

Hartford Circus Holocaust.

By Warren Y. Kimball,

N.F.P.A. Engineer.

Danger from fire was far from the minds of some 7000 happy patrons attending "the greatest show on earth" at the city-owned circus grounds on the outskirts of Hartford, Connecticut, on the hot sunny afternoon of July 6, 1944. About twenty minutes after the matinee started a "flash fire" occurred which caused fatal injuries to 163 persons, mostly women and children. Sixty-three of the dead were children under 15 years of age. Well over 200 other patrons were confined to hospitals as a result of burns and some 50 or 60 circus employees were treated by their own physician. Some of the critically injured patrons may yet succumb.

Hartford, Connecticut, the "Insurance Capital" has for years carried the proud boast of "best governed city in America." Just a few weeks prior to the fire the city won the grand award in the Inter-Chamber Fire Waste Contest. This was in a large measure due to the outstanding work of the Fire Prevention Bureau under City Fire Marshal Henry G. Thomas. As an overcrowded war industry center probably no city had been more aggressive in carrying out fire safety measures, such as the installation of adequate exits from various types of lodgings and places of public assembly. It is said that War Production Board officials had recently complained that Hartford was using up more critical iron in providing fire escapes than any other city, but when shown the need by the Fire Prevention Bureau the necessary priorities were granted.

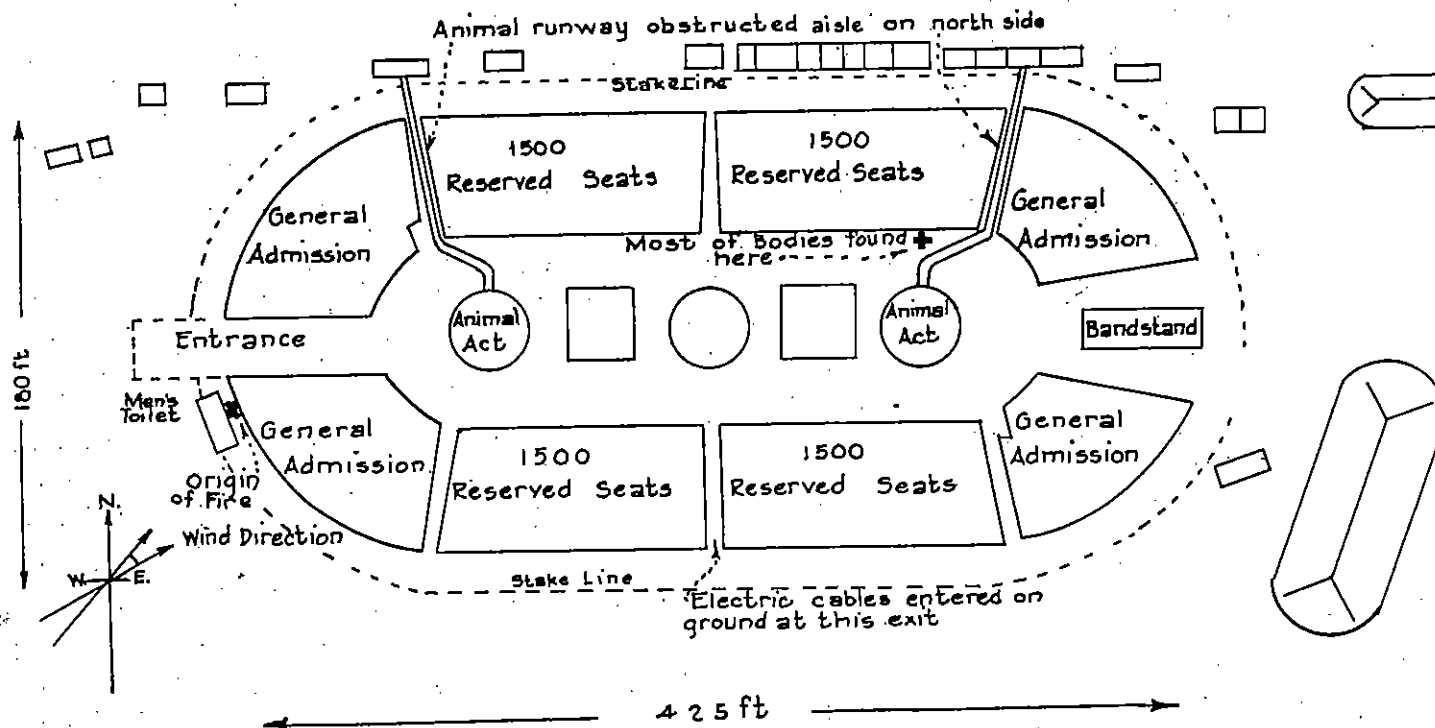
The Ringling Brothers and Barnum and Bailey Combined Shows had carried on their great show in many states and for many years with conditions substantially the same as those which resulted in the Hartford tragedy. The seating arrangements, the performances, the arrangement of the "big top" were all "routine." The circus had visited a number of other New England cities in the weeks prior to the fire. It had visited Hartford in previous years. The set-up had been the same and local officials in every case had welcomed

the circus without questioning. The circus was an institution older than the building codes of most cities and much older than the comparatively new development of municipal fire prevention bureaus. City officials everywhere enjoyed the circus. It brought them their youth again for an afternoon. They had no doubt welcomed the circus as small boys and helped "water the elephants." The circus was an old friend.

