SECTION A
PROCESS DESCRIPTIONS

1 BEVERAGEALCOHOL

1.1. Mashing

Starchy material such as wheat and corn must first be converted into a sugar that can be fermented. The usual process is to mash the grain with an enzyme, commonly malt, to first convert the starch into sugar. Yeast is then added to a wort composed of this mash and water and the resulting fermentation produces a beer of about 6% to 10% alcohol. This is distilled to the desired alcoholic strength.

1.1.1 Grain Storage

Process

Grain and corn was received at the plant by rail and, in the 19th century, by water. The Grand Trunk completed a railway south of the G & W site in 1856. Thus when the distillery was rebuilt in 1859–1860 a rail siding was constructed adjacent to the mill (building #3). Grain was dumped into a hopper beside the building and elevated into bins above the mills.

Grain and corn was elevated to the top of the mill, cleaned, and dumped into one of six bins. From the bins, the grain was moved by gravity to the mills.

The mill building was originally built in 1859/1860 with six bins of 2,500 bushels or a total capacity of 15,000 bushels. By 1900 the mill had grain storage capacity of 23,000 bushels. Although six bins are still found in 1990 in the building, the larger bins were likely constructed after the 1869 fire. Working at maximum production, the storage bins contained a one week supply of grain.

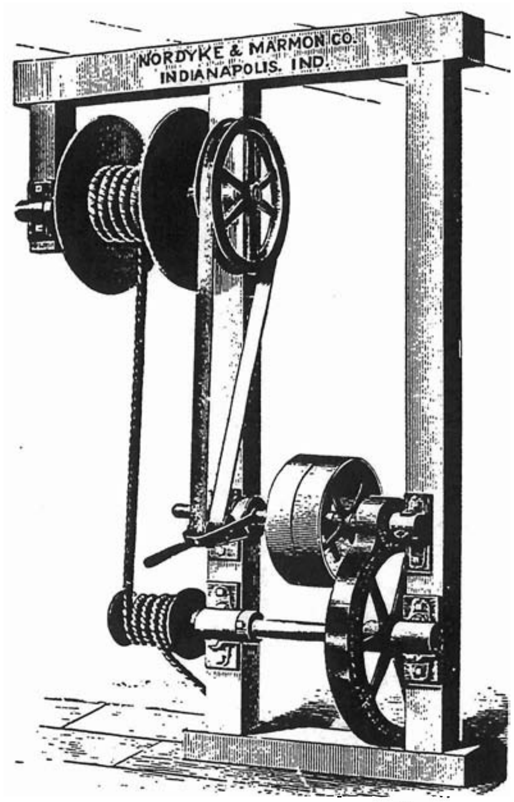
Although constructing the bins over the milling equipment took advantage of gravity feed, the location of the bins was unusual. In most merchant grist and flour mills storage bins were located beside the milling equipment. Distilleries, however, typically placed their bins over the milling floor. In the G & W mill, the building had to be stronger to support the weight of the grain and the building was taller than if the bins were located to one side.

A separate grain elevator was built on the G & W wharf at the foot of Trinity Street. As by 1885 G & W was consuming 400,000 bushels of grain annually additional storage was necessary. Grain was brought from the elevator to the mill by carts.

On Site Resources

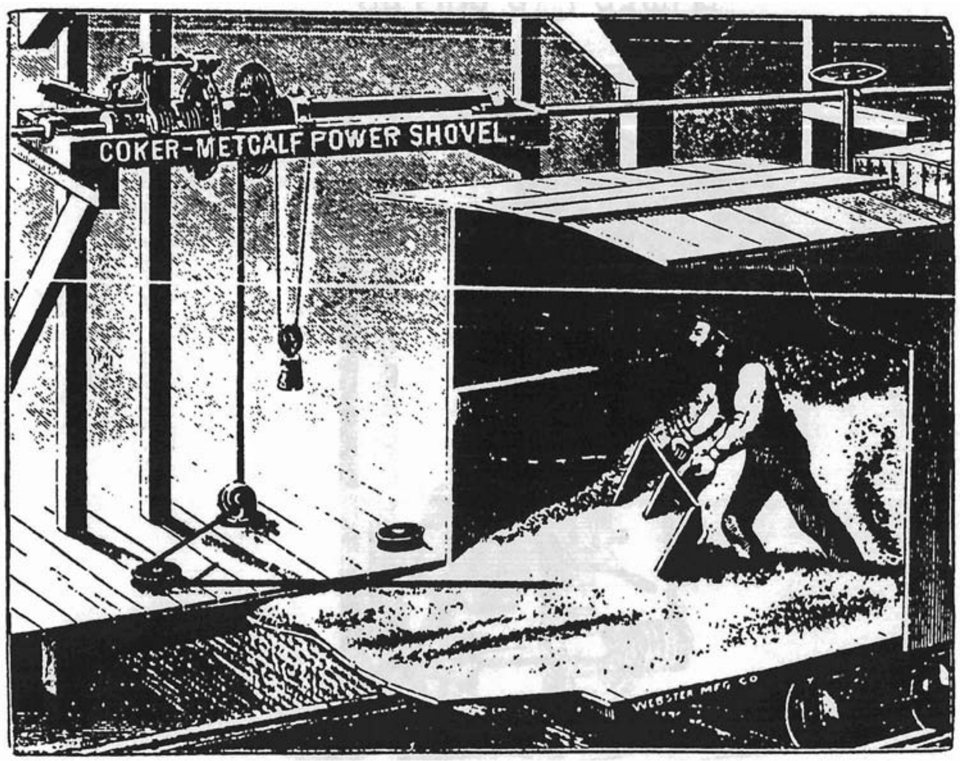
See Section B: Stone Distillery - Mill Building #3

POWER **CAR PULLER.**



Our Car Puller is driven with tight and loose pulleys, the belt shifter being conveniently placed. Other details are shown clearly in the cut above. It is very substantial and durable, and is easily operated. The rope is not included with the puller, but we are prepared to furnish it, together with grooved guide wheels, pulley blocks, hooks, etc.

FIGURE A-1
Railway car puller in which a cable was used to haul cars into position for unloading. **A** similar system is located in 1994 in Building **#3.**
Source: Nordyke & Marmon Company, ***Catalogue #48: Flour Milling Equipment***



The Coker-Metcalf Power Grain Shovel In Use.

This Power Grain Shovel in operation is entirely automatic, enabling one man to unload a car of 500 bushels of grain in about fifteen minutes. it goes in gear at any point in the car where the man stops, and draws the shovel with grain to the door. It occupies little space and is easily installed. .Where grain in quantity is handled, this shovel is a great convenience and a labor-saving device.

FIGURE A-2
Grain plough used to unload grain from railway cars. A haulage system and ploughs of similar design are located in 1994 in Building #3.
Source: Nordyke & Marmon Company, ***Catalogue #48: Flour Milling Equipment***

1.1.2 Milling

Process

The mill building is part of the 1859 building. Although the building was damaged in the 1869 fire, the interior appears to have been rebuilt along similar designs to the original plan. Much of the milling equipment survived the fire because the grain stored above fell onto the equipment and preserved it.

As originally built the mill contained a hursting mill consisting of eight run, or pairs, of 54 inch French burr stones. Only five run of stone were generally in use at one time. The other three were being dressed. [Figure A–3] Milling exposed the kernels to successive grindings that first remove the bran and then reduce the endosperm to a flour. The meal was sifted after each grinding to remove bran and produce various grades of flour. Until the 1870s grinding was undertaken by millstones. Grinding grain by millstones could not provide a good separation of bran from the endosperm. Usually grain could only be passed twice through millstones as further grinding produced too much fine bran in the flour. Stone grinding produced a product known as middlings which consisted of a mixture of bran and endosperm. It had no human market and was sold as animal food.

Later, probably during the 1880s, milling was augmented by ten steel rolls, nine inch in diameter and 30 inches long were installed used for bran and coarse middlings. During the 1870s the first practical roller mills were developed. These mills provided far greater control over the process and several grindings could be undertaken to reduce the flour. [Figure A–4] The power requirements were the same as for stone mills and the same quantity of flour were produced. Roller mills were also less labour intensive as a millstone had to be dressed every 10 to 15 days to ensure a good grinding surface. When roller mills first appeared, millers began to substitute the second grinding by millstones with roller mills.

After World War One the stone hursting mill was removed and replaced by a hammer mill, a third type of mill that came into use in the late 19th century. These were high speed grinders that could produce a coarse meal in a one stage reduction.

In overall design, the G & W mill was typical of a well designed grist mill. The mill was located adjacent to the engine room that provided power for all the equipment.

Sifting, scalping and grain cleaning equipment was located in the two floors between the grain bins and outside walls. Sifters, scalpers and reels were used to remove coarse refuse in grain such as straw and rocks, to separate bran and germ from the endosperm, and to produce various grades of flour. In the milling trade sifting is known as bolting. By world war one bolting was done by five gyrating scalpers and one round reel. Narrow four foot passages extend along the north and south sides of the bins. Along the other two walls the distance from the bin to the wall is about 12 feet. After the grain was ground it was transported to bins in the mashing room.

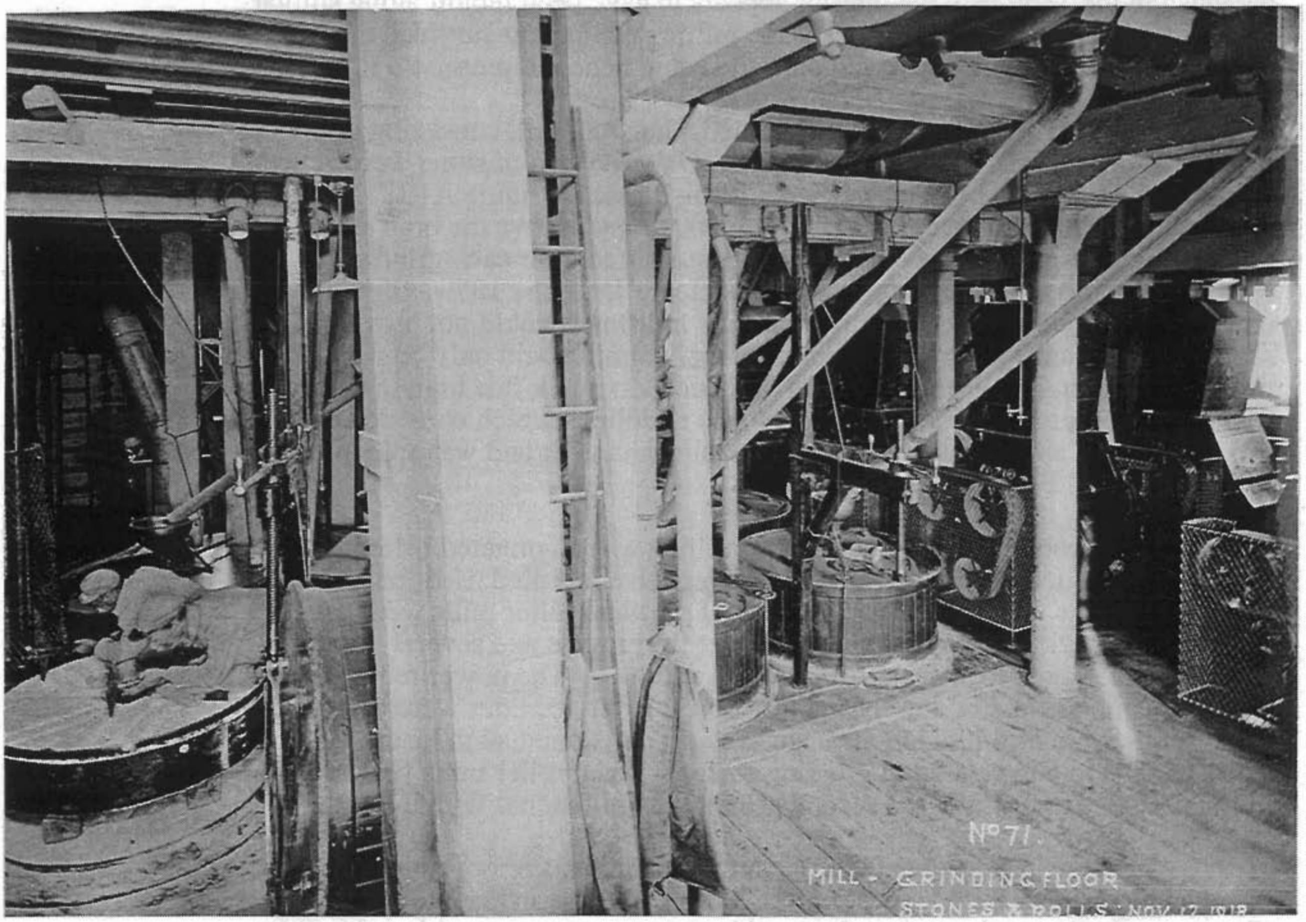


FIGURE A–3
The milling floor in Building 3, Nov 12, 1918. The floor, some chutes, power transmission shafts and equipment remain in 1994 but evidence the stone mills has vanished.
Source: G&W/British Acetones photograph #71.

