object of eliminating or substantially reducing the knocking of engines, and thus of adding to their efficiency. Our motoring correspondent explained at the time that the ethyl brand of anti-knock compound contained tetra-ethyl lead, ethylene dibromide, halowax oil and red aniline dye. The first ingredient was said to eliminate knocking; the second prevented the formation of lead oxide during combustion; the halowax oil served as a lubricant; and the red dye was for the purpose of identification. The compound had been used for racing and for aeroplane engines—about one teaspoonful of the liquid being added to a gallon of petrol; but otherwise its use in this country had been very limited, though it had been extensively used in the United States for some years. There seems no doubt that insufficient precautions in manufacture and handling tetra-ethyl had in fact led to deaths in the United States in 1924, and it was largely due to these unfortunate occurrences that the introduction of ethyl petrol for general use in this country was vigorously opposed until this distinguished committee of inquiry, under the chairmanship of Sir Frederick Willis, was appointed by the Minister of Health.

The committee found at once that the American government had already made a very thorough investigation of the same problem, and Surgeon-General Cumming not only placed at the disposal of the British committee the information obtained at the American inquiry, but also arranged for Dr. Leake, who conducted it, to come to London to give evidence. Without going into the technical aspects of the proceedings, it is sufficient to say here that the United States committee had followed up the few reported cases of injury to health which might have been due to the use of ethyl petrol; that they had satisfied themselves that these cases afforded no evidence of harmful effects attributable to the use of this material; and that at the time of the American report there were no good grounds for prohibiting the use of ethyl petrol, of the composition specified as motor fuel, so long as its distribution and use were controlled by proper regulations. Prohibition of the use of the fuel had been removed in all parts of the country—in New York as recently as June, 1928—and Dr. Leake said that, in spite of the wide publicity that the matter had received, no instances of injury had been found. Sir Frederick Willis's committee now declare that the findings of the American committee were justified. They say that there is no evidence to show that the use of ethyl petrol as a motor fuel involves more dangers to health than the use of ordinary petrol; but for the time being they think that the precautions indicated in the American report are desirable. In other words ethyl should be used as a motor fuel only, and not for such purposes as cooking or cleaning. No regulations have actually been made in the United States as regards the distribution of this petrol, but it is stated that careful observance of the regulations recommended—*e.g.*, in regard to notices to the public, the labelling of cans and pumps, the distribution of leaflets and the dyeing of the substance red as an additional check against its use otherwise than as a motor fuel—has been secured by the terms of the contracts between the proprietors of the fuel and the retailers. Sales in this country are governed in the same way, and the report does not recommend any legislative action so long as the terms of the contract are maintained. Further investigations are to be made, but there is no reason to suppose that the committee will find it necessary to modify the views they have now expressed. It is of course common knowledge that empyreumatic fumes are unpleasant and sometimes dangerous, and that the adequate ventilation of garages is very important whether ethyl petrol is used or not. But the report makes it clear that the danger is not from lead poisoning but from carbon-monoxide.—*The Times, London.*

THE BAKING POWDER CONTROVERSY

FOREWORD

FOR forty years the discussion of the use of alum in baking powder has been going on in this country almost continuously. At times it has become bitter in its terms. It has secured the opinions of perhaps two hundred experts, most of whom are of high character and standing. It never had been prominently brought before the courts until the last few years. Manufacturers of alum baking powders objected to a manufacturer of tartrate baking powders using the phrase, "no alum." They induced the Federal Trade Commission to issue a complaint against the Royal Baking Powder Company, charging the company with unfair competition. Voluminous evidence was taken in the case, and finally the Federal Trade Commission, after receiving the report of the examiner in the case, ordered the complaint which they had brought against the company dismissed.

The above order was issued on the 23rd day of March, 1926. The commission partly opened up the subject again for further evidence in an order issued on July 7, 1926. One of the commissioners was gravely in doubt of the legality of reopening a case which had once been settled by the dismissal of the complaint. This legality has already been challenged in the supreme court of the District of Columbia but not yet decided therein. In many respects this con-

troversy is the most notable of any that have taken place in the courts with direct or indirect relation to the proper enforcement of the act establishing the Federal Trade Commission.

