have the appearance of central convolutions. They are wholly internal, the surface of the colony being smooth. Illustrations will be published in a later paper. The markings might be described in brief as a mottled, wrinkled (convolute) central area fading to a homogeneous margin, appearing in five to seven days and visible for one to two weeks. In view of these facts the writer, rightly or wrongly, has decided to name the soy bean organism *Bact. phaseoli* var. *sojense*.

The writer has never seen the *Bact. glycineum* blight in the field, but, judging from Miss Coerper's description and illustrations and her own greenhouse experiments the two diseases very closely resemble each other in the later stages. In the early stages, however, they are quite different, *Bact. glycineum* causing a water-soaking, a phenomenon never observed in the disease under consideration. *Bacterium phaseoli* var. *sojense* does, however, produce water-soaking in *Phaseolus*. Another difference—only noticeable in young infections is a slight raising of the center of the infected area in the case of infection with *Bact. phaseoli* var. *sojense*, hence the name "pustule." This raised portion may occur on one or both sides of the leaf and rarely, if ever, exceeds 1 mm. in diameter. It ultimately collapses or is sloughed off. Microscopic examination of these pustules shows both hypertrophy and hyperplasia. In the later stages the disease is characterized by angular reddish brown spots on the leaves, varying in size from tiny inconspicuous specks to large irregular brown areas involving a considerable portion of the leaf. Frequently the leaves have a ragged appearance due to the dropping out of portions of the large spots. A conspicuous though not universal accompaniment of this disease is a pronounced yellowing. The writer believes that in this stage only the isolation of the parasite could make possible a correct diagnosis of the disease, and it is in the hope of avoiding further confusion that this preliminary note is published. A paper covering the results of work since 1917 is in preparation. This disease occurs from Washington southward.

FLORENCE HEDGES
U. S. DEPARTMENT OF AGRICULTURE

THE AMERICAN CHEMICAL SOCIETY

(*Continued*)

DIVISION OF DYE CHEMISTRY
William J. Hale, chairman
R. Norris Shreve, *Chemistry*

The preparation of phenylglycine-o-carboxylic acid. I. From anthranilic acid and monochloracetic acid: HERBERT L. HALLER. A study of the preparation of phenylglycine-o-carboxylic acid from anthranilic acid and monochloracetic acid has been undertaken. Optimum conditions have been determined for (1) concentration in water of the reacting substances, (2) time allowed for reaction, (3) ratio of reacting materials, (4) condensing agent, and (5) temperature of reaction mixture.

On the preparation of 7-7' Di (α-hydroxyisopropyl) indigo: MAX PHILLIPS. Starting with p-cymene obtained from "sulphite turpentine" and using a modified procedure of the Heumann phenylglycine-o-carboxylic acid synthesis of indigo, a new indigoid dye has been prepared. The method used consists in first nitrating p-cymene, then oxidizing the nitro cymene to o-nitro p-hydroxyisopropyl benzoic acid; reducing this to o-amino p-hydroxyisopropyl benzoic acid; condensing the latter with monochloracetic acid to hydroxyisopropyl phenylglycine-o-carboxylic acid and finally fusing with potassium hydroxide. This new dye has a similar absorption spectrum to that of indigo and has quite similar dyeing properties.

A new method for the preparation of dicyanine and related dyes (By title): S. PALKIN.

The necessity for reclassification and standardization of dyes: C. R. DELONG and W. R. WATSON.

The influence of sulphur on colors of azo dyes: W. R. WALDRON and E. EMMET REID. Some 30 different bases containing sulfur in a variety of positions and associated with various alkyl and aryl radicals have been prepared, diazotized and coupled with representative dye intermediates to form dyes so as to show the influence of sulfur groups in various positions on the color. Bases having sulfur in the sulfide and sulfone condition have been compared with the sulfur-free bases, and it has been found that the sulfide sulfur is bathochromic while the sulfone group is usually hypsochromic.

Experiments with dehydrothio-p-toluidine and related compounds: MARSTON TAYLOR BOGERT and MARTIN MEYER. When dehydrothio-p-toluidine is subjected to Skraup reaction, it yields the corresponding benzothiazolyl quinoline. The Atophan

reaction was unsuccessful. Attempts to prepare dehydrothio-p-toluidine by fusion of nitro-toluene or of p-nitrobenzal-p-toluidine with sulfur gave very poor yields of the product sought. 2-p-tolyl-benzothiazole was prepared by the Jacobsen method from thio-p-tolanilide and some of its derivatives investigated.