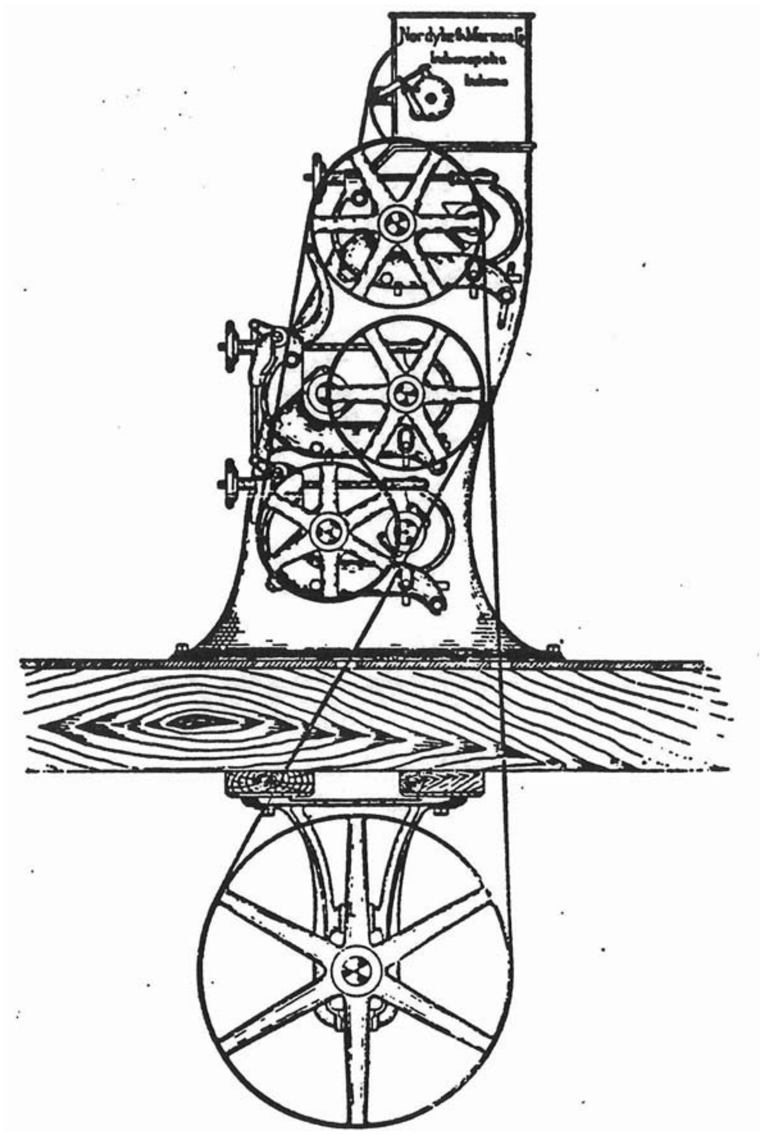


FIGURE A-4
Three high roller mill, powered from a line shaft below the floor, used by G&W around the turn of the century; in 1994 two almost identical mills are located in Building #3.
Source: Nordyke & Marmon Company, Catalogue ***#48: Flour Milling Equipment***

All machinery except the hursting mills were belt driven by a steam engine located in a separate room adjacent to the mill building (building #2A). [Figures A-14, 15] The hursting mill was driven by shafts and gears and the main gear train was situated on a brick platform on the ground floor. The mill equipment was steam powered until at least 1918. Line shafting on the ceiling of the ground floor powered both the elevating machinery and the mills on floor 1.

No evidence could be seen for how power was brought to the equipment on the scalping floors. Some belt connections must have been provided in the 19th century. After the first world war the equipment was converted to electric power. The grain elevator was still operated by belts and pulleys but powered by an electric motor. The belts and shafts for all milling equipment was removed.

During the first world war the mill worked 24 hours a day, six days a week and had an average daily capacity of 4,000 bushels. The G & W mill had a capacity similar to a medium sized grist mill. A small grist mill had a production of about 100 barrels per day while a large one would be about 6,000 barrels. G & W had a capacity of about 800 to 900 barrels.

Milling is presumed to have ended when grain alcohol production ceased at G & W in 1957.

On Site Resources

See Section B: Stone Distillery - Mill Building #3; Engine Room #2A

1.1.3 Malting

Process

Malt is an enzyme created during the germination of barley. The enzyme was essential in the manufacture of grain alcohol as it converted the starchy matter of grain into sugar. In the 19th century this was referred to as a diastatic ferment. Nineteenth century whisky grist contained generally 25% or more malted barley. The balance consisted of corn mixed with malted and unmalted rye, oats and wheat. It appears that **G&W** used no more than 10% malt.

Until the 20th century malt was the only economic way of converting starch into sugar. In the early 20th century a new process was developed that used fungal amylase.

When malt was used only as an enzyme, 19th century distillers commonly employed the so called "long" malt process. This consisted of steeping the barley in water for 48 to 70 hours and then leaving the grain to a prolonged "flooring" at a moderate temperature. This produced the maximum amount of enzyme. A short malt period was considered seven to ten days while a long malt process was about 20 days.

When the barley was taken out of the steep, the first step in "flooring" was to place the grain in a couch, or heap, to germinate for 12 to 24 hours. The heap retained the heat of germination and speed up the process. After germination had occurred, the grain was plowed, or turned over, twice a day for two or three days. On the fifth day of flooring, the malt was sprinkled, if necessary, with two to five gallons of water per quarter of grain (8 bushels).

Malting floors were constructed of cement, tiles, or slate, of which tiles and cement were considered the best material.

Germinated barley, called green malt, contained the maximum amount of enzyme and was preferred by distillers that used malt for its diastatic characteristics. Kilning of malt restricted its enzyme power. When a distiller could not use green malt, a malt kilned at a low temperature was sometimes preferred.

When germination has reached the correct stage, the grain was transferred into a malt kiln. Kilning terminated the germination process and drying the malt enabled it to be stored and to prevent any mold growth. Kilning took about four days while flooring took ten to 20 days. Thus, the flooring time determined the capacity of a malt house.

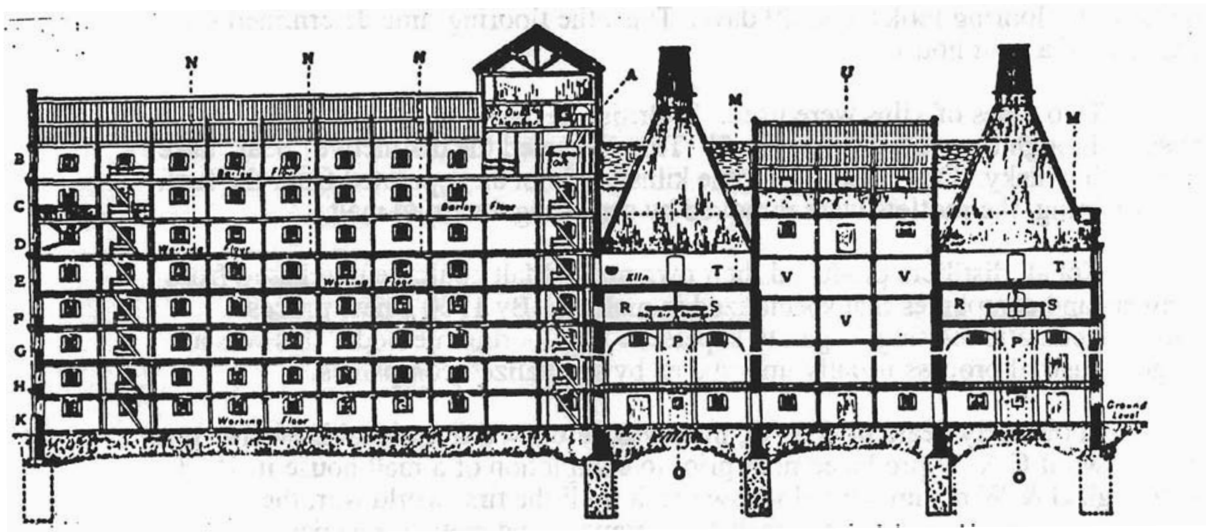
Two types of kilns were used. In British designs the combustion gases passed through the malt. [Figure **A-5]** This produced the distinctive "peat" taste of scotch whisky. On the continent the kilns used hot air separated from the fuel. **After** kilning, the rootlets were removed by screening the dried malt.

Not all distillers produced their own malt. Malt could be purchased from brewers and companies that specialized in malting. By 1900 a new process, called pneumatic malting, began to supersede the flooring method. This was a large industrial process usually undertaken by specialized companies.

In the early years of G & W, malt was purchased from local brewers. It is not known if G & W produced malt prior to completion of a malt house in **1863.** Although G & W manufactured its own malt until the first world war, the company continued to purchase malt.from brewers and malt companies.

The G & W malt house seems to have represented the current practice in malt house design. Barley was stored in the attic (floor **3).** The two floors directly below, floors **1** and 2, were used as malt floors. This arrangement continued until malting ended. Although the ground floor was designed for malting, it does not seem to have been used for this purpose.

Contemporary descriptions give the capacity of the malt house as 40,000 bushels per year. In reality the capacity was probably closer to half that amount. Each floor of the **G&W** malt house is 6,690 ft^2 and therefore would have a capacity of 268 bushels per floor or **536** bushels for the two floors. If flooring time is optimistically given as 10 days then there would be **36** possible maltings per year or 19,000 bushels per year.



F'IGURE **A–5**
Longitudinal section of a 200 quarter (1,600 bushel) malt house at Mortlake, Scotland. By the end of the 19th century, the recommending that optimal floor coverage was 8 bu/quarter (200 ft^2). The capacity of this building was about three times that of the G&W malt house but the design elements are very similar those that still exist in 1994 in Buildings #35/36.
Source: Encyclopedia Britannica, 11th edition, (1911), vol 17, p.503.

No evidence of a steeping tank was noted in 1994. Good designs called for the steeping cisterns to be located at the top of the malt house. This would have been on the second floor and the floor at the south end was of timber unlike the concrete covering over the rest.

As originally built barley seems to have entered the malt house by means of an inclined elevator. The location of the elevator may account for the fact that there are no doors on the first and second floor as they would have interfered with the loading hopper on the ground. The ground floor door was offset to the north. The elevator **was** powered by a steam engine on the third floor and connected by line shafting in the roof trusses. No evidence of the elevator, engine or line shafting remained in 1994. Only a portion of a chimney suggests that the system was actually installed.

In addition to the elevator, loading doors opened on the front of the building from the second and third floors. A hand operated hoist was still in place in 1994 on the third floor. Trap doors seem to have been used to move the barley from the top floor to the malt floors below. Several trap doors are still visible.

Doors entered into the malt kilns from floor 3 (attic), floor 1, and the ground floor. No kiln floors remain. The number of doors into the 'kiln suggest that there were once four floors per kiln. Signs on the doors on floor 3 state "#1 Malt Kiln Area 149,477 cubic inches" and "#2 Malt Kiln Area 149,477 cubic inches." The malt capacity of each floor is estimated at 268 bushels. The capacity of each "malt kiln area" is approximately 67 bushels. (one bushel equals 2218 cubic inches) If one assumes that each kiln served one malt floor, then four floors would have been necessary in each kiln. The remains of four floors can be seen in building #36A.

The *G* & W kilns appear to have followed British design. Contemporary plans depict two furnaces in the basement in locations that agree with the existing furnaces in 1994. They rested on heavy stone walls, suggesting that the extra stone wall in the east kiln is a later addition.

G & W reduced their malt production over the years as more was purchased from outside suppliers. The buildings were gradually converted into other uses. By 1890 the east kiln (building #36B) is indicated as for malt storage. All of the windows and a doorway to Mill Street were bricked in.

Kiln #36A was used up until World War One. During the war, and probably afterwards, the attic of the malt house was used for bran storage from the mill. The ***Report* of *British Acetones*** (Photo #167) shows a tall ventilator on top of building #36A while a glass cupola is situated on Building #36B. Fire plans for 1915 indicate that it was still a kiln. The malt house (building #35) was ·later used as a rack warehouse and at closure, in 1990, for lumber storage. The kilns (building #36) were used for storage and as an engineer's office.

On Site Resources

The malt process is surprisingly well represented at G & W.
See Section B: Maltings – Buildings #35 & #36

1.1.4 Mashing

Process

Grain mashing converted starch into sugar and produced a liquid known as a wort. Distillery mashing was similar to the process employed in brewing. However distillers attempted to convert the starch as completely as possible into alcohol yielding material.

A grist of malted and **unmalted** grains was mixed with hot water (66° to 77° C) and agitated for several hours. Throughout most of the 19th century mashing was done in large wooden tanks or tuns fitted with mechanical agitators. Typically these mash tuns were about 18 feet in diameter and eight feet deep.

By the end of the century mashing a preliminary cooking at high temperature was undertaken in horizontal cylinders or convertors known as "Steels Mashers." Mash produced by the convertor was more rapidly broken down by enzyme reactions of the malt. The mash was pumped into mash tuns to continue the process.

After the starch material had been converted into sugar the liquid was pumped through a cooler before entering the fermenting tuns.

Some contemporary sources indicate that the entire mash including the grain passed through the fermenting process and was pumped into the still. Others indicate that the spent grains from the mashing process were known as "draff" and used as cattle food.

In the 1860s mashing at **G&W** was done in four copper lined mash tuns. **A** pre–fire description indicated that the ground meal was stored in bins over the mash tuns.

By **1900** mashing was undertaken in four Cyprus wood tuns 16 feet in diameter and 5'6" deep. Each tun was heated with four steam heating coils and fitted with mixing rakes driven from below through mortised wheels and shafts from the mill engine. The grist was conveyed by spouts to hopper cars from storage bins located on the top floor of the mash building. The meal bins has a storage capacity of one day's production of the mill. The hopper cars measured the grist and conveyed it to the proper mash tun. After mashing the wort was pumped through six inch copper pipes to the fermenting room.

After World War One, two cylindrical mash cookers were installed that appear to be "Steels Mashers." Installation of these cookers resulted in considerable changes to the design of the ground floor. These grain mashers are still located in 1994 on the ground floor of Building #5.

On ***Site Resources***

See Stone Distillery – Building #5

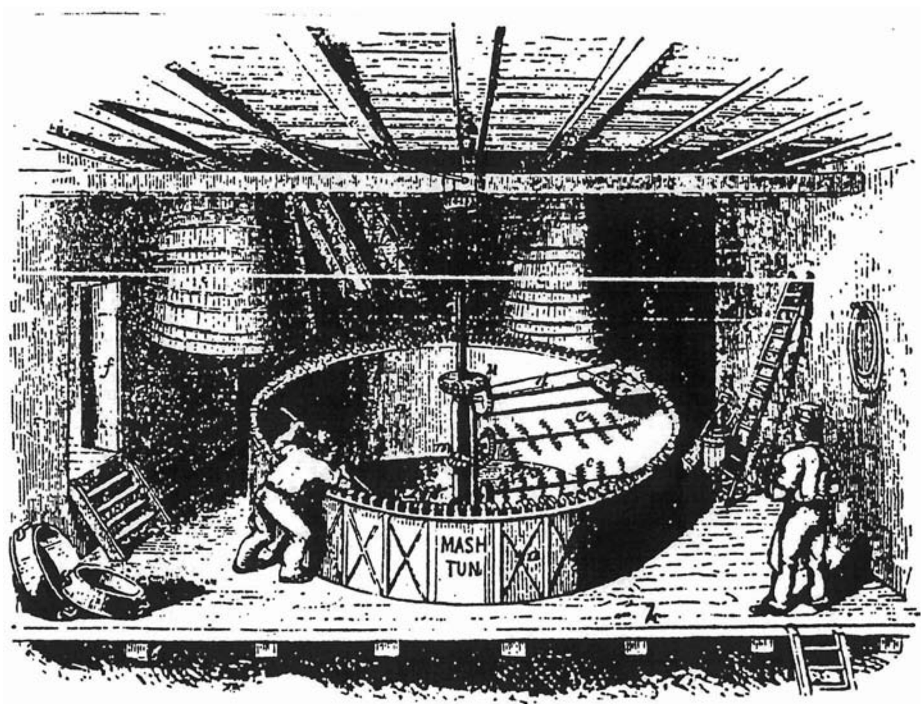


FIGURE A-6
A late 19th century distillery mashing area that was likely typical of that used at G&W. The drum type "Steels Masher" that is in Building #5 in *1994* is a 20th century development.
Source: ***Chemistry, Theoretical, Practical and Analytical as applied to the Arts and Manufacturers, 1882,*** p.70.

