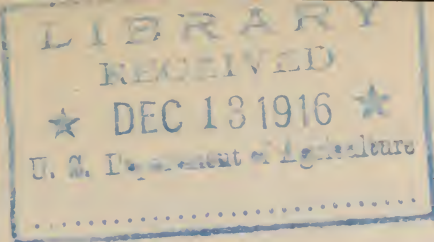


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REPORT OF THE CHEMIST.

DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
Washington, D. C., October 14, 1916.

SIR: I submit herewith the report of the work of the Bureau of Chemistry for the fiscal year ended June 30, 1916.

Respectfully,

C. L. ALSBERG,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

There was marked advancement during the year in the work of the Bureau of Chemistry, both in the development of agricultural chemistry and the administration of the Federal food and drugs act. More than 50 scientific investigations were completed. The results have either been published or are in the process of publication. Among them may be mentioned the discovery of a new sugar, studies on the molds and bacteria found normally in foods or producing spoilage in them, investigations upon forage and ptomaine poisoning, upon the physiological action of coal-tar dyes, upon vitamins, upon saponins, and upon the proteins of peanut, of kafir, and other seeds.

A large number of cases involving violations of the food and drugs act have been sent to prosecution. The number of civil and criminal actions recommended, however is not a complete index of the success attained in securing protection for the consumer under this law. Manufacturers of foods and drugs, more and more, are showing a willingness to comply with the regulations and in many cases have improved their products so as to anticipate expected requirements. To such manufacturers the service and regulatory announcements have been of direct assistance. In these announcements manufacturers and others concerned with the operations of the food and drugs act obtain ample notice of the department's opinions with regard to various trade practices and through this, as well as through other channels, are notified promptly of all changes. These announcements are supplemented by publication of the results of investigations which have developed improved methods of producing foods and drugs. The producers and manufacturers of food products also have been assisted directly through practical demonstrations of better methods of preparing and conserving foodstuffs.

The development of methods for preventing avoidable waste and spoilage of food products and the devising of new and valuable by-products have had special attention with the object of relieving as

far as possible the prices paid by the consumer for finished products by the elimination of losses and waste.

Special emphasis has been given by those in charge of the regulatory work in the past year to the control of drug products and in safeguarding the public from food subject to spoilage or pollution. Such foods if contaminated or improperly handled are liable to produce infection or poisoning and thus constitute a serious menace to health. With the object, therefore, of making the food and drugs act a hygienic measure as well as a preventer of economic fraud, the bureau has given especial attention to the interstate traffic in unclean milk, spoiled eggs, polluted oysters, and spoiled canned goods.

The interruption of imports has made it particularly important to the health of the people to curb the traffic in spurious synthetic drugs, because exceptionally high prices have offered unusual temptation to the sophisticator. Rigid enforcement of the Sherley amendment aimed at the false and fraudulent labeling of medicines was continued as a measure necessary for health protection.

As is pointed out in the report, much of the success in enforcing the food and drugs act has been due to the effective cooperation developed between State food, drug, and dairy officials and the Federal regulatory force.

RESEARCH.

PLANT CHEMISTRY.—Investigation of the nitrogenous compounds of kafir, *Andropogon sorghum*, has shown that fully one-half of them are soluble in hot 70 per cent alcohol. The soluble nitrogen consists in great part of a new alcohol-soluble protein, the percentage composition of which has been determined. It contains the amino acids lysin and tryptophan, both indispensable to the nutrition of animals. These are not found in zein, the corresponding protein of maize. Now that this is known a rational attempt can be made to learn how kafir may be fed to make it no less valuable than maize.

The peanut, *Arachis hypogaea*, and two globulins which have been separated from it have been found to contain an abundance of di-amino nitrogen. This form of nitrogen is indispensable to the nutrition of animals and is contained in inadequate amounts in the common cereals from which most feeds are derived. Peanut press cake should, therefore, prove to be an easily accessible material to make such cereal feeds more efficient. In cooperation with the Bureau of Animal Industry it is planned to make a practical test of this matter.

From the jack bean, *Canavalia ensiformis*, two globulins and an albumen have been separated and studied.

The nitrogen distribution in cotton and tomato seed, cowpeas, corn, corn germ, and wheat has been determined.

Many analyses of forage plants of the arid and semiarid West were made for the Bureau of Plant Industry.

