

ADDRESSES

"DOING OUR BIT"¹

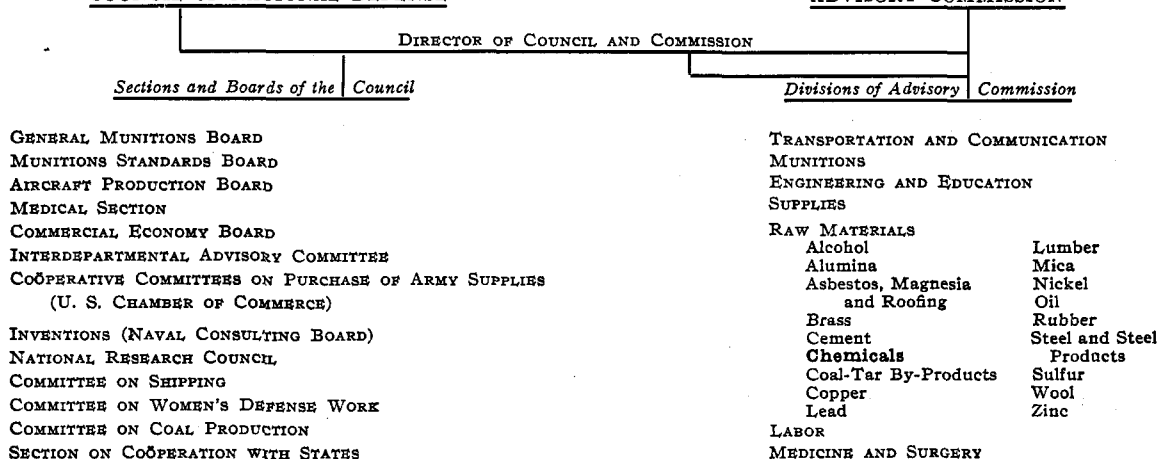
By BERNHARD C. HESSE

The American chemist, in common with all other good Americans, has his "bit" to do not only during the period of the war but also when peace returns. It is more than likely that we shall find new conditions when this war is over and to meet them we chemists will have to work along lines quite different from those to which we had theretofore been accustomed. Therefore, it can be only prudence and good policy to discuss now, in a more or less general way, just what these conditions may be and what may be the general modes of meeting them, and it is with this problem that we are now concerned.

THE PUBLIC AND SCIENCE

The general public has now realized as never before the important part that can be and in fact is played in matters of national aggression and of national defense by those who create, disseminate and apply science. There is hardly a single one of the many divisions and subdivisions of our Council of National Defense and of our National Research Council that does not call for a new application of some branch of science in one form or another. Every branch of our varied activities which pertains to the transporting, housing, feeding and equipping of our soldiers

TABLE I—ORGANIZATION OF THE NATIONAL COUNCIL OF DEFENSE AND THE ADVISORY COMMISSION



both here and abroad has to meet new and untried conditions; many of these are themselves the direct offspring of scientific knowledge, and have to make a demand upon sciences not only in their applied forms but in many cases in their pure forms; among the sciences so called upon, chemistry has been prominent.

It is inevitable that when peace does return, this new realization of the general public will not be at once laid aside. Further, it is inconceivable that, impressed as it now is with the potential and actual power of science in war, the public will not conclude that science must have equally great potential beneficial effect on peace-time pursuits and development and demand the full realization of those potentialities. This attitude of the public mind is of great importance and is something which should not be permitted to perish or to fall into decay. Unless those of us who are engaged in creating or in disseminating or in applying science make every effort to realize these fundamentally correct expectations of the public we can hardly expect their continuance, and the result will be that sooner or later and, as a nation, we shall be at a disadvantage with respect to those peoples who are not remiss in that direction.

¹ Address before the Chemical Society, Massachusetts Institute of Technology, Boston, Mass., November 22, 1917.

PUBLIC OPINION AND NATIONAL EFFORT

In our democratic government public opinion is, in general and usually, the source and fountain-head of all our governmental and national activities; whatever governmental machinery we have is here for the benefit of the public and the public is not at all here for the benefit of any of our governmental machinery. Except in times of stress we do not take orders from our government; it is our habit to give orders to our government.

We can give orders only if we have a well grounded and well founded public opinion upon which to base them and by which to give those orders force and effect.

The public is now in more sympathetic attitude towards science than ever before and it has singled out the science of chemistry as one of its especial hopes and supports, both in war and in peace. Every one of us must take hold with a will and do his level best to the end that this valuable national asset of a sympathetic public opinion and a favorable public attitude of mind be not withdrawn from us. We are the custodians of a most valuable trust and our responsibilities are co-extensive with our opportunities.