Uses of p. toluenesulfonyl chlorine in the manufacture of dyes and intermediates: JULES BEBIE. p. Toluenesulfonyl chloride is a by-product in the manufacture of saccharin. A great amount of chemical work has been devoted to the utilization of this material and one of its derivatives, chloraminte-T, is generally known as an excellent germicide. Other derivatives have found application in the dye industry. The p. toluenesulfonyl chloride itself can be used in various ways in the manufacture of dyes and intermediates, particularly as a component or a part of a component for the production of various classes of azo dyes and in the combination with azo dyes containing hydroxyl groups with the purpose of making the resulting dyes fast for alkali and soap.

The method of determining the class to which each dye belongs: ANDREW J. LEDDY.

The function of assistants used in dyeing cotton: ANDREW J. LEDDY.

The application of the direct dyes in coloring paper: WALTER C. HOLMES.

The functions of the dye testing laboratory: R. E. ROSE.

The analysis of B. naphthylamine: HENRY R. LEE and D. O. JONES. Methods are presented for the analysis of B. naphthylamine in the presence of its common impurities, namely, B. naphthol, a-naphthylamine and B B dinaphthylamine. By sulfonation of B. naphthylamine the nitrate titration can be applied in the presence of B. naphthol. A separation of D. naphthylamine from B. naphthol and B B dinaphthylamine is made by precipitation of the former as the hydrochloride from benzol solution. The hydrochloride is dissolved in water and titrated with N/2 nitrite at 0-5° C. The benzol solution is evaporated to dryness and the B. naphthol determined by titration with diazo p-nitro-benzene. The Kjeldahl Gunning method has been modified by sulfonation of the sample with 25 per cent. oleum in the cold and the use of a glass wool plug in the neck of the flask during digestion. B. naphthylamine, a-naphthylamine, B. naphthol and B B dinaphthylamine were prepared in the pure state and some of their physical constants determined. Melting point curves are given for B. naphthylamine with each of these impurities up to 10 per cent.

DIVISION OF BIOLOGICAL CHEMISTRY

Howard B. Lewis, *chairman*

J. S. Hughes, *secretary*

Higher alcohols formed in the fermentation of sugar: J. C. SWENARTON and E. EMMET REID. Crude fusel oil, from the large scale fermentation of molasses with pure culture yeast, contains substances boiling above isoamyl alcohol even up to 270°. A quantity of the high boiling portion has been repeatedly fractioned in vacuum and the alcohol part of each fraction extracted by treatment with phthalic anhydride. The alcohols obtained by saponification of the mono-alkyl phthalates boil up to 110° at 8 mm. and vary in density at 25° from 0.8007 to 0.9067. Some are optically active. They are being studied further with the hope of identifying the individual alcohols. The non-alcohol portions of the fractions boil up to 155° at 10 mm. and have densities at 25° from 0.80 to 0.90. Some are optically active.

The toxic constituent of greasewood (Sarcobatus vermiculatus): JAMES F. COUCH. Greasewood is an important forage plant for sheep on the winter ranges in the west. It is common in the semi-arid alkali valleys of the far western states, and, while it is extensively grazed, it has been found by Marsh, Clawson and Couch to be poisonous. Chemical examination of the edible portions of the plant showed that they contain a large proportion of oxalic acid and unusually large amounts of sodium and potassium salts. Toxic alkaloids, glucosides and saponins were absent, and it was shown by experiments upon sheep that the poisoning is due to sodium and potassium oxalates. The leaves of the plant contain the largest proportion both of ash and of oxalic acid; in the stems most of the oxalic acid is combined as calcium oxalate.

Influence of breeding upon oil and protein content of cotton seed: C. L. HARE.

The iodine absorption of urine: JACK MONTGOMERY.

Influence of sodium chloride upon animal excretion: E. R. MILLER.

Further experiments on the isolation of vitamin: ATHERTON SEIDELL. The method as now used for the preparation of highly active vitamin fractions consists in heating fresh brewer's yeast mixed with water to about 90° C.; adsorbing the vitamin present in the filtered solution by means of English fuller's earth; extracting this latter with saturated barium hydroxide solution; and concentrating the extract, after acidifying with sulfuric acid and filtering, by rapid vacuum distillation. More detailed experiments on the precipitation of the vitamin in these concentrated extracts by

means of silver salts have shown that approximately one third of the solids present unite with the silver salts to form insoluble silver compounds. About one half of the total vitamin, as determined by feeding experiments on pigeons, is present in these insoluble silver precipitates and the other half remains in the filtrate. This unexpectedly large unprecipitable fraction of the vitamin raises the suspicion that the portion accompanying the silver precipitates may not be in chemical combination but simply held by adsorption. Further studies of the silver precipitates and filtrates are in progress.

