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DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES  
REGION VIII

FINAL REPORT OF MINOR FIRE DISASTER  
NO. 3 ELKHORN MINE  
POND CREEK POCAHONTAS COMPANY  
EVANSTON, BREATHTT COUNTY, KENTUCKY

December 13, 1952

By

W. R. Park  
Chief, Barbourville Section  
Accident Prevention and Health Division, Region VIII

F. J. Gallagher  
Mining Electrical Engineer

J. D. Farris  
Coal-Mine Inspector

Originating Office - Bureau of Mines  
Barbourville, Kentucky  
W. R. Park, Chief, Barbourville Section  
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INTRODUCTION

A fire occurred in the No. 3 Elkhorn mine, Pond Creek Pocahontas Company, at Evanston, Breathitt County, Kentucky, between 12:00 midnight and 12:45 a.m., Saturday, December 13, 1952, causing the death of four men. Fifty men were in the mine when the fire occurred. Except the four men killed, no one was injured, temporarily imprisoned, or otherwise affected by the fire. The greater number of the third-shift employees remained in the mine and assisted with the fire-fighting operations. One man was injured slightly during the fire-fighting activities, when struck by a piece of falling overhead material. The names of the men killed, their ages, marital status, number of dependents, mining experience, and Social Security numbers are shown in Appendix A of this report. The fire originated in the No. 2 entry (main belt conveyor entry) of 3 butt off west main entries at or near the main conveyor drive. It is assumed that the fire was caused by friction created by a drive pulley running against the stalled belt.

GENERAL INFORMATION

The No. 3 Elkhorn mine is at Evanston, Kentucky, and it is served by the Chesapeake and Ohio Railway Company.

The names and addresses of the principal officials are:

R. E. Salvetti	President	Huntington, West Virginia
J. L. Hamilton	Vice President	Holden, West Virginia
D. E. Bayer	Manager	Evanston, Kentucky
M. M. McCormick	Superintendent	Evanston, Kentucky
C. E. Linkous	Safety Director	Holden, West Virginia
Ken Fields	Mine Foreman	Evanston, Kentucky
Ernest Baker	Safety Inspector	Evanston, Kentucky

The mine was opened in April 1949, by the present operating company, and previous fires or explosions involving loss of life have not occurred. The mine was opened by a 1,300-foot slope and by a 351-foot air shaft into the Elkhorn No. 3 coal bed, which averaged 34 inches in thickness in the areas being worked. The coal is high-volatile bituminous, and the coal bed is practically flat, except for local undulations. At the time of the fire 490 men were employed, of which number 237 worked on the first shift, 200 worked on the second shift, and 53 worked on the third shift. Coal was prepared and loaded on the first and second shifts, and only maintenance and supply crews were employed on the third shift. The average daily production was 2,500 tons of coal, all of which was loaded by shaker conveyors equipped with duckbills. Two mobile loading machines were used for loading rock in entries where roof was being brushed. The coal bed is overlain with laminated coal and fragile shale, which averages 8 feet in thickness. The laminated coal and shale is under a coal "rider", which varies from 12 to 24 inches in thickness. The main roof is massive shale or sandstone. The floor is hard, firm fireclay. The last Federal inspection of this mine was made June 16-18, 1952.

#### MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods. The mine was in the process of being developed by a room-and-pillar method. Main entries were driven in sets of 12 and cross entries were driven in sets of 4. Entries were driven 20 to 26 feet in width and rooms 28 to 32 feet in width. Crosscuts were made at 60- or 80-foot intervals (State permit). Pillars were not being recovered.

