two sureties, unless, under the authority contained in an act approved August 13, 1894, a corporation, duly authorized by the Attorney-General of the United States to become a surety on such bond, shall be offered as a sole surety thereon. The bond shall be for a penal sum of not less than double the tax on the alcohol it is estimated the distiller will de-nature during a period of 30 days, and in no case is the distiller to withdraw from bond for de-naturing purposes and have in his de-naturing warehouse in process of de-naturation a quantity of alcohol the tax upon which is in excess of the penal sum of the bond."
Sec. 12. If at any time, it should develop that the de-naturing warehouse bond is insufficient the distiller must give additional bond.

Sec. 13. The bond herein provided for must be executed before the distiller can withdraw from distillery bonded warehouse, free of tax, alcohol to be de-natured, and if he desires to continue in the business of de-naturing alcohol, said bond must be renewed on the first day of May of each year or before any alcohol is withdrawn from bond for de-naturing purposes. It must be executed in duplicate in accordance with instructions printed thereon. One copy is to be retained by the collector and one copy is to be transmitted to the Commissioner of Internal Revenue."

Conditions under which Alcohol is Withdrawn.

"Sec. 15. Not less than three hundred (300) wine gallons of alcohol can be withdrawn at one time for de-naturing purposes.

When a distiller, who is a producer of alcohol of not less than 180 degrees proof and who has given the de-naturing warehouse bond as aforesaid desires to remove alcohol from the distillery bonded warehouse for the purpose of de-naturing, he will himself, or by his duly authorized agent, file with the collector of internal revenue of the district in which the distillery is located, notice to that effect."

Upon the receipt of this notice (the form for
which is given in the Regulations) the collector for the district will order a gauger to inspect the alcohol so withdrawn, and to gauge the same, and to make report; and directions are given to the official "storekeeper" to permit the transferral of the spirits to the de-naturing warehouse.

**Spirits Transferred to be Marked.**

"Upon receipt of the permit by the storekeeper the packages of distilled spirits described in notice of intention to withdraw may be withdrawn from distillery bonded warehouse without the payment of the tax, and may be transferred to the de-naturing bonded warehouse on the distillery premises; but before the removal of said spirits from the distillery bonded warehouse, the gauger, in addition to marking, cutting, and branding the marks usually required on withdrawal of spirits from warehouse, will legibly and durably mark on the head of each package, in letters and figures not less than one-half an inch in length, the number of proof gallons then ascertained, the date of the collector's permit, the object for which the spirits were withdrawn, and his name, title, and district.

Such additional marks may be as follows:

Withdrawn under permit issued Jan'y. 10, 1907
For De-naturing Purposes
Proof gallons, 84
William Williams, U. S. Gauger,
5th Dist. Ky."
SPIRITS TRANSFERRED TO DE-NATURING BONDED WAREHOUSE.

"Sec. 20. When the packages of spirits are marked and branded in the manner above indicated they shall at once, in the presence and under the supervision of the storekeeper, be transferred to the de-naturing bonded warehouse."

RECORD OF SPIRITS RECEIVED IN DE-NATURING BONDED WAREHOUSE.

"Sec. 21. The officer in charge of the de-naturing bonded warehouse shall keep a record of the spirits received in said de-naturing bonded warehouse from the distillery bonded warehouse and the spirits delivered to the distiller for de-naturing purposes.

Upon the debit side of said record, in columns prepared for the purpose, there shall be entered the date when any distilled spirits were received in de-naturing bonded warehouse, the date of the collector’s permit, the date of withdrawal from distillery bonded warehouse, the number of packages received, the serial numbers of the packages, the serial numbers of the distillery warehouse stamps, and the wine and proof gallons.

Upon the credit side of said record shall be entered the date when any spirits were delivered to the distiller for de-naturing purposes, the date of the collector’s permit for withdrawal, the date of withdrawal from distillery bonded warehouse, the
number of packages so delivered, the serial numbers of the packages, the serial numbers of the distillery warehouse stamps, and the wine and proof gallons.

Immediately upon the receipt of any distilled spirits in the de-naturing bonded warehouse, and on the same day upon which they are received, the officer must enter said spirits in said record.

Likewise, on the same date upon which any spirits are delivered to the distiller for de-naturing purposes, said spirits must be entered on said record.

Sec. 22. A balance must be struck in the record described in above section at the end of the month showing the number of packages and quantity in wine and proof gallons of spirits on hand in packages on the first day of the month, the number of packages and quantity in wine and proof gallons received during the month, the number of packages and quantity in wine and proof gallons delivered to the distiller during the month, and the balance on hand in packages and wine and proof gallons at the close of the month."

Sections 23 to 25 of the Rules relate to the duties of the Internal Revenue officers in making reports and returns.

De-naturing Agents. Completely De-natured Alcohol.