Following is a list of recent books on the subject:

Potassium and Tartrates, a review by Ralph W. Webster, Ph.D., M.D. With a digest of the literature, by W. A. Brennan, A.B., published by The Commonwealth Press, Chicago, Ill. Pages, including bibliography and index, 168.

Aluminum Compounds in Food, including a digest of the report of the referee board of scientific experts on the influence of aluminum compounds on the nutrition and health of man by Ernest Ellsworth Smith, Ph.D., M.D., fellow and former president, New York Academy of Sciences, fellow of the New York Academy of Medicine, etc. Published by Paul B. Hoeber, Inc., New York, N. Y. Pages, including bibliography and index, 378.

Modern Baking Powder, by Juanita E. Darrah, A. B., M. S., University of Illinois, A. M. Columbia University, fellow at Johns Hopkins University School of Public Health, formerly associate professor, College of Industrial Arts, Denton, Texas, and later professor and research specialist, Florida State College for Women; author of the second edition, "Your Children's Food." Distributed by the Research Department of Calumet Baking Powder Company, Chicago, Ill., 1927; published by The Commonwealth Press, Inc., Chicago, Ill. Pages, 125.

The Truth About Baking Powder, sworn scientific testimony and government exhibits from records in Docket No. 540, Federal Trade Commission, Washington, D. C., compiled and distributed by Calumet Baking Powder Company. Pages, 172.

The Current Significance of the Word "Alum," by William D. Richardson, former editor of *Industrial and Engineering Chemistry*, The Commonwealth Press, Inc., publishers, 112 South Wabash Ave., Chicago, Ill. This booklet contains sixty-two pages and thirty-one additional pages of authorities. It is an answer to a smaller book entitled, "The Meaning of the Word Alum," by Austin M. Patterson, Ph.D.

This group of books is unique in several respects. When I received the first one, which was "Potassium and Tartrates," I looked it over with a great deal of interest and without the least suspicion of the purpose of its preparation. I naturally expected that it was what it claimed to be, a physiological study particularly of the toxic effects of potassium. The material was evidently collected with care, proper citations to the authorities are given, and apparently ethical discussions of the problem involved are found. Attention is called to the fact:

> In early life the rapid growth of the tissues requires potassium and much of the potassium ingested in the food is retained. However, as Frontini shows, after the age of 12 years the retention gradually grows less and only that which may be regarded as more or less normal is held by the cells. In their analyses of the ashes of new-born and of young children, Bunge, Abderhalden, Camerer, and Söldner, von Steinitz and others have found 9 to 13 per cent. of the ash attributable to potassium. That potassium is especially required by the growing child is shown by the fact that 38.6 per cent. of the ash of human milk is represented by this element as reported by von Wendt. Miller has established the point that inadequate potassium during the early development of the organism not only prevents the growth of the body tissues, but also causes abnormal physiological changes, which make themselves apparent later on.

The well-known physiological functions of potash and the fact that it is regarded as highly necessary in proper quantities are well-known physiological truths. Of course there is no disputing the statement that an excess of even a good and necessary element in our food is always undesirable. It is well known that during the grape season in many parts of Europe numerous grape cures are established and kept functioning every year. Many patients attend these grape cures, apparently with great benefit. During this period they eat a very great excess of grapes, and the potash, which is the principal mineral constituent of grapes, apparently acts favorably from the point of view of restoration to health.

As tartaric acid is distributed in nature, largely in grapes, this fruit may be regarded as the principal source of the potash which we take into our systems normally in eating grapes freely and drinking wine, which by many are regarded as restoring patients practically to health and vitality.

As we look over the literature which has been collected in this book, we find stressed many references to disturbed conditions established by the use of potassium and tartrates. The poisonous effects of tartar emetic have long been known, but the antimony has usually been blamed for these effects, rather than the potash and tartaric acid.

The most abundant preparation of tartrate of potassium, and the most common, is potassium bitartrate. It is described in the tenth revision of the Pharmacopœia, on page 206.

Webster describes cream of tartar as a cooling, acidulous salt, agreeing favorably with delicate stomachs. It is valuable for its ideal diuretic properties and is perhaps the most ideal diuretic used by physicians. The salt is recognized as a diuretic and as a grateful, cooling saline in feverish conditions.