New saponins have been isolated from *Yucca angustifolia*, *Yucca radiosa*, *Yucca filamentosa*, and *Agave lecheguilla*. A comparison of the surface tension effect of a series of saponins with their haemolytic power failed to disclose any interrelation of the two properties of the saponins.

The glucoside in the leaves of upland cotton has been found to be quercimeritrin. The results of this work are in preparation for

publication. The volatile oil distilled from the flowers has proven attractive to the boll weevil.

The results of the study of cyanogenesis in the common grass, *Tridens flavus*, showing that during maceration cyanogen may disappear, have been published. This observation signifies that many of the physiological studies upon cyanogenesis need revision.

The study upon boron absorption by plants discussed in the report for the year 1915 has been published.

A phytochemical laboratory has been established. It will undertake chemical investigations of the proximate principles of those plants which are of especial importance in connection with the enforcement of the foods and drugs act.

CARBOHYDRATES.—A new sugar, the only heptose hitherto discovered in nature, *d*-manno-ketoheptose, has been separated from the avocado. The data are ready for publication. A large number of investigations upon the preparation, the mutarotation, and the rotatory power of sugars and sugar derivatives have been completed and prepared for publication. Some of the results were published during the year in the following papers: "The Acetyl Derivatives of the Sugars"; "The Isomeric Pentacetates of Glucosamine and Chondrosamine"; "The Isomeric Tetracetates of Xylose and Observations Regarding the Acetates of Melibiose, Trehalose, and Sucrose"; "A Fourth Crystalline Pentacetate of Xylose and Some Related Compounds"; "A Second Crystalline *d*-Fructose Pentacetate"; "Crystalline β -Methyl Fructoside and Its Tetracetates"; "The Preparation of Melibiose"; "Bromoacetyl Xylose and β -Triacetyl-methyl-xyloside."

Papers have been published upon the occurrence of sucrose in relatively large amounts in a new seedling grape and upon the occurrence of sucrose in grapes of American origin. Bulletin No. 335, entitled "Development of Sugar and Acid in Grapes During Ripening," has been issued.

FLORA OF FOODSTUFFS.—An investigation of the range of conditions under which organisms of the *Bacillus botulinus* group may cause sickness or death in human beings and in domestic animals has been started. It was found that a strain of this organism obtained from a food poisoning case produced a very powerful poison. In cooperation with the Bureau of Animal Industry this poison was shown to affect rabbits, donkeys, and horses very quickly, cats in some cases and not in others, and not to affect fowls.

Because the losses to individual packers of sardines from swelled cans may be as high as 30 per cent of the yearly pack, this form of spoilage has been studied in the hope that means for preventing this waste may be found. The organism causing spoilage very rapidly forms spores which are killed only at high temperatures. Therefore, aside from ordinary cleanliness, careful processing at high temperatures is necessary to prevent the subsequent swelling of cans. In the "red feed" within the stomachs of "belly-blown" sardines a gas-producing bacterium, pathogenic to guinea pigs, has been found. A spore-bearing, gas-producing anaerobe identical with that found in sardines was isolated from two different consignments of spoiled sweetened condensed milk. *B. mesentericus ruber* was found to be the cause of the rose-pink color of certain spoiled sweetened condensed milks.

A general comparative study of the mold flora of the foodstuffs subjected to inspection has been begun, carefully distinguishing accidental organisms present as resting spores and those active in producing changes in the substrata.

The study of the effect of storage on bottled waters has shown that *B. coli*, *B. typhosus*, and *B. dysenteriae* inoculated into bottled mineral waters do not multiply, except the first two, which, in some instances, increased slightly during the first two days of storage. This was followed by a decrease in numbers. In a water practically free from dissolved solids, *B. coli* persisted in greatly reduced numbers for more than six months. A yellow micrococcus, multiplying rapidly, was found to be due to air contamination. The manner in which commercially bottled water changes its flora in one to six months was studied in considerable detail. Bulletin No. 369, "Bacteria in Commercial Bottled Waters," was issued. The results of a comparison of bile with lactose bouillon for determining the presence of *B. coli* in water were also published.

The United States Public Health Service has been assisted by the Bureau of Chemistry in making sanitary surveys of oyster beds. The results of a study of the preparation for and the transportation to the market of oysters, of a comparative study of bacteriological methods for the examination of oysters, and of a comparative bacteriological examination of oyster-shell liquor and oyster meats have been prepared for publication.