Roof in the slope and along the main entries where the roof had been brushed was supported with roof bolts. Holes were drilled vertically on 4-foot centers. Wedge-type bolts, 1 inch in diameter and 72 inches in length, were used. Formerly, 8- by 8- by 3/8-inch steel bearing plates were used. At the time of the investigation, roof ties, 6 inches wide by 18 feet in length, were being used. The roof has a tendency to spall between bolts. In rooms and entries where roof had not been brushed, the adopted systematic methods of timbering required the use of cross bars, supported by four posts (legs). Two cross bars were required to be set for each cut of coal extracted. Safety posts or jacks were required to be set close to the working faces. Timbering rules were well followed generally at the time of the last regular inspection. Extensive timbering had been done in the fire area, particularly near the main belt conveyor drive. Cross bars, on 4-foot centers, had been set, and 4-inch-thick plank lagging was used between the cross bars and the roof.

Explosives. All coal was undercut to a depth of about 7-1/2 feet with shortwall mining machines. Blasting was done on shift with permissible explosives and No. 6 electric detonators, fired with permissible blasting units by designated shot firers.

Ventilation and Gases. The mine is classed gassy in accordance with the Laws of the State. Ventilation was induced by a 6-foot propeller-type fan, operated exhausting. The fan was properly installed on the surface in a fireproof housing. The fan was operated 24 hours a day, 7 days a week. About 190,000 cubic feet of air a minute was circulated. An average of 10,000 cubic feet of air a minute was reaching the last open crosscut in each set of working entries during the last Federal inspection. Two main and seven secondary splits of air were used to ventilate the main workings, and nearly all the haulage roads and trolley wire were installed in intake air. All main conveyor belts were installed in intake air. Permanent stoppings and overcasts were constructed of concrete blocks. Doors were erected in pairs to form air locks, and line brattices were used where necessary. Records at the mine indicated that preshift, on-shift, and weekly examinations for gas and other hazards were made. Two inactive gas wells penetrated the coal bed on this property, one of which was within 350 feet of the west return entries. Reportedly, the wells have been plugged properly. An air sample collected in the main return near the bottom of the air shaft during the last inspection contained 0.08 percent methane, indicating that 185,472 cubic feet of methane was liberated in 24 hours.

All main belt conveyor sections, except one, were ventilated essentially the same as the 3 butt entries. This set of entries was driven four abreast; Nos. 1 and 2 entries were used as intake airways; and Nos. 3 and 4 entries were used as return airways. The intake and return airways were separated by a row of concrete-block stoppings installed in the crosscuts between Nos. 2 and 3 entries. Crosscuts between Nos. 1 and 2 entries and Nos. 3 and 4 entries were not closed. The main belt conveyor was installed in No. 2 entry, and "pony" belts and chain conveyors from face areas were extended to the belt entry. Consequently, intake air coursed through the belt conveyor entry was used to ventilate the face regions. Therefore, smoke and fumes from a fire in No. 2 entry (belt entry) traveled to all working faces in the section.

The last belt conveyor placed in service in the mine has been installed in accordance with recently revised Kentucky State Mining Laws. The revised Laws require that in new belt conveyor installations air coursed through the belt entry be returned direct to the return airway and not permitted to reach working places. If this method of ventilating belt conveyor sections had been used, smoke and fumes from the fire in 3 butt entries on December 13 would not have passed over the four victims.

General Conditions. The haulage slope and the air shaft were damp to wet; the rest of the mine was damp to dry. During the last inspection excessive accumulations of coal dust were not observed. Rock dust had been applied to within 40 feet of the faces, and the applications were adequate. However, excessive coal dust was present on the haulageway

between the slope bottom and the 3 butt conveyor unloading point at the time of the fire, and rock-dust applications at this location were obviously inadequate to render the coal dust inert. This coal dust was loaded and removed from the mine, and the area was well rock-dusted during the fire-fighting activities. Excessive dust was not observed along the roadways or along the conveyor belt in 3 butt entries. No appreciable amounts of coal dust were raised into suspension during the mining operations.

Transportation. Coal was transported from the faces to the mine-car loading points by shaker, chain, and belt conveyor, respectively, then to the bottom of the slope by trolley and cable-reel locomotives and to the cleaning plant on the surface by a belt conveyor. Men traveled on the slope with the aid of an overhead "Ski Tow", and they were transported on belt conveyors to and from the working sections. During the last inspection, clearance over four belts on which men were transported was less than 18 inches at numerous places.