THE CHEMIST IN THE LIFE OF THE NATION

Impressed as we are with the magnitude of our task and with

the seriousness of our responsibilities let us consider the situation in some detail. Now as to the problem and its scope.

In the first place, what is our position in the general scheme of affairs of our nation? The diagram of the early organization of the Council of National Defense is probably the most complete, authoritative and effective answer we can to-day obtain. A skeleton of it is given in Table I.

In the second place, what is the general position of the chemist in the industrial activities of our nation? Broadly and fairly speaking it can be said that the chemists make up about *one tenthousandth* of our population and that in their various industrial activities they are connected with industries that employ roughly *one-sixth* of our industrial wage-earners, produce about *one-fourth* of the value of our manufactured products and about *one-fifth* of the value added by manufacture; in our foreign trade in 1913 with Germany alone in products of and for chemical industries these made up *one-twentieth* of our total international trade and provided *one-seventh* of our balance of trade.

To take only a very few from a great many striking examples of the chemist's activities it may be said that he has added between \$10 and \$12 to the value of each bale of cotton grown, has invented or discovered, made and marketed over 100 different

commercial products from corn and for these he uses as much corn as is produced in North Carolina or is produced by the nine states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey and Delaware combined.

Many industries flourished for centuries before chemical knowledge and chemical treatment, as we understand them to-day, were applied to them and these are to-day brought to an efficiency, economy and diversity of production by the chemist, which without the chemist would have been impossible; such are those of leather, soap, iron, copper, textiles of all kinds, paints, varnishes, fats, paper, glass, stoneware and porcelain; there is also a large number of industries which were literally created by the chemist during the past 75 years, such as artificial fertilizers, fuel-gases, gas-lighting, photography, explosives, illuminating oils, carbide, aluminum, carborundum, dyes, medicines and in all but a very few of these the American chemist has taken a leading part and there is no reason why he should not keep right at it.

What the limits of chemical industry are, must in the very nature of things be vague but nevertheless more or less closely following that undefined thing called usage. One thing is certain, it does not include every industry making or using products of chemical change for that would include almost all human activities; it can no more be so inclusive than could every industry that employs or profits by the use of arithmetic be called a mathematical industry. Of course, there are many different accepted usages, but for present purposes the usage of the United States Census will be followed.

Coming now to more precise matters and taking the classification of the U. S. Census for 1909 as a criterion of what constitutes chemicals and allied products we find that these are nine in number, namely:

- 1—PAINT AND VARNISH
- 2—CHEMICALS
- 3—FERTILIZERS
- 4—EXPLOSIVES
- 5—DYESTUFFS AND EXTRACTS
- 6—SULFURIC, NITRIC AND MIXED ACIDS
- 7—WOOD DISTILLATION (NOT INCLUDING ROSIN AND TURPENTINE)
- 8—ESSENTIAL OILS
- 9—BONE, CARBON AND LAMPBLACK

From the 1909 census data it appears¹ that "if we compare the average chemical plant with the average plant in all domestic industries that the average chemical plant, when so contrasted, costs 330 per cent of that general average, employs 144 per cent as many persons of which the salaried employees are 264 per cent of the general average and the wage earners 134 per cent; the output value is 261 per cent of the general average and its enhancement in value is 248 per cent. Therefore, as a unit, the average domestic chemical plant costs more, produces more, enhances more, employs more salaried persons and more wage earners than the average industrial plant.

"A dollar invested in our chemical industries is not so productive as in our industries as a whole; it spends less for wages, salaries and materials and produces less product-value and less enhancement-value.

"Per \$100 of product, the general average and the average domestic chemical plant, respectively, expend \$16.58 and \$9.09 for wages, \$4.54 and \$5.65 for salaries, or \$21.12 and \$14.74 for services.

"Per individual wage earner the annual output of product is \$3,125 for the general average and \$6,035 for the average domestic chemical plant.

"Per individual salaried employee, the annual output of product is \$26,157 for the general average and \$25,733 for the average domestic chemical plant.

"The average salaries are \$1188 and \$1455, respectively, for our

industries as a whole and our domestic chemical industries; the average wages are \$518 and \$549, respectively; in the industries as a whole there are 8 wage earners to each salaried employee and in our chemical industries there are 4 wage earners to each salaried employee.

"Relatively, our chemical establishments are 0.79 per cent of all our industrial establishments and the number of persons employed is 1.15 per cent of all persons employed in manufacture.

