Analysis of gunpowder mill explosions in the United States from 1800-1865

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Objectives

• Through analysis of newspaper reports of 168 gunpowder mill explosions during the period 1801-1865 incidents we hoped to determine causes, magnitudes, and socioeconomic impacts of such incidents and relate this to national and regional industrial development. Data source was the newspaper archive genealogybank.com.

Overview of Gunpowder Manufacture

Gunpowder is a mixture of:
  ➢ Potassium nitrate (saltpeter) 75%
  ➢ Sulfur 12.5%
  ➢ Charcoal 12.5%

Steps of Gunpowder Production:
Note: Each process conducted in separate building to reduce danger explosion would destroy entire facility.
1) Pulverize separate ingredients into fine powder:
   • Usually done in a “stamp mill” or “pounding mill.”
2) Incorporate Ingredients Together:
   • Also in stamp mill or cylinder mill. Water added to mix to reduce explosion hazard. The purpose of incorporation was to work the fine particles together.
3) Graining:
   • Done in a grainery mill. Damp powder pressed through a screen to form powder grains. Different sizes used for different purposes, small grains for rifle powder while larger grains were used for cannons.
4) Drying:
   • Done in drying house, heated by an attached external furnace. Fire was put out before powder brought in to prevent accidents. Trays of damp powder grains were then taken inside placed to be placed on shelves.
5) Glazing:
   • Powder would be tumbled in a barrel to round off edges, helping keep it loose instead of packing tight--this would help reduce moisture absorption.
6) Packing:
   • Powder put in 25 to 125-lb kegs, stored in a magazine.

The STAMP MILL was the traditional way to incorporate the ingredients of gunpowder, used in mills from the Middle Ages through the late 19th century.

Findings

Quantities of Powder Involved and Damages:
• Quantities of gunpowder involved in explosion were reported for 47% of incidents.
• Minimum amount: 25 pounds, little structural damage.
• Maximum amount: 125,000 pounds (62.5 tons): 1853 explosion at mill in Enfield CT.
• The average amount involved in explosion: 6,100 pounds or a little over 3 tons.
• Explosions involving more than 1,000 pounds likely to result in complete destruction of building.
• Large explosions produce collateral damage to surrounding structures.
  ➢ May destroy all buildings at a facility, even though spaced out to try to avoid this.
  ➢ May destroy or damage nearby homes, barns or other structures.
  ➢ May shatter windows miles away.
  ➢ Sound of blast often heard at a distance of twenty or thirty miles or more.

Loss of life due to explosions during period 1801-1865
• Total of 327 persons killed.
• In large explosions, deaths and injuries can include non workers, bystanders hundreds of feet away.
• 60% of explosions resulted in one or more fatalities.
• 13% of explosions resulted in more than five fatalities.
• Greatest number of deaths in single incident:
  31 killed in explosion at Dupont Powder Works, Wilmington, Delaware, 1818.