Development Center in Schenectady, New York. There he progressed to the position of Manager of Metallurgy and Ceramics Research, which he held until he was beckoned to public service by President Johnson as Director of the Bureau of Mines.

As an expert in such fields as the plastic deformation of metals and the metallurgy of copper and its alloys, Dr. Hibbard won wide recognition from many professional societies. In 1950 he received the Raymond Award of the American Institute of Mining, Metallurgical and Petroleum Engineers. From 1957 to 1961 he served as a director of the Institute and is now its President-Elect for 1966. In addition, Dr. Hibbard belongs to the British Institute of Metals and the New York Academy of Sciences, and is a fellow of both the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He is a member of the National Academy of Engineering. He also is a member of the Materials Advisory Board of the National Academy of Science, and is currently its Chairman.

Dr. Hibbard has been elected to many honorary and professional fraternities, including Phi Beta Kappa, Sigma Xi, Alpha Chi Sigma, and Gamma Alpha. He is the author of more than 70 scientific papers and has been widely recognized as a major contributor to the science of metallurgy.

Dr. and Mrs. Hibbard have three children and reside in Rockville, Maryland.

PREPARED STATEMENT OF DR. WALTER R. HIBBARD, JR., DIRECTOR, BUREAU OF MINES, U. S. DEPARTMENT OF THE INTERIOR

INTRODUCTION

I am pleased to have the opportunity to appear before you to discuss the technologic problems facing the nation in its efforts to abate environmental pollution. According to reliable estimates, the combustion of fossil fuels produces approximately 130 million tons per year of contaminants, the larger portion of which is released into the atmosphere. Of these contaminants, approximately 85 million tons result from the combustion of fuel in all form of transportation including trucks, buses, railroads, and airlines. It is estimated also that over 23 million tons of sulfur dioxide are discharged into the atmosphere annually from the combustion of fuels for heat and power purposes and from industrial operations such as the metallurgical processing of sulfide ores. Thus, automobile exhaust and sulfur dioxide pollution produce approximately 83 percent of the total amount of contaminants emitted to the atmosphere from fuels combustion. Because the automobile engine and the sulfur dioxide from conventional fuel combustion constitute the principal source of pollution to the atmosphere, efforts in air pollution abatement have been largely concentrated on these two problems. The wide dissemination of information on the subject and increasingly severe effects of air pollution in highly industrialized areas have resulted in public demand for increased efforts to eliminate or control the pollution from these sources.

Mining, mineral processing and refining of mineral substances are processes conducted for the purpose of separating a usable product from the accompanying useless substances. Additionally, many initially useful products become waste after varying periods of use. Normally, the useless products are discarded by the least costly methods in the interests of economy. Thus, the mineral-based industries contribute a large part of the waste products that in some instances accumulate in a manner inconsistent with public interest and welfare. Because waste disposal problems and practices vary widely, the rapid accumulation of mining and processing waste and metal scrap has become a social and economic problem of considerable magnitude. In many cases these wastes represent a serious loss of natural resources unless methods are found to reconvert into useful products. The technology by which mineral wastes of all types can be conserved is a problem of primary importance to the Bureau of Mines.

The contamination of our water supplies by drainage from both active and abandoned mines is a problem of national importance. Many streams, particularly in the Appalachian region, have become unfit for most aquatic life and of questionable value for industrial use. However, practical solutions for many of the problems of acid mine drainage are either unknown or of doubtful value at the present time and must await future developments.