Cow's milk versus goat's milk as a source of the antiscorbutic vitamin: C. H. HUNT and A. R. WINTER. Four weeks before the experiment started two cows and three goats were placed on the same ration, consisting of equal parts of a grain mixture and alfalfa hay. Forty-four guinea pigs were divided into eleven lots of four each and were given a weighed daily amount of a basal ration consisting of rolled oats 69 parts, autoclaved alfalfa flour 25 parts, casein 5 parts and NaCl 1 part. All of the pigs received, with the exception of the control lot, in addition to the basal diet, a measured amount of milk each day; one half of the lots receiving cow's milk and the other half goat's milk. The amount of milk fed varied from 10-50 cc in increments of 10 cc. The control lot died of scurvy in 26-30 days. The pigs receiving 10 cc. of cow's milk survived from 42-53 days, while the survival period of those receiving 10 cc goat's milk was from 60-103 days. Up to a period of 90 days one death from scurvy occurred among the lot receiving 20 cc. cow's milk, while no deaths from scurvy occurred among the pigs receiving 20 cc. goat's milk. There was a decline in weight of both lots receiving 20 cc. milk, but the decline was greater with those receiving cow's milk than with those receiving goat's milk. When the amount of milk fed daily was increased to 30 cc. or more no difference was noted between cow's and goat's milk as a source of the antiscorbutic vitamin (C).

Results obtained by feeding breeding gilts a ration low in vitamin: J. S. HUGHES and H. B. WINCHESTER. Breeding gilts receiving a feed low in vitamin A and C developed no abnormalities during the first ten months. At this time they developed the eye trouble common to rats, rabbits, dogs and other experimental animals, and in addition to this they developed a nervous disorder manifested by a general incoordination accompanied by frequent convulsions. Two of the eight did not breed, two died during the latter part of the gestation period, two aborted a few days before they died, one farrowed dead pigs and the last one went fourteen days longer than the normal gestation period. Gilts receiving 5 per cent. alfalfa as a source of their vitamin A showed no abnormalities. Five per cent. alfalfa did not furnish sufficient vitamin for normal reproduction, as 28 per cent. of the pigs farrowed by these sows were dead.

Influence of the vitamin content of a feed on immunity to roup: J. S. HUGHES, L. D. BUSHNELL and L. F. PAYNE. Chickens receiving a feed low in vitamin were much more susceptible to roup than those receiving a similar feed high in vitamins. Four pens, of twelve chickens each, received feeds varying in their vitamin content. One chicken from the pen receiving a feed high in vitamins, eight from the pen receiving a feed low in the fat-soluble vitamin, seven from the pen receiving a feed low in the water-soluble vitamin and nine from the pen receiving a feed low in both fat and water-soluble vitamin, died with clinical symptoms of roup or a disease similar to roup. All chickens were exposed to the roup infection by keeping infected chickens in the pens.

The detection and estimation of inorganic activators in commercial rennin and pepsin preparations: HARPER F. ZOLLER. An activator-free pepsin or rennin solution coagulates dialyzed milk with great difficulty at the optimum temperature (41° C.) for rennin action. The presence of calcium or magnesium ions accelerates the enzyme action and gives the coagulum its normal physical consistency. The differential between the rate of coagulation in dialyzed milk and in undialyzed milk furnishes a factor, which when compared with a similar factor obtained from activator-free enzyme solution under the same set of conditions, furnishes a means of roughly estimating the quantity of activator or accelerator present.

A laboratory disinfectant solution to displace mercuric chloride: HARPER F. ZOLLER. Sodium hypochloride solution furnishes a means of providing an efficient, economical and safe sterilizing agent for use in biological laboratories. In the preparation of the solution it is essential to maintain a sufficiently high hydroxyl ion concentration for maximum stability—about p_H 10.5. Solution containing about 0.15 per cent. available chlorine (0.32 per cent. sodium hypochlorite) will destroy the most persistent of micro-organisms within ten minutes.

The decomposition of food by bacillus botulinus: I. K. PHELPS and J. E. BASCH.

The feeding of non-ketogenic odd-carbon fats

to diabetic patients: MAX KAHN. It is prohibitive to feed diabetic patients who have a very low carbohydrate tolerance even a moderate amount of natural fat because of the danger of inducting a severe ketosis which may prove fatal. It was found that synthetic non-ketogenic odd-carbon fats could be fed in large quantities to such persons without inducing any acidosis, and that the nutrition of such individuals was improved. A study is now being made of the intermediate metabolism of these fats and their effect on all types of diabetic and normal individuals.

