Modern Marvels

Firefighting Part One: Containing the Demon

The History Channel 1997
Writer/Producer/Director: Terry FitzPatrick

OPENING INTRODUCTION

modern fire footage

NARRATOR: It's nature's most-primal force. And the force we fear the most. Every year, fire kills nearly five-thousand Americans. Seven-billion dollars of property is wiped-out.

Bucket brigade still, horse-drawn steamer-engine footage, modern snorkel

For centuries, firefighters have struggled to develop better and better tools to battle the flames. From the perilous days of bucket brigades, through the spectacular era of steam, to the life-saving efficiency of today's fire trucks, the history of firefighting is a tale of courage and innovation.

Next on Modern Marvels: Firefighting.

Modern Marvels Series Open

ACT ONE

Seattle Fire Dept 911 operator answers call, alarm sounds in fire house, trucks roll

Fire dispatcher "Fire and Medic One. I need the address of the problem. What's burning? Do you actually see smoke or flames?"

NARRATOR: It happens every 16 seconds somewhere in America.

Fire radio call "Engines two, five: fire response on Channel One."

NARRATOR: The alarm. The sirens. And a race toward the unknown.

Pehrson: "Most people in their lifetimes may only see a few fires and so they don't think of it as occurring very frequently. But in fact, it does."

modern fire footage Los Angeles

NARRATOR: There are two-million fires a year in the United States. At most every blaze is the risk of death.

White: "Why is it so dangerous? The unknown mostly. You don't know when the roof's going to cave in on you, when those beams are going to start bowing. You never know when something's going to go wrong."

Hadfield: "You do get the feel of the adrenaline. You're put in a position where the heat is there and the smoke is over your head and you have to get together with your teammate and say: 'okay, I think we can make it. We're going to go on down there and we're going to put the wet stuff on the red stuff, win lose or draw.'"

mobile computers

NARRATOR: To make firefighting safer and more effective, there's an arsenal of high-tech equipment. Mobile computers provide instant blueprints of major buildings.

show-and-tell soundbite with computer	**Gibson:** "These drawings identify where the hydrants, the stand pipes, any kind of elevator shafts, roof access. You name it, we've got it in this system."
showing the thermal camera	**NARRATOR:** Thermal-imaging cameras--which detect heat instead of light--help the search for victims.
Show and tell soundbite with thermal camera	**Rice:** "When we go inside a building for a fire, we cannot see through the smoke. The technology with this camera can look through the smoke, something similar to radar looking through fog."
modern fire footage LA	**NARRATOR:** Despite centuries of technological progress, fire remains one of civilization's biggest problems. It takes 75-thousand fire trucks and more than a million firefighters to protect America's cities. It's a veritable army, fighting a battle that never ends, in a war as old as history itself.
dip to black	
Segment title The Fire Triangle	
Caveman illustration montage with flames	**NARRATOR:** For thousands of years, fire was a magical and mysterious force. Humans are the only species to ever attempt to control it. **Grant:** "Fire has always been a friend and foe of civilization. It served our needs in terms of keeping us warm and cooking our food and doing many other important tasks. However it can turn around and be our enemy just as quickly. And that's been the case throughout history as well."
Lavoisier portrait	**NARRATOR:** It wasn't until the 1700's that an inquisitive French chemist, Antoine Lavoisier, unlocked fire's secret.

Recreation of Lavoisier's experiment: wood shavings in a test tube are heated, giving off gasses that burn	With simple experiments, Lavoisier discovered that fire is a three-part chemical reaction. It starts when a substance like wood is heated. The wood itself does not ignite. Instead, it releases combustible gas which combines with oxygen and causes a flame.
graphic	Lavoisier's research led to a basic scientific principle: the "fire triangle." The three sides of the triangle are the three things necessary for fire to occur: heat, fuel, and oxygen. Remove any one of the three, and the flames go out.
Black/white old fire footage, hoses, fire extinguishers, forest fire crews	For centuries, firefighters have relied on the triangle concept. When they spray a burning building with water, they're attacking one side of the triangle: removing heat that a fire needs. Fire extinguishers attack a different side of the triangle: they snuff-out the fire with chemicals that prevent oxygen from reaching the flames. When battling a brush fire, crews attack the third side of the triangle by removing the fuel that a fire needs to advance.
roman fire woodcut illustration, Augustus portrait, wood syringe illustration	Ancient civilizations didn't need to know how fire works to appreciate its destructive potential. The world's first fire department was organized in 23 B.C. by the Roman emperor Augustus. The Romans invented history's first fire-fighting device: a wooden syringe that sucked water from buckets and squirted it toward the flames.
Crassus portrait, metaphor footage of feet in sandals running on cobblestones and ancient coins changing hands	Rome was also protected by a private fire force, owned by an enterprising construction contractor. Marcus Crassus would rush his men to a fire and negotiate a fee with the homeowner before attacking the blaze. Crassus wound-up owning nearly every building he saved, becoming Rome's largest landlord.
dip to black	
Segment Title	
"Throw out your buckets!"	