1.2 Molasses Mash

Process

Molasses mash was used to manufacture rum and industrial alcohol. As molasses was already a sugar, no special mash process was needed. Molasses was diluted with water and ready for fermentation.

Although rum could have been produced at G & W during the 19th century, there is no material or documentary evidence of the use of molasses in the plant until the 20th century. About 1902 the company began to molasses to produce industrial alcohol. The process is described in the industrial alcohol section of this report.

Sometime after 1918, perhaps 1920, G & W began to produce rum. After 1957 only rum was being produced and both grain and industrial alcohol production ceased.

On Site Resources

See Section B: Stone Distillery – Buildings #8 & #9 [Used for industrial as well as beverage alcohol].

13 Fermentation

1.3.1 Yeast

Process

Yeast was prepared in such a manner as to ensure a pure and vigorous culture which actively attacked the sugar in the mash. A master culture, kept in the laboratory, was purified through standard biological methods to eliminate any possibility of contamination. The pure yeast culture was used to inoculate a small amount of sterile sugar medium in a test tube. After about 24 hours, the growth was transferred to a much larger container holding a sterile molasses mash. The procedure was repeated, the culture being transferred to increasingly greater volumes of sterile molasses mash until a sufficiently large culture is established. This is used to seed the fermentation tanks. The yeast process specifically used at **G&W** was not researched.

On Site Resources

See Section B: Stone Distillery : Buildings #6 & #7

1.3.2 Fermentation

Process

Fermentation began with the addition of yeast to the wort in fermenting tuns. The resulting reaction converted the mash sugars into a 6% to 10% alcohol solution and carbon dioxide. Fermentation lasted from three to nine days, depending upon the season. [Figure A-7] Once the process was completed, the fermented wort was called a beer or a wash.

In order to prevent unwanted bacterial growth, a small quantity of acid was often added to the wort in a process known as souring. The acid created a better working medium for the yeast.

At the beginning of fermentation the wort temperature was about 60 ° F. and during the process rose to about 85 to 88 ° F. If the temperature went too high, the fermenting tuns were fitted with either water jackets or with pipes inside the tuns known as "attemperators" through which cold water could be pumped.

The fermented liquid, or wash, was pumped into a beer well prior to entering the distillation column.

Fermentation at G&W was historically undertaken in large wooden tuns located in buildings #6,#7,and #8. Pipe connections were made on the cover of the tuns in order to collect the carbon dioxide from the fermentation.

Beginning in 1916 the company began to replace the wooden tuns. At closure in 1990 the tuns were made of copper and did not have cover connections to capture carbon dioxide. The tuns were subsequently scrapped.

An 5,996 gallon acid tank was located outside building #6 in 1969.

On Site Resources

See Section B: Stone Distillery - Buildings #6, #7
Pure Spirits Complex - Building #57.

1.4 Distillation

1.4.1 Continuous Distillation

Process

Distillation is a purification process in which the beer, or wash, is separated into alcohol, water and other components by means of steam. Modem distilleries contain stills constructed of several columns in which the wash is redistilled on a continuous basis until the desired strength of alcohol is achieved and all undesired impurities are removed. Until multiple distillation columns were used, alcohol was purified, or rectified, by redistilling the wash several times in individual operations and filtering out impurities.

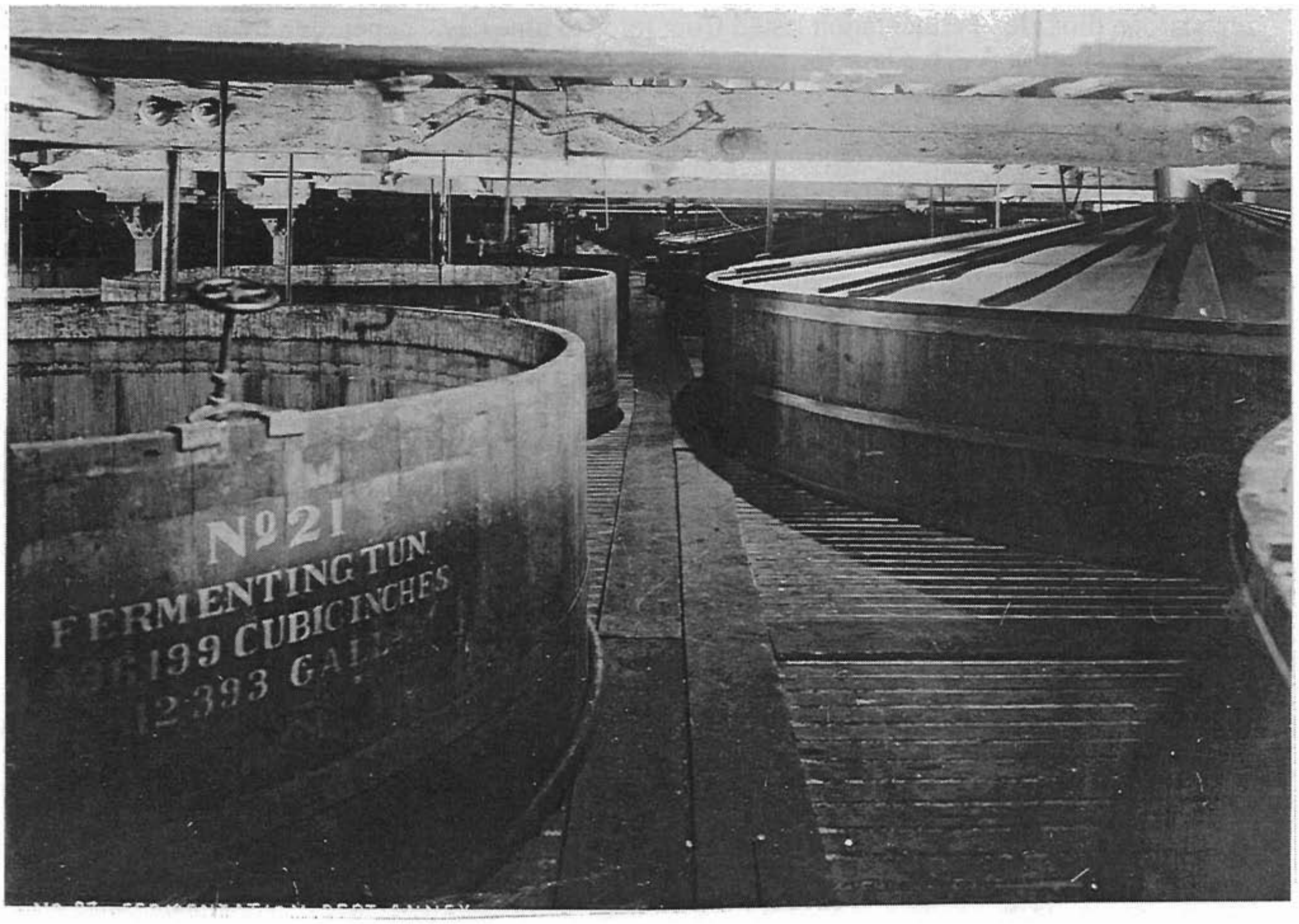


FIGURE A–7
Fermentation tuns in Buildings 6 or 7, Nov 19,1918. These wooden tuns were later replaced with copper tanks. In 1991 these copper tanks were removed, leaving concrete bases to indicate the size and pattern of tanks in these buildings. Source: G&W/British Acetones photograph #87.

The first distillation of a beer produced a product known as "low wines" that yielded between 45% and 75% alcohol and contained impurities. These impurities imparted distinct odors and tastes which were objectionable in beverage alcohol. Redistillation of alcohol removed the impurities and increased the alcoholic content. Historically, alcohol was purified, or rectified, by redistilling the wash several times in pot stills and filtering out impurities.

In the early 19th century Aeneas Coffey invented a still that bears his name in which the rectification was undertaken in one continuous operation. Coffey's still economized on time, fuel, and material as well as obtaining a spirit of higher purity than could be obtained by a pot still. The earliest Coffey stills were a double still consisting of two adjacent columns termed the analyzer and the rectifier. Both columns worked on essentially the same method. Later, additional columns were added to the system to produce better quality alcohol. Until the late 19th century the Coffey still was not considered suitable for whisky manufacture. The product was considered too pure a spirit, devoid of taste and suitable only for industrial alcohol. Pot or batch distillation was seen as the only suitable process. By 20th century all forms of beverage alcohol could be made in the stills.

The process of distillation began when the beer was pumped from the beer well into the analyzer column. This column was also known as the beer column or wash still. The columns are divided into a number of chambers by perforated copper plates. Each compartment is connected to the next by means of a drop pipe standing slightly above the level of plate and passing downwards into a cup which forms a seal. Each compartment also contained a safety valve in case the plates were choked or the pressure in the still rose excessively.

Steam from the base of the analyzer passed upwards and then to the bottom of the rectifier. Wash was pumped into the column near its middle. The upward pressure of steam kept the wash from passing through the perforations in the copper plate until its level reached the top of the first drop pipe. The wash then passed into the cup on the plate below and so on to the next plate. In this way, the wash flowed from compartment to compartment of the analyzer until it reached the bottom and passed out of the analyzer by means of a spent wash siphon. The spent wash was used as a cattle feed.

The steam on its upward passage through the analyzer carried the alcoholic vapors and other volatile matter of the wash. The alcohol passed from the top of the analyzer to the bottom of the rectifier and then upward through the rectifier from compartment to compartment.

At a specific location in the upper part of the rectifier, the bottom of the compartment was formed of a heavy copper sheet, known as the spirit plate. It was placed so that alcohol vapors condense either on or immediately above the plate. The alcohol passed out of the still from the spirit plate chamber to be cooled and collected. Vapors with a lower boiling point than alcohol, such as the aldehydes, passed out the top of the rectifier and were collected separately. Less volatile components of the wash were termed fusel oil and passed out the base of the rectifier to be cooled and gathered in a separate vessel.

The original **1837** Gooderham distillery was described as a wooden distillery. All vessels, pipes and stills were made of pine. The pipes were 9" square with a boring of 2 1/2" in diameter. The distillery contained equipment for filtering the spirits through charcoal. A description of a contemporary wooden distillery "near Toronto" is given in ***Chemistry, Theoretical, Practical and Analytical*** (pp. 104–104).

G & W probably relied on pot stills although there is a reference that by 1850 G & W was using a "patent still" (continuous still) to produce 50 over proof (o.p.) spirits.

The 1859 plant was constructed with a continuous still. The main column was 40 feet tall and was located on the third and fourth floors of the distillery. The original still equipment was constructed by Booth and Son in Toronto.

By 1872 the company operated six stills. There is no indication if all were continuous of if some were pot stills. Some were probably used for primary distillation and others for rectification.

In the 19th century most distilling in Canada was carried out between October and May. Traditionally, the water supply in summer months was of poor quality and unsuitable for mashing. As well, unrefrigerated water was used as the coolant in the condensers and warm summer water was less efficient as cold winter water. The G & W plant was typical in that it operated from October 15 to June 15 each year.

Secondary distillation, or rectification could be undertaken throughout the year. In order to provide stock for rectification in the summer, alcohol from the primary distillation was stored in vaults under the malt house.

When the plant closed in 1990 the company was using a five column still consisting of a four column still and one column of a second unit. Distillation was.carried out with 10 pounds of steam. Most of the distillation equipment in 1994 in building #5 was built by the E. B. Badger and Sons Company, Boston and the Vulcan Copper Supply Company of Cincinnati.

Distillation commonly produces two grades of alcohol – #1 alcohol and #2 alcohol. #2 alcohol was used extensively by vinegar manufacturers. Distillery by–products included fusel oils and distillery slop.

On Site Resources

See Section B: Stone Distillery – Building #5
Pure Spirits Complex – Buildings #55 & #56

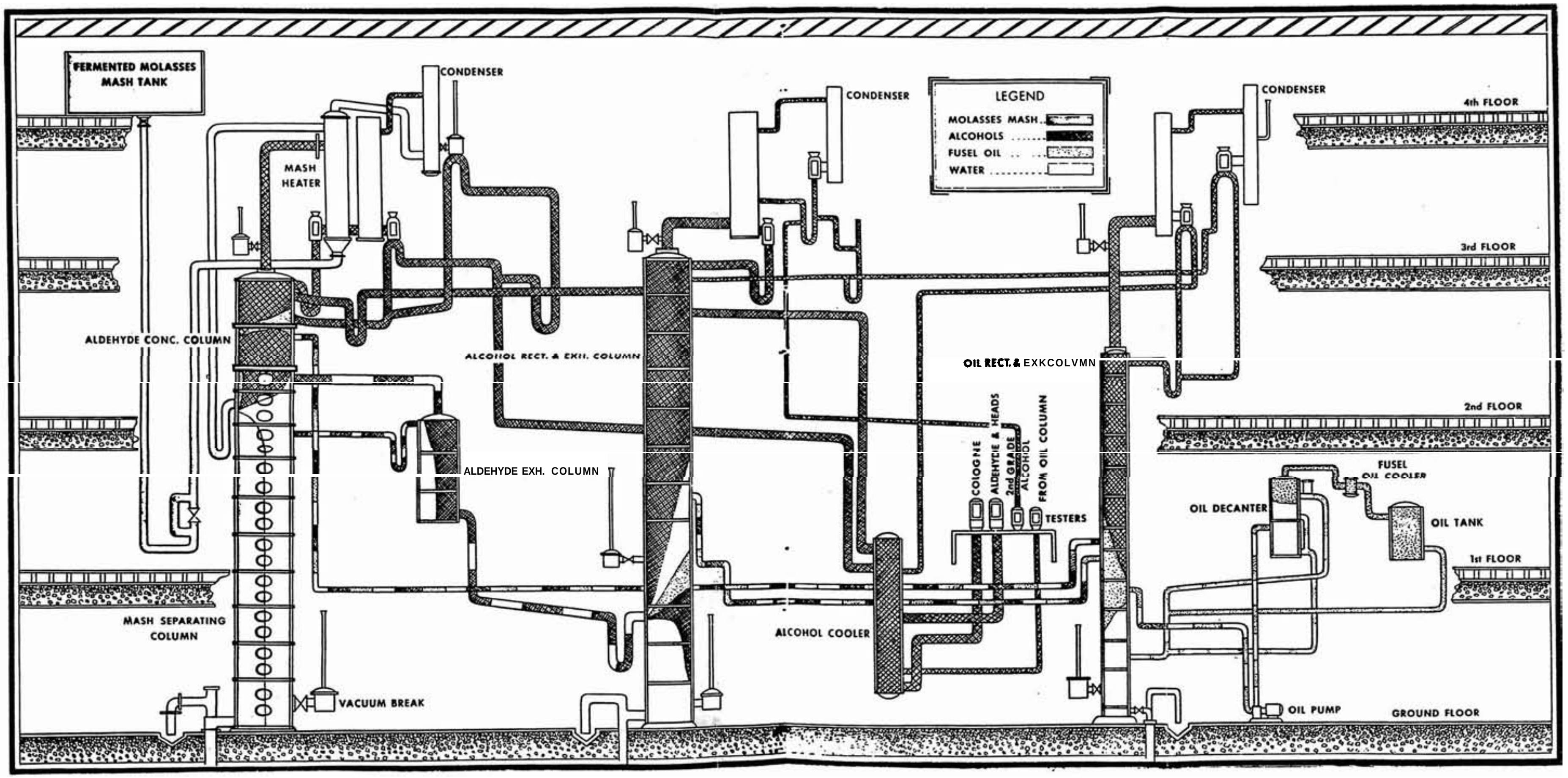


FIGURE A-8
Schematic diagram of beverage alcohol distillation in Building #5 in c.1938. A similar layout exists in the building in 1994 although some equipment has been replaced and additional columns have been added. Source: *Alcohol in Industry*, Gooderham & Worts, 1938.

