High costs of fatty materials have made the practice of economy in the soap business essential. This economy may manifest itself in several ways. We will assume at the outset that the soap manufacturer wishes to maintain the quality of his products and therefore does not wish to make any sacrifice in this direction. His economy must therefore direct itself in one of the following directions. He must be able to utilize the fats and oils which give the greatest soap-making value at the lowest cost per unit, whether these materials are of the better, or of the poorer grades, and he must so utilize his raw material that his final product will be of the same high quality no matter which grade is used. This means that he must have a method for getting good results out of poor material when poor material gives him the greatest value. It is also essential that he have some method whereby he may realize the maximum yield of glycerine at a low expense for recovery. This will readily be understood when I explain that at present market prices for fats and glycerine, which are both abnormally high, the value of the glycerine which can be obtained from one pound of neutral fat is about one-third of the cost of the fat. Another possible way of economizing is by quicker and easier methods of manufacture.

All of these advantages have been realized in some degree by the advent of the Twitchell Process. This process has given a quick and easy method of obtaining fatty acids and glycerine from the better grades of fats so that the fatty acids are at once ready for making into better grades of soap, and the glycerine is in a condition suitable for easy refining. With care of operation the yield of glycerine may be made to approximate closely that theoretically obtainable. When one operates on fats of poorer quality, and this may include black greases, the Twitchell process furnishes a most satisfactory method for saponifying. It renders the glycerine available even from such material and gives acids in good condition for refining by means of distillation. Such acids when carefully distilled yield a product of light color suitable for making good soaps of light color.

The use of fatty acid as such, has made it practicable to use soda ash very largely in the place of caustic soda. The former will combine direct with fatty acids making soap from which the glycerine has already been recovered, whereas caustic soda is necessary for the direct saponification of fats into soap, and tedious methods must be used for recovering the glycerine, and, except with the greatest care, the yields will be poor. It will thus be seen that in the use of fatty acids a saving may be effected even in the alkali employed, as soda ash is considerably cheaper than caustic soda per unit of alkali.

Fatty acids suitable for making into soaps are also suitable for making into candle material. Partial solidification on cooling, will, with the aid of pressing, separate the solid from the liquid acids. The former yields commercial stearic acid so extensively used in candle manufacture and the liquid portion yields the oleic acid, or red oil of commerce. Red oil is used for many purposes, one of the most important being in the manufacture of soaps for washing wool. The manufacture of stearic acid and red oil did not originate with the Twitchell process, but the advent of the Twitchell process gave a new and satisfactory method for the saponification of fatty materials at atmospheric pressure with advantages over methods formerly used. Saponification by means of the Twitchell process may be carried out on a larger scale, with less danger and with greater ease than is obtainable by other methods of acid saponification.

Twitchell's first process in which he recommended the use of sulfo-oleic acid was soon very much improved by the use of naphthalene along with the oleic acid during sulfonation. Whatever the chemical action in the formation of this reagent, it is my observation based on many experiments that satisfactory saponification will result from saponifier made as Twitchell recommends, whereas poor results only are obtainable when separate sulfonation and subsequent mixing are tried. I may

say that I was among the first to have an opportunity to become acquainted with the process, and that this acquaintance has become closer with added years.

This process has been put to extensive use not only in America but also in European countries.

Twitchell later devoted himself to a method of manufacturing his reagent which would enable him to produce it in a more concentrated form. He accomplished this by methods of washing, extraction, precipitating as an insoluble salt readily convertible into an active reagent, and drying.

Twitchell and others allied with him have been busy in trying to perfect still further the process of atmospheric saponification of fats into fatty acids and glycerine with the result that a new sulfonated reagent with increased efficiency has recently been put upon the market.

The Twitchell process has been so simple in use that one is almost inclined to look upon it as nothing out of the ordinary. On careful thought one is forced to conclude that it is this simplicity, which has become almost commonplace, that commends it most to the many who have become familiar with it in operation.