colonial building woodcut illustration, fire illustration, bucket brigade illustration

NARRATOR: Early America was built to burn. Homes were constructed with thatched roofs and wooden shingles. A spark from a chimney could start a blaze that threatened an entire village. When flames were spotted, the cry "THROW OUT YOUR BUCKETS" would echo through town. People scrambled to the nearest source of water to form a bucket brigade.

Pehrson: "Everyone in the community is expected to participate in the bucket brigade. The common sense of good with the bucket brigades was that you would have to help your neighbor because the next day they would be helping you."

footage of old buckets beside a stream engine in fire museum, portraits of Washington and Franklin, bucket brigade woodcut illustration

NARRATOR: For a speedy response, every homeowner was required to keep three leather buckets filled with water. Civic leaders like Benjamin Franklin and George Washington would coordinate the fire attack. An organized bucket brigade was essential for a village to survive. It was also an important hub of social life.

Pehrson: "You would have the men on the side of the brigade moving the full buckets toward the fire and the women would be on the side returning the empty buckets to the water source. And it would sometimes occur to some of the mothers that it would be a good idea to put their unwed daughters across from the most eligible bachelors in the bucket brigade."

colonial fire paintings

NARRATOR: Even the best bucket brigade had limited success. Often, all a brigade could do was fight spot fires on adjacent buildings to prevent the whole village from burning.

Sammarco: "It normally wasn't the building that was burning that they tried to extinguish. It was the surrounding houses. For usually--many times--these buildings that were burning were so far gone that they couldn't be saved."

hand pumper engine footage

NARRATOR: What Americans needed was better fire-fighting equipment. Soon, they would get it. A technological revolution was coming.

dip to black

ACT TWO

Segment title: The Age of Invention

montage of 1800's patent-application drawings

NARRATOR: The need to conquer fire has inspired hundreds of inventions. But one device developed in the 1700s revolutionized fire fighting: the piston pumper engine.

graphic

Pistons provided enough mechanical force to suck water from a well or stream, and shoot it toward a fire.

men hauling a fire engine and pumping

Early piston-pumpers were hauled by hand and were powered by crews of up to 60 men. Long wooden rails were attached to the piston pump. Raising and lowering the rails was a back-breaking chore that required remarkable teamwork.

Hinson: "During that time, there were chants and there were men encouraging each other, while this process would be going on: 'don't give up, keep on going, we're putting a fire out, we're saving a life.'"

hand pumpers in action illustrations

NARRATOR: The piston engine allowed firefighters to work from a safe distance--up to 200 feet away--putting a steady stream of water exactly where it was needed.

Footage of steamer in museum, putting coal into firebox, demo footage of steamer in action

Steam engines replaced hand-pumps in the mid-1800s. A steamer was powered by coal and worked like a railroad locomotive. The steam drove a powerful piston pump. A steamer could deliver more than 800 gallons of water per minute, and required only two men to operate.

Hinson: "The advantage of steam is no longer do you have to have 30 men laboring just to pump water. Now we're using steam to drive the pistons to drive the pistons to drive the pump and pump the water. Now the men, the firefighters, can be used at the front of the fire, to actually fight the fire and save lives"

images of steamers on city streets, Dalmatians with engines

NARRATOR: The age of steam was the most dramatic era in fire-fighting history. People would stand in amazement as these heroic, horse-drawn machines sped through the streets. Fire dogs ran with the horses and guarded them at the fire scene. Most fire dogs were Dalmatians, because they possessed a unique ability to get along with horses. Steam engines could stop a fire from destroying an entire town, if they arrived in time. Often, though, they did not.