1.4.2 Redistillation

Process

The first product of distillation – the "low wines" - were relatively low in alcoholic content and contained numerous impurities. The Coffey still automatically continued the distillation of the low wines to increase the alcohol and removed impurities. Prior to the advent of this still and in the manufacture of certain beverage alcohol, the alcohol was redistilled in discreet operations in a pot still in order to obtain the desired spirit.

Redistillation separated the low wines into three components - foreshots, clean spirit and feints. Foreshots had the lowest boiling point and were the first liquid removed from the still. Feints were the last part of the redistillation of the low wines. Feints contain fusel oils that had some commercial value as a by–product. Some of the foreshots and feints were added back to the low wines to increase the efficiency of the redistillation process."

After Gooderham & Worts closed their windmill for milling purposes, a distilling column was constructed in the building to rectify spirits. Alcohol was piped from the charcoal rectifiers and redistilled in two copper pot stills to 60 o.p.

Although the first distillation was not done in the summer, redistillation could be undertaken throughout the year. Alcohol from the first distillation was stored in vaults below the malt house (building #35) until they were redistilled.

A feint storage and tank shed was located on Trinity Street in 1880.The reason for storing feints is not known.

The rectifying stills were moved into a new building, called the pure spirits building in 1873. The building was constructed to manufacture neutral spirits for use as a base in gin, vodka, cordials and blended whisky.

Although the building contained four self contained areas, by the first world war the building only contained three stills in buildings #54, 55 and 56. In 1880 building #53 was called a "spirit house." By 1909 the building may have been used to produce special beverages as it had water tanks on the 2nd and 3rd floor and syrup barrels on the 3rd floor. By 1943 it was a still house.

Buildings #54–56 contained the three working stills. Still # 1 had a capacity of 4,000 gallons while #2 and #3 stills had capacities of 7,000 gallons. Number 2 and number 3 stills were used for the manufacture of whisky. The purpose of #1 still is unknown. The lines from the tail boxes went directly into the #2 tank house (building #61) which contained 16 9,000 gallon tanks.During the first world war, the pure spirits building was used for butyl alcohol rectification. Building #57 was also part of the pure spirits complex but used to store alcohol and fusel oil.

By 1969 the pure spirits building was no longer used as a distillery. Building #53 seems to have been used as an excise office and as an entrance into mixing room #61. Building #54 contained a denatured tank while #55, 56, and 57 were used for "anti–freeze drumming."

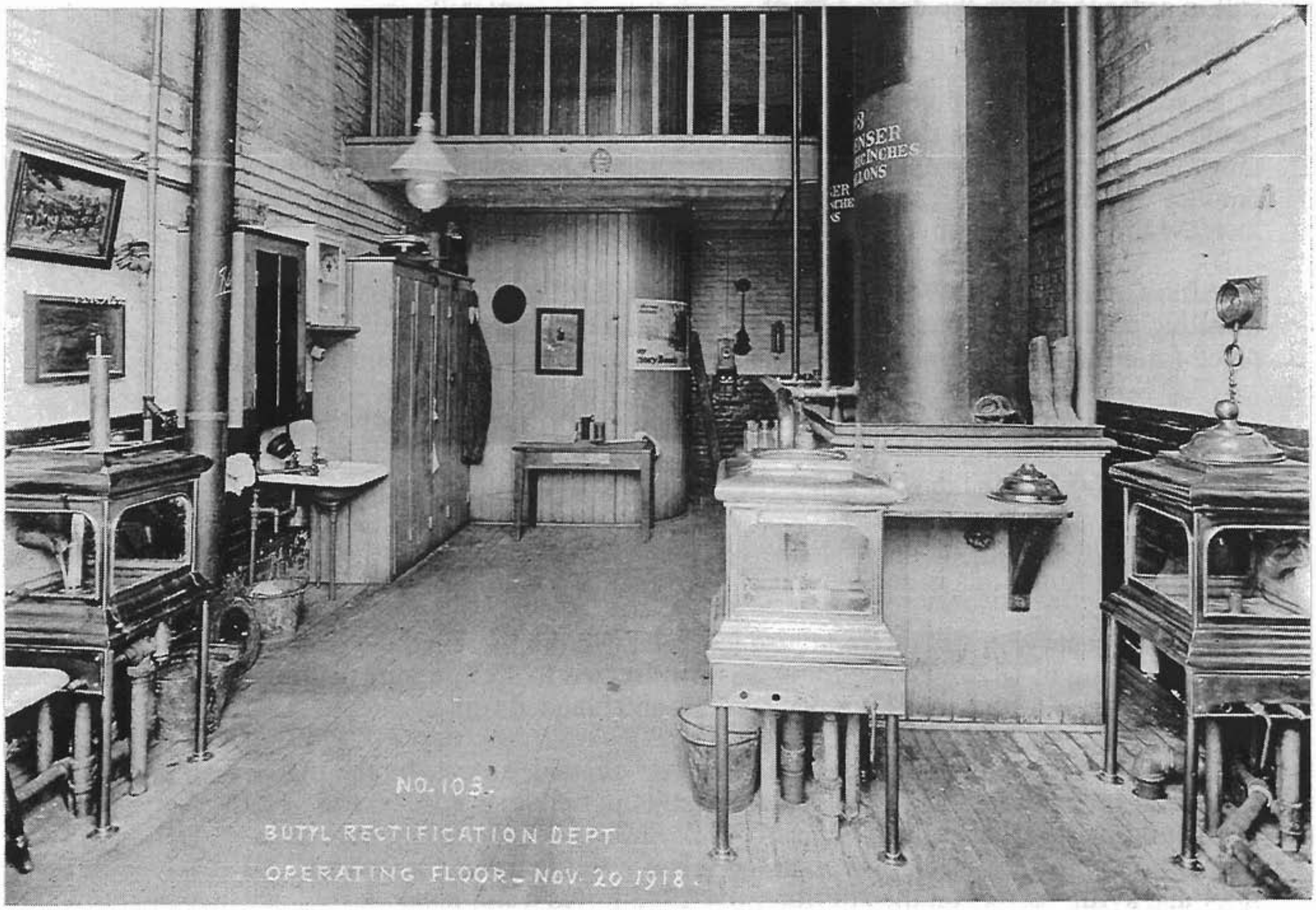


FIGURE A-9
The interior of the "Pure Spirits" Building 53, 54, 55 or 56, November 1918. The mezzanine level at the back of the photo and the corbeled brick to support a floor can still be seen in most of these buildings in 1994 but the exact building cannot be determined from this photo due to the extensive remodeling of the interior at various times during the 20th century.
Source: G&W/British Acetones photograph #103.

On Site Resources

See Section B: Maltings - Building 35
Pure Spirits Complex - Buildings 53 to 56

1.4.3 Filtering

Process

Impurities could be removed by filtering the spirits through charcoal. The technique was very simple but was not as effective as redistillation and did not increase the alcoholic content of the spirit. A charcoal column was commonly seven to 30 feet tall and three feet in diameter. In most cases spirits were filtered prior to redistillation and therefore were part of a larger rectification process.

By 1838, and probably since the still opened in 1837, G & W used charcoal to filter their spirits. This product was filtered through tall wooden rectifying vats containing charcoal and poured into barrels for aging. This type of alcohol was called "common whisky". It is not certain if the spirit was redistilled as well.

The Gooderham Company used charcoal filtering until the late 19th century. After the new distillery was completed, charcoal filtering took place on third and fourth floors of building #5. The charcoal filtering equipment consisted of 42 800 gallon tanks.

The company operated a charcoal burning shed to supply charcoal. By 1890 the building had been replaced by a copper shop (buildings #71 and 72). The land is now the vacant area west of building #75. This suggests that the company purchased it charcoal from outside suppliers.

Industrial alcohol was also filtered and in the early 20th century the General Distilling Co had a rectification house in its molasses distillery.

On Site Resources

None identified.

1.5 Mixing/Distribution

Process

Mixing Buildings #61 and 62 were last used to fill barrels and as a central area through which almost all of the product pipes in the complex passed. Filling barrels with spirits, both for aging and for sale, was the older of the two functions.

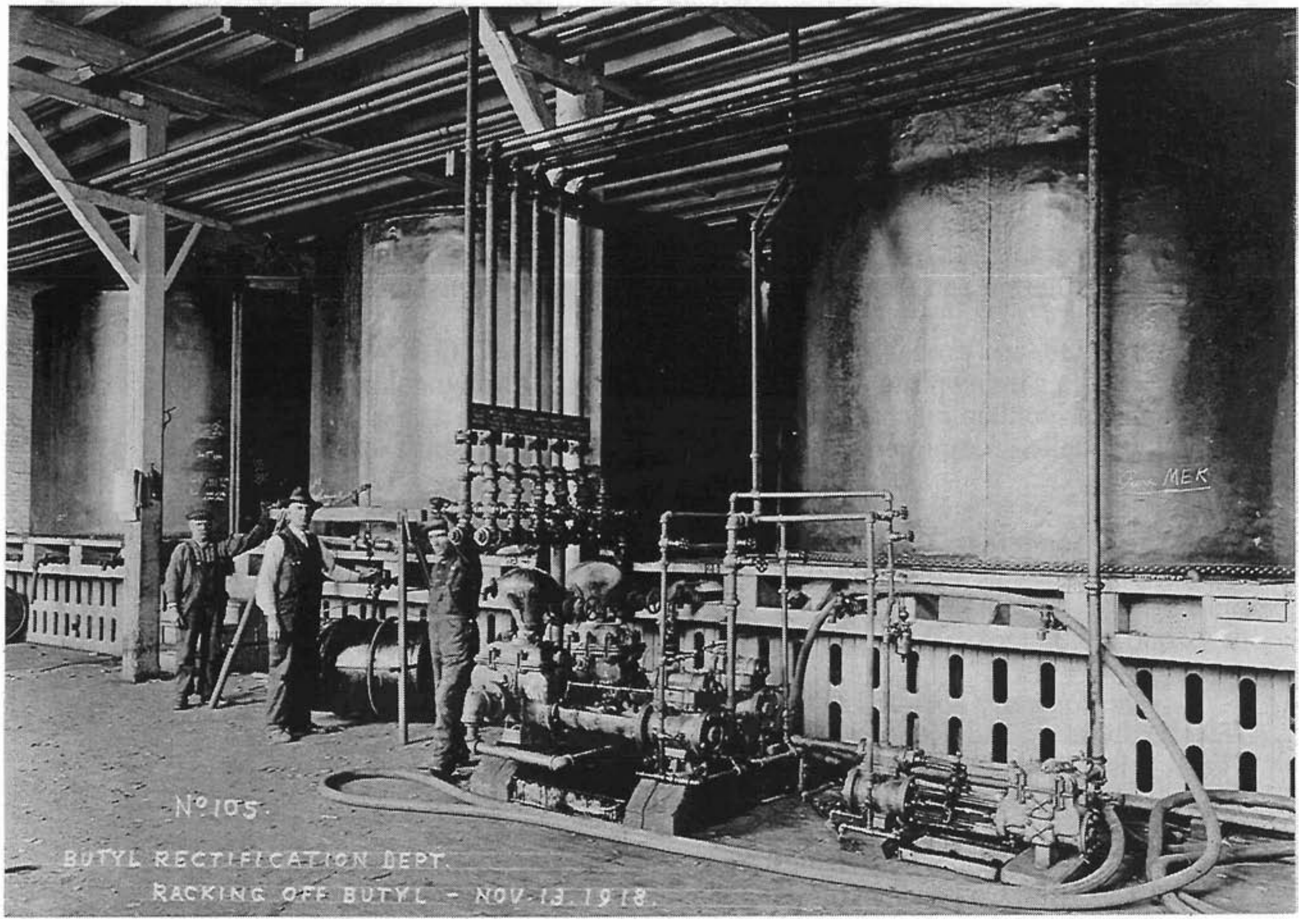


FIGURE **A-10**
Racking of butyl alcohol in Building 61 or 62, Nov 13,1918. The layout of tanks, pumps and associated equipment and pipes was largely unchanged until the facility was scrapped in 1991; the wooden tank platform remains in 1994.
Source: G&W/British Acetones photograph #105

In 1880 the "racking of spirits" into barrels occurred in building #34. By 1915 no building was identified for that function; building #34 having been converted into a paint shop. It may be that one of the tank storage warehouses was used for racking. By 1918 "mixing" or "racking" was probably undertaken in tank houses now called building #61 or 62.

The term "mixing room" was not used until after the first world war when the name was applied to a former tank house (building #61). The former cooperage and tank house, Building #62, was a mixing room by 1969. The mixing rooms came to play a central part in the operation of the distillery. Virtually all liquids used in the complex passed through the mixing rooms by pipe. The mixing rooms were connected by pipes to:

- Spirit receiving tanks in building #5
- Rail tank cars at building #60
  Denatured warehouse building #47
  Tank houses # 48, 49 and 50.
- Truck connections outside #61.