A new source of santonin: ARNO VIEHOEVER and RUTH G. CAPEN. As a result of a survey of American plants it is evident that santonin can be obtained from *Artemisia mexicana* and *Artemisia neo-mexicana,* which grow wild in Mexico, New Mexico and neighboring states. The survey thus far made comprises 17 species and plant material obtained from 30 different sources. The santonin isolated was identified by the form and refractive indexes of the crystals, the melting point, furfural reaction and the formation of santonin periodide. Though no quantitative data are as yet on hand, the manufacture of santonin, now quoted at $150 per pound, from domestic sources appears a distinct possibility. (Contribution from the Pharmacognosy Laboratory, Bureau of Chemistry, Department of Agriculture).

A new method for the colorimetric determination of Peroxidase: VICTOR E. LEVINE. The leuco base of malachite green is used as the reagent. In the presence of peroxidase this compound turns emerald green on the addition of a small quantity of hydrogen peroxide. Proteins of the enzyme extract are coagulated by chloroform, which also dissolves out the green dye. On centrifuging the mixture separates into a green chloroform layer on the bottom and a colorless layer on top. Between these two layers is a zone of coagulated protein. The chloroform solution is separated from the other layer and is made up to volume. The removal of the proteins renders the extract clear for colorimetric examination. The standard is a solution of malachite green in chloroform. It must be made up fresh as it has a tendency to deteriorate on standing.

A simple method for differentiating boiled or pasteurized milk from unboiled or unpasteurized milk; Selenium compounds as biochemical reagents: VICTOR E. LEVINE.

The catalytic properties of the metals occurring in respiratory pigments: VICTOR E. LEVINE and ARTHUR C. ANTONY.

DIVISION OF SUGAR CHEMISTRY

S. J. Osborn, *chairman*

Frederick Bates, *secretary*

The moisture absorptive power of different sugars and carbohydrates: C. A. BROWNE. Comparisons were made of the water absorptive power of anhydrous dextrose, levulose, rhamnose, sucrose, maltose, lactose, raffinose, starch, cellulose, mannite, invert sugar, honey, molasses, malt syrup, commercial glucose and agar under different conditions of atmospheric humidity. The substances of greatest absorptive power at end of one hour exposure (at 20° C., 60 per cent. rel. humidity) were starch (1.04 per cent), cellulose (0.89 per cent.), agar (0.88 per cent.), and of least absorptive power dextrose (0.07 per cent.), mannite (0.06 per cent.), sucrose (0.04 per cent.). At the end of nine days' exposure the substances of greatest absorptive power were agar (20.34 per cent.), starch (12.98 per cent.), raffinose (12.90 per cent.), and of least absorptive power dextrose (0.07 per cent.), mannite (0.05 per cent.), sucrose (0.03 per cent). At the end of 25 days' exposure at 20° C. and 100 per cent. humidity the substances of highest absorptive power were invert sugar (76.58 per cent.), honey (74.10 per cent.), levulose (73.39 per cent.), and of lowest absorptive power cellulose (12.57 per cent.), lactose (1.38 per cent.), mannite (0.42 per cent.). The presence of levulose increases water absorptive power, but the latter is not proportional to the levulose content. The absorptive power of the substances was lowest in February and highest in July and August. The natural fluctuation noted from some substances were: levulose, 11.19-36.31; invert sugar, 11.81-34.73; agar, 21.00-30.74; starch, 12.29-18.41; cellulose, 5.06-10.89; maltose, 5.46-9.37; mannite, 0.22-0.52. The general tendency of sugars is to absorb moisture up to the amount necessary to form a stable hydrate form.

Sugar purity determinations: W. D. HORNE. Great numbers of sugar purity determinations having to be made daily for chemical control of sugar factories and refineries, a very rapid and accurate method has been evolved, by means of special appliances. A Brix spindle containing a complete temperature correction scale gives a correct Brix for any density and temperature. Defecation with "dry lead" is practically instantaneous and more accurate than by the use of lead solution. From the Brix and the polarization thus obtained, one finds the purity on a table of purities printed on a long paper mounted on movable rolls easily exposing the desired portion.

Plastometer tests on alkaline thin boiling corn starches: C. E. G. PORST and M. MOSKOWITZ. Corn starches of various fluidities ranging from ten to fifty (as determined by the Corn Products Refining Company's funnel method) were prepared having alkalinities varying between acid to phenolphthalein up to .12 per cent. alkali. The pastes from these starches were then tested on the plastometer. Results show that the paste from starches which were just about neutral to phenolphthalein were firmer than those that reacted acid. As the alkalinity of the starch increased, the pastes became smoother and more elastic. Methods for preparing the pastes were standardized and made uniform. Two concentrations of starch pastes were used in the tests. Curves were plotted in the regular manner, and also on logarithmic paper. The equation for the flow in cubic centimeters per second in terms of a function of the pressure was determined from the logarithmic curve.