All timbering supplies, belt, chain, and shaker conveyor supplies, rock dust, explosives, and other supplies are delivered from the haulage tracks to the face regions during the third shift by supply and maintenance crews. The supplies and materials are transported on the belts in the butt entries.

Third-shift employees working in a section usually left the conveyor belts running toward the working places, particularly when other men were expected in the section.

Electricity. All of the underground electrical equipment is operated by a 275-volt direct-current supply from three 300-kilowatt rectifiers. The rectifiers are connected in parallel. One substation is located on the surface near the air shaft, and the other two are underground. The load centers are so concentrated that all three substations are comparatively close together. The substation farthest removed from the 3 butt entries, where the fire occurred, is approximately 2,500 feet. All three substations are equipped with circuit breakers set to open at 1,600 amperes, which is suitable overload and short-circuit protection on 300-kilowatt units. However, these circuit breakers are the only automatic overload protection in the direct-current distribution system.

The feeder system consists of 1,000,000 circular mil copper plus 6/0 trolley wire (positive) and 60-pound bonded and cross-bonded track (negative) on the main line, and 500,000 circular mil insulated copper feeders in the butt entries. The butt entry feeders conduct power to belt conveyor, chain conveyor, and shaker conveyor drives and face electric equipment. The feeder lines in the butt entries are well installed on spool-type insulators in brackets secured to cross bars. The

feeder lines, spaced about 10 inches apart, are drawn taut and dead-ended to prevent excessive sag. The manner in which the butt entry feeder lines are installed, by flat-spacing the feeders on cross bars, is pointed out to indicate the remoteness of the possibility of short circuits occurring from roof falls or other means. Furthermore, the length of line and size of feeders are such that the line resistance would readily permit sufficient current to flow to open all three substation breakers on short circuit.

The controls on each butt entry section are so interlocked electrically that all belt conveyors and chain conveyors can be operated from the point at which the final link in the conveyor system (the pony belt) discharges into mine cars or each conveyor unit can be run independently. Also, if any conveyor unit is stopped from the drive end, tailpiece end, or any intermediate point, it cannot be started until the switch used to stop the conveyor is reclosed manually.

The general manager stated that a maintenance program was in effect, which entailed constant attention to belt rollers. The rollers have sealed bearings and the possibility of a fouled roller causing sufficient friction to start the belt burning is another pretty well precluded possibility.

Although the present distribution system is protected by circuit breakers at the substations, it is advisable to use additional breakers at each butt entry, so that more critical overload and short-circuit protection will be afforded since such breakers can be set to function according to the connected butt entry load rather than depending upon the substation breakers, which are set up to handle the full-load capacity of the rectifier unit. Furthermore, such butt entry breakers will assure a degree of sectionalizing the system and minimize total power outages thereby realizing an important operating economy in addition to line protection.

Illumination and Smoking. The underground employees used permissible electric cap lamps for portable illumination underground. Smoking was not permitted or practiced in the mine, and there was no evidence to indicate that smokers' articles were being carried into the mine. The main slope and shaft bottom were illuminated with electric lights. The wiring for the electric lights was installed in conduit, and the light bulbs were installed in vapor-proof enclosures.

Mine Rescue. Ten universal gas masks and six Chemox oxygen breathing apparatus were maintained at the mine. None of the mine personnel had been trained in mine rescue work in recent years. However, a number of mine employees have received such training in the past.

Fire-Fighting Equipment. Water lines were installed along all main haulage tracks, and a water line and valve were maintained at each main belt drive. Water was used to allay the dust formed at each main belt unloading head during the coal-producing shifts. Fire extinguishers were maintained at permanent electrical installations, and a fire extinguisher was kept at each main belt drive. One 90-gallon capacity fire truck, mounted on wheels, was available for emergency use. Large supplies of rock dust were kept at the belt drives, and smaller supplies of rock dust were kept at 200-foot intervals along the belt conveyor lines. Key employees had been trained in the use of the fire-fighting equipment.

