run continuously and this gave spare chlorine at intervals to be disposed of. In looking for processes which would take care of this surplus chlorine gas, several by-product industries were started. Chloroform was made by treating acetone with chlorine under certain conditions. Instead of buying acetone, the company finally bought acetate of lime as raw material and made acetone by destructive distillation. Carbon tetrachloride is closely related to chloroform and was soon another by-product. As the sulphite mill had plenty of sulphur. the manufacture of sulphur chlorides was started. These are the ordinary chemicals used in making acetic anhydride from sodium acetate, and it was a simple step to convert acetate of lime into sodium acetate for treating with sulphur chloride to give acctic anhydride, now so much in demand for manufacture of cellulose acetate for airplane "dope."

"Kream Krisp"

All this time there was the loss of hydrogen gas from the cells. By bringing the hydrogen and part of the chlorine gas together in a combustion chamber and lighting a match, the hydrogen and chlorine burned one in the other to form hydrochloric acid, and the mixture has now been burning several years. with practically no attention, to form hydrochloric acid, which is one of the commonest and most important acids on the market. The widely advertised and highly nutritious lard substitutes are made by treating refined vegetable oils with hydrogen to form a harder fat of exactly the same composition as the main fat in lard. The company undertook to use up some of its waste hydrogen by combining with peanut oil and the well-known "Kream Krisp" of the Brown Company is now a standard by-product. Not content to buy prepared peanut oil, the company bought peanuts and made its own oil.

With water power and sulphur to spare, the electrochemical conversion of coke and sulphur into *carbon* disulphide was added to the list of by-product industries.

To make grain Alcohol.

There is now some talk of making grain alcohol (*ethyl alcohol*) from finely divided saw-mill waste by an improved process of heating the wood under steam pressure with mineral acid to form sugars by the breakingdown action known as "hydrolysis," and then extracting the sugars for fermentation into alcohol. It is claimed that *oxalic acid* can be made from the woody residue in the digester.

As a further example of careful attention to details, the company puts all its bark through a hydraulic press for use as fuel. Slabs from the sawmill are barked in rotating "tumbling barrels" and the clean wood is then chipped for use in making sulphite pulp. Even the *edgings* are freed from bark by a hand operation of holding against a rotating drum set with knives and this material also goes into chips for the sulphite mill. In the kraft process the spent sulphate liquor always has to be evaporated and burned to recover the alkali, and the company has adopted the Cottrell process of electric percipitation of fumes from the incinerator to recover some alkali that would otherwise be blown out to waste.

How it came about.

All this complication of manufacture did not develop from the original saw-mill without careful study, technical skill, and financial courage on the part of the men in control of the company. At the same time there is hardly anything strictly original with the company in the whole list of byproducts. What was necessary was an intelligent knowledge of the possibilities and painstaking experimental work to adapt each desired process to the company's own conditions. This has required first-class technical men with imagination and patience, as well as liberal advances of money by the company for experimental and development work. It is said that the number of dollars now spent by the company each year on re-