"Sec. 26. Unless otherwise specially provided, the agents used for de-naturign alcohol withdrawn
from bond for de-naturing purposes shall consist of methyl alcohol and benzine in the following proportions: To every 100 parts by volume of ethyl alcohol of the desired proof (not less than 180°) there shall be added 10 parts by volume of approved methyl alcohol and one-half of one part by volume of approved benzine; for example, to every 100 gallons of ethyl alcohol (of not less than 180 degrees proof) there shall be added 10 gallons of approved methyl alcohol and one-half gallon of approved benzine. Alcohol thus de-natured shall be classed as completely de-natured alcohol.

Methyl alcohol and benzine intended for use as de-naturants must be submitted for chemical test and must conform to the specifications which shall be hereafter duly prescribed."

**De-naturants Deposited in Warehouse.**

"Sec. 27. As the distiller's business demands, he may bring into the de-naturing bonded warehouse, in such receptacles as he may wish, any authorized de-naturant. Such de-naturants shall at once be deposited in the material room; thereafter they shall be in the custody and under the control of the officer in charge of the warehouse. Before any de-naturant is used it must be dumped into the appropriate tank and after the contents have been thoroughly mixed, a sample of one pint taken therefrom. This sample must be forwarded to the proper officer for analysis. The officer will then securely close and seal the tank."
DE-NATURING REGULATIONS.

No part of the contents of the tank can be used until the sample has been officially tested and approved, and report of such test made to the officer in charge of the warehouse.

If the sample is approved the contents of the tank shall upon the receipt of the report, become an approved de-naturant and the officer shall at once remove the seals and place the tank under Government locks.

If the sample does not meet the requirements of the specifications, the officer shall, upon the receipt of the report of non-approval, permit the distiller, provided he desires, to treat or manipulate the proposed de-naturant so as to render it a competent de-naturant. In such case another sample must be submitted for approval. If the distiller does not desire to further treat the de-naturant the officer shall require him immediately to remove the contents of the tank from the premises."

RECORD OF DE-NATURANTS RECEIVED.

"SEC. 28. The officer shall keep a de-naturing material room record. This record shall show all material entered into and removed from the de-naturing material room.

There shall be proper columns on the debit side in which are to be entered the date when any material is received, the name and residence of the person from whom received, the kind of material, the quantity in wine gallons, and, if methyl alco-
hol, in proof gallons, the date upon which the material was dumped into the tank, the number of the tank, the date upon which sample was forwarded, and the number of the sample, and the result of the official test.

On the credit side of said record shall be entered in proper columns the date upon which any material was removed from the de-naturing material room for de-naturing purposes, the kind of material, the number of the tank from which taken, the number of the sample representing the tank and sent for official test, the number of wine gallons, and, if methyl alcohol, the number of proof gallons."

MONTHLY RETURNS OF DE-NATURANTS RECEIVED.

"Sec. 29. A balance shall be struck in this record at the end of each month whereby shall be shown the quantity of material of each kind on hand in the de-naturing material room on the first day of the month, the quantity received during the month, the quantity rejected and removed from the premises during the month, and the quantity delivered to the distiller for de-naturing purposes during the month, and the quantity on hand at the end of the month.

The officer shall, at the end of each month, prepare in duplicate, sign, and forward to the collector of internal revenue a report which shall be a transcript of said record."
DISTILLER TO KEEP RECORD OF DE-NATURANTS.

"Sec. 30. The distiller shall also keep a record, in which he shall enter the date upon which he deposits any material in the tanks of the de-natur ing material room, the name and address of the person from whom said material was received, and the kind and quantity of the material so deposited; also he shall enter in said record the date upon which he receives any material from the de-natur ing material room, the kind and quantity of such material so received, and the disposition made of same."

NOTICE OF INTENTION TO DE-NATURE SPIRITS.

"Sec. 31. The distiller shall, before dumping any spirits or de-naturants into the mixing tank, give notice to the officer in charge of the de-natur ing warehouse in proper form in duplicate, and enter in the proper place thereon (in the case of distilled spirits) and in the proper column the number of the packages, the serial numbers of same, the serial number of the warehouse stamps, the contents in wine and proof gallons and the proof as shown by the marks, the date of the withdrawal gauge, and by whom gauged.

In case of de-naturing agents he shall enter in the proper place and in the proper columns the number of gallons, the kind of material, and the number of the de-natur ing material tank from which same is to be drawn.
The contents of the several packages of alcohol, as shown by the withdrawal gauge, shall be accepted as the contents of said packages when dumped for de-naturing purposes unless it should appear from a special showing made by the distiller that there has been an accidental loss since withdrawal from distillery bonded warehouse.

Upon receipt of this notice the officer in charge of the de-naturing warehouse shall, in case of the packages of alcohol, inspect same carefully to ascertain whether or not they are the packages described in the distiller's notice. He will then cut out that portion of the warehouse stamp upon which is shown the serial number of the stamp, the name of the distiller, the proof gallons, and the serial number of the package. These slips must be securely fastened to the form whereon the gauging is reported and sent by the officer with his return to the collector."