In cooperation with the Bureau of Animal Industry a manuscript has been prepared showing that one member of the group of molds known as *Aspergillus niger* produces 10 times as much oxalic acid as others, without accompanying differences in structure.

It has been found that the common molds *Penicillium camemberti* and *Aspergillus niger* produce substances reacting with ferric chlorid like phenols, a matter of significance in detecting moldiness in foods. It has also been found that the so-called salicylic acid reaction of the Japanese distilled liquor, sake, is in reality due to an acid formed by the mold used to ferment the rice from which sake is distilled. Mold products of this type may be mistaken for preservatives such as salicylic acid.

An as yet undetermined species of ergot was discovered in caraway seed.

ANTI-NEURITIC SUBSTANCES.—A variety of synthetic compounds have been made and tested physiologically. Several have been found to possess anti-neuritic properties similar to natural "vitamines." In collaboration with the United States Public Health Service a crystalline anti-neuritic product was isolated from yeast and some evidence obtained regarding its identity. A study of the nutritive and medicinal value of cod liver oil and extracts thereof was begun. One paper has been published and three nearly completed.

CEREALS—FLOUR.—Studies have been made upon the grading of flour and upon the determination of grades of flour with especial reference to the bleaching of flour. It has been found that the particles of various sizes in flour differ in chemical composition and in baking qualities. The work on flour substitutes has been continued, and a report on the determination of moisture in bread has been made. Chemical studies have been made upon the changes that take place in the deterioration of oats and in the bleaching of inferior oats.

Studies upon rice milling by-products have been completed. Bulletin No. 330. "The Milling of Rice and Its Mechanical and Chemical Effect on the Grain," has been issued jointly with the Bureau of Plant Industry.

SPICES.—Studies have been made of pepper, mustard, celery, caraway, and poppy seed, savory and sage leaves, and saffron to determine their constants as a guide in regulatory work. The determination of oxalic acid in pepper and cinnamon has led to a revision of the statements in the literature on this subject. Gingerol, the pungent principal of ginger, an oily liquid boiling at 227° to 229° C. at 6 mm. pressure, and paradol, isolated from grains of paradise, have been studied.

FATS AND OILS.—In cooperation with the Bureau of Plant Industry a bulletin has been issued upon peanut oil. A paper has been issued upon American charlock oil.

DRUGS AND PHARMACOLOGY.—Papers have been published on "The Stability of Nitrous Ether" and on the "Periodides of Phenacetin, Methacetin, and Triphenin." The results of investigations upon the "Periodides of Antipyrin, Iodantipyrin, Pyramidon" have been completed for publication.

Studies upon the heavy metals that may contaminate foods have been continued and some of the results published under the title, "The Influence of Heavy Metals on the Intestines." Papers upon the action of citrate and its decomposition in the body and upon the elimination of malate have been prepared for publication. An article on the toxicity of a series of oil-soluble dyes in which it is shown that some of them are eliminated in the urine combined with glycuronic acid has been finished and will soon be published. As a by-product of the study of the toxicity of water-soluble dyes containing iodine in the molecule, a research upon the influence of iodine and sodium iodide on the circulation has been printed. It has been found that digitalis and adrenalin antagonize the toxic heart action of oil of chenopodium while caffeine is synergistic. The result of this investigation has been published.

INSECTICIDES AND FUNGICIDES.—A tree-banding material has been developed which has been used by the Bureau of Entomology in its gipsy moth campaign. It promises to prove superior to and cheaper than the materials now in use in this country.

The Federal Horticultural Board has been further assisted in the fumigation of cotton bales, and the process has been so improved that a large part of the hydrocyanic acid used is recovered. One of the largest plants is now operating by this method.

In cooperation with the Bureau of Plant Industry attempts are being made to so modify the formula for Bordeaux mixture as to render it more efficient while at the same time reducing the amount of copper therein.

A paper upon the reduction of As^{V} to As^{III} by cuprous chloride and the determination of arsenic by distillation as arsenic trichloride has been published while others upon "The Preparation and Properties of Lead Chlor-Arsenate—Artificial Mimetite" and "The Arsenates of Lead" are in press.

ANALYTICAL METHODS.—Methods for the estimation of volatile esters in citrus oils and extract, of alcohol in the presence of phenol,

of phenacetin and salol in admixture, of tartaric acid, and of raffinose by enzymatic hydrolysis, have been published.