My first impressions, which I gained on reading this book, in a cursory way, were that it was a valuable contribution to the literature on the subject. There was nothing in it in any way to induce me to believe

it was written for any other purpose than for the advancement of science.

Dr. Smith's book I found a well-written, logical discussion of the uses of aluminum in our foods. From the very beginning of food control alum has been an object of suspicion by practically every writer, chemical or physiological, that has mentioned the subject. In Accum's writings of over a hundred years ago, lately collected in a most admirable manner by Dr. Charles A. Browne, the presence of alum in foods was regarded by Accum as an example of "death in the pot." In the early days alum was added to the bread for bleaching purposes. There has long been a craze, not founded upon any scientific fact, but rather in contempt thereof, for making our bread whiter. The use of alum was one of the first objectionable adulterations to which the attention of chemists and physiologists was called. Dr. Smith's volume is a valuable contribution to the establishment on an alleged scientific foundation of the benefits which are expected to accrue by the more general use of alum in our foods. The powerful influence of the Remsen board of consulting scientific experts is cited as one of the principal reasons why the use of alum in our foods, both as alum and in the form of alum baking powder, should be more generally extended. The argument is made skilfully and with more or less convincing force, especially on those who are not inclined to investigate problems of themselves. When such eminent authorities are cited in favor of the use of alum, the ordinary citizen can not be blamed for following the evidence adduced. When, however, this evidence, marshalled so skilfully by Dr. Smith, comes under the light of criticism in the opinions of other experts, it is bound to lose its luster and also its power of conviction. While the pro-alum forces could not have been marshalled in a more masterly way, the general impression is that the facts are not convincing, that the soundness of the conclusion is only superficial and that the real physiologist, moved by a spirit of interest in the welfare of humanity, will not become a devotee to the use of alum in any form or shape in human food.

Miss Juanita E. Darrah's publication, entitled "Modern Baking Powder," is a plain, open, honest contribution of the Calumet Baking Powder Company to the literature favoring the more extensive use of alum in our foods. Citations are made of nearly all vegetable foods and the argument is presented in this way—I quote some of the head lines in the book—"Coffee Contains Phosphate and Aluminum," "Tea Contains Phosphate and Aluminum," "Bread Contains Phosphate and Aluminum," "Wheat Contains Phosphate and Aluminum," "Corn Contains Phosphate and Aluminum," "Rice Contains Phosphate and Aluminum," thus throughout the whole book every article mentioned contains a similar description.

One of the curious arguments of Miss Darrah's book is found upon pages 49 and 50, as follows:

> The Food and Drugs Act declared any article of food adulterated "if it contain any added poisonous or other added deleterious ingredient which may render such article injurious to health."
>
> The food laws of every state contain similar provisions. The fact that baking powder containing Phosphate and S. A. S. (sodium aluminum sulphate) has not been proceeded against under these provisions of the law is a true sign that such baking powder does not contain a poisonous or deleterious ingredient, or one that may render such article injurious to health.

This is a most ingenuous argument and a perfect example of *non sequitur*. At the very beginning of the enforcement of the federal food and drugs act certain articles were taken out of the list of offenders against the law and given complete immunity from any efforts of a legal character to restrict these articles or to prevent them from being added to our foods. When the Remsen board of consulting scientific experts was appointed, certain problems were transferred from the Bureau of Chemistry, which had under the law supervision thereof, for study and investigation by the Remsen board. The secretary of agriculture issued a proclamation forbidding any interference with these favored ingredients pending the report of the Remsen board thereon. Among these exempted articles was alum. The reason alum was not proceeded against was not because of any belief that it was a harmless substance, but because of the immunity which had been granted it. When the Remsen board did report on alum it was a complete exoneration thereof of possessing any deleterious or poisonous qualities. The immunity therefore which has protected alum for the last twenty-two years is due solely to the decision of the Remsen board that has not yet been repealed.