The circus was pitched on a city-owned circus lot. It was late in arriving and there was some haste in getting ready for the afternoon show. A city Building Department inspector was on the scene before the stands were up and issued a permit. Apparently this was considered routine and it was stated the inspection was made to cover zoning ordinance requirements. There is no indication that the inspector gave any consideration to such matters as width of exits or flameproofing of the canvas. The Fire Prevention Bureau of the Fire Department received no notice from the Building Department regarding the issuance of the permit and had no official notification that the circus was in operation. Neither did the Fire Department, under Chief John C. King, have a fire fighting detail at the circus until after the tragedy, although the Police Department did have a detail at the scene.

Preparations for fire safety at the circus would appear to have been somewhat meagre considering the magnitude of the crowds handled and the fire hazards which obviously were present. The circus equipment included four all-purpose water tank trucks having pumps powered by a power take-off and supplying 50 feet of 2-inch hose having a 1/2-inch nozzle tip. These pumps produced a nozzle pressure of approximately 58 pounds, which would give a discharge of about 56 gallons per min-

This report, while necessarily of a preliminary nature due to the fact that official investigations have not been completed, is believed to include the essential facts responsible for this great tragedy. We are indebted to N.F.P.A. members in Hartford who have made it possible for us to inspect the circus site and have given us extensive help in obtaining pertinent details regarding this fire.



APPROXIMATE PLAN OF CIRCUS.

This plan, drawn after an examination of the ruins, shows the approximate arrangements, but may not be accurate in all details. The small squares beyond the side of the tent were animal cage wagons. Many other circus wagons in front of the main entrance and elsewhere on the grounds are not shown on this plan. At the right were performers' tents not involved in the fire.

ute. Three of the tank trucks had a capacity of 1000 gallons each and the other had 800 gallons capacity. During each performance there were two circus hands detailed to each truck and these were in operation during the fire, but the circus employed no professional firemen and had no fire marshal or fire chief on its staff. There is evidence that the circus equipment may have been of some use in extinguishing fire in the blazing stands near the point of origin, but it was obviously inconsequential as a means of preventing the loss of life. The only other private fire fighting equipment that was available for quick use were water buckets. A number of fire extinguishers carried by circus vehicles were not distributed about the tent for protection of the show.

The Connecticut State Police Commissioner, Col. Edward J. Hickey, who is ex-officio State Fire Marshal, was entertaining a party of children at the circus on the afternoon of the tragedy. He is conducting the official investigation of the tragedy, with a personal determination that such a fire shall never occur again in the State of Connecticut.

Description of the Tent.

The huge tent where the fire occurred was approximately 425 feet long and 180 feet wide and covering an area of approximately 74,000 square feet or better than 1½ acres. It was the usual type of large circus tent supported by a large number of heavy poles held by guy ropes secured to a double row of stakes approximately 15 feet outside the tent. The largest poles had a maximum diameter of 12 inches. The outer circumference of the tent contained a tier of stands having a seating capacity of 9048 persons. This was distributed between 6048 reserved seats, running along the north and south sides of the tent and 3000 general admission seats located at the two ends of the tent. During the afternoon performance when the fire occurred there were 6789 paid admissions, indicating that some 7000 patrons were in the tent. There is no indication of the number of performers or employees actually in the tent at the time of the fire, but the circus had a staff of over 1300 persons, as compared to a normal peace time complement of about 1600 employees.

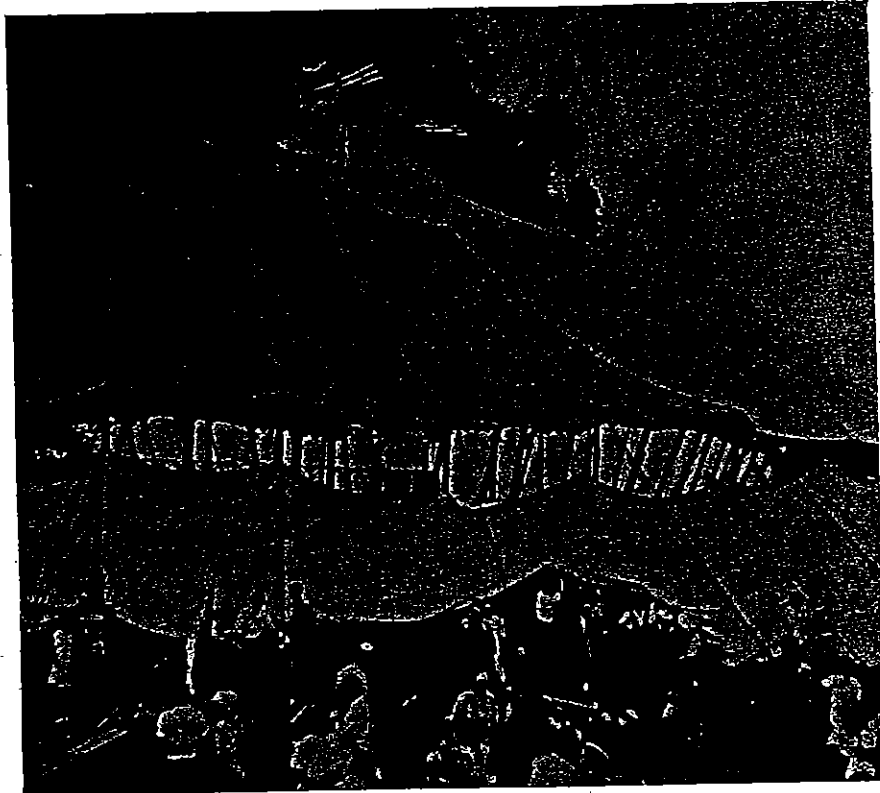
Running along the center axis of the tent and separated from the spectators by the wide aisle by which the patrons reached their seats, were three show rings. Between the show rings were two square platforms used for additional acts.