The results of investigations upon the identification and determination of lactic acid in biological products, upon the separation of lithium from the other alkali metals, upon a study of the Kjeldahl method for determining nitrogen, upon the freezing point of milk as a means of detecting water, upon the detection of watered milk by means of simplified molecular concentration constants, upon the detection of ergot and molds in food and drug products, upon the determination of the quality of gelatin by the measurement of its mutarotation, and upon the quality of commercial litmus papers have been prepared for publication. A method has been devised for distinguishing between bottle fermented and artificially carbonated wines.

The collation of the mass of information upon methods of food and drug analysis accumulated by the bureau described in the report for 1915 has made great progress. Forty-five subjects were finished during the year, making 66 in all since the work was begun. Much of the work is more than compilation, since the aim is to present the bureau's collective experience during the past 15 years. This requires not merely the critical sifting of the bureau's records, together with a study of the literature, but also not infrequently independent research.

CONSERVATION OF FOODSTUFFS.

POULTRY—EGGS.—A precooling plant has been developed, cooled by ice, capable of chilling 15,000 pounds of eggs and poultry a week, costing, installed, approximately \$800. With ice at \$3 per ton it has been found in actual commercial use to effect a saving of at least \$22 per carload in handling and chilling. The project upon improving the methods of fleshing poultry for the market has been continued. The work upon the transportation of perishables has been facilitated by the improvement of the method of installing resistance thermometers in refrigerator cars so that the temperature of the interior of a considerable number of cars may be observed simultaneously. The results of the previous work on damage to eggs in transit are being seen plainly throughout the country in greatly lessened waste at destination. Reports for the metropolitan district of New York City indicate that 41,161 dozens arrived broken during the calendar year 1915, while approximately twice that number were broken on arrival during 1914. In the study of the cold storage of eggs particular attention has been paid to the devising of methods to prevent stored eggs from acquiring the so-called "storage taste." Bulletin No. 224, "A Study of the Preparation of Frozen and Dried Eggs in the Producing Section," has been issued.

An investigation has been made of the contents of the crop of fowls for the purpose of furnishing data to detect the feeding, as a makeweight, of excessive quantities of sand just before slaughtering.

FISH.—Demonstrations in the preparation of fresh shrimp for the market with cleanliness, suitable boiling in brine, and thorough cooling has been of material value to the shrimp shippers of the southern east coast in the conduct of their business.

Studies of fish transportation to prevent decay have been continued. Perhaps no other perishable food is shipped long distances with so little knowledge of what is required to insure arrival in good order. The work was begun in Florida and at the end of the shipping season transferred to the Pacific coast, where transcontinental hauls are under observation. A Yearbook article upon the fish industry was published. Many analyses of food fish have been made which show that the data now on record are inaccurate because as a rule they were made without consideration of the season when the fish were taken. The studies upon the chemical changes taking place in fish in freezer storage begun last year have been continued.

The investigation upon the improvement of the methods of canning sardines has been brought to a successful conclusion. The industry has very largely accepted the recommendations of the bureau. It has taken steps to see that only sound fish are packed by imposing upon itself an inspection service.

POTATOES.—A process has been perfected for the drying of surplus and cull potatoes with simple machinery for the purpose of utilizing these tubers now largely wasted in certain localities in years of over-production. The product can be fed to animals or be used as a size or for the manufacture of gum, dextrin, or starch. Being dry, it can be stored indefinitely and transported more cheaply than the potato itself.

A simple practical method of ensiling potatoes without cooking or the use of pure cultures has been discovered. To the crushed raw potatoes is added a starter consisting of 1.5 to 4 per cent of ordinary corn meal. The loss from the resulting fermentation is negligible. Cattle and hogs eat the product freely. Extensive feeding experiments are planned for the coming year.

CITRUS AND OTHER FRUITS.—The development of a method for the manufacture of citrate of lime from lemons has been completed, while the development of a method for the manufacture of citric acid free from contamination by heavy metals is well advanced. The manufacture of lemon oil has been further studied and the determination of the seasonal variations of the oil and citric acid content of lemons has been practically completed for certain sections of California. A study of tangerines has shown that the green fruit has value as a source of citric acid and that the oil has commercial possibilities. The manufacture of marmalade stock has been undertaken. A fine orange vinegar has been manufactured on a small commercial scale which promises to find a market, though a limited one, because it costs more to produce than the usual product. The determination of the composition of California oranges with reference to season, climate, soil, location, and methods of cultivation has been completed and the results are being prepared for publication. The study of the composition of oranges from selected trees has been of great assistance to the Bureau of Plant Industry in studying bud variations for the purpose of making selections in propagation experiments. Similar studies upon grape fruit have been begun with the Bureau of Plant Industry for the purpose of standardizing and improving the varieties grown. A study to establish the range of variation in composition of mature Florida and California grapefruit has been undertaken to be carried through several seasons.