"Hence while an average chemical plant, as such, is of greater importance to the community than the average industrial plant, yet the capital so invested is not so productive as in the average industries."

PEACE TIME GROWTH OF OUR CHEMICAL INDUSTRIES

That these nine branches of the U. S. industries of chemicals and allied products are increasing actually as well as relatively to our entire industrial activities as a whole is one of the gratifying facts shown by the U. S. Census figures for 1914 only recently available. The actual figures are given in Table II; the growth is evidenced by the percentages.

Another gratifying disclosure of the 1914 census is that the groups of chemicals and allied products have been increased in number and scope and to the nine groups above enumerated and considered the following 17 have been added:

- 1—Baking Powders and Yeast
- 2—Blackening, Stains and Dressings
- 3—Bluing
- 4—Candles
- 5—Cleansing and Polishing Preparations
- 6—Coke (not including Gas-house Coke)
- 7—Drugs (including Drug Grinding, Druggists' Preparations, Patent Medicines and Compounds, Perfumery and Cosmetics)
- 8—Gas, Illuminating and Heating
- 9—Glue, not elsewhere specified
- 10—Greases (including Grease and Tallow, Lubricating Greases and Soap Stock)
- 11—Printing Ink
- 12—Writing Ink
- 13—Cottonseed Oil and Cake, Linseed Oil, Fish Oils, Oleo and all other oils have been added to Essential Oils
- 14—Petroleum, refining
- 15—Salt
- 16—Soap
- 17—Turpentine and Rosin

This is a very gratifying state of affairs particularly if we bear in mind that the 1914 census covers the fiscal year ending with June 30, 1914, or about one month before the present war broke out. It shows that domestic capital before the war was taking more to these chemical and allied industries than to our industries in general; that the compilers of the census have become convinced that the chemical and allied industries had therefore been too narrowly defined. That can only mean that prior to this war we had obtained greater official and hence public recognition of the chemist's influence in the nation's business and that domestic capital had of its own accord increased its confidence in our business as a business.

To give an idea of what this classification-expansion of "Chemical Industries" means to the U. S., statistical position of the "Chemical Industries," Table III has been compiled.

Because of the absence of information as authentic and as carefully checked, sifted and arranged as are these figures from the U. S. Census reports no profitable effort can now be made to measure the present effect of the war on these industries; to do so we must wait until such data are available.

ONE EFFECT OF THE WAR

Since the outbreak of the war, in addition to the many departments of the Federal Government which previously were engaged in applying and developing chemistry and our chemical industries for national benefit, there have been created a number of Federal agencies of national scope whose aim is, among others, to bring out promptly and efficiently the whole of our chemical science

¹ THIS JOURNAL, 8 (1916), 1050

TABLE II—GROWTH OF AMERICAN CHEMICAL INDUSTRIES 1909 TO 1914

ITEM	ALL INDUSTRIES		CHEMICAL AND ALLIED PRODUCTS		PER CENT INCREASE 1914 OVER 1909		Per cent of the Whole in Chemicals & Allied Products		Per cent Increase in 1914 over 1909 of Per cent of Whole in Chemical & Allied Products in 1909
	1909	1914	1909	1914	All Industries	Chemical & Allied Products	1909	1914	
1 No. of Establishments.....	268,491	275,791	2,140	2,461	3	15	0.79	0.89	13
2 No. of Wage Earners (Av.)....	6,615,046	7,036,337	70,426	86,788	6	23	1.06	1.23	16
3 Capital.....	\$18,428,269,706	\$22,790,979,937	\$483,729,410	\$722,989,000	24	49	2.62	3.17	21
4 Wages.....	3,427,037,884	4,078,332,433	38,658,201	53,021,000	19	37	1.13	1.30	15
5 Materials.....	12,142,790,878	14,368,088,831	258,115,975	340,218,000	18	32	2.13	2.37	11
6 Value of Products.....	20,672,051,870	26,246,434,724	425,084,540	547,802,000	17	29	2.06	2.09	1
7 Value Added by Manufacture (Item 6 less Item 5).....	8,530,261,000	9,878,345,893	166,968,565	206,864,000	16	24	1.96	2.10	7
Column.....	A	B	C	D	E	F	G	H	J