The determination of gums in sugar products: H. T. RUFF and J. R. WITHROW. The various analytical methods proposed for gum determination in sugar products were studied and compared for the purpose of determining the method best adapted for control work. Some proposed methods compared with each other on solutions of pure gums in water or refined sugar solutions, but were not comparable on customary sugar products. The method of precipitating the gums with ethyl alcohol acidified with hydrochloric acid was found to be the most suitable and was further studied to determine concentrations of alcohol and acid. While we have no claim to originality in method adopted, the technique is original and is definitely expressed to make results obtained rapid and reliable. It was found with certain precautions denatured or wood alcohol could substitute for ethyl alcohol. Curves are plotted to show the influence of concentration of alcohol and acid.

The determination of the p_H value of commercial glucose as a substitute for the candy test: O. A. SJOSTROM.

Some notes on the determination of reducing sugars: B. B. ROSS.

An improved precision refractometer for the sugar industry: WARREN P. VALENTINE. This paper contains a short reference to the development of the refractometer and its increasing application in the sugar industry; errors and approximations in the present sugar tables and the consequent demand for highly standardized data; the construction and test by the Bureau of Standards on a special refractometer, and the final development of an instrument to utilize new sugar tables now in process by the Bureau of Standards.

The observance of mutarotation in the polarization of raw cane sugar: M. H. WILEY and C. A. BROWNE. In the polarization of two deteriorated sugars from the Cuban crop of 1921, the direct polarization immediately after solution decreased at the end of three hours in one instance from 90.85 to 90.15 and in another instance from 90.15 to 89.50. The sugars had undergone considerable inversion during storage from the attack of micro-organisms, and the mutarotation is probably due to the very perceptible drying out of the sugar in the bags and the separation of the high rotating modification of dextrose in the sirupy films which cover the crystals of sucrose.

Note on the color range of cane sirups and molasses: F. W. ZERBAN. Dr. Zerban reported an interesting series of color measurements on cane syrups made according to the Bureau of Standards method with two simplifications, both of which are objectionable—the use of Kieselguhr to obtain an optically pure filtrate and the use of the Hess-Ives instrument with white light. The color values showed a general correlation with the purity.

Manufacture of plantation standard granulated sugar with and without activated char: C. E. COATES. An outline is given of the various methods for making standard granulated sugar in the sugar house, including: Its manufacture direct from the cane without the use of char, using sulfitation or carbonation of the juice; the non-chemical process using heat and Kieselguhr, the clear juice being given immediately a char filtration; making carbonated or sulfited syrup, which syrup is subjected directly by a char filtration; the manufacture of 96 test sugar as usual and immediately remelting and treating the melted sugars with char. Much improvement has been made during the last few years, both in quality of product and in yield.

The decolorizing power of bone char (preliminary report): PAUL M. HORTON. It has been claimed by Patterson that the decolorizing power of boneblack is due to a nitrogenous base which can be extracted by concentrated sulfuric acid. Patterson's experiments have been repeated, the results leading to the conclusion that the nitrogenous base mentioned has no special decolorizing power, and that the decolorizing power of boneblack must be due to other causes. The extract

was made with both warm and cold sulfuric acid and the acid removed by dialysis, leaving the acid-free base in a form suitable for testing its decolorizing power.

Color and ash absorption by boneblack and decolorizing carbons: W. D. HORNE. While a number of very good decolorizing carbons have been developed, they generally lack the power to absorb ash, which is of great importance in sugar refining. Experiments show that it is the mineral frame-work in boneblack which absorbs most of the ash taken up by boneblack. Calculation shows that a carbon deficient in ash absorbing power could scarcely compete economically with boneblack in refining. Encouraging results in ash as well as color absorption were had with an artificial boneblack formed by the fixation of carbon on a porous earthy substratum. The attention of investigators is invited in this direction.

Control of reaction in sugar house (and refinery) liquors: J. F. BBEWSTER and W. G. RAINES, JR. No matter what clarifying agent was used, in the clarification of cane juice, there always was obtained upon concentration to sirup a precipitate changing in quantity and composition according to the cleanness of the cane and the method of clarification.

The precipitate formed in sugar house sirups: J. F. BREWSTER and W. G. RAINES, JR.

Modifications in the use and application of the Hess-Ives tint photometer: H. H. PETERS and F. P. PHELPS. In addition to the Hess-Ives color plate, various Wratten light filters were used in connection with white light. It is pointed out that special lamps (for instance, a mercury vapor lamp in place of white light) may advantageously be employed with special light filters in place of the Hess-Ives three fundamental colors (red, green and blue), for instance, mercury yellow, green and violet. One then obtains scale readings (per cent. transmittancy), which, interpreted as negative logarithms, refer to definite wave-lengths instead of to broad spectral bands. The color values of the Hess-Ives plate and of several Wratten filters are plotted as transmittancies and luminosities, which were also given for Stammer standard color plates, Stammer's ulmine solution and various sugar products. Their absorption graphs are given also. The authors use the subject of tint photometric analysis as introduction to their spectrophotometric investigations. In three of the papers given so far, the chemical aspect of color analysis was discussed, while here the optical aspect is treated in detail. Hundreds of quantitative spectrophotometric analyses of sugar products have proven conclusively that the absorption and transmittancy in the blue end of the spectrum is of paramount importance.