Transfer of De-naturants to Mixing Tanks.

"Sec. 32. The distiller, unless pipes are used, as herein provided, shall provide suitable gauged receptacles, metal drums being preferred, with which to transfer the de-naturing agents from the material tanks to the mixing tanks. These receptacles must be numbered serially and the number, the capacity in gallons and fractions of a gallon, the name of the distiller, and the number of the de-naturing bonded warehouse marked thereon in durable letters and figures. They shall be used
for transferring de-naturing material from the material tanks to the mixing tanks and for no other purpose. The distiller must also provide suitable approved sealed measures of smaller capacity. The gauged receptacles are to be used where the quantity to be transferred amounts to as much as the capacity of the smallest gauged receptacle in the warehouse. The measures are to be used only when the quantity of material to be transferred is less than the capacity of the smallest gauged receptacle.

Sec. 33. The distiller may provide metal pipes connecting the material tanks and the mixing tanks and the de-naturant may be transferred to the mixing tanks through these pipes. Such pipes must be supplied with valves, cocks, or faucets, other proper means of controlling the flow of the liquid, and such valves, cocks, or faucets must be so arranged that they can be securely locked, and the locks attached thereto must be kept fastened; the keys to be retained by the officer in charge, except when the de-naturing material is being transferred to the mixing tanks.

In the event pipes are used as above provided, the glass gauges affixed to the material tanks must be so graduated that tenths of a gallon will be indicated.

Before any material is transferred from a material tank to a mixing tank the officer must note the contents of the material tank as indicated by the glass gauge. He will then permit the de-naturant to flow into the mixing tank until the exact quan-
tity necessary to de-nature the alcohol, as provided by the regulations, has been transferred. This he will ascertain by reading the gauge on the material tank before the liquid has begun to flow and after the flow has been stopped. He should verify the quantity transferred by reading the gauge on the mixing tank before and after the transfer.

Sec. 34. The distiller must provide all scales, weighing beams, and other appliances necessary for transferring the de-naturing materials gauging or handling the alcohol, or testing any of the measures, receptacles or gauges used in the warehouse, and also a sufficient number of competent employees for the work.

Contents of Mixing Tank to be Plunged.

"Sec. 35. The exact quantity of distilled spirits contained in the packages covered by the distiller's notice having been ascertained by the officer and the spirits having been dumped into the mixing tank, and the quantities of the several de-naturants prescribed by the regulations having been ascertained by calculation and added as above provided to the alcohol in the mixing tank to be thoroughly and completely plunged and mixed by the distiller or his employees."

Drawing Off and Gauging De-natured Product.

"Sec. 37. The distiller may from time to time as he wishes, in the presence of the officer, draw off
from the tank or tanks the de-natured product in quantities of not less than 50 gallons at one time, and the same must at once be gauged, stamped, and branded by the officer and removed from the premises by the distiller."

**Kind and Capacity of Packages Used.**

"**Sec. 38.** He may use packages of a capacity of not less than five gallons or not more than one hundred and thirty-five (135) gallons, and each package must be filled to its full capacity, such wantage being allowed as may be necessary for expansion.

All packages used to contain completely de-natured alcohol must be painted a *light green*, and in no case is a package of any other color to be used."

**Alcohol to be Immediately De-Natured.**

"**Sec. 39.** No alcohol withdrawn from distillery warehouse for de-naturing purposes shall be permitted to remain in the de-naturing bonded warehouse until after the close of business on the second day after the said alcohol is withdrawn, but all alcohol so withdrawn must be transferred, dumped, and de-natured before the close of business on said second day."

**Application for Gauge of De-Natured Alcohol.**

"**Sec. 40.** When the process of de-naturing has been completed and the distiller desires to have
the de-natured alcohol drawn off into packages and gauged, he shall prepare a request for such gauge on the proper form. The request shall state as accurately as practicable the number of packages to be drawn off and the number of wine and proof gallons contents thereof.

This notice shall be directed to the collector of internal revenue, but shall be handed to the officer on duty at the de-naturing bonded warehouse.

Sec. 41. If the officer shall find upon examination of the proper record that there should be on hand the quantity of de-natured alcohol covered by said notice, he shall proceed to gauge and stamp the several packages of de-natured alcohol in the manner herein prescribed, and shall make report thereof on the proper form.

In no case will the officer gauge and stamp de-natured alcohol the total quantity in wine gallons of which taken together with any remnant that may be left in the de-naturing tank exceeds in wine gallons the sum of the quantity of distilled spirits and de-naturants dumped on that day and any remnant brought over from previous day.”

How De-natured Alcohol Shall be Gauged.

"Sec. 42. The gauging of de-natured alcohol shall, where it is practicable, be by weight. The officer shall ascertain the tare by actually weighing each package when empty. Then, after each package has been filled in his presence, he shall ascertain