NOTE—Percentages given above were obtained as follows: $E = \frac{(B - A) \times 100}{A}$ $F = \frac{(D - C) \times 100}{C}$ $G = \frac{C \times 100}{A}$ $H = \frac{D \times 100}{B}$ $J = \frac{(H - G) \times 100}{G}$

and industries for the good and the safety of the nation. Among these are the National Defense Council, the National Research Council, the Naval Consulting Board, the War Trade Board, the Tariff Commission and others all supplied with chemical advisers, while all the earlier Federal agencies have intensified their efforts and enlarged their scope. In addition thereto, members of the chemical faculties of almost every one of our universities, technical schools and colleges are working with governmental departments and with industrial enterprises in positions and on subjects and in a manner heretofore never known and the American chemist is to-day in better position than ever before to obtain sympathetic interest and action in any proposition he may have that looks toward national benefit. Most, if not all, of our states, and many of our cities, have similarly provided for intensified chemical aid. We have therefore, through this war, progressed along the line of coöperation between our governmental agencies, Federal, state and municipal, our universities and our industries to an extent almost inconceivable in its power for national welfare.

CHEMICAL SOCIETIES AND THE GOVERNMENT

On the other hand, all our chemical and allied associations and societies, whether business, scientific or technical in their aims and objects, have whole-heartedly placed all their resources and information at the disposal of our various governmental agencies; not the least among these societies is the AMERICAN CHEMICAL SOCIETY with a membership well beyond 10,000, meeting in 53 Local Sections throughout the country and conducting its affairs in 8 technical and similar Divisions. In order to assure as far as possible that in such a multitude of organizations there shall be a minimum of duplication of effort and lost motion the AMERICAN CHEMICAL SOCIETY has recently created a special committee to direct the participation of that Society in all matters of national scope and with this committee the expectation is that the President of the American Chemical Society will be in better position than otherwise to give prompt effect to any meritorious suggestions that may be made to him. There are therefore many avenues through which the individual American chemist can get national action on his suggestions. Other societies have made similar provision.

Thus it is clear that not only did we have in 1914 a wider public recognition and a greater confidence of capital in us than in 1909 and that both have grown greatly since the outbreak of the war but also that all our governmental and private agencies have since then immensely increased the points of contact and the avenues of communication between the chemist, the public and our governmental agencies. As individuals we also have added machinery in our hands wherethrough to direct and shape the course of events and to prevent what might ultimately become, first, a chemical bureaucracy and finally a chemical autocracy in this country. We thus have each of us our clear and well-defined duties, responsibilities and opportunities.

PROMPTNESS AND EFFICIENCY

All of our efforts are, however, bound to be vitiated if we are not at all times mindful of the fact that unless we and each of us do our share promptly and efficiently that the whole national effort cannot fully succeed; the net result can hardly be better than its poorest component nor completed faster than its slowest part. Hence, our watchword should be at all times: "Accuracy, Completeness and Despatch." The student in the classroom is no more exempt from it than is the faculty-member, the corporation head or the government official; in that respect we are each and all of us in the very same boat.

Having thus briefly summarized the position of the chemist in the public mind, in the government's view, in the view of domestic capital and in our national industrial life and having described the avenues through which the chemist can work and the agencies upon which he can draw, what is he to do? What is the problem?

"OUR BIT"

For the period of the war all our national activities will be directed toward immediate national needs largely, with only relatively small attention to after-the-war matters, and for these sufficient directing machinery exists and it is merely a question of selecting the right means.

In the period after the war and in the rush and stress of rebuilding and making up for lost opportunities in the multitudinous directions offered, the chemist is likely to be lost sight of unless he systematically and continuously plans ahead and prepares accordingly. Broadly considered, our future activities can be classified as relating to:

- 1—Matters of national defense.
- 2—Development of our natural resources.
- 3—The highest national independence possible in chemicals and allied products.

KEEPING PUBLIC INTEREST ALIVE

In order to accomplish the above-mentioned ends we must make sure that we do not lose our place in public opinion nor the confidence of capital nor the helpful attitude of our governmental agencies, legislative as well as administrative. To retain our place in public opinion we must take the public into our confidence much more than we have heretofore, and in this delinquency we are not alone; other countries and other sciences have been afflicted with the same shortsightedness. We must inform the public of such of our problems as are of public bearing in language as free from technicalities as possible and as a very valuable aid in that direction we now have through the PRESS AND PUBLICITY COMMITTEE OF THE AMERICAN CHEMICAL SOCIETY the interested attention of a great many influential daily and other papers. Our scientific and technical societies everywhere should make an effort as does the AMERICAN CHEMICAL SOCIETY to have at least one meeting a year at which technical topics of interest to that ubiquitous and powerful person "the man-in-the-street"

