BULLETIN 418, THE FIRE TAX AND WASTE OF STRUCTURAL MATERIALS IN THE UNITED STATES

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HERBERT M. WILSON & JOHN L. COCHRANE

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THE FIRE TAX AND WASTE OF STRUCTURAL MATERIALS IN THE UNITED STATES

BY

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THE FIRE TAX AND WASTE OF STRUCTURAL MATERIALS IN THE UNITED STATES.

By H. M. WILSON and J. L. COCHRANE.

PURPOSE OF THE INVESTIGATION.

The United States Government is the owner of buildings costing more than $300,000,000 and is spending each year more than $20,000,000 in new buildings. In the construction of these buildings the Government endeavors to maintain as high a standard of efficiency as can be obtained with economical design, for all of them are intended to be of a permanent and enduring nature. This work is of such magnitude and importance that the Government can afford to take no risks either in methods of construction or in materials to be used; therefore it has been found necessary to make a general investigation of materials used in construction work.

An important part of the investigation is designed to show the fire resistance or the fireproof qualities of the materials employed and their strength at different temperatures. The Government does not insure its buildings against loss by fire but endeavors to provide against such loss by making them fireproof, for the expense of insurance would be very great. It is estimated that if the public buildings of the United States were insured it would cost the Government more than $600,000 each year.

The Geological Survey, through its technologic branch, has been charged with the conduct of these investigations, which include tests of the fire-resisting and fireproofing qualities of building stones, brick, architectural tile, reinforced concrete, and other materials—tests made with a view to procuring information for the Supervising Architect of the Treasury, who has under his care buildings valued at more than $200,000,000. In some of these tests the materials are subjected to ordinary fire temperature—about 1,000° F.—and to conflagration temperatures of about 1,700°; and the heated material is then drenched with water from a fire hose and its behavior is observed. Measurements are also made of the rate at which temperatures are transmitted from fire on one side to the other side of walls constructed of various materials and of different thicknesses. The purpose of these investigations is to meet the Government's own

needs as the greatest consumer of structural materials, but the results will be generally useful to States and municipalities and to the people of the whole country.

The results already obtained direct attention to the necessity of using cheaper fireproof materials, so that property owners may be encouraged to construct buildings that will better resist fire. They also show the necessity of better building codes in cities and especially of a better enforcement of the codes already enacted if the present enormous fire losses are to be diminished. The investigations indicate that fireproof buildings will be constructed at less expense in the future than in the past, and that the difference in cost between fireproof and inflammable buildings will soon cease to be an encouragement to flimsy construction.

SCOPE AND GENERAL RESULTS OF INQUIRY.

The contrast between the small losses by fire to government buildings, due to the great care taken to make them fireproof, and the immense losses reported from the country as a whole led the Geological Survey to conduct an inquiry into fire losses in the United States and their exact cost to the people. This inquiry covered not only the value of the property destroyed by fire but also the cost of maintaining fire departments, the amount of insurance premiums paid less the amounts returned, the cost of protective agencies, the additional cost of water supplies, etc.

The investigation disclosed the fact that the total cost of fires in the United States in 1907 amounted to almost one-half the cost of new buildings constructed in the country for the year. The total cost of the fires, excluding that of forest fires and marine losses but including excess cost of fire protection due to bad construction, and excess premiums over insurance paid, amounted to over $456,485,000, a tax on the people exceeding the total value of the gold, silver, copper, and petroleum produced in the United States in that year. The cost of building construction in forty-nine leading cities of the United States reporting a total population of less than 18,000,000 amounted, in 1907, to $661,076,286, and the cost of building construction for the entire country in the same year is conservatively estimated at $1,000,000,000. Thus it will be seen that nearly one-half the value of all the new buildings constructed within one year is destroyed by fire. The total fire cost in this country is five times as much per capita as in any country of Europe. This fire cost was greater than the value of the real property and improvements in any one of the following States: Maine, West Virginia, North Carolina, North Dakota, South Dakota, Alabama, Louisiana, Montana.

The actual fire losses due to the destruction of buildings and their contents amounted to $215,084,709, a per capita loss for the United

States of $2.51. The per capita losses in the cities of the six leading European countries amounted to but 33 cents, or about one-eighth of the per capita loss sustained in the United States. In addition to this waste of wealth and natural resources, 1,449 persons were killed and 5,654 were injured in fires.

COOPERATION BY EXPERTS.

The data on which the present report is based were the result of a statistical inquiry which involved the mailing of about 20,000 circulars and the tabulation and study of the resulting replies. Careful study was also made of the statistics gathered by the Fire Underwriters' Association in its reports on conflagration hazards, the statistics of the Spectators' Year Book, the Chronicle fire tables, and the census reports.

As a preliminary to this inquiry, personal interviews were had, early in 1908, with a number of persons qualified to advise as to the scope and character of the investigation. Valuable suggestions were received regarding the inquiry into fire losses from Messrs. Charles A. Hexamer, chairman board of consulting experts, National Board of Fire Underwriters, Philadelphia; C. U. Crosby, chairman National Fire Protective Association, New York; H. K. Miller, general agent National Board of Fire Underwriters' Association, New York; George W. Babb, chairman executive committee, National Board of Fire Underwriters' Association, New York; J. E. Curtis, consulting engineer, Fire Protective Association, New York; and W. H. Merrill, manager Underwriters' Laboratories, Chicago.

Advice and suggestions regarding the nature of the inquiry and the conditions affecting the design of public water supplies, with a view to separating the items which may properly be considered as chargeable to domestic service and ordinary fire protection from the additional expenditures involved in procuring water supplies adequate to the prevention of conflagrations, were received from Prof. George F. Swain, Massachusetts Institute of Technology, Boston, Mass.; Messrs. John R. Freeman, consulting hydraulic engineer, Providence, R. I.; John T. Fanning, consulting engineer, Minneapolis, Minn.; Ben C. Adkins, city engineer, St. Louis, Mo.; Walter H. McFarland, superintendent water department, Washington, D. C.; and a number of other hydraulic engineers and superintendents of waterworks, who offered to furnish valuable information and to comment on the replies received.

To all of the above and to the many others who furnished assistance and advice in connection with replies to the circulars of inquiry the authors are indebted and wish to express their regret that the limited time and funds available have prevented the gathering of more complete data.