The seating stands were reported to be 10½ feet maximum height at the rear of each stand and there were 16 to 18 rows of seats, depending upon the type of accommodation.

At the time of the fire wild animal acts had just been completed in the rings at the east and west ends of the tent. Temporary steel cages were erected in these rings for the animal acts. Animals were brought into these rings through long temporary cage runways, called "chutes" in circus parlance. These extended to animal conveyance trucks located north of the main tent. It was one of these animal cage runways extending across the main north aisle that blocked the escape of many of the spectators as they fled in an easterly direction away from the fire. These animal chute cages appeared to vary in height from about three to four feet. They were two to three feet wide.

Exit Arrangements.

It is understood that the Hartford Building Department records indicated nine means of exit from the tent. This was confirmed by N.F.P.A. staff investigation at the scene of the fire. The main entrance at the west end was a little over 20 feet wide on the inside of the stands and widened out to something over 30 feet at the point of egress, which was under an entrance canopy. At the opposite or east end was located the bandstand with an exit on each side of the stand. These exits were better than 14 feet wide at the narrowest point and widened to nearly 19 feet at the point of egress. These were the only really commodious exits from the circus tent. On both the north and south sides there were three minor exits used primarily by performers, but available to the public. These exits averaged 9 or 10 feet wide at the ringside, but narrowed down to as little as 5 feet 2 inches at the point of egress. The center of these exits on the south side was used to bring electric cables along the ground into the tent. At the time of the fire the east and west exits on the north side were occupied by the animal chutes,



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Many people jumped off the back of the stands, or crawled down between the seats and escaped under the canvas side walls. Perhaps this possibility has been the excuse for grossly inadequate exits in circuses, but this fire shows the fallacy of relying on anything but standard exits.

leaving unobstructed only a single exit having an egress width of 5 feet 2 inches to serve two sections of grandstand each approximately 125 feet long and having approximately 3000 total seating capacity. The runway chute, cages that obstructed the main north aisle and two of the exits on the north side were bridged by a stile five feet wide and five steps high. These stiles proved utterly inadequate to handle the panic-stricken crowd.

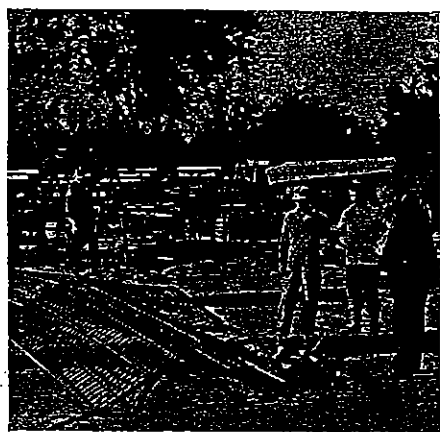
Adequacy of Exits.

As is well known to most N.F.P.A. members, the Building Exits Code of the National Fire Protection Association has for many years been the life safety standard for the protection of public gatherings and other crowded occupancies against fire and panic hazards. The Building Exits Code was prepared by the N.F.P.A. Committee on Safety to Life, a representative

group of experts in this field. While many persons may not have thought of applying the Code to anything as unsubstantial as a tent, this fire is evidence that adequate exits are needed for tents and other temporary structures serving large crowds.

The Building Exits Code requires one 22-inch unit of exit for each 100 persons accommodated. On this basis the circus would have required 91 units of exit width, whereas our study of the circus grounds after the fire showed a maximum of 43 units of exit width actually provided. At the time of the fire these limited exit facilities were further reduced by the obstruction of two of the north exits by the animal chute cages. The effect of this was to block off two sections of reserved seats, having approximately 3000 seating capacity, and leaving only one narrow exit which was less than three 22-inch units in width,

and thus could not be expected to take care of more than 10 per cent of the persons isolated in the northern grandstands. Incidentally, it should be pointed out that the N.F.P.A. Building Exits Code requirements are considered to be quite lenient because they are designed for more substantial structures than tents and many cities might wish to have more stringent requirements in the case of temporary structures or tents.



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Site of the main entrance. A section of one of the animal chutes in the foreground.