COLGATE AND COMPANY
JERSEY CITY, NEW JERSEY

AN APPRECIATION OF DR. TWITCHELL

By H. B. SCHMIDT

Thirty years is a span of life; practically a generation has passed. In these thirty years there has been marked in this country profound changes, unparalleled growth and vast development. The bankers may tell you that the bank deposits have increased maybe ten times in this span of life. The iron people tell us the production of iron has increased about ten times, but what measure of increase can be put upon the developments that increased the chemists' opportunity; how many times—surely hundred-fold at least.

Only a generation ago when the industrial chemist started on a career, what had he before him? Simply the obligation to create an opportunity. As an example, going back to conditions then in Chicago, it was hard work to gather together a dozen men at a meeting. There were two iron and steel chemists, two railroad chemists, two metallurgical chemists, one soap chemist, one packing house chemist, two assayers and two professors.

The audience will get an idea of how inadequate the conception was of what a chemist's work consisted. One day in walking across the Stock Yards in Chicago I was stopped by one of the then partners of what to-day is one of the largest institutions of its kind in this country, who said: What do you do over at Fairbanks? Explaining what the routine duties consisted of, what new things had been taken up by the laboratory, he finally said he did not think his institution could employ a man full time at that kind of work and yet three months after that interview that institution employed its first chemist. I dare say that that institution to-day has at least fifty in its employ.

In Cincinnati the conditions were similar and if we look back on the chemist's equipment and temporary abode on a far-off lot or prairie, with no gas, no electric lights, coal oil lamps and gasoline torches to work with, good work was carried on under severe conditions. I am always amused when I think of the difficulties of nitrogen determination at that time compared with the Kjeldahl method of to-day. Then we required a glass combustion tube and charcoal furnace and a boy to fan the coals. If he fanned too hard the glass tube cracked; if he did not fan hard enough, the distillate was colored and you could not titrate it. Under just such conditions our distinguished guest started.

Comparing these meagre facilities with the magnificent equipments that every college laboratory has to-day, reminds me of Dr. Wolcott Gibbs, when one day in his research laboratory the inadequacy of the equipment came up and he said, why—do you know how the great Berzelius got his results? Why, all he had were some bottles, a sink and a cook stove. The present generation hardly realizes the huge advantages it enjoys.

Away out in a field, in a lean-to to a still building, Dr. Twitchell also had to create his opportunities, and there seeds of progress were sown. There were no fixed lines to work on; every step was capable of researches and these had to be made, in order to find the ways in which the chemist could make himself valuable and gradually the structure grew. Twenty-four years ago next July, there was a meeting of the Society of Chemical Industry at Liverpool. One morning while riding on the second story of a tram car, the two-story horse car affair that was a characteristic of English streets, reading the itinerary of the meeting, a party slapped me on the back and said: Are you a chemist? Yes. Oh! he said, you are from the States; where from? Chicago, but expected to go back to Cincinnati to live. Well, he said, Cincinnati—why, do you know Mr. Twitchell? Yes; we went to school together. Well, he said, he has made the best contribution to the chemistry of soaps that I know of. His method of determining the percentage of rosin in a soap is the only method that gives us the means of determining what

a competitor had in his soap and then my party said, here is my card, I am Dr. Lewkowitsch and I had the experience of Mr. Twitchell's method in a soap works at Warrington. So our honored guest early in his career had made a valuable contribution to chemistry and was known to every chemist that was in fat and soap lines.

Only a few more years elapsed when Mr. Twitchell was able to announce the working out of the Twitchell Process of Glycerine Recovery. The means employed were so novel that when the German Patent Office was asked to pass upon the patentability of the Twitchell Reagent, they doubted that a compound described by Mr. Twitchell could exist. It is needless for me to dwell on what the process has done. You have heard that told to-night.

Just one more word. The young chemists will appreciate much more what Mr. Twitchell has done. His methods, employed in hundreds of factories throughout the world, have necessitated chemical control of operations and so have afforded just that many more opportunities for the employment of skilled chemists in those works. So what one man has done benefits one hundred or one thousand men through a new opportunity and this is only one example of where the opportunity has grown a hundred-fold.