As G & W manufactured both beverage and industrial alcohol, the different products had to be handled in separate systems. Pipes were colour coded to ensure that improper connections were avoided.

On Site Resources

See Section B: Pure Spirits Complex - Buildings #61 & #62

1.6 Aging

Process

The aging of alcohol involves a series of chemical reactions producing changes in the original distillate that improve the aroma and taste of the final product.

Prior to 1885 G & W alcohol was filtered through charcoal and then aged for between two months and one year and sold as common whisky. In 1880 buildings #31, 32, 33 were used for the storage of spirits, probably in barrels. Additional warehousing was done in tanks in buildings #61, 62, and 63. Buildings #58 and 59 were for the storage of"spirits and whiskey," suggesting this was for bottle and barrel storage.

In 1885, an aging law was introduced whereby spirits had to be aged for two years before being sold. All whisky referred to as rye whisky was stored in barrels. The spirits required for chemical and mechanical uses were kept in tin and copper tanks. This alcohol had to be kept white and clean, otherwise the druggists could not use it if it had any colour.

As a result of the aging law that required two years of storage, the company had to increase the manufacturing as well as storage capacity.

By 1915 only building #42 was a rack warehouse; all other storage, including the east half of building #58 was in tanks. The building #59 and the rest of building #58 were a bonded warehouse and spirit storage. By 1943 #58 and #59 were converted to an antifreeze canning operation.

Most of the warehouses were specifically built for spirit storage. However some buildings were converted to rack storage. By 1918 the malt house (building #35) was used for general stores and by 1943 all four floors had been converted into a rack warehouse. Building #34 was used as a rack house by 1943.

For some years, around the 1940s two rack warehouse, #43 and 44 were used as general warehouse of the Howell Forwarding Co.

On Site Resources

See Section B: Buildings #42 #43 #44, #64, 65, #66, #75: barrel warehouses
Building #48, 49, and 50: tank storage.
Maltings: Building #35 [later used as rack house]

1.7 Blending, Packaging and Shipping

Process

Various batches of alcohol were blended together to produce a standard product. This was then poured into bottles or barrels for sale. No research was undertaken on blending or packaging history.

Little evidence of blending operations were noted on the G & W property. The principle survivors in 1994 were the tank bases and barrel dump trough in Building #61. The process of bottling was not researched for the property. A bottle storage warehouse was located south of the tracks in 1915 but was removed by 1943.

No bottling was done at the plant by the 1980s. Products produced at other plants were warehoused on the property. By 1943, after building #58 and #59 were converted into an anti–freeze line, beverage bottling was undertaken in the former laboratory (building #25).

In 1880 a small shipping warehouse was located near the railway tracks and connected by a "raised tramway" to building #62. A shorter tram was used after the "long room" building #62A was completed in 1883. The shipping warehouse disappeared when warehouse #74 was completed on that site in 1927.

By 1943 the former east boiler house (building #46) had also been converted into bonded storage.

Building #62A ("Long Room") was constructed in 1883 and used for bulk shipping. This was a long, low building used as a barrel transfer warehouse. This area was used to hold stock material awaiting shipment. There were five lines of rails for barrels.

The conveyor system from the canning plant, third floor, entered into room **62A.** There was also a narrow loading bay between **62A** and the packaging building. This had a covered roof and a large chute in it. This seems to have been a garbage drop for extra material from the packaging department.

On Site Resources

See Section B: Pure Spirits Complex – Buildings #58 & #59
Case Goods Warehouse – Building **#74**

2 INDUSTRIAL ALCOHOL

2.1 Manufacture

Process

The General Distilling Company was organized by the owners of G & W to produce industrial, non–potable alcohol from molasses. No reason for the construction of the plant was found. G & W may have been looking for new products. As well, molasses alcohol could be made in the summer which would complement the winter distillation of beverage alcohol.

The plant was completed in 1902 and operated virtually independently of the G & W distillery. The complex was constructed on the site of two former G & W tank houses at the comer of Mill and Parliament Streets. The company converted 100 tons of molasses into 10,000 gallons of alcohol per day. The distillery operated in the summer for about six to ten weeks or until all the molasses was used up.

The distillery needed a large storage facility for molasses. By 1915 a 1,250,000 gallon molasses tank had been constructed where the present large glycol tank stands. By 1918 the tank had been converted to butyl storage but was back to molasses by 1943. **A** smaller outside molasses tank seems to have been constructed after 1918.

In general, the process for manufacturing industrial alcohol was identical to beverage alcohol. The main object .was to produce as high a yield of alcohol as possible. Taste and flavour were of secondary consideration and only important when the alcohol was employed for some purposes such as pharmaceutical products.

Industrial alcohol was filtered and redistilled like beverage alcohol. The General Distilling charcoal filter room was 123 feet by 29 feet and located between the distillery and boiler house. It contained 32 cast iron rectifying filters using charcoal.

During the first world war the industrial alcohol complex was converted into an acetone plant. Although the buildings of the General Distilling Co were newer than the original G & W plant, they were demolished sometime after the first world war. They may have been too expensive to reconvert to alcohol production after the war.

Large scale industrial alcohol production ended with the removal of the General Distilling plant. G & W produced some industrial alcohol in its originally distillery after this date. In the **1920s,** the company began to produce anhydrous alcohol in the original distillery building.

Possibly the largest single use of alcohol in Canada, in the **1930s,** was as an antifreeze. G & W developed a new product called "Hot Shot" as a blend of denatured alcohol, certain oils and other ingredients which produce a non–corrosive solution. The demand for "Hot Shot" enabled the company to change from shipping the product in only steel drums to producing sealed gallon and quart cans of the antifreeze.

Ethylene glycol was stored in tanks at the west end of the property and brought by pipes to the canning department in building #58/59. The business was so important that by the 1940s the former bottling line in the building had been moved and replaced with the anti–freeze line.

Until closure of the plant, G & W continued to import industrial alcohol to the plant to supply the industrial needs of Toronto.

On Site Resources

See Section B: The vacant area along Mill Street is all that remains of the General Distilling Company plant.
Pure Spirits Complex - Buildings #58 & #59.

2.2 Denatured Alcohol

Process

Since an excise duty was collected on pure spirits, most industrial alcohol was sold as denatured alcohol. G & W in the 1930s carried over 100,000 gallons of various grades of industrial alcohol in stock for immediate delivery. This required a large denaturing department for both the storage and movement of drums.

The most common denaturent was methanol. **A** methanol line ran from pump in building #74 to denaturing building #47. The pipe ran through #62A but did not enter mixing rooms #61 and 62. **A** second pipe ran from pump house #60 through mixing room to #47

The denatured alcohol building was built in 1887 as a tank house and converted to its current use before 1943.

Building #47 contained 12 large alcohol tanks that are used to mix denatured alcohol. Denaturing chemicals were stored in small metal tanks of five to ten gallons and then mixed with ethyl alcohol. Compressed air was used to mix the chemicals. By the 1980s, G & W no longer manufactured industrial alcohol at their plant as the company's distilling process had become too expensive. Instead, G & W bought ethyl alcohol from Montreal and denatured it in Toronto so that they could supply the local markets.

On Site Resources

See Section B: Denatured Building #47

23 Anhydrous Alcohol

Process

Distillation in a continuous still **can** produce alcohol that is about 95% pure, the remaining consisting mostly of water. For most commercial uses, alcohol of this strength or weaker is used. Consequently, alcohol is stored at that strength.

It was only during the 1920s that the large scale commercial production of anhydrous ethyl alcohol became financially viable. Ordinary alcohol is 95% alcohol and 5% water. Ordinary distillation methods will not remove the remaining 5% of water because it is the nature of ethyl alcohol to hang on tightly to this remaining water.

Several processes may be used in the manufacture of absolute or anhydrous alcohol. **A** "few years ago" G & W installed a process by which the vapor of boiling alcohol was bubbled through ethylene glycol running down the column from plate to plate. This chemical had a remarkable affinity for water and as it descended, it carried away water remaining in the alcohol. The product was condensed and collected as absolute alcohol that was 99.98% pure. The product was piped from the still in building #5 to the mixing room #61. The still was not in use by 1969.

On Site Resources

See Section B: Stone Distillery - Building #5 [anhydrous alcohol still]

3 ACETONE

Process

Acetone was a solvent in production of cordite - an explosive used in great quantities by the British in the First World War. By the early 20th century, the British Ordnance Committee had standardized the formula to consist of 65% gun cotton, 30% nitroglycerin, and 5% mineral jelly (Vaseline). Acetone was the solvent to reduce the nitroglycerin and gun cotton into a jelly. One pint of acetone was sufficient to make one pound of cordite.

The British Acetones Toronto Limited was formed early in 1916 to manufacture acetone fiom corn by the, then, newly discovered Weizmann process. G & W converted their industrial alcohol plant operated by the General Distilling Co. into an acetone plant for the duration of the war. The first agreement with British Acetones was that only the property of the General Distilling Company would be used. The G & W facility would only provide milling and mashing facilities. Then, "through the patriotism of Gooderham and Worts", the entire plant was gradually converted to the production of acetone by the end of the war. The plant produced 2,850 tons of acetone during its operating history from August, 1916 to November, 1918.

Acetone could be produced by several methods. One process used before the War consisted of converting alcohol into acetic acid, the acetic acid into calcium acetate, and finally calcium acetate into acetone. Acetone was also extracted from seaweed and this became an important source during the War. But all methods had production limitations and war demands forced the development of new technologies.

British Acetones adopted the Weizmann process at the G & W plant. This was a bacteriological process analogous to the manufacture of alcohol. **A** starch solution, either grain or corn, was inoculated with a "culture" and the ensuing fermentation produced a beer of acetone (0.7%), butyl alcohol (1.4%), ethyl alcohol (0.08%), carbon dioxide and hydrogen.

The Weizmann process produced large quantities of butyl alcohol - a product for which there was limited commercial or military demand during the war. Therefore, in 1917 British Acetones began constructing a plant to convert the alcohol by means of a catalytic process into methyl-ethyl-keytone (MEK), a solvent with similar characteristics to acetone. Only a small quantity of MEK was shipped before the war ended.

On Site Resources

After the war, most of the former General Distilling Co. plant was demolished. The only remaining building is a former still house constructed on Mill Street sometime between 1916 and 1918. This building is not owned by G & W.

An iron cooler still remains in Building #6. [Figure B-16; further research should be undertaken to confirm if this was an acetone mash cooler]

4. DISTILLERY BY-PRODUCTS

4.1 Mill By-Products

Bran, the outer covering of a grain of wheat, was removed from the grain during milling and separated from the meal by means of scalpers.

The method of handling bran at G & W in the 19th century is unknown. By the early 20th century the bran was blown from the ground floor of the mill (building #3) through a 12 inch galvanized pipe to an 82 inch cyclone separator in the attic of the malt house (building #35). Here the bran was sacked and sold.

Middlings were another mill by-product. In the 19th century middlings were a poor grade of flour produced by mill stones and that contained a high level of bran. It was only suitable for animal feed. With improvements in flour purification and milling techniques, the term middlings came to be applied to a high grade intermediate flour and to a finished product used as animal feed after the flour has been extracted. No documentation on the use of middlings from the G & W mill could be located.

On Site Resources

None identified.

4.2 Fermentation/Distillation By-Products

4.2.1 Mash Grains and Distillery Slop

Process

The residue from mashing and distillation could be used for cattle food. The spent grains from the mashing process were sometimes known as "draff" while the residue from the still was known as distillery slop. Distillery slop could also be concentration as a thick syrup and burned in a furnace. The ash, containing about 35% potash, was a valuable fertilizer while gases from the furnace could be washed with water to recover ammonia. This process was not used at G & W.

In the 1830s no ready market existed for distillery slop in Toronto. Therefore, Gooderham expanded into a dairy operation in order to use the by-product. In 1843, the firm purchased 22 cows and by 1850 the herd had expanded to 108 cows. By the early 1860s G & W had sold the cattle business to William Lumbers. Distillery slop was piped under Trinity Street and sold to Lumbers' operation.

By the early 1870s G & W had reestablished itself in the cattle business and opened a large farm on the east side of the Don River, about 3/4 mile from the distillery. In the mid 1880s, the company was feeding 2,500 head of cattle from distillery slop. The slop was pumped through a six inch copper pipe directly from the distillery to the farm. The pipe crossed the Don on the south side of the Grand Trunk Railway bridge. The farm and pipeline were still in operation in 1911.

By the 1880s three slop vats were located near the railway in the vicinity of building #60 perhaps to supply the retail trade. By 1915 two large slop tanks were located at the west end of the property on the site of the small glycol tank today. One was removed by 1918.

There seems to have been a switch from liquid slop to dried slop in the early 20th century. By 1915 slop drying was undertaken on the first floor of building #4. By 1918, a two story, wooden louvered shed on top of the mill boiler house (building #2) was probably associated with slop drying. In 1994 Building #4 still contained a slop drying rack and storage hopper. The area was still used for drying in 1943.

On Site Resources

See Section B: Stone Distillery - Buildings #4 & #5.

4.2.2 Carbon Dioxide

Process

Carbon dioxide from fermentation could be collected, purified, and stored in cylinders to be sold or utilized for the production of dry ice. By the 1940s the Liquid Carbonic Company had a factory at the northwest corner of the G & W property. This probably was the firm that used the carbon dioxide from the fermentation. The former Liquid Carbonic plant is now a vacant field.

On Site Resources

None identified.

4.2.3 Distillation By-Products

Distillation yields small quantities of by-products, primarily in the form of aldehydes and fusel oils. Only the fusel oils had any commercial value as solvents. Fusel oil are an undesirable impurity in ethyl alcohol and are removed by filtering and redistillation. Fusel oils consist of several alcohols such as amyl, propyl, and butyl alcohol. Amyl alcohol came into demand because of its high boiling solvent and its use in nitrocellulose plastics, films and lacquers. Butyl alcohol found use as a solvent in many applications. G & W had a fusel oil tank in building #57 from at least 1880 until at least the 1940s. When the plant closed in 1990 fusel oil was still collected and stored in Building #5. At the early part of the 20th century aldehydes had no particular-use as they were too reactive to be used as solvents.

On Site Resources

See Section B: Building 5

5. AUXILIARY SYSTEMS

5.1 Fire and Explosion Protection

Explosion:
Protection from explosions was very important in the production of volatile alcohol. Preventative measures included ventilation slats in the flooring of the distillation building #5. All switches, lights and telephones were enclosed in explosive proof electrical boxes.