One factor that should not be overlooked in any appraisal of exit facilities at the circus was that the main exit aisle in front of the stands, some 26 to 27 feet wide at the narrowest point, was not available to the audience during much of the performance. Not only was this main track blocked temporarily by the animal chutes, but it is in use by the performers through much of the show. The grand parade circles the track, it is used by the parade of elephants, by chariot races, wild west riders and numerous other attractions. In short, except at the beginning and end of the show the spectators are largely kept behind the metal railing that circles the arena. There is room behind this railing for the movement of only a very narrow file of persons in the limited space in front of the stands. This situation conflicts with Building Exit Code requirements that exits be unobstructed at all times. Likewise the fact that several of the exits were much smaller at the point of egress than was indicated by their dimension at the

ringside is also a further conflict with good exit arrangement.

Story of the Fire.

The fire began on or near the ground at the outside canvas immediately to the south of and about 20 feet from the main exit. The point where the fire started was between the outside canvas of the main tent and the canvas enclosure for the men's toilet which backed up to the main tent at that point. The grass is said to have been dry from the heat and dust common to circus grounds, and might easily have been ignited by a match or cigarette. However, some grass within a few feet of the fire area did not appear to be burned, although trees 50 to 60 feet from the fire showed scorched foliage.

When first noticed, the flame was 5 or 6 feet high. Although standard fire extinguishers or a small hose line immediately applied might have conceivably controlled a fire of this size without difficulty, it had already spread enough to make 3 buckets of water thrown on it ineffective.

As the fire rapidly increased and hit the edge of the top canvas, the flame was about 2 feet wide at the point of contact. A gust of wind from the southwest then drove the fire across the underside of the tent and almost instantly the entire canvas was enveloped in flames. The ropes holding the supporting poles were burned through almost at once, allowing the great poles to fall among the panic-stricken throng and causing several fatalities.

It is reported by several spectators that the majority of the crowd did not leave immediately at the first sign of fire. Several persons seated near the point of origin are said to have walked the entire length of the tent to the further exit before the panic occurred. It is said that at the outset the crowd viewed the fire incredulously, thought it part of the show, or believed it to be an incipient fire that would quickly be controlled. The delay, if only momentary, may have been fatal to some of those who a few seconds later were in the panic-stricken mob seeking to escape.

As previously pointed out, the animal runway chutes temporarily blocked the best means of exit for most of the seats on the north side of the tent. As the people ran down the aisle toward the eastern end of the tent to escape the flames they piled



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The burning of the circus tent in Hartford, July 6, 1944, where 163 people were killed, mostly women and children, and some 200 injured. The flames flashed over the paraffin treated canvas with incredible rapidity.

up against the animal runway at that end. The steps over these runways proved utterly inadequate. Attempts to climb over the steel cage bars were largely futile for women in high heeled shoes and for small children. Most of the bodies of those who failed to reach the outside were found piled four deep against this cage obstruction in the main north aisle.

Another cause of confusion and injury was the excessive use of loose folding chairs in substantial portions of the reserved seat section. This was contrary to provisions of the N.F.P.A. Building Exits Code which specifies that where more than 200 seats are provided they shall be securely fastened to the floor. As the people dashed out, they shoved the loose chairs down the tiers ahead of them. Those in the middle tiers stumbled and fell across the piles of loose chairs blocking their escape. Persons in the first five or six rows got out more easily. Those in the back jumped the 10 or 12 feet to the ground to escape under the canvas.

Most of the fatalities were due to severe burns as the blazing canvas fell on the crowd, igniting flimsy summer clothing. This is in contrast to the Coconut Grove fire in Boston where many of the deaths were by suffocation. It is probable that some of the deaths were due to crushing by the panic-stricken mob, even though burns quickly followed. The fire appeared to be quite spotty in character, as some seats and poles showed unburned paint, while adjacent areas were deeply charred and some of the wooden stands, particularly on the south side, were almost completely consumed.

Fire Fighting Operations.

Once the fire started it was obviously impossible for fire fighters to reach the scene in time to prevent a tragedy. As a matter of fact, had the entire fire department been stationed at the circus grounds there is little likelihood that the outcome would have been any different once the top canvas became ignited.

Calls to the fire department were given promptly by an off-duty fireman attending the circus, a police radio car, and a resident of a near-by house. Three box alarms were sounded almost simultaneously.

These calls brought an immediate response of seven engine and three ladder companies. The nearest fire company was approximately one-half mile from the tent.

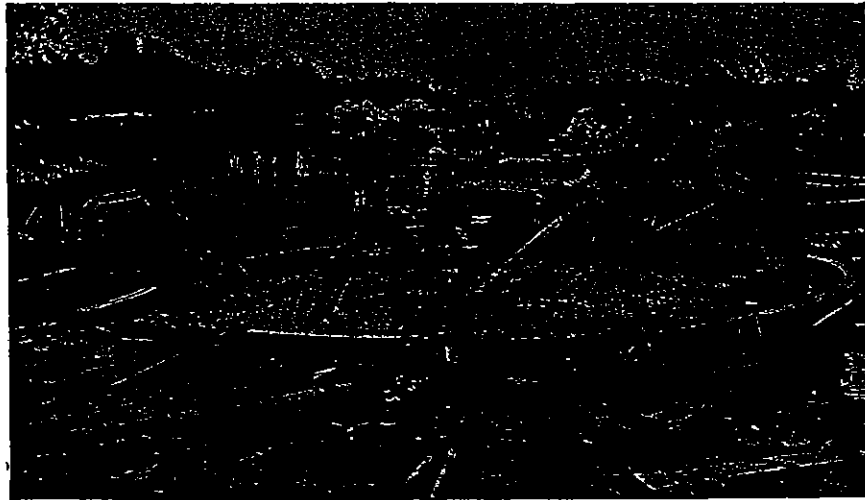
The nearest hydrant was approximately 300 feet from the front entrance of the tent. Other hydrants were spaced about 500 feet apart along the street leading to the circus grounds and on adjacent streets. Some six hydrants were used. There were no fire hydrants in the circus grounds.