Color values of high grade sugars: W. B. NEWKIRK and H. H. PETERS. The absorption and transmittancies of 204 high class sugars were determined for yellow, green and violet mercury light, using a Stammer colorimeter which had been modified in such a manner that it was practically a spectrophotometer. The Stammer color plate was entirely dispensed with, and a rotating sector disc used in its place. The average results of various classes of sugars are plotted in various ways.

A laboratory vacuum still: E. P. CLARK. A laboratory vacuum still is described which is of a simple type of construction and is compact and easily dismantled. The capacity is quite large (12 liters), concentration taking place in glass. An ordinary laboratory water pump furnishes sufficient vacuum.

Preparation of adonitol: R. S. BLACK. Crystalline adonitol is prepared by extracting adonis vernalis plants with hot water, defecating the expressed liquid by first adding aluminum sulfate solution followed by an excess of slacked lime until precipitation is complete. The yellow precipitate is removed by fitering upon a suction filter. Concentrate the filtrate in vacuum to a thin sirup when basic lead acetate is added, filter, remove the excess lead, concentrate to a sirup and add alcohol. At this point a little phosphoric acid added to the alcoholic solution throws out more impurities and aids in the subsequent crystallization. The alcoholic solution is evaporated to a thick sirup and taken up in an equal volume of 95 per cent. alcohol, is seeded and is allowed to crystallize. Recrystallize from 95 per cent. alcohol.

DIVISION OF INDUSTRIAL AND ENGINEERING CHEMISTRY

W. K. Lewis, *chairman*

E. M. Billings, *acting secretary*

Symposium on Distillation

W. A. Peters, Jr., chairman

Efficiency and capacity of fractionating columns: W. A. PETERS, JR. The efficiency of plate columns and columns filled with spheres and cylinders of various sizes was measured by comparing the performance of each with the calculated performance of a theoretically perfect col-

umn. The capacity of the different types of columns was determined by measuring the maximum possible heat input or vapor velocity through the column when various materials were being separated. Both efficiency and capacity were found to vary widely with the type and size of filling and with the materials being separated. From the data determined, it is possible to figure the size and cost of a fractionating column of any type for almost any work. Moreover, it is possible to set up in the laboratory a small column which will duplicate the performance of any plant sized column. Thus, a fractionating problem can be worked out in laboratory apparatus and from the laboratory data a plant sized column can be designed.

The plate efficiency of a continuous alcohol still: CLARK S. ROBINSON. Three tests on a continuous alcohol still under varying conditions indicated average plate efficiency of from 24 per cent. to 56 per cent.

The simple distillation of hydrocarbon mixtures: W. K. LEWIS and CLARK S. ROBINSON. It is possible to predict the simple (Engler) distillation curve (boiling temperature plotted against percentage distilled over), for mixtures of two or more components which follow Raoult's Law approximately. This is of great importance in the petroleum industry and in the recovery of the benzene homologues from the destructive distillation of coal. The application to binary mixtures is simple, but when applied to complex mixtures, the problem must be solved graphically. The Engler curve is calculated for benzene-toluene mixtures and is compared with the experimental curve.

Benzol purification: S. S. HEIDE. The custom has been as outlined in making C. P. products to make separate crude cuts of light oil, such as 90 per cent. benzol, 90 per cent. toluol and crude light solvents and treating these separately with sulfuric acid. With this procedure the benzol fraction is somewhat difficult to wash down to proper color test, due to nature of acid sludge produced by action of sulfuric acid. The toluol fraction gives no trouble, good clean separation being obtained. One point brought out is that C. P. benzol will have lower color test than sample taken from agitator subsequent to acid treatment. Just the reverse is true in operation using 90 per cent. crude benzol fraction.

Wood turpentine: C. A. LAMBERT. A brief outline of the factory method for the manufacture of steam distilled wood turpentine, the approximate composition and the physical chemical characteristics of the turpentine and of the heavier fractions of the turpentine known as pine oil.

The calculation of the heats of vaporization of various liquids, first by means of the Hindebrandt function; second, from vapor pressure curves: W. K. LEWIS and H. C. WEBER... This is a short article dealing with an original method of using the molal entropy of vaporization of liquids for determining their heats of vaporization of various vapor compositions, together with a method for determining heats of vaporization from vapor pressure curves.