Previous Fires in this Mine. A fire occurred in this mine at the drive of the main conveyor in 3 butt entries on December 6, 1952. This fire occurred during the third shift (maintenance and supply shift) while a crew of six men and a foreman were removing supplies from the west entries off 3 butt entries. The supplies and materials were loaded on the "pony" belt in west entries, transported to No. 2 entry of 3 butt entries, and then unloaded near the tailpiece of the main belt conveyor in 3 butt entries; both belts were being operated. After unloading the belt materials, the workmen returned to west entries to help remove power wires.

Apparently, the belt materials were stored too close to the 3 butt belt, and one of the rollers from the material pile fell onto the return side of the 3 butt belt and jammed against the tailpiece pulley, thereby stopping the belt. The drive pulley on the 3 butt belt continued to run, and the friction of the pulley caused this belt to burn at the drive head.

The crew members, after pulling the wire from the west entries, observed smoke on No. 2 entry of 3 butt entries and smelled burning rubber and noticed that the main belt was not running. They had no way of determining the length of time the 3 butt belt had been stalled by the roller wedged against the tailpiece pulley. However, a workman opened the remote control switch on the 3 butt belt motor, and another workman traveled outby in the No. 1 entry of 3 butt entries (intake airway) and extinguished the fire at the belt drive head with five or six bags of rock dust. The fire burned the belt in two pieces, and it was necessary to splice it.

This fire, similar to the one which occurred December 13, at the same location, indicates that it is possible to stall the belt and the drive pulley will continue to run and cause the belt to burn without putting an excessive overload on the 40-horsepower drive motor. The control circuit is equipped with an over-current relay.

## STORY OF FIRE AND RECOVERY OPERATIONS

Activities of Bureau of Mines Personnel. Mr. J. B. Benson, Chief, Norton Branch, was notified of the fire about 6:20 a.m., December 13, 1952, by a telephone message from an official of the company. Mr. Benson immediately informed W. R. Park, Chief, Barbourville Section, of the fire. Inspectors J. E. Jones, J. W. Cromwell, N. L. Adams, R. Lloyd, J. D. Farris, and W. R. Park arrived at the mine about 11:00 a.m., December 13, and Messrs. Farris, Adams, and Park went underground immediately. Inspectors J. S. Malesky, W. R. Stewart, and E. I. Duncan arrived at the mine early Saturday afternoon, and Inspectors D. W. Barger and C. E. Hyde arrived at the mine about 8:00 p.m., December 14, 1952. Conferences were held with various company officials and State Inspectors concerning ventilation changes, plans and procedures to locate the missing men, and plans and procedures to combat the fire and to seal the affected area. Bureau of Mines representatives relieved each other underground so that at least one representative was in the mine 24 hours a day from the time Bureau personnel arrived at the mine December 13, until the fire area was sealed at 10:45 p.m., December 19, 1952.

On Sunday, December 20, 1952, Bureau personnel accompanied State and company officials into the mine to examine the fire seals and area and to collect air samples. Analyses of several of the air samples showed that the fire seals were effective, and plans to patrol the fire area and resume operations in the rest of the mine were discussed by Local Union officials, company officials, and representatives of the Kentucky Department of Mines and Minerals and the Bureau of Mines.

An investigation of the fire was conducted December 29, 1952, by a group of men, including four Bureau of Mines representatives.

Story of Fire. The mine was operating normally; and no unusual conditions, as far as could be ascertained, had been reported prior to the time of the fire.

The third-shift workmen, supply and maintenance men, entered the mine by way of the slope about 11:20 p.m., December 12, 1952. The second-shift production crew from the 3 butt entries arrived at the slope bottom shortly after the third-shift employees. No unusual conditions were observed by the second-shift employees when they rode the main belt conveyor out of the 3 butt entries. Third-shift employees were given work assignments at the slope bottom, and four men (the victims) were instructed to go to the inby working section in 3 butt entries and begin moving the equipment from the worked-out shaker conveyor places and prepare new set-ups. These four men were informed that two additional men and a foreman would follow them to an outby working section in 3 butt entries in a short time.