Pehrson: "Somebody had to go run to a fire station. Then somebody had to go run from the fire station and go find the firefighters--if they were volunteers--have them come back, they would get the piece of apparatus and then go to the fire. There was a significant delay."

tapping a fire hydrant, soda-acid patent drawings and illustrations of extinguishers, graphic

NARRATOR: It also took time to connect an engine to the closest water supply. This delay gave rise to another invention: the soda-acid fire extinguisher. By creating a controlled chemical reaction, soda-acid extinguishers provided an instant source of pressurized water. The extinguisher was filled with soda-water, a solution of water and sodium bicarbonate. On top, was a capsule of hydrochloric acid. At a fire, the two were mixed, generating large amounts of carbon dioxide gas--which pushed the water out.

fire scene woodcut illustrations

Soda-acid extinguishers were a vital component of a successful fire attack. They could easily tackle small fires and delay the spread of bigger fires until a steam engine was ready for action.

Early firefighter painting

By the late 1800's firefighting had become a profession. Most cities developed corps of expertly-trained men who were strategically placed in firehouses around town.

	Sammarco: "With paid fire fighters, they themselves would be considered professionals. They would actually be able to approach a fire and decide what had to be done, and then transmit that to the great amount of volunteers that actually came."
Photo of person pulling a street alarm	**NARRATOR:** To ensure a speedy response, alarm boxes began to appear at nearly every street corner in the 1850's. They were connected to the firehouse by telegraph.
Show-and-tell soundbite seated at antique fire dispatch desk	**Rice:** "A person would go up and he would open up the box. And pull the lever inside the fire alarm box. That would transmit the signal down to here. It would punch this paper tape. In this case it would be like 2217. And then the dispatcher would look up in the book here and see who was supposed to go and what type of fire they might be involved in."
inside firehouse illustrations, fire scene stills	**NARRATOR:** The firehouse sprang to action when an alarm came in. Everything was organized for speed. At the scene, specialized crews--called "companies"--would perform different tasks. Engine companies would lay hoses and prepare the steamer. Ladder companies would set up the aerial equipment.
ladder crew with aerial	By 1870, ladders could reach up to 75 feet--although they were difficult to place because they had to be extended with crude hand-cranks. Still, ladders were the ultimate life-saving device, allowing firefighters to cheat death by plucking victims from peril.
Currier & Ives drawings	Images of dramatic rescues boosted public confidence in America's fire departments. Many people felt the professional firefighter, with his elaborate equipment, reduced the risk of death. Firefighters knew better.
tenement image	American cities were growing faster than their fire departments. Warehouse and tenement districts were disasters waiting to happen.

Sammarco: "In many instances these buildings were connected, they were rows of building, of warehouses, and townhouses. And the concept of not only compacted urban areas, but tall urban areas meant that they had to actually have new and specialized techniques to fight fire."

Modern footage of Chicago and San Francisco

Narrator: These lessons were learned the hard way. In 1871 and 1906, two of America's largest cities would burn to the ground.

fade to black

ACT THREE

Modern Chicago/San Francisco footage

NARRATOR: San Francisco and Chicago: two of America's largest cities. To see them today, it's hard to believe these thriving communities endured two of history's most devastating fires. In a span of just 35 years, Chicago and San Francisco became dramatic examples of what can happen when people fail to prepare for fire.

Segment title:

"Chicago is in Flames. Send Help!"

stills of old Chicago and fire fighter crews, Williams portrait, mayor's portrait

NARRATOR: By 1871, Chicago was America's fastest growing city, with a fire department comprised of 16 steam engines and 219 men. Chicago's fire chief wanted more, insisting his force wasn't big enough to protect a city built of wood. Two-thirds of Chicago's 60-thousand buildings were made with wood. Even the streets and sidewalks were paved with wood blocks. Chicago officials rejected the chief's request for more men and equipment. The decision would lead to disaster.