Buildings #53 to #56, the "Pure Spirits Building," has a distinctive glass front and the four distilling areas were separated by brick walls. The west wall of each floor is composed of glass doors that was designed to blow outwards if the distillery blew up. [Figure A–11]

Many doors through the complex were constructed of heavy metal that seemed to be explosion proof as well as fire proof. They separated buildings such as between the mashing in building #5 and the grain elevators in building #3. Another set were the doors from building #53 into building 61. This double door with a timber door on the east side and a metal door on the west side of the wall for fire protection.

Steam engines and pumps may have been retained at G & W longer after electric motors became practical in order to minimize the threat of sparks prevalent in motors.

Fire
Virtually all buildings were of masonry construction to reduce the fire hazard. The spacing between the buildings, especially the rack warehouses may have also been designed to reduce the risk of fire spreading from building to building.

Fire protection by the 1880s was limited to six pumps located through the property. About 1895 a fire pump house was constructed to hold a boiler room and two 1,000 gallon per minute fire pumps. Steam was always kept in one boiler and the second boiler was always ready for use. Steam was provided by two 85 horsepower Babcock and Wilcox boilers. Fire protection water was brought from the bay. In 1927 a large water reservoir was constructed under the case goods warehouse #74 to provide an assured supply of water for the pumps.

Sprinkling of the buildings did not occur until after 1915. This seems rather late for such a vulnerable complex. Good sprinkler systems had been developed in the late 19th century. In 1915 only the boiler room for the fire pumps in building #60 was sprinkled. All buildings were sprinkled by 1943.

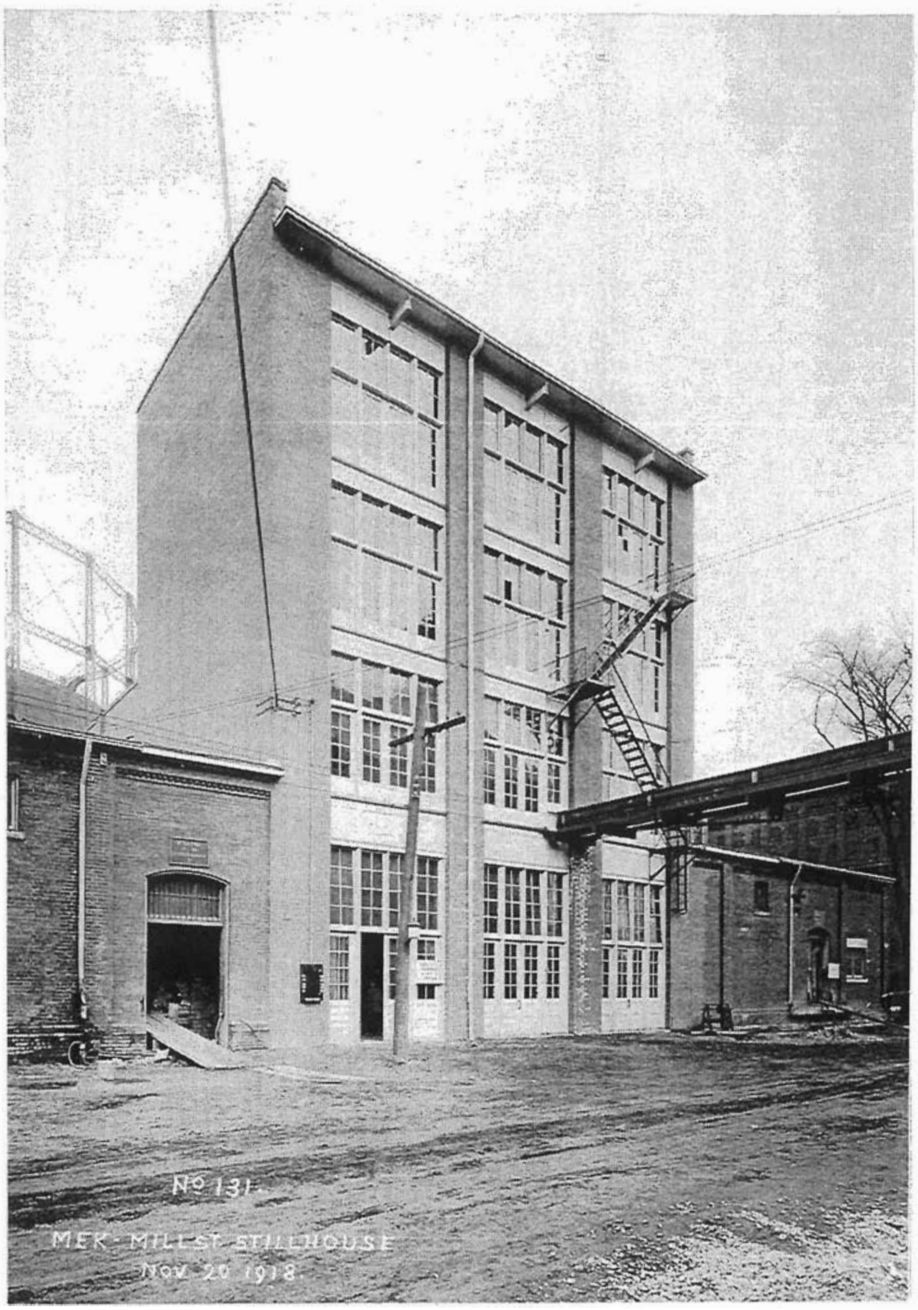


FIGURE A–11
The MEK still house used in the manufacture of acetone in 1917–18. The glass walls indicate the three bays for still columns. Each is separated by thick brick walls to deflect the blast of an explosion out onto Mill Street rather than into the adjacent equipment. The building still stands in 1994 at the northwest corner of Mill and Trinity Street. The building is owned by the City of Toronto and is not part of the redevelopment scheme.
Source: G&W/British Acetones photograph #131

5.2 Material Handling

5.2.1 Vertical Haulage

Hoists: ***A*** non–functional hoist serves all floors on the outside of the north side of Building #5. On the ground, to the right side of the building, was an "eye" through which a cable passed and was pulled by horses. **A** hand operated winch is found in the attic of the malt house. (Building #35) Small hoists were found in several buildings including the slop drying areas (Building #4) and the malt kiln (Building #36).

Bucket Elevators: The malt house is assumed to have once contained **an** elevator to carry barley to the top floor. No evidence of the hoist remains. The mill building contained bucket elevators typically found in grist mills for the movement of grain. A coal hoist was located in the boiler room to load an overhead coal bunker.

Gravity Slides and Chutes: Warehouse buildings #59 and #74 have spiral slides to move case goods. Chutes, or spouts, were used in the mill building as gravity feed for the mills. Trapdoors in the malt house were used to bring material from the upper floors.

Pneumatic: Bran was once moved from the mill building to the attic of the malt house by air. No evidence of this system exists today.

Freight and Barrel Elevators: The malt house (building #35) contains an electric freight elevator installed after the building was completed. It served the basement and all floors except the fourth (attic). The electrically powered hoisting equipment was situated on the top floor. The cables have been removed and the carriage is situated in the basement. Rack warehouse #42 contained a freight elevator and evidence of a rope hoist in 1994. Portable barrel hoists were used in the smaller rack houses. Case goods building #74 had an elevator.

5.2.2 Horizontal Haulage

Belt Conveyors: ***In*** 1994 various conveyors, both belt and roller, could be seen in buildings #58 and #59 for the movement of case goods. Conveyors also carried packages to other buildings. Other buildings may have once had conveyors but the evidence has been removed.

Screw Conveyors: Screw conveyors exist in the mill building and mash cookers to move grain. No evidence of other screw conveyors were noted.

Tramways: ***In*** 1880 a small shipping warehouse was located near the railway tracks and connected by a "raised tramway" to building #62. After the "Long Room" (building #62A) was completed in 1883, a shorter tram ran from this building to the railway. The shipping warehouse disappeared when warehouse #74 was completed on that site in 1927. The "Long Room" (building #62A) had barrel rails and plates in the shipping area. **A** movable barrel runway connected the drum reconditioning building #63 with the denatured alcohol building #47.

5.2.3 Liquid Transport: Pipes and Pumps

A characteristic of the *G* & W complex are the large number of overhead bridges used to carry steam pipes and product lines between the buildings. Because alcohol does not freeze, it can be taken through above ground pipes. The principal products pumped through pipes included:

- Molasses from dock to storage tanks
- Molasses from storage tanks to fermenting tuns;
- Raw beverage spirits from distillery to mixing room;
- Spirits from mixing room to denaturing room and tank storage;
- Beverage/industrial alcohol from rail cars/tanker trucks to mixing room;
- Ethylene glycol from storage tanks to anti-freeze canning;
- Methanol from rail cars to denaturing room;
- Denaturing line from railway to building #54;
- Anhydrous alcohol from distillery to mixing room;
- Beer well to distillation column;
- Distillery slop to farm.

In addition to fixed pipe routes, flexible hoses were used with portable pumps to empty and fill fermenting tuns and pump the wash to the beer well.

Several duplex and simplex steam pumps were located throughout the property but none seemed to have been in use when the plant closed in 1990. At the time of closure the main molasses pump, a modern electric pump from West Germany, was located in building #8. Alcohol pumps used for unloading rail cars and tank trucks were located in Building #60.

A slop pipeline was used to connect with the Don farms. The pipeline was 3/4 mile long and operated from about 1872 until the early 20th century. Portions of this pipe are still buried adjacent to the stone distillery and were identified in 1994.

5.2.4 Compressed Air

In the early 20th century compressed air was used to move acids in the MEK plant, to handle the butyl and for pneumatic construction tools. Two air compressors are located in Building # 2A. Compressed air was used to clean pipes of fluids after the pumping operation is over and to mix products in the denaturing room. In the early 20th century two air compressors were located on the "stone floor" of the mashing area. The principal compressor was operated by steam. A smaller compressor was operating by a belt drive only used when demand was heavy.

5 3 Weighing

A wagon scale house stood outside the mill (building #3) from the 1880s until at least 1943, **A** variety of scales were found throughout the complex. A flour scale was located in the mash house (building #5). A track scale was located on the ground floor of the mill building.

Weighing was a very important component of record keeping for excise requirements and to keep track of production yields. Three large tank scales are located in a loft in Building #61. Tank scales for spirits were noted in the still area, mixing rooms and the pure spirits building. Barrel scales were noted in several location such as the mixing room (building #62) and the denaturing building.

Dormant Warehouse **Scales, with Two** Iron **Pillars** and **Sliding Poise** Beam.

No. 1, Capacity, 5,000 lbs......Platform, 48x48 in........each, $

No. 4, Capacity, 3,500 lbs......Platform, 41×43 in....... "

FIGURE A-12
A Fairbanks warehouse scale of c.1865. Scales of similar design are still located with the G&W complex in 1994. The largest and most distinctive are three immense tank scales in the loft of Building #61.
Source: ***Illustrated Catalogue of American Hardware of the Russell and Irwin Manufacturing Company,*** 1865.

5.4 Barrel and Drum Manufacturing

Initially a cooperage for repairing and cleaning barrels was located in building #5. This area was later converted into additional fermenting rooms. By 1880 a cooper was located in building #28 and by 1890 had expanded to include building #32. As well a large barrel (wash?) house had been built on the west side of the malt house.

Until at least 1890, a cooperage for new barrels was located at Cherry and Front Street, a half mile to the north. By 1943 the former tank house, building #62, was used as a cooperage and continued in this function until at least 1969. There is no cooperage on the property today.

In 1915 building #8 was a fermentation room but by 1918 it had been converted to a drum washing room. By the 1930s the space was called a drum room for the manufacture of steel drums. This required presses, rolls and other metal working machinery to produce these steel containers. No evidence of drum making equipment existed by the 1980s.

Building #63 was constructed as a tank house in 1879. By 1943 it had been converted into a paint shop and may have been used to paint drums. By 1969 it was called a drum paint shop and the shop continued to recondition steel barrels until the plant closed. Alcohol has such an affinity for water that it will be drawn into the barrel and cause rust and barrels returned from customers had to be cleaned. The barrel reconditioning unit had two barrel rollers. Chains were put into the barrel and the machine rotated the barrel until all rust was removed. Barrels were also painted. None of this equipment was evident in 1994.

5.5 Cooling

Cooling was needed in the both fermentation and distillation. As early as 1850 an ice house was constructed by G & W to provide cooling for the condensers. From at least 1880 until the early 1920s an ice house was located where building #75 was built in 1927. No mechanical refrigeration equipment seems to have been built in the complex. By the 1890s the company had an intake pipe from the harbour. When in operation, Building #2A contained two electric water pumps to bring water from the harbour for cooling. The intake pipe had a water filter and the line was periodically back washed to remove sediments. The pumps were still in place in 1994.

5.6 Utilities

Gas: The distillery received gas lighting in 1841. This was the time when municipal gas were installed throughout the city. Gas jets were noted in Malt House #35 and riser pipes for gas were observed in Mill Building #3.

Electricity: The date when ***G*** & W received hydro is unknown. The original service was 550 volts at 25 cycles. It was brought into the Trinity Street pumphouse and metered there for distribution to the plant. As demand grew, a new switchboard was established on the General Distilleries property. In 1890 a building north of the fermentation building was called "electric light". The purpose of the building is unknown.

Water: The distillery obtained city water from **watermains** on Trinity Street and Mill Street. By the 1890s the company had a water intake pipe extending into the harbour that provided cooling water and a supply for the fire protection system. The intake began 3,200 feet from the shore of Toronto Island and was 79 feet below water level. The temperature of the water ranged from **35°** F in winter to **58°** F in summer.

Sewage: No information on sewage systems was located.

5.7 Transportation

5.7.1 Railways

Railways were an important means of both importing raw materials and exporting finished products. The original route of the 1856 Grand **Trunk** ran along the south side of the distillery building. The building was served by a railway siding. In the 1920s a new grade separation scheme relocated the mainline further south over what had formerly been harbour. G & W became interested in railways as a natural extension of their milling activities. The Gooderham family was involved in the promotion of both the Toronto, Grey & Bruce Railway and Toronto & Nipissing Railway.

5.7.2 Water

The original shoreline of Toronto harbour is delineated by the railway siding. Gooderham's first wharf and windmill had been established at the foot of Trinity Street in the late 1830s. The original wooden wharf and store house was replaced by a longer, sturdier structure and a large grain elevator as business expanded. By the **1860s, G&W** owned schooners on the Great Lakes.