The four men (victims) left the slope bottom about 12:00 midnight, to walk to 3 butt entries. The two men, who were to work in 3 butt entries later, Reed Spencer and Clarence Tackett, left the slope bottom between 11:45 p.m., and 12:00 midnight, to move a shovel trough and a feeder trough to another working section, north main grade. Spencer and Tackett delivered the troughs and returned to the mine-car loading point for 3 butt entries about 12:30 a.m., December 13. The "pony" belt between the mine-car loading point and the main conveyor belt in 3 butt entries was running in the reverse direction (toward the working places), and Spencer and Tackett boarded the "pony" belt to ride to the 3 butt entries. As the two men approached 3 butt entries, they encountered dense smoke. Spencer instructed Tackett to open the master switch controlling the conveyor equipment in 3 butt entries; this switch was installed at the mine-car unloading point. Spencer began throwing rock dust in the direction of the fire and on the roof in the area, but he was not able to get closer than within 40 feet of the main conveyor drive because of the intense heat and heavy smoke.

After applying rock dust for a short time, Spencer and Tackett tried to telephone the four men (victims) in by the fire, but they were unable to contact them. Spencer and Tackett decided they should inform officials of the fire, and they left the fire area and returned to the slope bottom, where they encountered Ed Tackett, foreman, and several other employees. Spencer then traveled out the slope to the surface and advised the general mine foreman, Ken Fields, of the fire. Mr. Fields made arrangements to have other company officials and State inspectors notified concerning the fire and went underground immediately.

Ed Tackett, foreman, learned of the fire about 12:45 a.m.; he and several employees traveled to 3 butt entries immediately where they were joined by additional officials and employees in a short time. Ed Tackett and the men began applying rock dust by hand, but heavy smoke and intense heat kept the men from getting close to the fire. A stopping between Nos. 2 and 3 entries of 3 butt entries was removed to short-circuit part of the air from the fire, and several 2-1/2-gallon capacity fire extinguishers were used on the fire.

When the general night foreman arrived in 3 butt entries, a high-pressure rock-dusting machine was used to distributed rock dust in the fire area, and arrangements were made to begin applying water on the burning material. The fire appeared to be near the main belt conveyor drive, but none of the men was able to approach closer than to the spill boards on the "pony" belt.

As a result of the fire, four men died and about 200 feet of the belt, the belt drive, control cables, and other power wires in the fire area, and about 400 feet of feeder cable were destroyed. Furthermore, roof supports in the fire area were destroyed and two working sections were inundated by water pumped on the burning materials. These sections will be dewatered promptly, and equipment and supplies from the sections can be recovered without affecting the fire seals.

Recovery Operations. Shortly after the general mine foreman, Ken Fields, and the superintendent, M. M. McCormick, arrived in the fire area, universal gas masks and Chemox oxygen breathing apparatus arrived from the surface. Heavy smoke was encountered in No. 1 entry of 3 butt entries, as the crosscuts between Nos. 1 and 2 entries had not been closed. A group of men began closing these crosscuts temporarily with brattice cloth, and an unsuccessful attempt was made to short-circuit the air in by the fire, from Nos. 1 and 2 entries to No. 3 entry. The main conveyor belt was severed about 75 feet in by the main drive. While some of the officials and employees were applying water and rock dust directly on the burning materials, other officials and employees began clearing the smoke from No. 1 entry of 3 butt entries by closing the crosscuts between Nos. 1 and 2 entries with brattice cloth. As the entry was cleared, the area was searched carefully for the four missing men. Shortly before 6:00 a.m., Saturday morning, two of the victims were located just in by the mouth of a chain conveyor room, turned left off No. 1 entry. These men were lying face down, with their heads pointing toward the face of the chain conveyor room, apparently dead. The victims were examined, and although a pulse beat could not be located and their bodies were becoming stiff and cold, artificial respiration was administered to each victim for 30 to 45 minutes. While the artificial respiration was being administered, other men examined the two conveyor places and tried to examine parts of No. 2 entry near the conveyor tailpiece and telephone. Dense smoke prevented a careful examination along the belt conveyor in No. 2 entry, but the examination of the two conveyor rooms indicated that the four supply men (victims) had not likely reached the working faces when they were overcome.