O'Leary home photo

At 9:30 p.m. on October 8th, 1871, flames broke out in a barn on Dekoven street on Chicago's west side.

men in firehouse drawing, various woodcut illustrations of Great Chicago Fire

The fire department, which was overworked and stretched dangerously thin, was slow to respond. By the time men were in place at the scene, the blaze was spreading out of control. Stiff autumn winds were whipping the fire like a bellows, creating "tornadoes" of flame that ripped through the heart of the city. In two hours, 500 buildings were ablaze.

Grant: "It's massive. They're sending up millions of embers that are raining down in other parts of the city starting many, many spot fires. It's a wind of fire approaching."

woodcut illustration	**NARRATION:** Firemen tried to make strategic stands at major intersections, but their steam-driven pumpers were no match for the firestorm. **Pehrson:** "There was very good equipment available at the time for fighting fires, but it still wasn't good enough. The firefighters were able to get water to the seat of a fire, but not enough, not in sufficient quantities yet." **Grant**: "It's everything the fire department can do to stop it at a street or some kind of natural firebreak, and even then those fires would simply hop right over those streets and just continue to burn and flatten everything in their path."
Recreation montage: mayor's portrait layered with modern footage of hand on telegraph key	**NARRATOR:** At the courthouse, the mayor was desperately sending telegrams to nearby cities. **Actor's voice:** "Chicago is in flames. Send your entire department to help us. Mayor Roswell Mason"
woodcut illustrations	**NARRATOR:** For 30 hours, Chicago was gripped by panic. **Actor #1** "The dogs of hell were upon the housetops, bounding from one to another. The fire was moving like ocean surf. Horace White, eyewitness." **Actor #2** "The whole air was filled with falling cinders. It looked like a snowstorm lit by colored fire. Alexander Frear, eyewitness."
fire aftermath illustrations	**NARRATOR:** It took a major rainstorm to finally end the Great Chicago Fire. 300 people were dead and a third of the city was in ashes. 100-thousand residents were homeless. The disaster prompted cities throughout the nation to pour resources into fire preparedness. They purchased more equipment, and required the use of fire-proof building materials. However, one city--San Francisco--failed to follow the trend.

Segment Title:

Water, Water, Everywhere...

Old San Francisco photos and footage

NARRATOR: San Francisco, 1906: a bustling boom-town with a major problem: water. Fire officials were worried about the city's aging water mains. They proposed the construction of an emergency back-up system, which could pump saltwater from the ocean.

Grant: "Here is a city surrounded by water on three sides. However, they need to have that readily available. They need it up the streets where they can use it. They need it in a sense that it's not going to be compromised during a big fire, or an earthquake, or any other event."

Post-earthquake photos

NARRATOR: Disaster struck San Francisco at 5:13 a.m. on April 18th, 1906. An earthquake measuring 8.25 on the Richter Scale. As buildings crumbled, lanterns and gas lamps set them ablaze. In an instant, there flames throughout the city. Firemen responded quickly. But their greatest fear had come true.

Pehrson: "All of the water mains were severed and so the fire department had no water to fight these fires. There were fires cropping up that if they had water available, the chief felt they could easily fight. They probably would've had a fighting chance of putting these fires out. But with no water, all they could do was helplessly sit there and watch the fires spread."

Fire photos, Dougherty portrait

NARRATOR: San Francisco hadn't built the emergency water system that the fire department requested. As a result, the city now looked like Armageddon. The hopeless situation forced Assistant Fire Chief John "Leather Lungs" Dougherty to take drastic action: demolish part of the city to create a line of flattened rubble. Since rubble catches fire less easily than standing buildings, the chief hoped he could stop the fire from spreading.

Grant: "The military was called from the Presidio, and they, with cannons and whatever else was available, destroyed buildings. They blew them up along Van Ness Avenue to create that fire break."

Pehrson: "It was very much a gusty thing to take it and start destroying people's buildings for the good of everyone else. You had to write off some buildings and say we're going to have to destroy these by blowing them up and save the city."

Fire fighting stills and post-fire footage of city in rubble

NARRATOR: Dougherty's desperate decision paid off. The firebreak was strategically placed along the one boulevard where water hydrants were still working. A curtain of water along Van Ness Avenue delayed the fire's advance until rain began to fall and finally extinguish the blaze. The San Francisco Earthquake Fire burned for three days, incinerating 514 blocks and claiming 674 lives. It remains the costliest fire in U.S. history: 350-million dollars in damage, the equivalent of 6-billion dollars today. San Francisco was the last of America's city-wide conflagrations. The scope of the disaster prompted cities across the country to upgrade their water systems to fight fire.

fire truck footage

As well, a second revolution in technology was coming that would dramatically help firefighters do their job.

