D. M. Clark, Society of Grain Elevator Superintendents of North America, Chicago.
Morris Cohen, Schulze Baking Company, Kansas City, Mo.
Will Cooper, Executive Offices, Stevens Hotel, Chicago.
Alexander Dienst, The National Sugar Refining Co., Long Island City, N. Y.
Paul Goodnough, The Quaker Oats Company, Chicago.
E. W. Green, Oahu Sugar Company, Ltd., Waipahu, Oahu, T. H.
C. E. Griffin, The Axton-Fisher Tobacco Co., Louisville, Ky.
Elmer Heimbach, Manager, Hotel Allen, Allentown, Pa.
S. B. Horrell, The Carey Salt Co., Hutchinson, Kan.
Robert McDade, Atlantic Sugar Refineries, Ltd., St. John, N. B., Canada.
Adolph Pfeffer, Adolph Pfeffer Rice Milling Co., Houston, Texas.
G. L. Rhys, John Morrell & Co., Ottumwa, Iowa.
William A. Sullivan, Loose-Wiles Biscuit Co., Kansas City, Mo.
Vern D. Sutton, Postum Company, Inc., Battle Creek, Mich.
C. W. Turning, James H. Harper Co., Duluth, Minn.
R. W. Upshaw, Anheuser-Busch, Inc., St. Louis, Mo.
Earl Whitelock, Washburn Crosby Co. Inc., Buffalo, N. Y.
Charles F. Wiehrs, The Southern Cotton Oil Co., Savannah, Ga.

TUESDAY AFTERNOON SESSION

October 4, 1932

This session of the Food Section was held at the Department of Agriculture Experiment Station, Arlington, Va. Here a series of dust explosion tests was carried out before the delegates, demonstrating the force of certain kinds of dusts when exploded under various conditions. The fundamental idea in presenting these test explosions was to demonstrate the relative dissipation of the force of the explosions by means of openings and other escape vents in the explosion chamber. The tests were conducted under the supervision of David J. Price, U. S. Department of Agriculture, who gave a detailed explanation of each as it was prepared and took place.

Descriptive Statements of Dust Explosion Tests at Arlington Farm Testing Station

By DAVID J. PRICE

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In the work on dust explosions and resulting fires in industrial plants, the Chemical Engineering Division of the Bureau of Chemistry and Soils has obtained records of 560 explosions of this character. In 184 of these explosions 434 persons were killed and 866 injured. In 449 cases the property loss amounted to approximately $46,000,000. The dust explosion hazard exists in about 28,000 industrial establishments employing approximately 1,325,000 persons and manufacturing products of an annual value of more than ten billions of dollars.

The Department of Agriculture has given special attention to the development of safety codes for dust explosion prevention in grain handling and manufacturing establishments. The Dust Explosion Hazards Committee of the National Fire Protection Association has been under the leadership of the Chemical Engineering Division of the Bureau of Chemistry and Soils since its origin. This committee is composed of representatives from the industries directly concerned, insurance and safety

organizations, state and federal officials and construction and equipment engineers. The Dust Explosion Hazards Committee has prepared the following nine safety codes: (1) Flour and Feed Mills; (2) Sugar and Cocoa Pulverizing Systems; (3) Terminal Grain Elevators; (4) Pulverized Fuel Insulations; (5) Starch Factories; (6) Spice Grinding Plants; (7) Coal Pneumatic Cleaning Plants; (8) Wood Flour Manufacturing Establishments; and (9) Inert Gas for Explosion and Fire Prevention.

These safety codes provide a practical means of translating into actual plant practice the results of research work such as you will see here today. They have been adopted by the National Fire Protection Association and the National Board of Fire Underwriters and have been approved as American standards by the American Standards Association. These codes have been published by the Bureau of Labor Statistics of the U. S. Department of Labor as Bulletin No. 562, entitled "Safety Codes for the Prevention of Dust Explosions."

It is gratifying to safety engineers to observe that the losses of life and property in the grain handling industries as the result of dust explosions have decreased in the ten year period 1921-1931. The average loss per explosion has gradually decreased from approximately $520,000 in 1921 to about $28,000 in 1931. (The records indicate that there were thirty-nine dust explosions in industrial plants in 1931. On the basis of the reduction in loss of $500,000 per explosion, this would mean a saving of $19,500,000 in 1931 in property values without any reference to the saving of human life). The yearly losses have dropped from $4,160,000 in 1921 to $1,100,700 in 1931.

The reduction in losses from dust explosions in the grain handling and associated industries has been due in a very large degree to the splendid cooperation which the Department of Agriculture has enjoyed with all the agencies directly concerned, and with national organizations such as the National Fire Protection Association, National Safety Council, National Fire Waste Council, National Board of Fire Underwriters, and other similar associations and organizations engaged in explosion and fire prevention.

The structure in which the dust explosions are produced consists of a room, gallery, and tower. The room, 4 x 5 x 5 feet, has a volume of 100 cubic feet. The gallery, 2½ x 2½ x 20 feet, has a volume of 125 cubic feet. The tower, 3 x 3 x 12 feet, has a volume of 108 cubic feet. Total volume is 333 cubic feet.

Vents on the room consist of hinged metal doors and pivoted sash. The metal doors range in size from 0.1 square feet to 1.55 square feet and the sash contains approximately 7 square feet of glass.

The gallery has 8 roof vents, each one square foot in area covered by hinged doors. There are also 8 fixed glass windows with an area of 1.3 square feet each. The opening into the tower, which is the full size of the gallery, may be closed when the gallery is used as a unit.

The tower contains one swinging panel about 7 square feet in area, 3 hinged doors, each 1.55 square feet in area, and adjustable vents on top ranging from 0.1 square feet to 2.75 square feet, and 4 fixed glass windows with an area of 1.7 square feet each.

In these tests, grain elevator dusts, soap powder, starch dust, milk powder, baking powder, sugar dust, wood charcoal dust, wood dust, and cork dust were used. In order to produce each explosion it is necessary to have dust in suspension in air and a source of ignition. The dust cloud is produced when a jet of air strikes the dust in the cups and throws it into suspension. The dust cloud is ignited by an electrically heated coil.

Some of the most disastrous dust explosions, said Dr. Price, have occurred in terminal grain elevators in connection with grain handling and storage operations. The first test, an explosion of grain elevator dust in the entire structure, will show the possibility of venting an explosion without damage. In this test approximately