While the artificial respiration was being administered, the rescue party was notified that the fire had burned through a crosscut between Nos. 1 and 2 entries, the roof was "working" in the crosscut and in No. 1 entry, and they (rescue party) should retreat immediately. The rescue party carried the victims and returned to the mouth of No. 1 entry promptly, and a few minutes after this group of men returned to the entrance to 3 butt entries, a roof fall occurred in No. 1 entry, which closed the entry completely.

Late Saturday afternoon, ventilation was changed to permit intake air to be coursed through each of the four entries of 3 butt entries. A number of attempts to examine the area in No. 2 entry along the main belt were made, particularly in the area near the conveyor tailpiece, supply hole, and telephone. The examinations were made by means of line curtains and universal gas masks and Chemox oxygen breathing apparatus, but the dense smoke traveling in No. 2 entry prevented a careful examination.

Early Sunday morning, a major ventilation change was made in 3 butt entries by means of erecting six stoppings and making a small opening in a permanent stopping along west main entries. This ventilation change caused intake air to be coursed through Nos. 2, 3, and 4 entries of 3 butt entries and part of the return air to be coursed in No. 1 entry.

Shortly after the ventilation change was affected, smoke in No. 2 entry in the area near the telephone and belt conveyor tailpiece began to disappear, and it was possible to explore the area without protective equipment. The two remaining missing men trapped by the fire were located along the belt conveyor in No. 2 entry about 40 feet outby the telephone. They were lying face down with their heads facing outward toward the belt drive. These men were located about 8:00 a.m., and moved to the surface immediately.

After the men were located, a greater effort was made to extinguish the fire by direct attack. The fire was burning in Nos. 1 and 2 entries and in the crosscuts connecting these entries. Water lines were extended so that water could be applied on the fire on each of four sides; at the outby and inby end of the fire in No. 1 entry and at the outby and inby end of the fire in No. 2 entry.

The "pony" belt in No. 2 entry was placed in operating condition, and two conveyors, a shaker and a chain conveyor placed on opposite sides of the entry, were extended from the "pony" belt to the outby edge of the burning material in No. 2 entry. The fire material was cooled with water and loaded by hand onto the conveyors for transportation to the surface. The loading of the fire materials was continued 24 hours a day until Tuesday, December 16, when a Goodman 860 caterpillar-mounted loading machine was moved to the fire area, and the material loaded with this machine onto the conveyors.

Sufficient progress at loading the burning material was not being made, and during a conference of State, Federal, and company officials at 10:00 a.m., Friday, December 19, it was decided to enclose the fire area with concrete block seals immediately.

Loading of the burning materials was discontinued, and preparations were made to start erecting the fire seals at 11:20 a.m., December 19. The fire was enclosed completely by means of 15 concrete block seals at 10:45 p.m., and all persons were out of the mine at 11:00 p.m., December 19.

At 1:00 p.m., Saturday, December 20, a group of seven persons, consisting of three company officials, two State inspectors, and two representatives of the Bureau of Mines, entered the mine, examined the fire seals, and collected a number of air samples for analysis. The seals appeared to be effective, and the party returned to the surface promptly where several of the samples collected at the outby seals in No. 2 entry of 3 butt entries were analyzed by means of a portable water Orsat. The analyses of the samples were fairly consisted and showed that the atmosphere in the sealed area contained about 14 percent carbon dioxide, 1/2 percent carbon monoxide, 3 to 5 percent methane, and less than 1/2 percent oxygen. The same party entered the mine about 1:30 p.m., Sunday, December 21, and collected samples at the same seal. The analyses of these samples indicated that there had been practically no change in the atmosphere in the sealed area.

