

cent. by volume and is usually less. Moreover, when the cars are re-iced the air in the cars is renewed to some extent and the accumulated carbon dioxide largely swept away. In ventilated refrigerator cars the percentage of carbon dioxide is lower. It may, while the

TABLE I  
*Accumulated Carbon Dioxide, Expressed in per cent. by Volume, in Refrigerator Cars Loaded with Strawberries*

Approximate Number of Hours After Loading	Shipment Monnet, Mo., to St. Paul, Minn., 1918		Shipment Bowling Green, Ky., to Pittsburgh, Pa., 1919		Shipment Bowling Green, Ky., to Pittsburgh, Pa., 1919	
	Unventilated	Ventilated	Unventilated	Ventilated	Unventilated	Ventilated
1 .....	1.6	—	1.0	0.7	0.7	0.2
2 .....	—	0.2	1.1	1.0	1.0	—
3 .....	—	0.2	1.3	—	—	—
4 .....	1.8	—	1.4	1.4	—	—
5 .....	—	—	—	—	—	0.3
8 .....	2.5	—	—	—	—	—
	0.7 <sup>1</sup>	—	—	—	—	—
9 .....	—	—	—	—	1.4	—
11 .....	—	—	0.4 <sup>1</sup>	0.4 <sup>1</sup>	—	—
19 .....	1.3	0.6	0.3	0.2	0.3 <sup>2</sup>	—
	0.6 <sup>1</sup>	—	—	—	—	—
30 .....	—	—	—	—	0.4	0.4
34 (also) 47	—	—	0.3	0.2	—	—

cars are standing after being loaded, become nearly or quite as great as in unventilated cars. When the cars are moved it drops to 0.2–0.4 per cent. and rarely exceeds that amount.

The accumulation of carbon dioxide in unventilated refrigerator cars is apparently not sufficient, with strawberries, to cause injury to the berries.

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#### THE AMERICAN CHEMICAL SOCIETY (Continued)

*The preparation and analysis of a cattle food consisting of hydrolyzed sawdust:* E. C. SHERRARD and G. W. BLANCO. Investigations carried out at

<sup>1</sup> Immediately after re-icing.

<sup>2</sup> Car re-iced seven hours previous.

the Forest Products Laboratory indicate that a cattle food can be prepared from eastern white pine sawdust and that it has considerable food value. The cattle food was prepared by digesting the sawdust for 15 to 20 minutes with 1.8 per cent. sulphuric acid at a steam pressure of about 120 pounds per square inch. After cooking the sugars were extracted with water and the acid removed from the solution by means of lime. The liquor containing the sugar was evaporated to a thick syrup and mixed with the digested residue which had been previously dried. The whole was then dried to a moisture content of 15 per cent. It is shown that when the product has a greater moisture content than 15 per cent. the keeping qualities are not good. Leaching experiments removed all but 2.04 per cent. of the total acid and all but 7.16 per cent. of the total sugar. A comparative analysis of the wood before and after conversion shows that cold water soluble, hot water soluble and NaOH soluble substances are greatly increased but the ether soluble substances are almost unchanged by the treatment. The pentoses are reduced 46.4 per cent. while the methyl pentosans are not affected. The total cellulose is reduced by 21.68 per cent. The sugars produced correspond to 71.5 per cent. of the cellulose removed by the digestion. The lignin content is unchanged. The crude fiber corresponds to about 75 per cent. of that in the original wood. The cellulose is greatly altered by the treatment. Practically the whole of the cellulose obtained is soluble in 17.5 per cent. alkali. It is reprecipitated from the alkaline solution by dilution with water. After filtering no precipitation of beta-cellulose is obtained upon acidification with strong acetic acid.