Improved methods for the preparation of jams and jellies have been devised and manufacturers have been assisted in improving their methods and utilizing their waste products. In connection with the States Relations Service, from time to time lectures and demonstrations have been given at meetings of State agents upon the methods of preparing jams, jellies, and preserves in the household.

MISCELLANEOUS.—A method has been developed, though not yet applied on a large scale, by which a pure cane sirup can be made which will not crystallize nor ferment. The studies upon the effect of the different manufacturing processes upon the composition of maple sirup and of sorghum sirup have been continued. A paper has been published upon the composition of tamarind sirup.

Beans produced in certain localities are not as highly esteemed as their otherwise excellent quality warrants, because when soaked they do not swell uniformly. It was found that a cuticular substance is especially abundant in the epidermis of the hilum of those beans which, when soaked, swell slowly. The oxalic acid content of a large variety of beans has been investigated.

An investigation of the sauerkraut industry has shown that while factory construction and management have largely followed German models, the climatic differences between this country and Germany have not been considered. Adequate temperature controls to diminish losses in waste liquor, kraut, and brine have not been provided.

TECHNOLOGICAL INVESTIGATIONS.

DUST EXPLOSIONS.—For the prevention of explosions in the threshing of grain an automatic fire extinguisher, a blower device, and a plan of wiring the machines have been devised in cooperation with the Office of Public Roads and the Bureau of Mines. They were described in a joint bulletin with the Office of Public Roads, Bulletin No. 379, and blue prints were furnished to all manufacturers of threshing machines in the United States by that office. Detailed information has also been sent to underwriters and to farmers' mutual insurance companies dealing in threshing-machine insurance. Plans were made jointly with the Office of Public Roads to demonstrate these devices in the field, with the assistance of the State experiment stations of Idaho, Oregon, and Washington. The States of New York and Pennsylvania have been assisted in the drafting of regulations designed to reduce the danger from dust explosions and fire in mills and elevators. With the assistance of the Bureau of Standards laboratory apparatus was constructed for the mechanical separation of dust into fractions of definite size and density. By means of specially designed apparatus the force developed by the explosion of various kinds of dust has been measured. Results of the investigation upon the inflammability of carbonaceous dusts and upon the inflammability of carbonaceous dusts in atmospheres of low oxygen tension have been prepared for publication. In cooperation with the State College of Pennsylvania, the study of explosions in attrition mills has been begun.

PAPER.—A test has been found to determine the strength of paper when wet, which is a most important consideration in preparing specifications for photographic blue and brown print, bag, and wrapping

papers. An instrument has been constructed for the measurement of the translucency of paper. Instructions for testing the folding endurance tester, with data on the accuracy of this machine, have been prepared for publication. Papers have been published upon a new colorimeter and upon the detection of faulty sizing in high-grade papers.

TANNING.—A manuscript has been prepared upon American sumac to aid the farmer in gathering this plant and to help supply the demand in the dyeing and tanning industry. It has been found that the best way to denature egg yolk for tanning is to add 2 per cent of birch tar oil. Power distillate may also be used.

NAVAL STORES.—The Board of Trade of Brunswick, Ga., adopted the glass standards of the rosin types. They are now practically universally recognized in the Union. Examination of samples of rosin, mostly the pale grades, representing nearly 6,000 barrels, showed 9 per cent to have been graded too low and 38 per cent too high. A method for defining and determining the grades of turpentine has been perfected. A rough survey was made east of the Mississippi to determine the extent of the adulteration of spirits of turpentine sold for technical purposes. Twenty-six per cent of the samples were found to be adulterated with mineral oil to the extent of from 3 to 100 per cent.

DEMONSTRATION.

In connection with its research and regulatory work the bureau has done much demonstration and educational work. This has during the past years grown to such an extent that it deserves separate notice. Some of it has already been mentioned, as, for example, that in connection with the canning of sardines, the manufacture of dried and frozen eggs, the refrigeration of perishables, the shipping of fresh shrimp, and of fresh fish. The work of the poultry and egg packing demonstration car has increased greatly in efficiency and results. During the year 101 towns in the State of Indiana were visited and 10,600 people came to the car.