Dip to black

ACT FOUR

1920's fire response footage

NARRATOR: The early 1900's brought a new efficiency to America's fire departments. Motorized fire trucks often made the difference between life and death.

segment title: Horsepower

Footage of early motorized fire equipment in action, and footage of fire trucks in museum

NARRATOR: Motorized equipment began to appear in 1912. Some of the earliest rigs were simple tractors that merely replaced a team of horses. Other units were made from modified Model-T automobiles. Engineers then developed a new concept: the fire truck: a specialized unit that all at once could haul men, hoses, ladders, and a tank of water for immediate use. Fire chiefs bought the new engines by the thousands.

Grant: "Motorized apparatus offered some great advantages because it allowed firefighters to get the equipment to fires much more quickly, get more equipment, bigger equipment, faster equipment, get all of that to the scene of the fire where they really needed it."

Footage of early fire trucks in action

NARRATOR: The motorized fire engine transformed America's fire departments in less than ten years. They dramatically reduced the time it took to respond, giving firefighters a better chance of keeping a small fire from growing. The engine's powerful pumps could supply more than a thousand gallons of water every minute, and keep the water pressurized through hundreds of feet of hose. The improved water supply allowed firefighters for the first time to take their attack inside a burning structure.

Pehrson: "By being able to go into a building, firefighters now have changed the whole focus of firefighting, from preventing the spread from building to building to controlling a fire within a building and even save you, an occupant, that may be trapped in the building."

ladders at fire scene

NARRATOR: Ladders were greatly improved in the 1920's and 30's. Ladder trucks grew so long they required a second driver in the back to control the rear wheels around corners. Wooden ladders gave way to lightweight metal, and the old hand cranks were replaced by motors. A ladder company could raise and position its equipment in moments.

Now, firefighters could enter a building on different floors, and spray water on the blaze from above. The use of motorized equipment allowed firefighters to take a more aggressive approach. However, this presented a new technological challenge: protecting the firefighters themselves.

dip to black

segment title: In Harm's Way

Currier and Ives prints

NARRATOR: For most of U.S. history, artists have portrayed firefighters in an idealized light.

Sammarco: "These romantic polychromatic prints give a muted impression of what fire fighting was really about. Chromolithographs showing them bringing women down ladders and children to safety were very salable items in the 19th Century, but it also didn't show the magnitude of the fires that they were combating."

mid 1900's fire scene footage

NARRATOR: The reality of firefighting was brutal, leaving many men singed and blistered. Until recent times, it was rare when a major blaze didn't claim at least one firefighter's life. Even into the 1950's, safety equipment was often crude and ineffective.

White: "When I went on the fire department, all they issued you was a raincoat and a pair of short boots, and you couldn't get into certain places for being burned yourself for not enough protective clothing on your body."

Old footage of men with SCBA gear	**NARRATOR:** Safety took a big step forward in 1964, with the development of S-C-B-A: self-contained breathing apparatus. An S-C-B-A unit works like SCUBA diving equipment, delivering fresh air from a fiberglass tank--or "bottle."
Show and tell soundbite while putting SCBA gear on in firehouse	**Pehrson:** "The mask protects my face and keeps the fresh air that I'm breathing in from mixing with the toxic gasses that I'm exposed to. I've got a regulator that then reduces the pressure from the bottle down to something that I can breathe."
Laboratory fire experiment footage time-lapse sequence	**NARRATOR:** The need for S-C-B-A became clear as firefighters discovered how a blaze behaves inside a building. This demonstration tape illustrates how quickly a house can fill with deadly smoke. A mere chair fire can blacken a room in 90 seconds.
firefighter training videos	S-C-B-A gear allows firefighters to work safely in this toxic environment, searching for victims and putting water directly on the flames.
men in fire suits, mannequin in laboratory flame test	In 1967, another breakthrough improved firefighter safety: the development of fire-retarding clothing. A suit made with heat-resistant fabric can withstand temperatures of more than 1000 degrees. Fire-resistant suits and breathing apparatus have improved firefighter safety. But there is one drawback. **Hadfield:** "With the equipment that I'm required to wear today, they have taken away all of my senses. So I don't know whether I'm in trouble or not in trouble, how much heat there is."
training footage	**NARRATOR:** Rigorous training is now required to teach firefighters how to spot the warning signs of danger. One of the biggest risks they face is "back draft."