After the samples were analyzed on Sunday afternoon, a conference was held by company officials, State inspectors, representatives of the Bureau of Mines, and Local Union officials. In this conference, it was decided that the fire was being contained successfully and that it would be reasonably safe to resume operations in the rest of the mine on the following day. Company officials agreed to patrol the enclosed area 24 hours a day and keep a written record of the examinations. Two additional fire seals were built to reinforce the original seals. During the conference on Sunday afternoon, it was decided that because of the forecoming holidays, the official investigation of the fire would be conducted on Monday, December 29, 1952.

Samples of the atmosphere from the sealed area were collected on the dates shown below. The results of the samples analyzed in the gas laboratory of the United States Bureau of Mines at Pittsburgh, Pennsylvania, are as follows:

Bottle No.	Date	Location	Co 2	O 2	CO	CH 4	N 2
E-826	12-20-52	No. 3 Seal	12.9	2.6	2.0	9.9	72.6
E-827	12-20-52	No. 3 Seal	13.5	1.5	2.1	10.7	72.2
D-6500	12-21-52	No. 3 Seal	13.5	1.9	1.5	6.2	76.9
D-6501	12-21-52	No. 3 Seal	13.7	1.5	1.5	6.3	77.0
C-9443	12-23-52	No. 2 Seal	13.6	1.3	1.3	3.4	80.4
C-9444	12-23-52	No. 3 Seal	11.2	4.7	1.0	4.0	79.1
E-864	12-29-52	No. 2 Seal	12.21	3.97	0.93	2.52	80.37
E-825	12-29-52	No. 3 Seal	13.00	3.15	1.15	1.98	80.72

These results show larger amounts of oxygen, methane, and carbon monoxide in the atmosphere from the sealed area than were indicated by the average results of samples analyzed by means of a portable water Orsat at the mine.

Company officials stated that only a limited amount of coal was left in 3 butt entries and that no effort would be made to reopen the sealed area in the near future. They mentioned further that analyses of the atmosphere from the sealed area would have to indicate that the fire was extinguished completely before any consideration was given to opening the enclosed area.

The efforts of company officials and employees during the recovery and fire-fighting operations were highly commendable. Unlimited amounts of water, materials, supplies, equipment, and men were available at all times during the recovery and fire-fighting operations.

#### INVESTIGATION OF CAUSE OF FIRE

Investigation Committee. The investigation of the fire was begun about 10:30 a.m., Monday, December 29, 1952, by representatives of the United States Bureau of Mines, Kentucky Department of Mines and Minerals, Pond Creek Pocahontas Company, United Mine Workers of America, Big Sandy Elkhorn Operators' Association, and Bituminous Casualty Company. The investigation consisted of an examination underground and a conference on the surface where company employees and officials were interrogated regarding mine practices and conditions and events immediately before and after the fire was discovered. The interrogation was resumed and completed in the headquarters of the Kentucky Department of Mines and Minerals at Lexington, Kentucky, on January 2, 1953. The names of the persons in the investigating party on December 29, are:

##### Pond Creek Pocahontas Company

D. E. Bayer	Manager
C. E. Linkous	Safety Director
A. J. Bartlett	Director of Industrial Relations
M. M. McCormick	Superintendent
Ernest Baker	Safety Inspector
Ken Fields	Mine Foreman
James Crider	Electrician

##### United Mine Workers of America

Bart Bloomer	Safety Director, District 30
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Big Sandy Elkhorn Operators' Association

J. D. Mosgrove                      Safety Director

Bituminous Casualty Company

Sam Williams                      Special Representative  
C. J. Ladson                      Inspector

Kentucky Department of Mines and Minerals

A. D. Sisk                      Chief  
W. H. Roll                      Administrative  
                                 Assistant Chief  
Elmer Layne                      Senior Inspector  
Pearl Elkins                      Senior Inspector  
Frank J. Forsyth                  Electrical Inspector  
                                 and Engineer  
Walter Williams                  District Inspector

