CHAPTER 2

SOME GENERAL OBSERVATIONS REGARDING SAPONIFICATION

975. Let us put together the facts from the previous chapter and books that must serve as the basis for the theoretical study of the saponification reaction mechanism. Let us coordinate them with new facts in order to draw conclusions that will enable us to understand what happens between fats and alkalis in general.

976. Spermaceti and the species of fatty matter that belong to the 5th and 6th genera[1] as well as the fats that are derived from them do not react immediately with potassium hydroxide[2]. For this reaction to take place, the fats must undergo some changes in the equilibrium of their elements. Accordingly, spermaceti is converted by the alkali into cetyl alcohol and solid fatty acids, stearin and olein are converted into glycerin and solid fatty acids, butyrin, phocenin and hircin are converted into glycerin and solid fatty acids and one or more volatile acids. It should be noted that these conversions take place without oxygen absorption and without any portion of any of the elements of the fatty matter splitting off, so that these elements end up in their entirety in the saponification reaction products. We shall see in the next chapter that the *elementary analysis of the species of fatty matter of the 4th[3] and 5th genera, when compared with that of their saponification products, is completely in accordance with this.*

977. Because the change in the equilibrium of their elements that fats and oils undergo during saponification is determined by an alkali, the entities that appear after saponification, or at least some of them, must have a certain degree of affinity for bases capable of forming salts. And since acidity is just this affinity raised to a certain energy level, the possibility immediately arises that at least some of these entities possess the properties of an acid. Accordingly, *the appearance of palmitic, stearic and oleic acid and the volatile acids after saponification is easy to understand,* just as *the proportionality that exists between the amount of alkali that reacts during saponification and the amount of oil or fat saponified.* This proportionality has been demonstrated by the experiments described in Chapter 5 of this book.

978. It is evident that the substances that will saponify most readily must be those in which the elements occur in such proportions that together they can constitute acid compounds[4]. This is the case for the stearins, olein, phocenin and butyrin since at least 92/100th of their mass

is made up of acids, the remainder being glycerin. It is also evident that spermaceti, in which cetyl alcohol, which is not acid, constitutes about 2/5th of its mass, is bound to be more difficult to saponify than the previous substances.*

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[1] As mentioned in the Table listing species of lipids on page 13, the 5th genus comprises triglyceride fats such as tallow and human fats and their fractions, which on saponification yield solid fatty acids and glycerin. Triglycerides of the 6th genus also yield glycerin, but volatile acids instead of solid ones.

[2] The author compares the saponification of fats with for instance the reaction between potash and hydrochloric acid. The latter is 'immediate'.

[3] The species mentioned in the Table on page 13 as belonging to the 4th genus is spermaceti.

[4] This is pure inorganic chemistry. Bases react with acids, but it was not yet known that in organic chemistry, acids can also form compounds with alcohols. This was something the author came to discover. Like most discoveries, this started somewhat hesitantly.

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* Another cause that might influence this result is that the cetyl alcohol remains part of the mass being saponified and forms a mechanical obstacle for contact between the caustic potash and the spermaceti particles that have not yet been saponified.