graphic	When a room fills with smoke and combustible gas--but there's not enough oxygen to allow the gasses to burn--there's the potential for back draft. When a firefighter opens a door or window, oxygen rushes in. Flames race toward the incoming oxygen, which is why the phenomenon is called "back-draft." A back draft can cause a house fire to rage out of control in seconds.
Firefighters on roof	To prevent back draft, firefighters deliberately poke ventilation holes in the roof to allow smoke and gasses to gradually escape. **Pehrson:** "This is a very misunderstood feature of firefighting: that we want to do some damage, and we're going to with ventilating. But at the same time, we're going to remove all that heat and smoke. We're going to make it easier for the firefighters to find the fire, and find you if you're trapped in the building."
fire scene footage	**NARRATOR:** The emphasis on safety and rescue were lessons learned from two of history's deadliest fires. Technology had conquered the specter of city-wide conflagrations. but firefighters learned that disaster could strike a single building with equally deadly results.
dip to black	

ACT FIVE

Segment title: Putting People First

Scientist in laboratory

NARRATOR: The newest frontier in firefighting technology is not in the firehouse, it's in the laboratory, where scientists are studying how building materials react when they burn.

Lucht: "We're starting to be able to simulate how fires would develop in a building on a computer. And the more sophisticated we can become in predicting how a fire might develop in a building using computer technology and modern science, the more we can get ahead of the problem."

Sprinkler head footage in lab

NARRATOR: Engineers use this knowledge to design buildings that can fight a fire even before the fire department arrives. Structures equipped with automatic sprinkler systems can knock down a fire before it has a chance to grow.

Old woodcut of sprinkler system

Sprinklers were invented in 1874 to protect American factories. The valve on a sprinkler head contains a small tube of glass, which is filled with a heat-sensitive liquid.

Show and tell soundbite in laboratory

Lucht: "As the fire gets hotter and hotter, it heats up this little glass bulb here. As the fluid gets hotter and hotter, it expands and eventually breaks this glass. After the glass is broken the water is no longer held back and it sprays out onto the fire."

Demonstration in laboratory with trash can set on fire, sprinkler head goes off

NARRATOR: Sprinkler heads work independently: only the sprinkler directly above the fire goes off. They are remarkably sensitive. The heat from a smoldering waste basket can trigger the sprinkler into action in less a minute. A sprinkler doesn't always put a fire out, but it dampens the surrounding area to prevent the flames from spreading until firefighters arrive.

Still photos of Triangle building, inside the factory, women working, firefighters responding

Although sprinklers have existed for more than century, it took one of history's most shocking disasters to prompt their widespread use. It happened in 1911 at a New York garment factory: the Triangle Shirtwaist Company.

drawing of a woman in a shirtwaist blouse

The Triangle company made a type of blouse known as a "shirtwaist." Like other sweat-shops of the era, the sewing floor was crowded, with little in the way of worker protection. On March 25th, 1911, firemen raced to the Triangle factory when fabric scraps caught fire on the 8th floor. Ladders and hoses were unable to reach that high, and the blaze quickly spread to the 9th and 10th floors.

Grant: "There was a massive panic. There was a fire escape, which quickly became overloaded and collapsed. People plunged to their death in flames. Many of the people on that 9th floor had to choose between either burning to death, or jumping. And many did both."

Photos of destroyed building interior, shots of bodies lined up in caskets for identification

NARRATOR: The building was equipped with buckets and hoses to protect the structure from burning down. But there was nothing to protect the people inside. If the upper floors had been equipped with sprinklers, workers might have survived. Instead, scores of employees were dead. The shocking image of their scorched bodies lined up in a warehouse for family members to identify prompted major reforms.