Present practice of dynamite and chemically pure glycerine distillation: J. W. BODMAN. It is shown that the most recent glycerine distillation plants use the principle of double effect evaporation in that the superheated water vapors used as a distilling agent for the glycerine receive superheat from the latent heat of condensation of the glycerine distilled. While the apparatus illustrated and described for distilling dynamite glycerine has thus far been used in the comparatively restricted field of glycerine distillation, the same principle is well adapted for use in connection with any liquids which show a tendency to partially decompose when distilled directly or alone at normal pressure.

Turpentine distillation: MCGARVEY CLINE.

Carburetor adjustment by gas analysis: A. C. FIELDNER and G. W. JONES. Road tests on motor vehicles has shown that approximately 30 per cent. of the heat value of the gasoline is lost due to incomplete combustion products in the exhaust gas. At least 50 per cent. of this loss can be saved by proper carburetor adjustment. Curves are given showing how the CO_2 per cent. in the exhaust gas bears a direct relation to the mileage and completeness of combustion from the gasoline used. Tests are given showing proper method of sampling exhaust gases and procedure for adjusting a carburetor on the road. A portable CO_2 indicator for adjusting carburetor is described and examples given showing increase in mileage obtained with increase in the CO_2 percentage in the exhaust gas.

Investigations of whitewashes and aqueous lime paints: G. J. FINK. Results are given on the development of whitewashes and aqueous lime paints which involved exposure tests of 175 formulas. The effects of a large number of ingredients in various combinations are shown and conclusions given regarding the relative merits of the various formulas. Of the siccatives used those as casein forming insoluble films with

lime proved best, while those which are water soluble as glues are not so satisfactory for exteriors. Several alkaline salts were used for accelerating the solution of casein, trisodium phosphate proving most satisfactory. Among the addition agents used with lime in mixtures containing no definite siccative alum and table salt were effective on improving the workability and permanence of the whitewashes. Several formulas developed and tested are shown to be superior to most of those in common use.

Can we afford to make potash in America? R. NORRIS SHREVE. Broad economics regarding the manufacture of potassium salts in America and from American raw materials are considered. Cost of materials, labor and freight is discussed and the value of various by-products cheapening the cost of the primary material is treated. Is it worth America's while to pay the cost necessary to finish the development of the potash industry? Past, present and probably future costs to farmers and chemical industry for their potash are described. It will be money in the pockets of American potash consumers to build their own industry here, but the potash industry should be developed regardless of cost for it is necessary to safeguard food and clothing of the country.

Discontinuous extraction processes: L. F. HAWLEY. This paper is a study of Turrentine's extraction process[1] according to the theory of discontinuous extraction formerly developed.[2] By using Turrentine's data in the mathematical theory of the process it is shown that the incomplete extraction is due to the fact that complete solution of the potassium chloride was not obtained in the first treatment of the raw material. The other conditions of extraction were so efficient that the final recovery was only slightly less than the theoretically perfect recovery with the solvent ratio and number of treatments employed in the process.

The classification of coal: S. W. PARR. The use of ratios between certain constituents as an index of coal types shows that the value of a ratio depends upon the freedom of the factors employed from adventitious material, or material not essential in producing the type characteristics to be indicated, and shows that the use of analytical factors in the construction of a system of classification based on ratios is limited, for the ratios do not differentiate with respect to variables inherent in the actual coal substance as oxygen. This factor is significant as between different types, and its effect should be given a place in any system indicating type distinction. Such a factor may enter into the scheme of classification by using heat values referred to the unit or pure coal substance. Accuracy of the values derived from the author's unit coal formula are shown.

A comparison of the standard gas furnace and micropyrometer methods for determining the fusibility of coal ash: A. C. FIELDNER, W. A. SELVIG and W. L. PARKER. The micropyrometer method for determining coal ash fusibility is quicker than the gas furnace method and better for the operator. Coal ashes fusing under 2,600° F. by the gas furnace method can usually be checked within 100° F. by the micropyrometer method if fused in a reducing atmosphere of combustion gases similar to that employed in the gas furnace method. Very refractory ashes, fusing above 2,800° F. as determined by the gas furnace method, tend to give considerably lower results by the micropyrometer method. The two methods can not therefore be considered as strictly alternate methods for all ashes. The great majority of coal ashes from American coals, however, fuse below 2,800° F. in the gas furnace.

The calorific value of American woods: S. W. PARR and C. N. DAVIDSON. There are no well authenticated values published in the literature for the calorific value of American woods, and the published values for foreign woods are unreliable. The values of the time of Berthier and Winkler are about 50 per cent. of those reported by Gottlieb, yet no basis of fair comparison is possible because of the lack of definite information as to the presence of moisture. The paper reports on a detailed study of the moisture factor in order to base calorific values upon the moisture-free material. The heat values were determined by means of a calorimeter, adiabatic in type, using a bomb with platinum lining.