TABLE III

	1914 RETURNS		INCREASE	
	Based on Classification of		DUE TO NEW CLASSIFICATION	
	1909	1914	Actual	Per cent
1 No. of Establishments.....	2,461	12,374	9,913	403
2 No. of Wage Earners (Av.).....	86,788	299,569	212,781	245
3 Capital.....	\$722,989,000	\$3,034,209,000	\$2,311,220,000	320
4 Wages.....	53,021,000	167,494,000	114,473,000	216
5 Cost of Materials.....	340,218,000	1,289,348,000	949,130,000	279
6 Value of Products.....	547,802,000	2,001,634,000	1,453,834,000	265
7 Value Added by Manufacture.....	206,864,000	712,286,000	505,422,000	244

are presented in such a way as to receive and to hold his attention, and a readable digest of those proceedings will no doubt be very welcome in the editorial offices of most newspapers; if they are not welcome then there must be something wrong with the meeting, with the digest or with both, and the only thing to do is to go at it again.

Now, telling a technical story in non-technical language or thought is no easy matter, but all of us should endeavor so to frame our technical stories that they are free from such matter because we can none of us tell when we may be in position to render good service by such a story told in such a way. Personally, I very much suspect that we have not really mastered a technical subject unless and until we can make it understood by the willing but non-technical "average man." That ability is indispensable in creating and in holding public interest in any technical subject like ours, and since public opinion is formed wherever there is a public it behooves all of us to cultivate that ability to our utmost since we can never know when or where we can make it tell. For example, at any one of the National Expositions of the Chemical Industries, which promise to become a fixture in New York City every September, large opportunities of legitimately and helpfully adding to the public understanding and appreciation of the chemist's efforts are offered and the cumulative effect of such additions, if sound and clearly made, cannot help but be advantageous. Each of us in our ordinary routine has almost daily opportunity to aid the public thought in these matters. It should be our aim to prevent recurrence of any public apathy like that in England towards the dangers of synthetic indigo to the British indigo growing interests or in our own country when we were apprised in 1912 of foreign advances in fixing atmospheric nitrogen. This is merely preventing the chemist from crawling into his shell, *i. e.*, keeping him a human.

RETAINING THE CONFIDENCE OF CAPITAL

We shall retain the confidence of capital so long as we do not indulge in any wild schemes, so long as we keep our promises, promise no more than we can do, expose and condemn hare-brained schemes, of which there are plenty, and in general behave in a level-headed but optimistic and perhaps even enthusiastic manner. Most business ventures contain hazards but there are reasonable and unreasonable hazards, and we must exercise good judgment there; so long as we do that, capital, that is desirable capital, will not withdraw the confidence it has now given us. This is merely common-sense behavior.

OUR GOVERNMENTAL AGENCIES

Having public opinion calling for a complete and independent domestic chemical industry and capital in good standing behind us, with a fair and frank approach to them, our standing with our various governmental agencies, legislative and administrative, ought not and will not be a matter of conjecture. This is merely civic candor.

These sound trite and sophomoric, and no doubt they are. I should not have made these statements if, as a matter of fact, it had not taken this colossal nightmare of a war to shake us all awake and to bring us to our senses. We thought the public to blame and the public said we were to blame. Perhaps both were right. However, if we as a body refrain from acting along these simple general lines we need not be surprised

if sooner or later the old conditions return. It is our job to make the public take an interest in us; that, to my mind, is one of these war-lessons we should never forget; we have paid too high a price ever to let it get away. As I see it, it is of the greatest importance that, even in our college days, we should lay the foundations for these view-points and these rules of conduct.

THE NEED OF A COMPREHENSIVE PLAN

But all this will be of no avail unless we show vision, imagination, foresight, initiative, enterprise and strength of purpose on our own account. We shall have to inform ourselves very thoroughly of the country's requirements of chemicals and the like in war and in peace as to quantities and values and their uses and also their modes of manufacture and their needful raw materials; further, of our suitable natural resources, their nature, extent and location whether of vegetable, animal or mineral origin. Then we must plan wisely for the most efficient development and set about it. Sounds simple, does it not? But it is one of the tallest orders 10,000 men ever had handed to them.

