in a 1300 gallon per day steam-heated still. Analysis of this water is made for the presence of copper, iron and residue. Since it is to be used for dilution of the final product to the desired proof, it is necessary to know the pH value as well.

D. FUELS.

The Calvert Distilleries operate their own power plant so their organization of chemists checks the fuels used for power as a further means of extending control. Moisture, fixed carbon, fusion point, B.T.U. content, volatile material, and ash are all determined.

IV. MAIN PROCESS.

On the accompanying flow sheets the points in the process where samples are withdrawn for test are marked in red to give an idea of the completeness of the supervision given production in a modern plant. The tests conducted are designed to indicate the condition of the entire batch of material.

Grain from the railroad siding is unloaded by means of a screw conveyor, capable of handling 1000 bushels per hour, and carried to the top of an elevator, where it is cleaned and screened to discard about two per cent. As needed, the grains are allowed to descend over magnetic separators to remove metal particles and passed to the high speed mills for grinding.
The meals thus prepared are sent to bins for future use. It is at this point that starch content is determined. As needed, the meal is conveyed to the top of the main process building, where it is weighed continuously to the proper proportions by control from a central panel on the third floor. This is approximately 85 per cent rye and 15 per cent malt, which is mixed with warm water on its way to the cookers. The mash is brought quickly up to $150^\circ \text{F.}$ by the entrance of live steam and held for an hour at which time it is lowered into drop tubes to continue conversion of the starch to sugar. Here in the process the pH value (about 5.5 is right for best conversion), acidity, and the ratio of maltose to dextrine are determined.

The mash, as it leaves the drop tubes, is again sampled and tested on its way to the coolers where the temperature is lowered to about $80^\circ \text{F.}$ From the coolers, the mash is piped to one of the fifteen large fermenters to be inoculated with yeast.

This fermentation process occurs in 40,000 gallon tanks equipped with air pipes, cooling coils and live steam outlets for sterilization.

Tests are run daily to determine the degree of fermentation on what is known as 24, 48 and 72 hour beer. These include specific gravity, acidity, and pH.

No attempt is made to recover the CO$_2$ formed in the fermentation, for it is believed that the reaction is more complete when open to the atmosphere.

The mash is pumped from the fermenters to the "beer wells" in preparation for distillation.
BEER WELLS

CALVERT DISTILLERY
DISTILLATION CONTROL PANEL OF

CALVERT DISTILLERY
The equipment for the distillation of the prepared mash is a five column unit consisting of beer, aldehyde, rectifying, pasteurizing and fusel oil columns for the separation and purification of the ethyl alcohol formed from the other products of fermentation. The residue, or spent beer, is tested for the percent alcohol present as it leaves the beer column.

V. BY-PRODUCTS.

No distillery for the production of grain spirits would be complete without a plant for the recovery of the grain tissue remaining for use as cattle food. At the Calvert plant, the spent grain travels to a separate building where it is screened and pressed to separate a large amount of cake from the beer. The remaining liquid is then evaporated to a thick syrup and mixed with dried meal to pass into a revolving steam-heated dryer. Testing is necessary of the final product to be sure that certain requirements are met. Bushel weight, moisture, protein, fat and fibre are among the items controlled.

The fusel oil that is recovered from the distillation consists of a mixture of higher alcohols and is sold to chemical companies for their recovery.

VI. AGING

As it comes from the stills, the alcohol is approximately 110 proof and water white. It must now be aged in charred
BEER COLUMN CONTROL PANEL
CALVERT DISTILLERY