*A comparison of wood cellulose and cotton cellulose:* S. A. MAHOOD and D. E. CABLE. Samples of wood cellulose and cotton cellulose which had been subjected to various conditions of cooking and bleaching were analyzed by determining a number of constants on them, including ash, moisture, alkali solubility, pentosan and methyl pentosan content, methoxy content, ether extract, cellulose, lignin and "copper number"; for the purpose (1) of following the changes which take place in wood cellulose on successive cooking and bleaching treatment with a view to increasing the yields of purified cellulose by varying these conditions and (2) to determine so far as possible the points of similarity or difference of cellulose from wood and

that from cotton. The data show that wood cellulose most nearly corresponding to cotton, taking munition linters as a standard, is obtained by re-cooking "easy bleaching" sulphite pulp with soda and bleaching with two per cent. of bleaching powder. The practise of checking wood cellulose according to the specifications for cotton is a questionable procedure.

*Supply and preparation of wood for the manufacture of pulp:* HUGH P. BAKER.

*Parchmentizing paper and the reaction of mordants:* J. E. MINOR. The work of Schwalbe and Becker recently published confirms theories of the author as to the reactions which occur on the decomposition of cellulose during beating. The hydrolysis of cellulose forms dextrines which are mucilaginous, soluble in water and easily reduce Fehling solution. These dextrines are readily adsorbed by pure cellulose thus constituting the reactive, insoluble, colloidal hydrocellulose, and in this position they catalyze further cellulose hydrolysis. Complete hydrolysis leaves only soluble dextrines or sugars. For a mucilaginous accumulation as is desired for making parchment paper, the velocity of the initial reaction must be catalyzed, either by the hemi-celluloses of wood incrustation, or by acid treatment of pulp prior to beating. Acid treatment of pulp reduces the time required to beat to mucilage to one half or one tenth the original amount required, and increases the strength of the paper made from it. Pulp mucilage has a greater power of splitting salts and adsorbing metal ions than has cellulose and, therefore, assists in holding size, dye, coating, etc. Metal impregnation weakens paper strength.

*Is it feasible to form a section of cellulose chemistry?* G. J. ESSELEN, JR.

*Solvents for phosgene:* CHARLES BASKERVILLE. An impelling factor in causing the Germans to sign the Armistice was a knowledge of the rapid development of the stupendous poison gas program of the United States. One of the earliest gases, a real gas, used by the Germans, was phosgene. It had been manufactured on a small scale in Germany before the war. Small amounts were exported to the United States prior to 1914. It was being produced in this country for similar uses after the blockade had shut off the importation of chemicals in the manufacture of which the Germans had made a specialty. It was transported in small quantities liquefied in cylinders. When hostilities ceased we were producing the

poison gas for war purposes at the rate of fifty tons a day, with a program nearly completed for a much larger production. Soon after the Armistice was signed restrictions were imposed which prevented railroad transportation of phosgene liquefied in cylinders. Uses for war gases in peace times have been sought. The author has found several solvents for the gaseous phosgene, among them gasoline, benzene and ethyl acetate, which dissolve an equal weight of the poison gas at ordinary temperatures. The solutions exert practically no pressure beyond atmospheric, so may be transported with safety within ordinary closed containers. On exposure to the air the liquid and dissolved gas evaporate. The solutions offer simple means for the use of a poison gas to exterminate rats and moles. On warming the solutions in suitable vessels the phosgene is liberated and may be used in a pure form in the manufacture of certain coal tar products of color or medicinal value.

*An electrometric method for detecting segregation of dissolved impurities in steel:* E. G. MAHIN and R. E. BREWER. Previous work has shown that both non-metallic and metallic inclusions cause carbon segregation in steel and the hypothesis has been advanced that this is due to the steel acting to some extent as a solvent for the foreign material. If this is correct the electrode potential of the metal should be altered in the regions immediately surrounding the inclusion. It is not possible to determine this point by the usual method involving immersion of the specimen in an electrolyte but a method has been devised for exposing microscopic areas of metal surface to an electrolyte, so that the micro-electrode thus formed may be connected with a standard calomel half-element and the E.M.F. of the system measured by the usual compensation method. This method has been applied to an investigation of the ferrite bands produced by heating steel in contact with metallic inclusions; it has been found possible thus to measure the potential of these micro-areas and to establish the fact that the ferrite of these segregated portions possesses a distinctly lower potential than the ferrite of the body of the steel. The work is being extended to include investigation of the potential of ferrite adjoining other metallic and non-metallic inclusions and it may be applied also to the detection of segregation of the constituents of non-ferrous alloys.