// Wrong seems check //

The first filling of the harbour around G & W occurred in the 1890s as a result of the tripartite agreement. Much of the area was filled with railway yards. By 1906, G & W was isolated **from** the harbour by a wide belt of railway tracks. The tracks must have created problems trying to transfer goods from the company's wharf to the distillery. The problem would have been alleviated with the grade separation project of the 1920s. However, the Gooderham wharf and grain elevator were removed for the project - thus ending the company's presence on the waterfront.

By the early 20th century the marine loading equipment had long since been dismantled from the former wharf elevator. All grain and corn **arrived** by rail. The elevator was seldom used except when excess corn and grain could not be handled at the mill.

G & W maintained a slip at the foot of Parliament Street in order to receive barges of molasses brought in from Hamilton. A pipeline connected the slip to the storage tanks at the distillery.

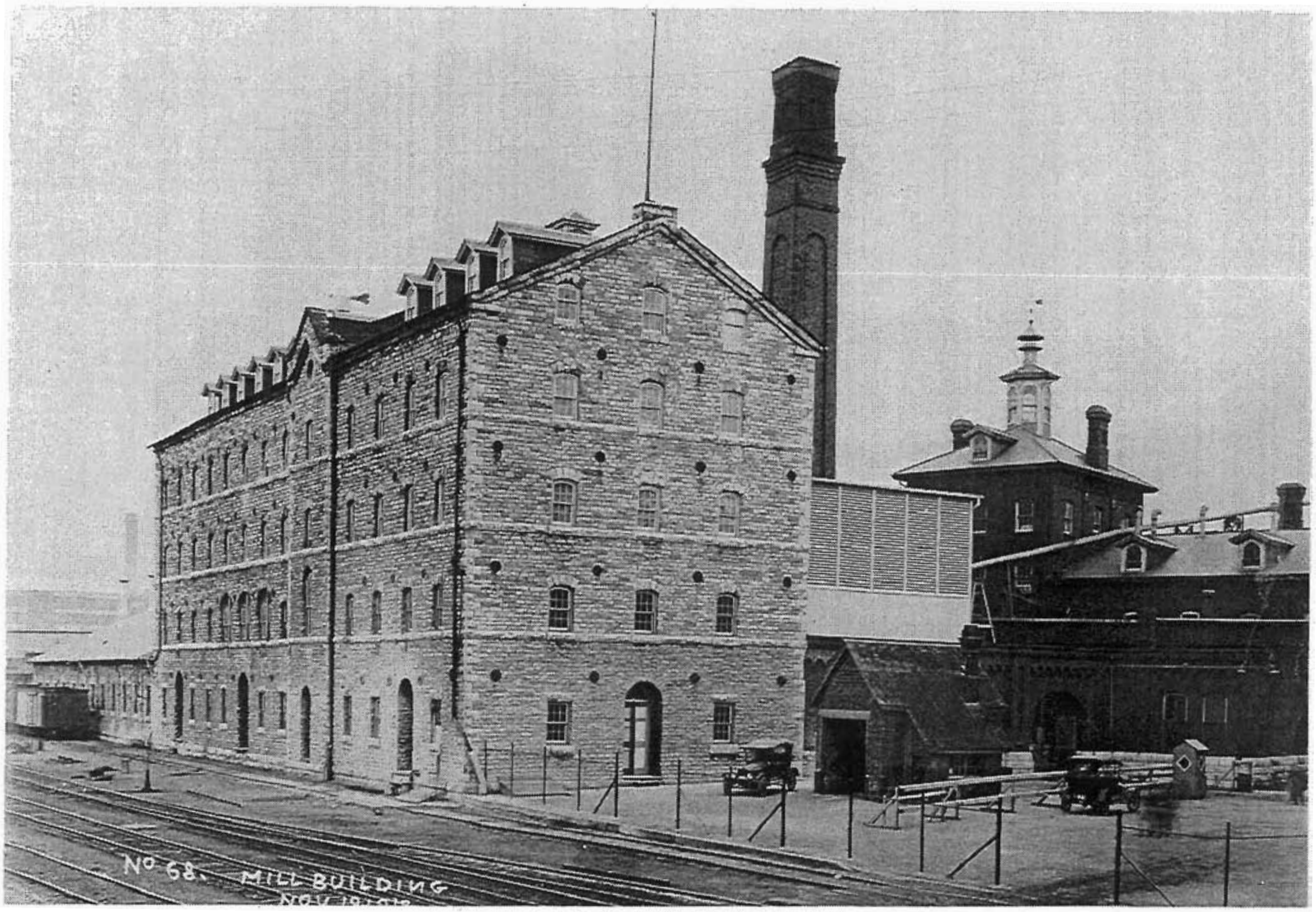


FIGURE A-13
The Mill Building (Stone Distillery) November, 1918 showing the Grand Trunk Railway mainline and company sidings on the left. The grain unloading hopper is visible at the comer of the Mill Building. **A** weigh house is situated between the two automobiles and was used to receive goods delivered by road. The louvered wail of the Mill Building behind the weigh house was associated with grain drying.
Source: G&W/British Acetones photograph 68.

5.7.3 Road

G & W used road vehicles to move commodities among its buildings and to ship products. For example, grain was transported from the elevator to the mill by carts. During the first world war acetone was taken by motor truck in the summer months to the wharf and shipped by water. By the early 20th century, G & W operated an assortment of road vehicles. A few resources of early road transport still exist. The red paving bricks used on Trinity Street is a 19th century road surface, now uncommon. Building #52 was constructed for stables in 1877–1880. By 1918 it was a coach house and garage and later only a garage. The building was still a garage in 1969 but was subsequently converted into offices for ***G*** & W.

5.8 Process Steam

Steam was used for mashing, operating the stills, slop drying, heating buildings, and to provide power for pumps and engines. In addition to the boiler houses, pipes were necessary to carry steam to various buildings and equipment. Large iron pipe brackets are located in Building #61.

5.8.1 Boiler Houses

Mill Boilers: Buildings #2 and #4 were originally built in 1859–1860 and rebuilt after the 1869 fire. [Figure A–141 It was a one story building and contained six boilers with a total capacity of 600 h.p. **An** "economizer" was installed in early 1870s and was still in use in 1918. Economizers pre–heat boiler water from the flue gases prior to entering the chimney.

The boiler house was extensively modified in 1889 when four boilers were installed by the John Abell Company. These boilers are no longer in place indicating that the existing boiler was constructed after 1918. By 1918 the boilers were removed from #4 and the area used for slop drying. The floors above the boiler buildings were used for this purpose.

The mill boilers were no longer in use by 1918 but were retained in serviceable condition. The boiler room contained four 100 horsepower horizontal return tube boilers that worked on 70 pounds of steam. They used a Jones underfeed stoker. **A** forced draft was provided by a 30 foot diameter fan.

In 1994 the mill boiler room contained three gas fired boilers and provided steam heat for the buildings. These boilers were probably installed within the last 20 years.

East Boiler House: The east boiler house (building #46) was completed in 1886 and contained eight 100 h.p. boilers that worked under 60 pounds of steam. By 1943 the building had been converted into a bonded warehouse.

West Boiler House: This boiler house had been constructed near the intersection of Mill and Parliament Streets to provide steam for the General Distilling Company plant. The boiler house was subsequently demolished.

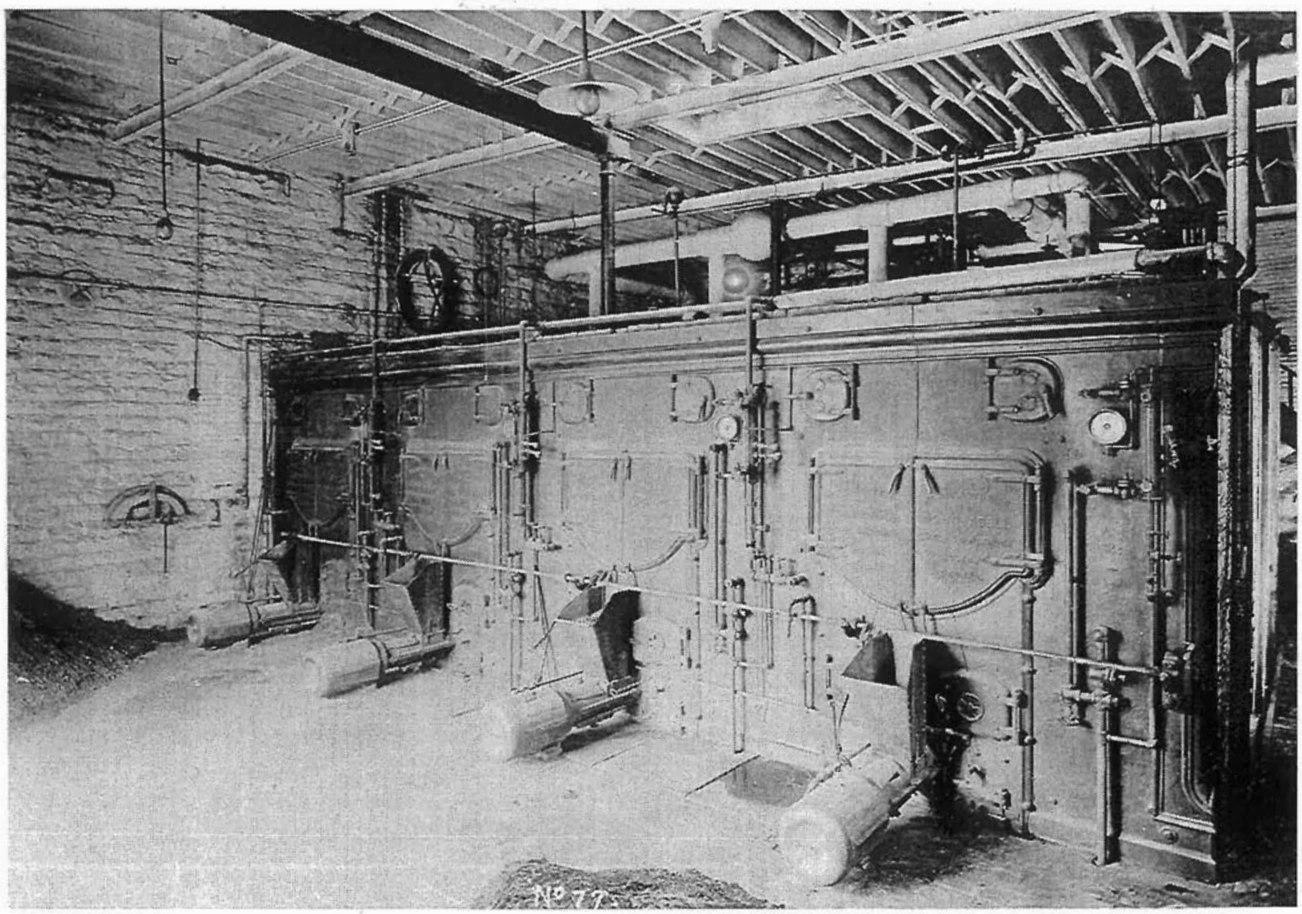


FIGURE A–14
Boilers, likely in Building #4, November, 191.8. In 1994 a Taylor coal fired boiler still remains in Building #2 but has been out of service since the early 1970s. Source: G&W/British Acetones photograph 77.

These three boiler houses were interconnected but the operation was complex because the west boiler house operated under 125 pounds of steam. Generally, the "60 pounds system" was provided by the east boiler house for the Trinity Still Building, mill engine, mash equipment, and mash pumps.

Unidentified Boiler House: In 1880 a small, two boiler building was in operation west of #47 and south of #46. The area is vacant today and the complex was replaced by the east boiler house.

Building #60 Boiler House: The stack and ash doors associated with this boiler still exist. Pump ?

5.8.2 Coal and Ash Handling

In 1880 coal storage was located at the west end of property. The plant consumed 7,000 to 8,000 tons of slack coal annually. Coal was received only by rail. By 1915 coal storage was south of the tracks. Coal was brought by carts from the storage area to the boiler rooms. Today steam is produced in gas fired boilers. During the 1870s, the considerable quantity of ash produced by the boilers was used to build roads in low lying areas surrounding the distillery.

5.9 Industrial Power

5.9.1 Steam Engines

When the mill was constructed in 1859, a centrally located engine house (Building #2A) was designed to power all equipment. [Figure A-15] The building was so arranged that the major power users were located on either side of the steam engine. On the east side was the mill that required power for grinding, elevating and cleaning grain. On the west side was the mashing operation that required power to operate agitators.

The engine was manufactured by Bartley and Gildert and survived the 1869 fire. It was a vertical beam engine, turning a 26 foot flywheel and with a nominal 40 h.p but capable of working at 100 h.p. The company was proud of its motive power as the engine room was described as being carpeted and having the feel of a "ladies parlor." By 1880 the engine was rated as 150 h.p.

In 1882 the engine had been replaced with a Thomas Worswick 28" by 60" single cylinder horizontal steam engine with Brown valve gear that worked on 60 pounds of steam and produced 400 (later 500 horsepower) at 60 rpm. [Figure A-161 The flywheel ran within a wooden housing and the location of the housing can still be seen today. The engine was scrapped in 1957.

Power was transmitted by shafts and gears to the stone mills. Belt drives were used to operate the mill equipment.

The former engine room #2A still exists although all the equipment has been removed.