Fire Marshal Thomas, who is also First Deputy Chief of the Hartford Fire Department, was the first chief officer on the scene. He reported that within ten minutes from the start of the fire the canvas was completely consumed, the poles were down and the fire fighters' chief task was to extinguish the blazing stands and extricate the dead. Examination of the ruins indicates that the fire department devoted its first attention to extinguishing the fire in the area where the people were trapped, in an effort to save all possible lives.

Cause of the Fire.

As soon as the fire was under control, Mayor Mortensen of Hartford authorized the Fire Marshal to conduct an investigation of the fire. This was started immediately and continued at the circus ground until 11 P.M., when the investigation was transferred to the State Fire Marshal's office. Newspapers have reported that the cause of the fire has been determined, but this information as well as many other technical details is being held for presentation to the State's Attorney. However, the point of origin is definitely known and the fire is generally attributed to careless smoking.

At the point where the fire started the sidewall canvas was supported by a wooden framework. This framework was in the shape of an inverted V of approximately 2 by 4-inch timbers. This was braced by a sill of about 1 by 4-inch board mortised into the uprights at either side. At the left hand side of this inverted V the structural members had been charred through over an area about 5 inches long. This was considered unusual as it showed an intensity of fire much more serious than evidenced at other places close to the point



International.

The grim ruins of the 1½-acre tent. One of the animal chutes leading to the large cage may be seen at the left center. Most of the loss of life occurred in front of the stands at the left.

of origin. It has been observed that the seats nearest where the fire started were the least damaged. It is reasoned that the wooden structural members should have been less flammable than the sidewall canvas which was so quickly consumed, and therefore this portion of the framework should not have been subjected to the intense localized exposure indicated by this evidence of severe heat at the immediate spot where the fire started.

It has also been observed that a match or cigarette could have smoldered for several minutes in the dried grass at the point of origin before the fire extended to the sidewall canvas and attained sufficient headway to attract attention.

It was recalled during the investigation that the same circus had suffered a serious fire of believed incendiary origin when a menagerie tent was destroyed at Cleveland, Ohio, on August 4, 1942. Negro roustabouts had reportedly confessed setting this previous fire after being discharged from employment. However, a number of circus hands questioned after the Hartford fire reportedly expressed the opinion that the Cleveland fire was due to a locomotive spark or some other external cause. Electricity has been ruled out as a possible cause of the Hartford tragedy, as cables entered the tent at a point remote from where this fire started.

However, under normal circumstances the immediate cause of this fire seems immaterial, as the flame once started by any common cause of fire could have had the same results once the highly flammable canvas ignited, irrespective of the source of ignition.

Flameproofing of Canvas.

The practically new canvas of the "big top" had no flameproofing. It had been processed against water by the use of paraffin applied with gasoline as a solvent. This was done late in April. It was said to have been the time-honored method of waterproofing used by the circus. The gasoline solvent undoubtedly had evaporated prior to the date of the fire, although possibly some petroleum residues may have remained with the paraffin waterproofing. It is reported that a circus "big top" had been destroyed in a previous fire in 1912 at Sterling, Illinois, when sparks from an exposure fire ignited the paraffin coated canvas. Fortunately on that occasion the fire occurred shortly before the show and the crowd was refused admittance to the tent. On March 5, 1929, a huge tent housing the Los Angeles Auto Show was destroyed by a fire of unknown origin, which caused \$1,500,000 loss. Some 2500 patrons, who represented only a small fraction of the reported capacity of

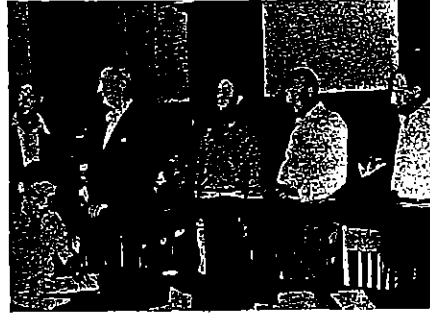
the tent, escaped without fatalities.

It is probable that one aftermath of this fire will be the adoption of ordinances requiring the flameproofing of tents used for various circus shows, and carnivals. While no treatment of combustible material such as canvas can make it actually "fireproof," it is possible to apply flameproofing chemicals so that the canvas not previously treated with wax or paraffin, cannot be ignited by the flame of a match or any similar minor source of ignition. The practical difficulty with most flameproofing treatments has been that the chemicals would dissolve in water and after continued exposure to the weather they would be washed out. This difficulty has been overcome by certain manufacturers of flameproofed canvas who combine effective waterproofing with the flameproofing and produce a product which retains its fire-resistant properties for the normal life of the canvas. It is reported that such treated canvas is used extensively by the Army and Navy; it is also used for awnings, and for tarpaulins to protect railroad shipments.