*Soda-lime for industrial purposes:* R. E. WILSON. The work to be described in this paper was an

outgrowth of work done in the Chemical Warfare Service to develop soda-lime for military purposes. Soda-lime for industrial purposes, however, must have much greater activity and capacity and, on the other hand, need not be so hard and need not contain an active oxidizing agent, both of which requirements seriously limited the efficiency of the soda-lime used for military purposes. The paper describes extensive experiments designed to determine the best method of manufacturing soda-lime in order to get maximum activity and capacity against the different gases. The factors determining the brand of lime to use and the best percentage of caustic soda and water were found to be the most important variables after the basic method of manufacture was decided upon. Slides will be shown to indicate the effect of each of these variables on the efficiency of the resulting product against  $\text{CO}_2$ ,  $\text{SO}_2$ , phosgene, chlorine, superpalite and hardness. The final formula developed as the result of these experiments has been used with great success for a variety of commercial purposes and has been found to be many times as efficient as any of the commercial grades now on the market which are made by radically different processes and contain much more alkali.

*Flow of viscous liquids through pipes:* ROBT. E. WILSON and M. SELTZER.

*New solvents for rosin extraction:* H. K. BENSON and A. L. BENNETT. The use of Douglas fir as a source of rosin and turpentine is discussed and the method of tapping the forest trees now in use to a limited extent is described. Attention is called to the very large quantities of resinous mill waste which could be made available for rosin production under proper organization. Realizing that rosin extraction has been under a heavy handicap due to the retention of the solvents by the wood to an extent of as high as 25 gallons per cord in some commercial plants, a search for more easily recoverable solvents was undertaken. Among those that lend themselves to rosin extraction are 5 per cent. ammonium hydroxide and 70 per cent. denatured alcohol solutions. Analytical data are presented on the effect of time and size of wood, on the efficiency of extraction, the decomposition of the ammonia extract, the separation of humus from rosin and the recovery of ammonia from the wood by steam distillation. The following conclusions are presented: (1) When resinous wood of pulp size is treated with 8 times its weight of 5 per cent. ammonium hydroxide for 10 hours 94.5 per cent. of the rosin is extracted.

(2) The ammonia extract decomposes slowly in the air at ordinary temperatures and at  $90^\circ$ – $100^\circ$  C. is rapidly and completely decomposed yielding ammonia vapor and finely divided rosin and humus in suspension. (3) Humus does not retain more than 1.7 per cent. of petroleum ether upon heating at  $100^\circ$  C. for thirty minutes. (4) Wood chips saturated with ammonia solution give off the ammonia completely when steam distilled. (5) Denatured ethyl alcohol at a dilution of 70 per cent. is as efficient a solvent for rosin as ammonia, benzene, turpentine or petroleum ether.

*Comparative study of vibration absorbers:* H. C. HOWARD. A simple instrument for obtaining records of horizontal and vertical vibration in buildings was constructed. Comparative measurements of the vibration absorbing capacities of various materials and devices, such as cork, felt, rubber air-bags, rubber balls and suspensions were made. Certain arrangements of rubber balls were found to be very effective.

*Note on catalysis in the manufacture of ether:* HUGO SCHLATTER. Senderens' experiments (*Comptes Rendus*, Volume 151, page 392) on the action of aluminum sulphate in the manufacture of ether were repeated in glass apparatus and confirmed. When the same experiments were carried out in a small ether still constructed of lead, no difference in production was observed between the usual method of procedure and the process in presence of aluminum sulphate. The author's conclusions are against Senderens' theory of the formation of a double salt, inasmuch as not only lead sulphate, which is normally present in the lead stills used in factory practise, but broken porcelain also gives the same results as aluminum sulphate.

CHARLES L. PARSONS,  
*Secretary*

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