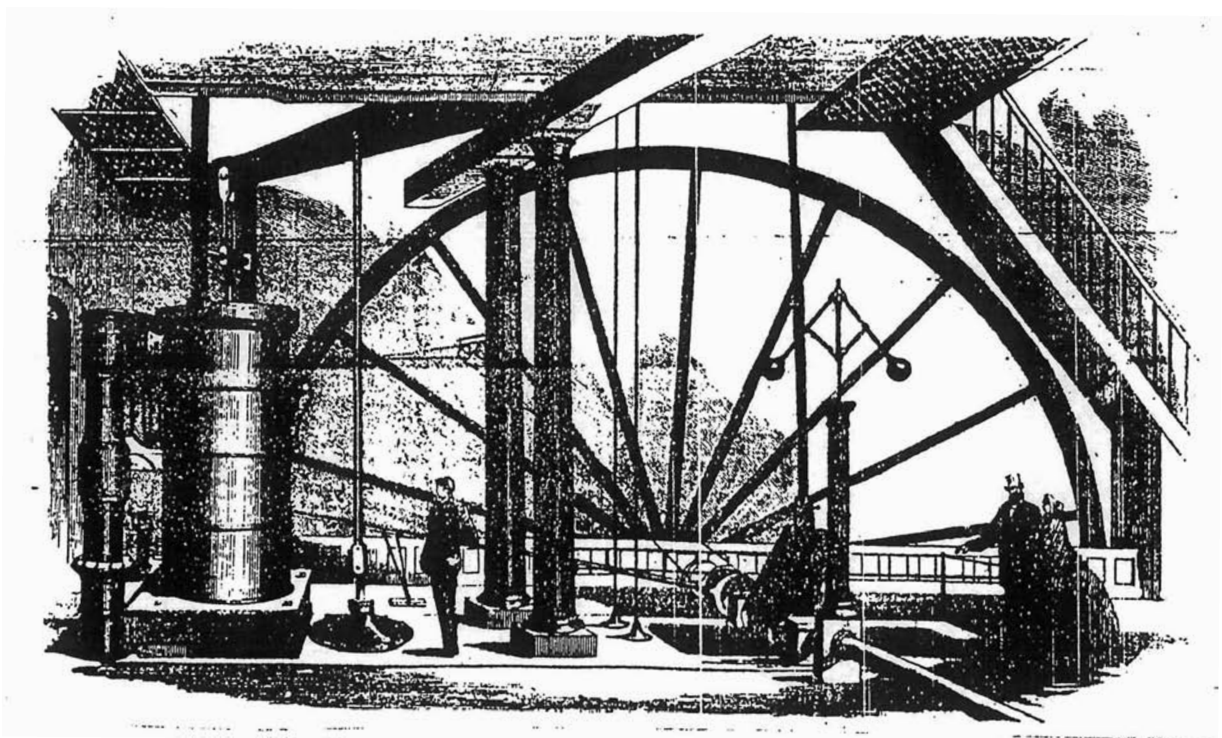


FIGURE A-15
The engineer's floor of the 1859 Bartley and Gilbert steam engine in 1863. The layout of the former engine room as seen in 1994 was determined by the need to house this engine.
Source: *Canadian Illustrated News,* April 23,1863.

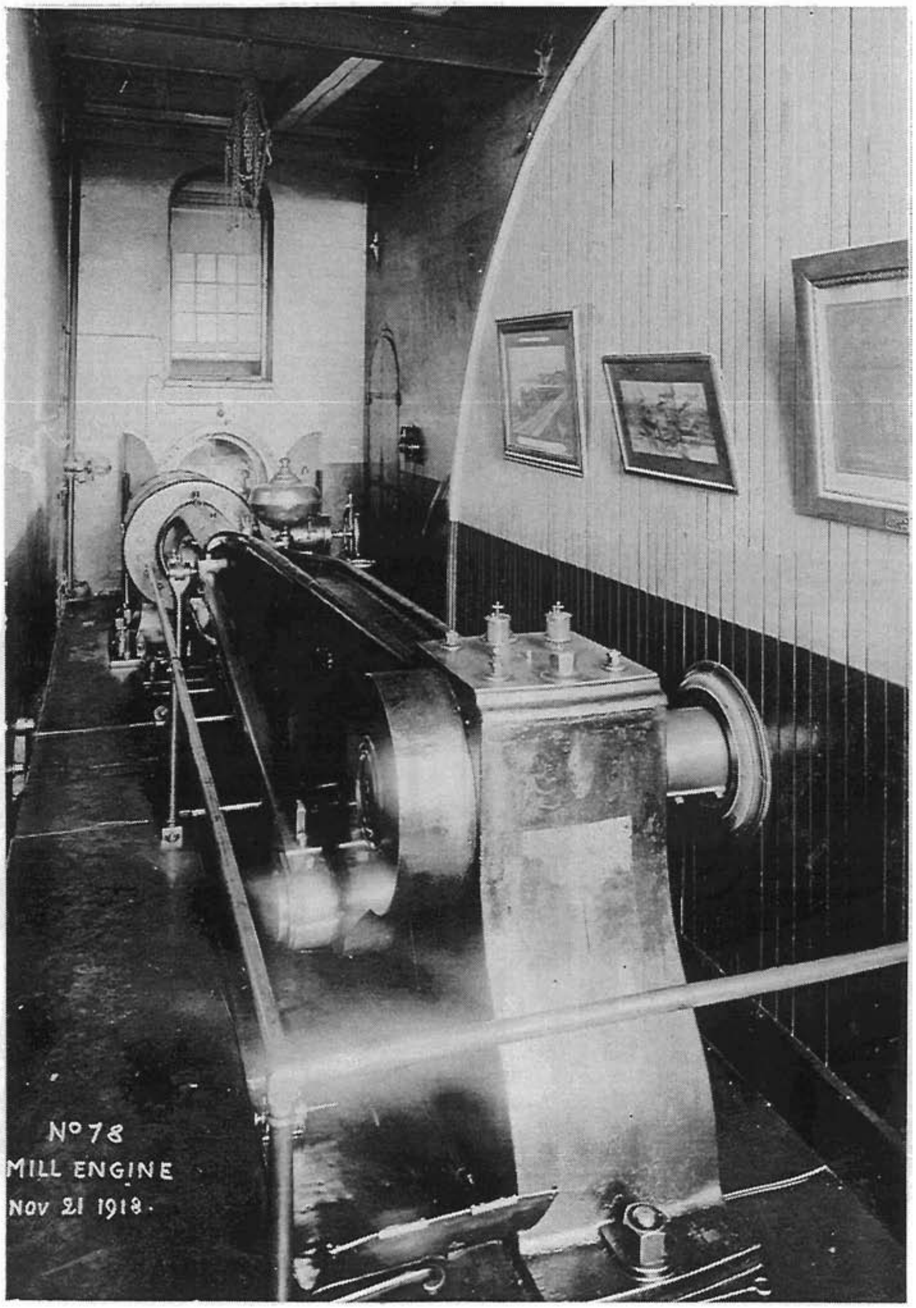


FIGURE **A–16**
The engineer's floor of the 1882 Thomas Worswick steam engine in November, 1918. Piaster marks on the engine room wall in 1994 indicate the location of the wooden flywheel housing shown in this photo; see Figure B–2.
Source: G&W/British Acetones photograph #78.

5.9.2 Other Forms of Power

Wind: For two years in the 1830s G & W relied on a windmill for power. Although it became a landmark structure on the harbour shore, wind was not a reliable source of power and the mill was only able to grind 50 barrels of flour per week. After the second year of use, a 16 h.p steam engine was installed and from then on G & W relied on steam power.

Electricity: The date when electric motors came into use is not known. Small horsepower motors are now used throughout the plant. Two gasoline engines are used to power the fire protection water pumps.

5.10 Plant Maintenance

A small paint storage and tool house was in existence in 1918 on site of building #74. A paint shop located in buildings #27 and #34 in 1915. Building #8 was still used in 1994 as a machine shop for site maintenance. All of the machines are driven by overhead line shafting driven from an electric motor. Down the middle of the floor is a truck driveway. In the northwest corner is a shop for metal working. It contains mainly modern tools. A large sheet metal shear was manufactured by the Excelsior Tool and Machine Company of St. Louis, Illinois. It is also a belt driven machine.

Building #45 was completed in 1887 as a carpentry and plumbers shop.This building has continued in use for the same purpose to the present day. The west half of the building is used as a workshop. All of the equipment is relatively typical and modern woodworking equipment. There is a few remnants of former belt drive pulleys on the ceiling. There appears to be nothing special about the equipment or function of this area. The east half of #45 is used as a steam pipe fitting shop. The equipment in it is modern and of no particular importance.

Much of the distillation equipment was manufactured of copper. In 1880 a copper shop was located on the site of the present building #74. By 1890 the former charcoal house had been converted into a copper shop and the old copper shop converted into a paint and storage area. Enlarged over the years, the new copper shop continued in that use until at least 1969. It was know as building #71 and #72. The area is now vacant and some of the equipment may have been removed to Building #2.

5.11 Employee Facilities

In 1885 the company employed 150 men. The number of employees at the time of closure was not determined for this study. By the 1980s there were three main employee areas. Building #45A, although referred to as the First Aid building seems to be used as a lunch room. It was described in that function in 1915. By 1943 it had become a time room but after 1969 reverted back to a lunch room.

Other employee areas are provided throughout the complex. Lockers for employees were located on floor 1 of building #5. At one time floor 2 contained an abandoned washroom area. It had a large industrial sink, a shower and two toilets. A coverall list on the wall was dated October 19,1955. An employee lunch room and showers is in the southwest corner of building #8. Lunch rooms/change rooms were also located in Buildings #74 and #75.

5.12 Laboratories and Offices

By the 20th century laboratories played an important role on the quality of the product. British Acetones maintained two labs during the first world war. A bacteriological lab was located over the G & W offices (building #25) while a chemical lab was located in a General Distilling Company building. Building #25 was later converted into a bottling plant and today is offices. It is connected by a pedestrian bridge to the fermenting building.

A modem laboratory is located on floor 2 of building #6 and is constructed within the framing of the ceiling. There is a bridge connection between this floor and the office building across the lane.

On floor 2 of building #7 is an old autoclave made by the Bramhall Deane Company of New York. It was a rather attractive copper barrel about 2 feet in diameter.

By 1880 offices were located on the second floor of #31, and #33 and have continued in that function to the present day. Throughout the years, other offices have been located throughout the property. The second floor of the former boiler room of building #60 had been converted into offices but is now vacant. The office was reached by an inside staircase adjacent to the doorway to the alcohol pump house. Apparently this was the original sales office for McGinnis Distilleries.

In the 1980s buildings #25,27,28,31,32,33,and 34 were used by Hiram Walker as offices while G & W used Building #52.

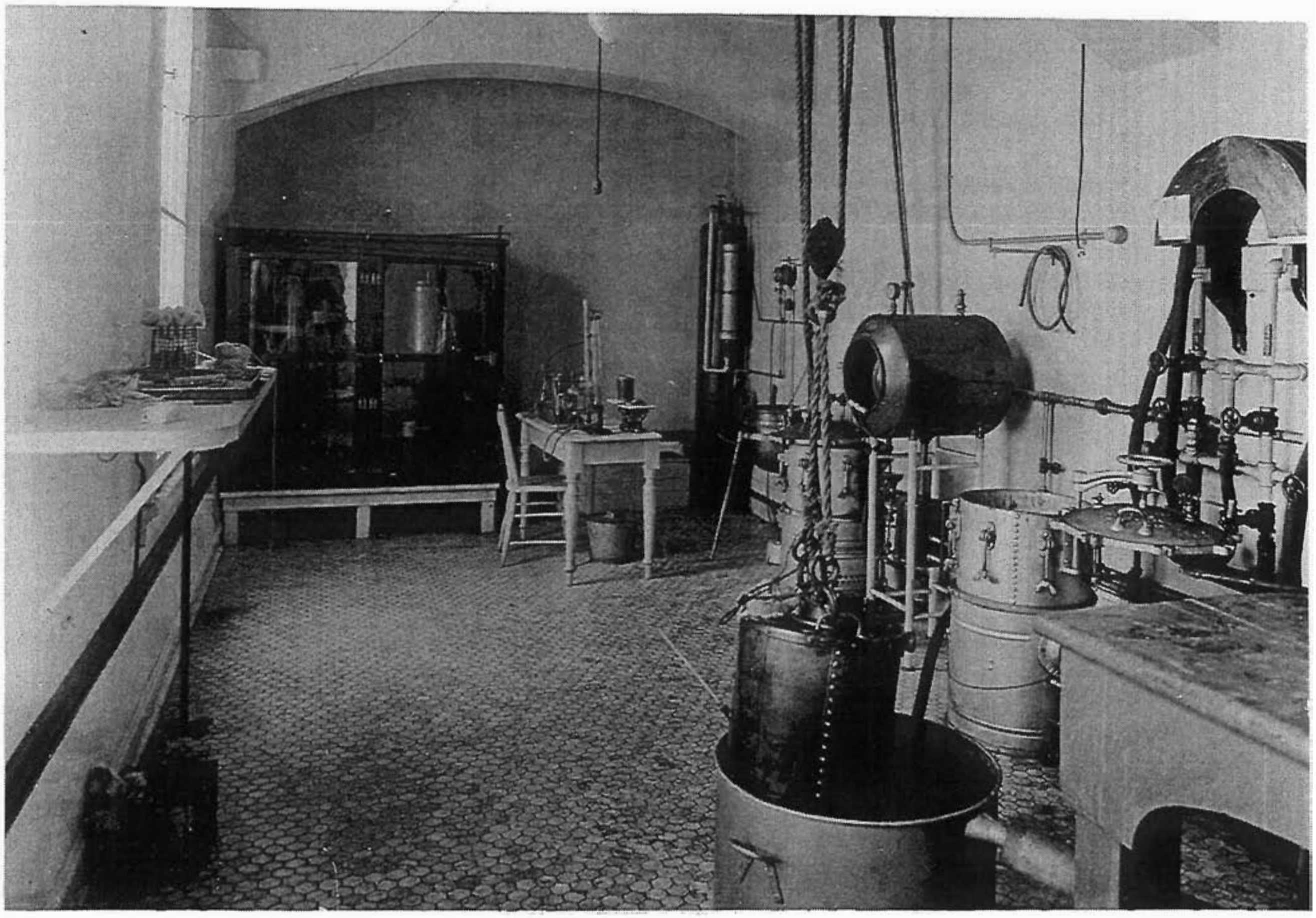


FIGURE A–17
The sterilization room (location unknown) November 1918. In 1994, the copper autoclave in this photo, or another one of identical design, is still located in the mezzanine of Building #7.
Source: G&W/British Acetones photograph #2

6. OBSERVATIONS

- Major modernizations of the complex was undertaken in the 1920s and 1940s. After the second world war, the small size of the plant did not encourage further modernization.

- In the 20th century there was a transition from grain to molasses alcohol. This evolution began in the early 20th century when the production of industrial alcohol from molasses began. Grain alcohol production ended in 1957 and only molasses was undertaken at closure.

- The importance of industrial alcohol increased during the 20th century. Anhydrous alcohol was introduced as a product line in the 1920s and antifreeze by the 1930s. As industrial alcohol distilling could not keep up with demand, increasing amounts of alcohol were transported to the site and the plant used as a distribution centre for the Toronto market.

- Acetone production was undertaken for a very short time in 1917/18. The process had no effect on changing the product lines of the company as acetone production ended with the war.

- Distillation is the distinctive process of the spirit industry. The existing distillation columns probably date from no earlier than the 1930s. Although the process is distinctive, the equipment is modern.

- Industrial alcohol became a major *G* & W product by the early 20th century. *G* & W was also an early producer of anhydrous alcohol in Canada.

- Large quantities of process steam were necessary to power engines and pumps, dry slop, heat buildings, and operate the distillation columns. Even after electrical power replaced steam engines in the mid 20th century, process steam was still necessary and is used today.