Grant: "The Triangle Shirtwaist fire was a turning point in fire protection history in the United States. Prior to this fire, there was such an emphasis on keeping whole cities from burning down. So there was a great emphasis on fire-resistive buildings and fire resistive construction; property protection. However, the Triangle fire clearly delineated the need to protect people."

NY legislature footage

NARRATOR: Government officials responded with reforms that included things we take for granted today: building codes that mandate the use of sprinklers and cover everything from the design of stairwells to the safety of electrical wiring. However, another fire 30 years later showed that America's fire codes still didn't go far enough.

Cocoanut grove aftermath footage

On Thanksgiving weekend 1942, fire suddenly broke out in a crowded Boston nightclub. The Cocoanut Grove quickly filled with combustible fumes. A spark set the mixture ablaze.

Dreyfus: "We were sitting in our seats and somebody shouted fire. And then, all of a sudden, I saw a sheet of flame come about 70 miles an hour up from the doorway and all the way across the room toward where I was."

fire aftermath footage

NARRATOR: The flash fire raced through the nightclub, fueled by satin draperies, plastic upholstery and *papier-mâché* decorations. The building was fire-proof, but its contents were not.

Dreyfus: "I couldn't see, but I could feel my hands. And it felt like there was bacon on the back of my hands. It was all burned off and raised, just like bacon. And I said: 'Oh my god, how can I possibly be a doctor.' I was going to be a surgeon."

bodies, fire department still photos

NARRATOR: Most patrons inside the club found it impossible to escape. There were no emergency lights. And the revolving-door exits quickly clogged with bodies.

Sammarco: "People were actually piled up in front of the doors and caught in the revolving doors so that eventually close to two-thirds of the people at the Cocoanut Grove died."

Still photo of man holding dead woman

NARRATOR: In 12 minutes, 492 people were dead or dying.

Newsreel footage

Newsreel Reporter: "I saw scenes of indescribable horror. The street was in chaos, people running around screaming, bodies were laying on the ground. These people were all dead and all horribly burned."

Boston hospital footage

NARRATOR: Hundreds of survivors were rushed to hospitals, where doctors were overwhelmed.

Dreyfus: "Two of the residents came in and they looked at me and said: 'Oh, he's dead, cover him up.' And I said: 'No, I'm not. I'm alive!' I must have shaken them up a little bit, I think, so they began working on me. Otherwise they would have just let me go and I would have been dead."

Fire aftermath still photo

NARRATOR: The horror of the Cocoanut Grove Fire generated a renewed call for better fire safety.

Sammarco: "The Cocoanut Grove was something that shocked not only Bostonians but people across the country. We saw these people being brought to morgues, that hundreds of people had died and eventually thousands of families were affected. It could have been anyone."

Cocoanut grove aftermath footage

NARRATOR: Reforms that followed the fire included restrictions on the use of flammable decorations and requirements for improved fire exits in public buildings. The Triangle and Cocoanut Grove incidents were vivid reminders that, despite our best efforts, fire can strike without warning, leaving tragedy in its wake.

dip to black

Segment title: Eternal Vigilance

modern fire footage

NARRATOR: America's fire departments are some of the best-equipped and best-trained units in the world. Modern pumpers can shoot more than 9-thousand gallons of water per minute. Ladders and snorkel rigs can now reach the 24th floor of a burning building. However, firefighting remains one of the deadliest occupations in America. Nearly 100 firefighters die every year in the line of duty. More than 90-thousand firefighters are injured every year.

White: "Regardless of all the equipment you got, it still comes down to the firefighter and him having nerve enough and enough guts to get in there. And it's always going to be the unknown that will get you in the end."

man in fire suit walks through flames, smoke alarm in home, lab test of home fire sprinkler system

NARRATOR: Scientists continue to develop better fire-fighting tools, such as improved heat-resistant clothing. And simple things like smoke detectors have dramatically reduced fire fatalities. Engineers are also developing household sprinkler systems to add another level of protection inside the home. It's uncertain, though, that the next generation of technology can conquer nature's most frightening force.

Pehrson: "Fires are going to break out. There's nothing in the foreseeable future where we are ever going to conquer fire. There are better tools for the firefighter to use, they're better protected. There are building codes and fire prevention regulations that are available that will help reduce and stop fires from occurring. But there are always going to be fires starting."

House fire closing scene

dip to black

closing credits