CINCINNATI, OHIO

CURRENT INDUSTRIAL NEWS

VOLCANIC HEAT HARNESSSED

The idea of utilizing volcanic heat to drive an electric power house of 15,000 h. p. might seem as being out of the realms of possibility, but Prof. Luigi in an interesting article published in *Engineering* for November 17, 1916, shows that this has been realized in Italy. In Central Tuscany, near Volterra, there are numerous cracks in the ground from which powerful jets of very hot steam spout high in the air with great violence and constancy, bringing up boric acid and other mineral substances. These substances were found to have a corrosive effect on the engines in earlier experiments and the difficulty has been overcome by applying the steam, not directly in the engine, but to a boiler instead of fuel. Steam is produced in the boiler and then passed to a superheater after which it is utilized in the steam turbine for driving electric generators.

The undertaking has been financed by Prince Ginori-Conti and three large installations on this system have been made; one, of 3000 kw. units, was started in January, 1916, the second in April, and these seem to be giving satisfactory results. The third system has been started quite recently. These installations are said to be a great boon to the industries of Tuscany, where coal is scarce and very expensive and, since the region available is a large one, it seems likely that the system may be developed in such a way as to produce hundreds of thousands of horse-power.—A. McMILLAN.

RUSSIAN MANGANESE ORE

The Board of Trade, London, is in receipt of a memorandum by a Russian mining engineer dealing with the subject of Russian supplies of manganese ore. The memorandum discusses the manganese ore industry in Russia, the production and exportation of the ore and the market values of the same. Tables are also given showing the production of steel in certain countries and the imports of manganese ore into these countries distinguishing the proportion of ore of Russian origin, etc. It is stated that the output of manganese ore in Russia has increased from 396,324 tons in 1904 to 681,424 tons in 1909 and to 1,255,175 tons in 1913.

ADULTERATION OF COD-LIVER OIL IN NORWAY

According to an article in the *Oil and Color Trade Journal*, 50 (1916), 1815, the oils of exotic fishes used for the adulteration of cod-liver oil by some merchants are mostly those obtained from the so-called "coal-fish," "cusk" and haddock. It is asserted that the Lofoten merchants do not practice adulteration during winter fishing and that the oil then made is extracted exclusively from cods' livers because no other fish is caught at that season there. Chemicals are not used for purposes of adulteration as far as is known, excepting perhaps a very small percentage of sulfuric acid during the steaming process in order to facilitate the extraction of the oil. If cod-liver oil be mixed with oils from the livers of fish akin to the cod (such as mentioned above), the mixture is never more than 10 per cent or less. It is very difficult to prove this adulteration by methods of analysis. Medically pure genuine cod-liver oil is of a bright yellow color with a slight odor only. The adulteration of this oil is said to have started in Norway just about 1900.—M.

ON SOYA-BEAN EXTRACTION BY TRICHLORETHYLENE

During recent years, says *Nature*, 98, 235, trichlorethylene has been used to a limited extent for the extraction of the oil of soya beans. The residual meal has been disposed of as food for stock and, as trichlorethylene is not poisonous when given in comparatively large doses to cattle, little risk would appear to be involved in the use as food of the extracted meal. Cases of poisoning of cattle attributed to soya meal have, however, been brought to the notice of the Board of Agriculture and the results of their investigations which are summarized in the October number of the *Journal*, throw strong suspicion on the meal obtained by the use of trichlorethylene. The cases of poisoning, both on the farms and in the investigations, were limited entirely to cattle and, in no case, was a sudden effect produced. Experience with soya extracted with naphtha makes it very improbable that the poisonous principle could have been inherent in the meal. It would appear more probable that it was either a non-volatile impurity present in the trichlorethylene, or a product of interaction between the trichlorethylene and some ingredient of the soya beans.—M.