Such flameproofed canvas is entirely different in its fire behavior from ordinary canvas used for tents. Ordinary canvas is frequently treated with paraffin or some other waterproofing compound which tends to increase its naturally high flammability.* The only practical method of determining the flameproof qualities of canvas is to make a fire test on a sample. This would involve cutting out sections of the tent for a test, necessitating subsequent patching. It is not surprising that fire inspectors have not made such tests on circus tents which are customarily erected only a few hours before they are used for public performances.

Underwriters' Laboratories, Inc., list flameproof fabrics made by two different manufacturers. These fabrics are chemically treated. The product is comparatively difficult to ignite and does not propagate flame, even when in drafts, beyond the area exposed to the source of ignition. Smouldering combustion which occurs on ignition may spread in folds of such fabrics, but does not extend beyond the area exposed to ignition.

*The N.F.P.A. has a standard on the Flameproofing of Textiles.



International.

Five of the circus officials were arrested on warrants for manslaughter.

Damage and Loss.

Estimates of loss to circus property varied from \$200,000 to \$300,000, including destruction of the main tent said to be valued at \$50,000. According to reports the circus was extensively insured against both fire damage and liability, although the full amount of coverage has not yet been reported. The city of Hartford has attached all of the circus property in the city not destroyed by fire, except the menagerie animals (which are hearty eaters) in an effort to prevent removal of values which might be used to meet various claims. It was reported in the press that within a week of the fire papers had been served by individuals asking a total of \$497,000 in damages. Later damage claims reached \$1,100,000. The city was co-defendant with the circus in most of the actions. Judging from previous fire disasters, life insurance and social security claims in a disaster of this sort may reach a sizable sum, even though women and children, who suffered most of the casualties in the Hartford fire, seldom have as much insurance protection as would be the case with an equal number of men.

Indictments.

Subsequent to the fire, five circus officials have been indicted on manslaughter charges, but all were released on bail amounting to \$10,000 to \$15,000 each. Hearings on these indictments have been set for July 19. It was not known whether other indictments would be returned.

Corrective Measures.

Col. Edward J. Hickey, Connecticut State Fire Marshal, took prompt action to prevent similar disasters in the future. Another circus visiting the state was compelled to remove the top canvas of its main tent and a detail of 50 firemen stood by with pumpers and charged hose lines during performances.

Likewise, it is reported that Mayor Mortensen plans to appoint a body of distinguished citizens to investigate the operations of the various city departments in relation to the disaster. It seems quite likely that one result will be the strengthening of the fire prevention ordinances along lines previously recommended by the Hartford Fire Prevention Bureau. More adequate staffing of the Fire Prevention Bureau is another urgent need. This important bureau, which is an adjunct of the Fire Department, has been chronically understaffed considering the large volume of inspections, records, and permits it is called upon to handle. The excellent work accomplished by the Bureau under these handicaps is largely due to the energy and devotion of the small fire prevention staff. This is a condition not alone peculiar to Hartford, as Fire Prevention Bureaus throughout the United States have had a marked curtailment as fire departments have felt the pinch of manpower since the start of the war. In a number of cities the fire prevention staff has been completely eliminated and all inspectors have been sent back to active fire fighting.

Conclusions.

Perhaps the most concise summary of lessons from this fire was that published editorially in the *Hartford Times* for July 12, as follows:

"To make sure that such a disaster shall not be repeated the following are absolutely essential:

"1. Maximum fire-resistant treatment of material used for tents housing circuses or other large gatherings of people, plus frequent inspections to assure that the treatment remains effective.

"2. Provision of numerous unobstructed exits from all parts of the enclosure, regardless of how much such exits may reduce seating capacity of the grandstands.

"3. Restriction, even prohibition of smoking. Already smoking is forbidden in crowded stores; it is much more necessary to forbid it in all places where large crowds gather for amusements."

There can be little doubt that like all great disasters, such as major fires and conflagrations, a combination of unfavorable circumstances was present to formulate a disaster. The circus had played thousands of performances under substantially similar arrangements without difficulty. It just happened that at Hartford the canvas was ignited supposedly from an accidental fire at a spot close to the main entrance at a time when the wind from the southwest was in a position to push it through the tent, and at a time when the exits for the north side of the tent were seriously obstructed.

It is, however, felt that under other circumstances the disaster might have been much worse. A few minutes prior to the start of the fire the main exit aisle was occupied by the parade of more than thirty elephants. Had the blaze occurred at that time and sent the giant beasts terror-stricken among the audience the toll could have been greater. Likewise, had the fire occurred at night and the crowd been forced to flee from the tent through the maze of tent pegs and ropes into the night the loss of life might have been many times greater despite the use of numerous floodlights on the grounds.

Proper exit facilities unobstructed at all times during the performance and flame-proofing of the tent canvas would have prevented this loss of life from fire and panic, although it is doubtful that a tent can ever be considered as safe for large audiences as a well-constructed exhibition building. Severe lightning and windstorms, and the danger of escaping wild animals, present a danger of panic conditions, particularly now that the public is aware of the heretofore unappreciated dangers of a circus performance.