A start has been made in the Norton Dyestuff Census published a year ago by the Department of Commerce. That tells us about the amounts, values and kinds of coal-tar dyes used and puts us in the way of getting at their raw materials and their uses. The reasonable expectation is that, through the initiative of the AMERICAN CHEMICAL SOCIETY, in about six months or a year from now we shall have a printed compilation giving us the names, quantities and values of every chemical other than coal-tar dyes imported into the United States from any country during the fiscal year ending with June 30, 1914, the last peace-year before the present war. Then comes the rest of it; the manufacturing methods, the needful raw materials and where they are located in this country and elsewhere, and in what industries these chemicals are used. Through the initiative of the AMERICAN CHEMICAL SOCIETY it is expected that this will also be completed within a reasonable additional time. After that, plans have to be made as to how, when and where these various things shall be made, and in deciding that there comes in the further question as to the importance of the individual chemicals to the nation's welfare, their arrangement in the order of their importance, and an efficient plan of making them at home. That is going to take some "midnight electricity."

GOVERNMENTAL HELP

Further, it is not inconceivable that some of these important things will not be made without added governmental help, as, for example, by increased tariff-protection. This will not be as difficult as heretofore for the very important reason that both principal political parties, Republican and Democratic, have by enacting the present dyestuff tariff emphatically affirmed sweeping, and let us hope lasting, changes in their heretofore views of tariff-legislation. The Republicans have in the past refused to help chemicals because they did not employ enough labor or because their products were "raw materials" for many industries that stood well in the eyes of that party largely because they did employ much labor. Now the Republicans admit that there are industries which are "key industries" because their products are "raw materials" for many industries and hence they should be made in this country and protected by tariff, if need be. The Democrats by levying for, I believe, the first time, a tariff avowedly for the purpose of creating an industry in this country

and necessarily thus potentially depriving the U. S. Treasury of a corresponding amount of revenue have also endorsed the "key industry" view-point.

But right in this comparative ease is where difficulties are going to come for us chemists. "Key-industries" is a new expression; just exactly and precisely where it begins and ends, no one yet knows. Merely because the Republicans and the Democrats have agreed that because coal-tar dyes constitute a "key-industry" and hence should be protected is a very long way from saying that they have agreed that every "key-industry" should be so protected, but it is a very tempting inference. It would be a peculiar kind of a product, chemical or otherwise, for which a more or less plausible argument of "key industry" could not be constructed. Unless we are very cautious we may find this "key-industry" notion a very unwholesome and treacherous thing. In presenting to Congress or to the Tariff Commission the "key-industry" claims of any particular thing, we shall have to be very circumspect and very frank and straightforward. I very much suspect that there may be times when this will be a severe test of our civic candor. Whenever we are sure that any such product really, or fairly so, is a "key-industry" in the sense of coal-tar dyes and in the manner that the 64th Congress viewed them then we must have sufficient strength of purpose to keep at Congress or the Tariff Commission or at both until they "see the light," for surely that is what public opinion now wants. When we believe that the country's welfare, as viewed by that public opinion, demands our industry and there is opposition to it, we must seek out that opposition and bring it down; that is not merely our privilege, it is our civic and professional duty.

THINKING IN TERMS OF THE NATION

In this same connection we shall all have to learn to think in terms of the Nation and have the map of the world in our minds as we study our chemistry and apply it to our industries. In order to do that our publications will have to make a change. None of our chemical journals systematically and in a form that lends itself to preservation, presents its readers with world-information, both detail and general, at any stated periods or in any correlated or coördinated way. In that respect we have much to learn from foreign chemical journals and particularly the German journals which, while they did it far better than others, still left a very great deal to be desired. Then, after our journals have made such a change you and I and all the rest of us will have to learn to read those statements. They *are* dry; but there is no help for it. It is a new language and a new job, but we have simply got to master it. Perhaps the AMERICAN CHEMICAL SOCIETY may be able to find a way to sugar-coat that pill and if it does, more of us may be induced to take it.

The Superintendent of Documents, Government Printing Office, Washington, D. C., will supply for cash or money order (stamps will not be received) any of the Government publications dealing with our domestic and foreign commerce. For domestic production the 714-page cloth-bound publication, entitled "Abstract of the Census of Manufactures—1914" (price, 65 cents); for our foreign import business, the 90-page paper-bound publication, known as "Summary Table No. 9 of the Annual Report on Commerce and Navigation" (15 cents) and for all the U. S. activities and as a whole the 749-page paper-bound publication entitled "Statistical Abstract of the United States" (50 cents) make a good starting point, not only for individual study in college or after, but for the majority of our chemical publications as well. If then we apply only a very small fraction of the industry we usually put on the statistics of our baseball players we ought very soon to show a marked increase in our knowledge and appreciation of the place chemical industry holds in the business and economic affairs of our Nation and of the world. All our publications must more systematically than heretofore help to disseminate in coördinated and more readily appreciated and preserved

form the vast amount of fundamental and valuable information collected by our Government. The Government cannot do it all; we as individuals have a share to perform.