The shatter and friability tests for metallurgical coke: S. P. KINNEY and G. ST. J. PERROTT. A discussion of testing methods, reproducibility of results, and their interpretation. A large amount of test data obtained at the Southern Experiment Station of the Bureau of Mines is used as the basis of the discussion. A comparison of results of the machine and bag shatter test procedure, an improved method of conducting the bag shatter test, the effect of size of coke on absolute and relative results obtained by the friability or "hardness" test, and the effect of other modifications of the standard procedure are given.

[1] *Jour. Ind. and Eng. Chem., 13,* 605 (1921).

[2] Discontinuous Extraction Processes, *9,* 866 (1917).

Determination of true specific gravity of coke: HAROLD J. ROSE. Methods published, and in actual use, for the determination of the true specific gravity of coke, include important variations in practically every detail of the test. The writer presents data which shows that discrepancies of many per cent. may be obtained by the use of various wetting liquids. A distinct increase of the true specific gravity figure was found as the fineness of the sample was increased. The paper shows the need for a uniform method for making this determination.

Smokeless fuel for Salt Lake City: G. ST. J. PERROTT and H. W. CLARK. A consideration of the practicability of by-product coking of Utah coals for supplying smokeless fuel to domestic consumers of Salt Lake City. A summary is included of smoke abatement work carried out in Salt Lake City since 1919 and of experiments by the Bureau of Mines in determining the coking properties and by-product yields of Utah coals at low temperatures.

The ultimate analysis of coal by utilization of sodium peroxide fusions: S. W. PARR. All heat developed in combustion comes from the sulfur, carbon and hydrogen present. The amount of the first two constituents being known, their heat value can be calculated and subtracted from the total heat determined by the calorimeter. The remaining heat comes from the available hydrogen whose percentage is equal to the remaining heat divided by 34,450, the accepted value for hydrogen. The formulas are given in the complete paper which is to be published later. The total carbon factor is obtained from a fusion with sodium peroxide and the carbon discharged as CO_2, which is measured. From this the weight of carbon present is derived.

The value of brands to buyers: W. D. COLLINS. Materials often have been purchased by trade name at higher prices than when purchased on specifications. A pure merchandise law regulating dealings in all kinds of merchandise in the way the food business is regulated by the pure food law has been suggested. The tendency to standardization and adoption of uniform specifications has been marked during the past ten years, but drawing up acceptable specifications and standards of products involves much work and time. Specifications failing to insure proper quality or demanding unnecessarily high standards as to raise the cost out of proportion to the benefits received may be adopted. For a long time small buyers will benefit by securing material by brand than specification.

Acetone, butanol and ethanol in gas from the butyric fermentation of corn: ARTHUR L. DAVIS. Gases produced during fermentation of corn by anerobic, spore-forming bacteria (*B. granulabacter pectinovorum*) carry with them considerable quantities of solvents since the temperature of operation is from 39° to 40° C. The enriched gases are passed through activated carbon to remove all condensible material. The carbon is then distilled with cresol and the distillated freed of cresol by agitation with sodium hydroxide solution with subsequent distillation. The volume of total solvents was found by removing water from a definite volume of the aqueous solution with potassium carbonate. The acetone content is determined by the Messinger method. There is no known manner of conveniently separating the butanol and ethanol when only small quantities of a mixture containing them is available.

Crystallization in transparent soap: A. F. THAL. Three types of spots in transparent soap are described. Two are crystalline with evidently the same chemical composition but differing in crystalline structure. The first type consists of a large mass of small needles which are interspersed with soap. These are obtained in an impure state by extracting the soap with boiling alcohol. The second type are compact, hard, glass-like crystals which can be removed mechanically. These consist of two mols of sugar combined with one mol of sodium carbonate probably in the form of a double compound. The third type is amorphous soap which has separated from solution on slow cooling.

The control of industrial processes by light sensitive means: LLOYD LOGAN. A proposed method of automatically controlling chemical and other industrial processes is described and its possible field of application outlined. This method includes the use of light-sensitive cells to detect, through changes in the optical character of the substance undergoing treatment, deviations from the desired constitution of the product and, by suitable relays and valves, to correct the character of the product. Among the properties of the final and intermediate products, variations in which may be used to alter the illumination of the photoelectric cell sufficiently to operate the control, are color, *e. g.*, on addition of a chemical indicator, absorptive power for white or mixed light, index of refraction, power of scattering light, specific rotatory power, reflective power, or intensity of light emitted at a given temperature.

CHARLES L. PARSONS,
Secretary.