An extensive demonstration campaign has been conducted on the proper methods of packing tomato products which supplements the effect of prosecutions in eliminating unfit products from the market. In cooperation with the States Relations Service assistance has been given to canning clubs, especially in Florida, in the preparation of jams, jellies, and preserves. Assistance has also been given to manufacturers of these products. Instruction has been given in the grading of naval stores. Unfortunately a sufficient number of glass standards is not yet available because the disturbed trade conditions make it impossible to secure the necessary glasses. The demonstration of improved methods of producing rosin and turpentine has been begun in a small way. It is soon to be made more extensive.

ENFORCEMENT OF FOOD AND DRUGS ACT.

DOMESTIC FOODS AND DRUGS.—Five hundred and seventy-seven recommendations for seizure and 787 recommendations for criminal prosecution were made through the office of the Solicitor to the De-

partment of Justice. The work with the Bureau of Standards to establish "tolerances and reasonable variations" under the net-weight amendment has progressed, that upon dairy products being completed. Among the 1,036 cases of all kinds terminated in the courts during the year were 198 alleging false and fraudulent labeling of medicines, in all of which save 5 the courts found for the Government. In 1 food case a sentence of imprisonment was imposed. A number of indictments for conspiracy were found, upon evidence obtained by the bureau, concerning the adulteration of olive oil, domestic traffic in refuse eggs, traffic in refuse eggs exported to England, and the sale of spurious synthetic drugs.

There were collected 4,483 official samples. These showed an increasing percentage of substantial violations, an index not of increased disregard of the law, but, as pointed out in the report last year, solely of greater discrimination in the selection of samples. In addition an increased number of informal samples, about 4,000, were taken, because these demand less labor and yet are adequate for the routine checking of staple products to gauge the effect of the bureau's action, and for general surveys preliminary to definite campaigns. The number of official samples analyzed by the field force is given in Table I. The use of the guaranty legend and serial number ceased very largely during the year.

TABLE I.—*Report of branch laboratories for year ended June 30, 1916.*

Laboratory.	Import samples, analyses.			Floor-inspection samples.	Interstate samples, analyses.			Miscellaneous samples.	Total samples analyzed.	Hearings held.	
	Legal.	Illegal.	Released without prejudice.		Legal.	Illegal.	Check analysis.			Personal.	By correspondence.
Central district:											
Chicago.....	154	277	47	2,612	421	574	174	246	1,593	232	133
Cincinnati.....	192	51	4	243	163	176	39	1,977	2,602	134	326
Minneapolis.....	30	19	5	122	201	187	0	1,190	1,632	56	62
New Orleans.....	35	112	30	1,213	82	127	10	208	604	146	65
St. Louis.....	5	12	1	240	1,737	740	23	1,744	4,262	375	140
Total.....	416	471	87	4,430	2,604	1,804	246	5,365	10,993	943	726
Eastern district:											
Boston.....	364	453	84	10,089	125	343	23	195	1,587	439	193
Buffalo.....	9	60	13	43	31	143	0	306	562	64	113
New York.....	4,146	2,994	1,161	31,786	102	333	2	161	8,899	1,224	2,221
Philadelphia.....	277	227	101	2,973	47	59	2	42	755	360	40
Porto Rico.....	189	596	108	3,264	9	94	0	1	997	491	121
Savannah.....	36	39	1	0	84	150	0	25	335	13	39
Washington.....	68	11	1	14	314	304	9	657	1,364	13	4
Total.....	5,089	4,350	1,469	48,169	712	1,426	36	1,387	14,499	2,604	2,731
Western district:											
Denver.....	17	6	18	59	60	68	9	102	280	4	25
Honolulu.....	93	207	8	2,807	1	2	0	42	353	217	0
San Francisco.....	703	938	113	14,398	176	162	23	865	2,980	918	251
Seattle.....	134	351	68	6,605	76	73	0	340	1,042	267	29
Total.....	947	1,502	207	23,869	313	305	32	1,349	4,655	1,406	305
Grand total.....	6,452	6,353	1,763	76,468	3,629	3,535	314	8,101	30,147	4,953	3,762

In the Service and Regulatory Announcements were published 52 opinions and 600 notices of judgment.

All the work on the certification of colors was concentrated in Washington. The laboratory at New York City was transferred to new and more commodious quarters in the United States Appraiser's Stores. The St. Paul laboratory was moved into the new Federal building in Minneapolis. The dairy laboratory was abolished and its work distributed among other laboratories of the bureau.