Treatment of the Injured.

The following article, reprinted from the *Hartford Times* of July 12, gives an account of the way in which the more than 200 seriously burned circus patrons received medical aid.

Preparations for War and Cocoanut Grove Experience Prove Boon to Scores of Injured in Circus Tragedy Here.

Many of the badly burned casualties of Hartford's circus catastrophe will owe their lives to the grim tragedy of war, and to the disastrous fire in Boston's Cocoanut Grove.

Patients streaming into the Municipal Hospital Thursday afternoon, with 25 to 75 per cent of their body surface severely burned, could not have been cared for before the war. Plasma, the all-important life-saver, would not have been on hand in adequate amounts, nor would it even have been available, for the public has only recently become educated to the necessity of blood donation. Without plasma the mortality rate would have been increased 50 to 60 per cent, perhaps even 90 per cent, doctors on the scene say. One of the greatest lessons learned from war experience and from the Boston fire was the absolute necessity for speed, for the generous use of plasma, and for oxygen.

When the first call for ambulances came in to the Municipal Hospital from the Police Department, no one could guess at the extent of the fire, nor foresee the great number of severely injured. In preparation for any exigency, however, every department of the hospital was immediately mobilized. Each floor was directed to send the maximum number of nurses which could be spared to the admitting room; doctors and nurses off duty were called back; extra nurses and internes were requested from Hartford and St. Francis Hospitals, and transported almost immediately to the Municipal Hospital by the Red Cross Motor Corps:

As the staff doctors, internes and nurses on duty brought supplies of morphine and plasma and other necessary equipment to the admitting rooms, calls were still going out from the hospital office to the Red Cross for help from its volunteer services, to the Hartford War Council, to the list of the visiting staff of doctors.

Within five to ten minutes after the first call came in, the hospital roads and grounds were swarming with every available ambulance from Hartford and vicinity. Two staff doctors, each with two nurses as assistants, met the casualties at the door, made a quick estimate of the extent of the burns of each, considering body surface injured and intensity of the burns, prescribed immediate care and directed distribution of the patients.

Ambulatory cases were sidetracked to the out-patient clinic rooms, treated on the spot, and sent home. All those needing hospitalization were given morphine immediately during the initial examination, their clothes were cut off, they were wrapped in sterile sheets, and the injection of plasma was started as soon as possible.



International.

The Morgue. Three days after the fire 32 bodies were still unidentified.

While the mobilization of hospital facilities was getting under way, scores of doctors from all parts of the city and state were streaming into the hospital in answer to the radio appeal for medical help. Within an hour or two after the first patient arrived, an estimated 60 doctors were working throughout the hospital.

Physicians were organized in plasma and operating teams of two, to start the flow of plasma into injured bodies in whatever way possible, to allay shock, the initial and perhaps most vital effect of severe burns. If injury was too severe to permit injection of plasma in the usual way, the patients were taken immediately to the operating rooms where a vein could be isolated by incision and the flow of life-giving plasma started. Then the more severe cases were put into oxygen tents. Doctors and nurses worked according to the pattern outlined by doctors in attendance following the Cocoanut Grove fire, morphine, plasma and oxygen were administered in the initial step; vaseline dressings were applied; stimulants were given by teams and tetanus anti-toxin administered to those who could take it.

While the medical staff gave immediate care to the casualties, members of the hospital's social service department were collecting and recording whatever identification data possible, with details of care already given, and tagging each patient. Within a few hours after the fire, a nurse's aide had been allocated to each patient and a graduate nurse to every one or two. Later in the evening family visitors were permitted, one to a patient.

After the patients had been transferred to the wards upstairs, medical teams circulated through the wards to evaluate the cases from

the medical point of view, considering heart, lung, and special conditions such as diabetes, and to prescribe further care.

At no time during the emergency did any needed drug run short. The hospital was well stocked with blood plasma and penicillin since the equipping of its bomb casualty rooms. Thirty-six units of plasma were on hand at the hospital, and more was obtained from the Red Cross, the government, Army and drug houses before the initial supply was exhausted. An estimated 150 units of plasma and of blood were used during the first four days, and it is still being administered in many cases.

Since penicillin was not used immediately in most cases, the amount used in the emergency cannot be predicted. Two orders for five million units have been received from drug laboratories, to supplement the hospital's 3,800,000 units on hand. All patients were placed routinely on sulfa drugs the first night, and this treatment was continued for 24 hours. Then all patients with fever were placed on penicillin.

Between 300 and 400 nurse's aides offered their services, and those who couldn't be immediately put to work were asked to stand on call. On Friday there were 332 on duty in the city.

While medical workers were absorbed in their grim task in the upper floors of the hospital, the regular service staff was busy trying to care for the hundreds of extra workers as well as the patients. The laundry staff voluntarily worked throughout their free week-end to keep the hospital supplied with clean sheets, doctors' and nurses' uniforms, and sterile equipment of all kinds. Volunteers from the Red Cross dieti-

tian's aides and the Rolling Kitchen turned to with the hospital kitchen staff to feed the army of workers busy throughout the first night.