OUR EDUCATIONAL INSTITUTIONS

But even with all this our task is not yet done. All these efforts will be of short life, from the point of view of the Nation, if we overlook or fail to encourage the science of chemistry in its purest forms as well as in its applied forms at our universities, colleges, and technical schools or if we overlook keeping them in the very forefront of educational efficiency. We must test and examine every scientific advance made anywhere as to its potential value for, or harm to, this country and act accordingly. It goes without saying that our chemical industries must each and all have their own research laboratories, whether individually or in groups, and these must be as well equipped and manned as any for it is not inconceivable that publication of research results in foreign countries hereafter may not be as unrestricted as it was before the war. Chemical fellowships like those of the Chemists' Club will, no doubt, be a welcome help in this direction.

OUR GOVERNMENT OFFICIALS

Nor would we be fully utilizing our opportunities of aid and help were we to overlook the various Federal governmental departments or committees of the AMERICAN CHEMICAL SOCIETY or other chemical societies that coöperate with them. Our Federal officials are more than ready at all times to help the Nation and if they have not in times past done all that we now think they should have done the blame for that rests squarely on our own shoulders—we simply have not told them, and perhaps have not even tried to tell them, how they could help or where and in what way we needed help in any such fashion as to make help on their part practical or practicable.

Successful chemical industry calls for dependable labor and therefore labor laws, workmen's compensation acts and the like will call for a good deal of our attention. Should we also have an eye on export business additional competent chemical members of our foreign trade and consular service will also be required.

COÖPERATION THE ONLY WAY

From this, of necessity sketchy and fragmentary outline, it is obvious that the American chemist has and will have a multitude of new things to engage his attention and that the only practicable way of handling them is through coöperation. Unless all signs fail there will be more of national coöperative effort throughout the world than ever before and we must shape our course accordingly. As a first-step student chemical societies like this one at "Tech" are to be highly commended and supported either as independent organizations or as sections of the AMERICAN CHEMICAL SOCIETY which has done so much to coördinate the efforts of American chemists in so many different ways and which is the best organized and the largest chemical society in the world. The trial now being made by the section of the AMERICAN CHEMICAL SOCIETY at Buffalo, New York, of affiliating and meeting with other local technical societies is a step forward and in the right direction. We should also seek out opportunities for coöperative effort with our educational and governmental institutions as well as with strictly commercial organizations such as Boards of Trade, Chambers of Commerce, Merchants' Associations, and the like, of local, state, national and of international scope. We must widen our horizon in every direction and we can do that only through coöperative effort, intelligent and persistent.

"THERE ARE OTHERS"

It must not be forgotten that the chemist is not the only one who was shown to be behindhand as a result of this war. A very good index of that is supplied by a recent and dependable statement that of the some 650 British enemy-owned patents under which license to operate had been granted British manufacturers under the British Trading-with-the-Enemy Act, only "some

scores" applied to the dyeing industry, while the remainder dealt with the following twenty arts, namely: leather substitutes; sewing machines for boots, etc.; wood impregnation; taximeters; turbine compressors and pumps; explosive engines; magnetic separators; treatment of waste paper and fibrous materials; reduction of ores; aluminum alloys; speed indicators; electric ignition apparatus; incandescent gas lamps; elastic bandages; embroidering machines; calculating machines; electricity meters; talking machines; internal combustion engines and printing machines. Quite a formidable list. It will be most instructive similarly to follow the course of events under our own recently enacted Trading-with-the-Enemy Law.

PATENTS AND INVENTIONS

The proper lesson for us to learn from this seems to me to be that whenever a foreigner patents anything anywhere we should really invent and make something better or just as good ourselves. It may, and no doubt will be expensive, but will it be more expensive to the Nation than our present situation has turned out to be? I say decidedly not. And this applies to others besides us chemists. It will certainly be better than tinkering with our patent laws. The proper answer to an invention is another invention and not a hamstringing or a boomeranging change in our patent laws.

CONCLUSION

This, then, presents, in rough outline, as I at present see it, our future and the work it holds for us; our work may fairly be said to be stupendous and it is made so wholly by the national complacency, not to say indifference, of our entire country's past. We must all make up for lost time and for lost opportunity. With an enlightened public opinion and a truly national spirit in our Federal legislation, the American chemist can safely and confidently be depended upon to do his full share, and more, toward making this country as independent of any other nation on earth as it is possible to be, and toward making our democratic government lastingly as efficient and as far-sighted as any autocratic government ever dreamed of being.