Enclosed with Miss Darrah's book was a typewritten foreword by Marian Jane Parker, home economics and domestic science, 1020 S. Karlov Ave., Chicago, Ill. This foreword calls attention to the fact that Miss Darrah shows that the amount of alum ingested in our daily diet of fruit, vegetables and meats is many times the quantity that is taken into the body from baking powder products. If this be true, the quantities of alum ingested are already up to and above the physiological limit and, therefore, this would be a reason for not adding more thereto. Naturally, as clay, a silicate of alumina, is the basis of all our agricultural soils, traces of aluminum in some form or

other would find their way into crops grown on a soil of this kind. Analyses of agricultural products, made by Langworthy and Austen in the Department of Agriculture, show the quantities of alum in our agricultural food products to be extremely minute. It is not likely that the combined intake of aluminum from the sources mentioned would in any way equal the hundreds of tons of alum taken into our stomachs every year through the wide-spread use of alum baking powders. The very warning that Miss Parker gives should be a danger signal not to increase beyond a minimum content the intake of aluminum compounds in our foods.

"The Truth about Baking Powder" is chiefly concerned with the evidence showing that S.A.S. (sodium aluminum sulphate), which is an alum according to the common definition of the term, is not, in point of fact, alum as it is understood at the drugstore. Copious extracts from evidence to establish that fact form the bulk of the book.

"THE CURRENT SIGNIFICANCE OF THE WORD 'ALUM'"

Dr. Richardson's work is peculiarly well written, in a proper ethical spirit and was copyrighted by himself in 1927. It bears no indication of having been written in any spirit except that of a difference of opinion as to the scope to which the term alum should apply. It was published, evidently, by interests engaged in the production of alum baking powder. It thus belongs to the category of the other books mentioned in this discussion. They are all intended for propaganda to further popularize the use of alum in our foods. There can be no valid objection to propaganda of this kind if it is plainly labeled. The vice in this particular case lies in trying to conceal this purpose. In two cases the title page contains a statement that the book was in the interest of alum baking powder. In the other cases such information is not found. The greater number of readers of these books (including myself) would naturally conclude that the authors had no ulterior purpose beyond stating facts and drawing unbiased conclusions therefrom. I was not even rendered suspicious by the fact that all these publications came to me without a bill. The chemical authors are my personal friends.

Mr. Richardson pays a high compliment to Dr. Patterson's contribution. He says:

> Dr. Patterson has taken great pains in looking up authorities and his presentation is a scholarly one. The bibliography of the subject which he has worked up is extensive and the quotations which he introduces are correct * * * The author is indebted to Dr. Patterson for many references and takes this opportunity to express his appreciation of the pains-taking way in which Dr. Patterson has investigated the early, middle and recent history of alum. Dr. Patterson and I agree with reference to our authorities but we differ widely in our conclusions.

Dr. Richardson takes the ground that the term "alum" should be applied strictly to its original chemical definition as a double sulphate or aluminum and potash or ammonia. He accedes, however, to the chemical definition of the term alum in general, which is a double sulphate of aluminum and any other metal that will fit in and produce a sulphate of similar crystallographic structure.

Dr. Patterson, on the other hand, claims that sulphate of alumina alone is also entitled to the name alum, and particularly when used without water of crystallization in baking powders.

Officials of the United States and states when called upon to enforce the national and state laws have placed upon them an obligation expressed by the phrase *noblesse oblige*. Their first duty is to the people of their respective states and of the whole country. When the Bureau of Chemistry was selected by law to enforce the National Food and Drugs Act, its officers were animated by the one supreme obligation, namely, that, when doubt existed of any kind as to whether the given article of food or drugs was adulterated or misbranded, the decision should always be in favor of the people of the United States. If any harm or injury were done to the manufacturer and dealer they had full recourse to defend themselves before a federal judge or, in the states, before a state judge. It seems to me that this is the attitude which the instructed citizen at large should take in regard to the use of alum in our foods. If there is any doubt as to the wholesomeness of alum we should incline to the decision that it ought to be forbidden in our food products.

HARVEY W. WILEY

WASHINGTON, D. C.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ETHYLENE GLYCOL AS AN ATMOMETER REAGENT TO MEASURE THE EVAPORATING ENVIRONMENT AT TEMPERATURES BELOW FREEZING

IN certain investigations where it is necessary to measure the evaporating environment, limitation is encountered when the temperatures are below freezing, especially at the beginning and toward the close of the active growing season. For want of a desirable anti-freeze compound there is practically nothing to tell us what the evaporating complex is during periods of cold weather.