By 5 p.m. of the afternoon of the fire, seven extra telephones had been installed in the hospital, and extra switchboard operators placed on duty. Hugh electric fans have been installed in all corridors to ease the discomfort of the current heat wave, and hand fans were supplied so that each patient can be kept cool 24 hours a day by the attending nurse's aide. Oxygen tents were sent in by other hospitals, bringing the total in use at one time to about 40.

All patients admitted to the hospital, numbering 143, were treated even when they seemed beyond medical aid. As the strain lifted later in the evening, and it could be determined that certain patients could be moved without danger, a number were transferred to Hartford and St. Francis Hospitals to ensure the maximum of medical care for each.

A group of six fourth-year students from Yale Medical School, skilled in administering plasma and giving blood transfusions, came on Friday with a graduate interne and technician to assist in meeting the heavy demand for blood analyses. They will remain here for a week or more, working in shifts with the hospital staff. A committee of physicians who had charge of the Coconut Grove casualties came to Hartford when first word of the fire was received, to be on hand for consultation and assistance.

The hospital will depend for some time upon the volunteer efforts of many agencies, and the need for plasma and whole blood will be a continuing one, for many of the patients will be hospitalized for weeks or months.

Circus Fire Safety.

By Robert S. Moulton,

Secretary, N.F.P.A. Committee on Safety to Life.

Following the Hartford circus tragedy, fire protection authorities throughout the country have been concerned with the establishment of appropriate measures to prevent similar fires in other circuses. There are many inherent hazards in circus operation which cannot be completely overcome by any practicable measures, but various steps can be taken to reduce the hazard. The following suggestions indicate how existing N.F.P.A. standards may be applied to minimize the fire and life hazards. In most instances it should be possible to apply measures such as these without the necessity of enactment of any new legislation, for most cities have codes

or ordinances applying to various aspects of life safety from fire in places of assembly, which broadly interpreted can be applied to tents and other temporary structures as well as to places of assembly housed in permanent buildings.

1. Exit arrangements should comply with the standard provisions of the N.F.P.A. Building Exits Code or with the local code which in many cases will be found to have provisions substantially equivalent to the Building Exits Code. This specifies for places of assembly on the ground level one 22-inch unit of exit width for each 100 persons, and includes provisions on all exit details.

2. Exits should be maintained free and unobstructed at all times when the tent is occupied. No temporary use of exit ways for performers, animals, ticket booths, or for any other purposes should be permitted to obstruct the minimum required exits. If operating requirements call for the temporary use during performances of exit spaces there should be provided sufficient additional exit facilities so that the minimum required exit width will be freely available at all times. Adequate aisle space must be maintained at all times to reach exits and, where necessary, fences or other suitable barriers should be erected to prevent encroachment upon the necessary aisles by parades of animals or other features in connection with the performance. If adequate exit facilities cannot be secured in the normal way through the center of the tent, stairs or runways may be erected at the rear of the stands, with adequate aisles leading thereto, so that it will be possible to escape directly outside of the tent at all points.

3. Circuses should not be permitted to operate except under effective supervision from the appropriate municipal or state authorities, with firemen or police or both on duty to make sure that exits are properly maintained, that no unusual features of fire hazard are introduced, etc.

4. All unnecessary combustible material should be eliminated from the tent and its immediate surroundings prior to every performance and where necessary collection of papers and rubbish should be continuous during performances. No papers or rubbish should be allowed at any time to accumulate under stands. All dry grass should be cut or burned before the tent is erected.

5. Tents, if possible, should be made of approved flameproofed canvas. Their flameproof qualities should be tested under fire department or other appropriate local supervision immediately prior to the opening of performances in any location. The method of testing given in the N.F.P.A. standards on Flameproofing of Textiles should be found suitable for such

use. This will entail cutting out samples for tests, but the circus management should be prepared to patch areas of canvas cut out. Existing tents which have previously been waterproofed with paraffin and similar materials probably cannot be flameproofed effectively. In order to permit the use of such existing tents the hazard might be somewhat reduced by having all of the canvas, particularly the side walls near the ground, thoroughly wet down by the fire department prior to the start of each performance, with the wetting repeated at intervals. It should be noted in this connection that there is no assurance that there is any practicable method of eliminating completely the inherent hazard of the use of a canvas tent, but that flameproofing, wetting, or any other measures that may tend to reduce this hazard should be employed. Where weather conditions permit, the operation of a circus without any canvas over the center top portion should be a helpful factor in reducing the possibility of rapid spread of fire internally.

6. An adequate supply of first aid fire extinguishing equipment should be kept on hand ready for use at all times, and employees should be drilled in its effective use.

7. Electric wiring should be in accordance with the applicable provisions of the National Electrical Code.

8. No gasoline, gas, charcoal or other heating or cooking devices (e.g. peanut and popcorn machines) should be permitted in or near the main circus tent.

9. All other tents and enclosures on the grounds should be subject to the same requirements as specified for the main tent, if such other tents or enclosures are open to the public or are near any tents used by the public.

10. Advance arrangements should be made for prompt calling of the nearest fire department in case of fire or other emergency. A desirable plan used in some cases is to have the fire department on duty with charged hose lines.