25 BROAD STREET
NEW YORK CITY

MERCHANDISE CONTROL LABORATORIES

By ELLWOOD HENDRICK
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An episode in the history of the Bureau of Chemistry of the U. S. Department of Agriculture may throw a little light on the progress and workings of private laboratories in the few mercantile concerns that have adopted chemical control.

The Pure Food Law was passed and it was necessary to have means to enforce it. The law and the courts were in existence but other machinery was needed. In the Bureau of Chemistry more inspectors were appointed, happily under civil service rules, for at the first examination for inspectors only 16 out of 1400 applicants passed. They then went about collecting samples and brought them into the department for analysis. They looked for breaches of the law and they found them; found them with increasing facility as they developed the art of search. Convictions were frequent. The question then arose whether increasing the number of convictions was the best and most useful work that the Bureau could do. The conclusion was reached that while this was a necessary part it was not the whole duty of the Department of Chemistry in the interest of general welfare. Various industries were studied from the standpoint of chemical control and producers of foods were informed how to avoid error and how to get the best results. Vigilant inspection makes adulteration dangerous while chemical supervision and aid improves the product. The government is not the enemy of honest producers but rather their friend. Chemical control goes far beyond police duty.

Now the introduction of chemical aid in mercantile establishments seems to develop in a similar manner as time and experience enrich their laboratory records. Foods and drugs are standardized by law; they are already under chemical control and we shall not even discuss the pharmaceutical trade for the obvious reason that it is already established in chemical technology. The same holds good in regard to the preparation and handling of meats, the great packing houses being models of efficiency in the administration of materials. The fisheries are in sore need of chemistry but the possibilities in the utilization of these products would not be within the scope of an article on merchandising.

In order to determine what advances have been made in this respect a number of large, progressive houses were visited. Of these several were entirely willing to display their laboratories and methods in the interest of science, but insisted that no special praise be accorded them for their accomplishments on the ground that it would smack of gratuitous advertising. I shall therefore make the record as impersonal as possible.

Foods, drugs and insecticides are under government supervision while most other merchandise is not, but as we proceed, I think it will be borne out that wherever efficient chemical control is instituted, there it stays, law or no law; and that those who maintain it would not do without it. A guaranty is a good thing in its way; it is a kind of free insurance policy thrown in with the goods. What is wanted of it is that it shall be passive, for, as a general rule, the better a guaranty is the less frequently is it brought into action. It is always an endorsement and therefore a liability. Chemical control on the other hand determines the status of the goods warranted; it fixes credit by the establishment of fact and it is therefore an asset.

A leading wholesale grocery house was good enough to give me the following outline of the functions of their laboratory, which speaks for itself:

1—Without a competently conducted laboratory we should not of our own knowledge know what we are selling.

2—Our laboratory is maintained for the protection of our customers, and in order to keep our qualities uniform.

3—Raw materials differ greatly in percentages of essential parts, so that to buy intelligently the make-up of each lot must be studied.

4—The greatest function of the laboratory is to safeguard purity and wholesomeness. The enforcement of Federal and State Food Laws must necessarily be based upon standards and these cannot but be of a technical nature. We must be certain that all food products meet legal requirements and thus conform with the iron-clad guaranty of the house that all its goods comply with all Food Laws. With a laboratory any contaminations are discovered.

5—The laboratory does creative work. New food products are constantly sought and many good ones are discovered. These are both simple and complex. In the latter class various food substances are mixed together. During the past three years several very successful combinations have been worked out.

6—The laboratory maintains records of all our drug supplies. The value of this is shown by a recent instance. A physician in a small town purchased of a customer several half pint bottles of Castor Oil. He complained that it was not U. S. P. From the markings on the bottle labels the lot was traced back to the identical original package for which there was complete analysis. This analysis was submitted to the physician with the suggestion that he also analyze the oil, and make a comparison. The result was a complete vindication of the product.

7—Another instance showing the value of the laboratory is the case of a customer who claimed to be able to purchase Pure Black Pepper at a considerably lower price than we were quoting. A sample was procured, and analysis showed the competing article to consist in large part of *Piper longum* instead of *Piper nigrum*. On our laboratory report the business of this customer was retained.

The creative or synthetic work calls for varying degrees of scientific application. To mix up fruits and spices until a sweet-meat is achieved that commands a successful sale may be more the job of a candy man than of a chemist, but you never can