A separate office has been established to deal with cases of false and fraudulent labeling of medicines and mineral waters under the Sherley amendment to the food and drugs act. To this office are also referred such medical matters as may arise in connection with the work of the bureau. At the request of the Secretary an officer of the United States Public Health Service was detailed to take charge. In consequence this work has been carried on more expeditiously and efficiently than heretofore.

A very close inspection was maintained during the past year over the early shipments of oranges and grapefruit. In this campaign the bureau received the active help of the greater part of the citrus fruits producers. Comparatively few sweated, immature oranges or grapefruit were marketed. The better quality of the fruit is believed to have resulted in a steadier market, so that the producer as well as the consumer benefited.

The unusual demand for cotton lint by the munitions factories greatly increased the delinting of cotton seed. The cake and meal made from such delinted seed has usually less protein than that from undelinted seed. Many mills in labeling their product used the analyses of former years, thus misleading the consumer, who, as a rule, was unable to protect himself because of the rising market. With the assistance of State officials, the Bureau has taken action in many cases.

Based upon cooperative sanitary surveys of the waters over oyster beds in certain sections, described in the report for the last two years, the department, by appropriate notice, warned the producers against the shipment interstate of oysters from such sections during the fall, spring, and summer, when the oysters are not hibernating. In the case of particular regions warning of this nature had been issued some few seasons prior to last year. This warning had not been heeded in all cases. Last fall prosecutions were brought, with the result that all shipments from such condemned territory thereafter were stopped in the fall and spring.

Other forms of adulteration not already mentioned that received especial attention are: The substitution of mountain maple, *Acer spicatum*, for cramp bark, *Viburnum opulus*, the adulteration of oysters, scallops, and canned tomatoes with water, the substitution of colored starch paste for tomato sauce, the reprocessing of spoiled canned goods, the traffic in cull beans, in decomposed tomato products, in rancid olive oil, in wormy horse beans, the substitution of foreign fat for cacao butter in, and the addition of cacao shells to, cacao products, the adulteration of rice bran with rice hulls, the coloring of inferior macaroni and of plain noodles, the misbranding of domestic macaroni in simulation of imported goods, and the adulteration of oats with water or weed seeds.

COOPERATION WITH STATE OFFICIALS.—It is not possible to give a complete account of the assistance given State and municipal officials by the bureau, or of the assistance received by the bureau from them, because much of this cooperation is of an informal nature and because local officials do not always report to the bureau upon the value of the information received. However, such cooperation has been more effective than ever before owing to the manner in which the Office of State Cooperative Food and Drug Control, established in 1914, has conducted its work, described in a general way in the report of last year, and because of the greater amount of information it has distributed. Many conferences have been held with State officials, and they have been notified of the beginning and termination of court cases, of court decisions, of all public hearings held by the bureau. Twenty-three sets of information cards on methods of food and drug analysis have been issued to them and they have been furnished copies of analyses and inspection reports. A Manual of Procedure for the Guidance of State Health, Food, and Drug Officials has been compiled and forwarded to State officials for their information and guidance when endeavoring to use the Federal food and drugs act as outlined in section 5 of the act. A list of Federal and State Dairy, Food, Drug, and Feeding Stuffs Officials has been prepared and kept up to date for the information of these officials. A compilation of State food and drug laws and of State food inspection decisions has been begun. Twenty-three instances of seizure action instituted by State officials are known to the bureau. Other seizure actions under the Federal law, not reported to the bureau, were undoubtedly inaugurated by joint action of the State official and the local United States attorneys. One hundred and ninety-one official samples were collected by State officials in 19 States. Among the adulterated articles proceeded against under State laws or municipal ordinances upon information furnished by the bureau may be mentioned decomposed eggs, decomposed canned goods, decomposed fish and poultry, polluted or watered oysters, watered scallops, saponin-containing foods, liquors containing wood alcohol, misbranded nostrums, and spurious drugs. In a large number of instances information was given to the Health Department of New York City which led to condemnation of adulterated food not coming under the jurisdiction of the Federal act. Many of the State and municipal officials have reciprocated for information of this kind by furnishing to the bureau evidence of violations of the Federal law. Among the most notable instances are polluted or watered oysters, watered scallops, adulterated milk or cream, decayed eggs, decomposed canned goods, butter and fish, wood alcohol in liquors, cottonseed meals and other feeds below guarantee, adulterated oats, and misbranded nostrums. Some specific instances of effective cooperation with State and municipal officials have been mentioned above in connection with other phases of the bureau's work. Two other types follow:

Abnormal trade conditions fostered the production of spurious drugs in place of synthetic ones which are ordinarily imported, notably acetyl-salicylic acid and neosalvarsan. Though a number of shipments were seized, a number of individuals successfully prosecuted under the food and drugs act, and indictments returned under

the postal laws, the traffic could not wholly be suppressed by Federal action nor the goods in the hands of local dealers in many sections of the country destroyed. The situation was laid before State and municipal officials who instituted many prosecutions and seizures with the result that through this joint action this fraudulent traffic was broken up.

In cooperation with the food and drug commissioner of Texas, the cause of contamination of certain wells in Texas, the water of which is widely distributed, was determined. When the results were laid before the local authorities steps were taken to remedy the situation. Similar action has been taken in the case of other spas.

The cooperation in the sanitary control of the milk supply of small cities described in the report for last year has been extended in Illinois, Iowa, Missouri, Kansas, Nebraska, and in New England. It is proposed to repeat this work year after year, extending it each year to new territory. In some localities bad conditions were found, due in the main to insufficient cooling and careless handling. Perhaps the best result of this work has been that it stimulated some of the local authorities to take up similar work independently so that definite permanent improvement of the milk supply of a number of cities has resulted. The cooperative work on the control of the shipment of decomposed eggs described in the report of last year has been extended to cover much of the territory in which shipments originate so that eggs are now candled before shipment far more than formerly and the spoiled eggs destroyed or fed to poultry and stock. At the same time information given to local officials has helped them to curb local traffic in eggs rejected in candling.

The joint committee on definitions and standards has considered a large number of products. Based upon its recommendations the following food inspection decisions have been issued: No. 160, Gluten Products and "Diabetic" Food; No. 161, Maple Products; No. 162, Egg Noodles and Plain Noodles; No. 165, Cacao Products.

IMPORTATIONS.—The analyses and inspections made in the control of the importation of foods and drugs have been tabulated in Table I. Owing to the unusual trade conditions, while the quantity of imports has been reduced, the variety has not; and there has been such a variation in a single class of products that it has been found necessary to make a great many more examinations of a single importation than were formerly required. This situation is particularly reflected in the quality of the crude drugs and spices received. Prices have been unusually high and the temptation to offer spurious or adulterated articles correspondingly great. The quality of senna leaves, cinchona products, ipecac, and strophanthus was often poor and sometimes a completely spurious article has been offered. The inability to procure certain spices from the usual sources has resulted in the introduction from new sources of new types, some of which were adulterated or spurious. Especial difficulty was encountered with coriander, fennel, celery, anise, cumin, and Chinese and Indian mustard. The poisonous leaves of *Coriaria myrtifolia* were found in marjoram leaves, *Origanum marjorana*. Owing to the increase of the bureau force of microscopists the control of crude drugs and spices is becoming more effective. Worthy of special mention is the continuation of the exclusion from New England of spoiled Canadian milk and

cream. Especial attention has also been paid to decomposed tomato products, spoiled sardines, and wormy olives. Mineral waters have been frequently examined for pollution. Many misbranded medicines have been detained until the misbranding was corrected. Many shipments of low-grade alimentary pastes colored in simulation of high-grade products have been excluded.

COLLABORATION.

For other bureaus of the department 8,194 samples were analyzed. For other executive departments and Government establishments 789 were analyzed as shown in detail in Table II. The totals do not include samples that were analyzed by the field service of the bureau. These are included among the miscellaneous samples given in Table I.

TABLE II.—*Miscellaneous analyses for other branches of the Government.*

Department of State.....	1	Department of Commerce.....	26
Department of the Treasury.....	65	Department of Labor.....	1
Department of War.....	97	Government Printing Office.....	10
Department of Justice.....	3	The Panama Canal.....	90
Post Office Department.....	67	District of Columbia.....	72
Department of the Navy.....	352		
Department of the Interior.....	5	Total.....	789

Sixty-seven samples of fraudulent medicines sent through the mails have been analyzed for the Post Office Department. Assistance was also rendered at hearings and in court at trials.

Assistance was also given in the revision of the United States Pharmacopœia and in the revision of the official methods of analysis of the Association of Official Agricultural Chemists.