United States Bureau of Mines

J. B. Benson                      Chief, Norton Branch,  
                                 Accident Prevention and  
                                 Health Division  
W. R. Park                      Chief, Barbourville Section  
                                 Accident Prevention and  
                                 Health Division  
F. J. Gallagher                  Mining Electrical Engineer  
J. D. Farris                      Coal-Mine Inspector

Evidence of Activities. Exactly what the four victims were doing at the time of the fire will probably never be known, but previous practices and conditions in the area indicate that the four employees (victims) had not reached the working faces but were near the telephone at the main belt conveyor tailpiece when they were trapped by the smoke and fumes of the belt fire. Evidence indicates that the "pony" belt and main belt were running toward the entry faces when the fire occurred. It is also evident that the original fire was extremely large or became extremely large in a matter of a few minutes and that the four victims had practically no chance to escape after becoming aware of the fire.

Probable Point of Origin. It is apparent that the fire originated at the drive head of the main belt conveyor in No. 2 entry of 3 butt entries. One of the men who was riding on the "pony" belt into 3 butt entries and who was first to discover the fire said he saw flame near the bottom of the main belt drive.

Summary of Evidence. The evidence leading to the conclusions concerning the probable point of origin, cause, and rapid spread of the fire is based on observations of Federal investigators, State officials, and company officials and employees; and information obtained during hearing conducted on December 29, 1952, and January 2, 1953. This evidence indicates that the fire was either of electrical origin or was caused by friction.

The investigators' belief that the fire was not electrical in origin was indicated by the manner in which the feeder lines were installed, which practically precluded the possibility of short circuits on the supply system. The good installation of the butt entry feeder lines, flat-spacing the feeders on cross bars, has been mentioned previously to indicate the remoteness of the possibility of short circuits occurring from roof falls or other means. Furthermore, the length of line and size of feeders are such that line resistance would readily permit sufficient current to flow to open all three substation breakers on short circuit. Additional evidence that the feeder line was not short circuited was indicated when no flash occurred when the line switch in the 3 butt feeders was pulled. If this feeder line had been short circuited, an intense arc would have appeared as the switch was pulled, unless the short circuit had burned itself clear and there was no indication of such burning anywhere in the feeder line examined. The substation breakers did not open during the period of the fire. Also, the outer rubber jacket of the leads entering the control box and the insulation on the individual conductors were badly burned outside the box. However, within the box it could be seen that the insulation on the leads was untouched by flame indicating that there had been no fire within the sheet metal control compartment. The insulation on the drive motor field coils and armature were burned apparently from external heat. The motor commutator was smooth and in good condition, as were the brush faces. If the fire had originated from an electrical source within the motor, the commutator bars would show evidence of pitting or blistering from arcs, and the brush faces would probably be spotted from arcing. Furthermore, the motor and control compartment were so enclosed and located that it would be difficult for a fire within either one to extend to the belt before it could be detected and brought under control in the short period of time, which elapsed from when the victims entered the section and the discovery of the fire. Also, examination of the over-current relay and small fuses in the control box indicated that an excessive overload or short circuit had not occurred in the circuit.

Conditions, practices, and evidence to support the conclusions that the fire was caused by friction are:

The man who first discovered the fire stated that the "pony" belt on which he was riding toward the 3 butt belt head had been left running by the victims after they had ridden into the 3 butt section. Also, he stated that it was customary for third-shift employees to leave

belts running toward the working places when other men were expected to follow into the section. Therefore, he assumed, as did all other interested persons, that the 3 butt belt was running, as it was a standard practice to keep the belt operating, but smoke from the fire was too dense to see whether or not the belt was actually running.

The belt near the drive and the fabric covering on the drive pulleys were burned completely. Tremendous amounts of smoke were made by the burning materials, and excessive flame was not apparent during early stages of the fire. Flame was observed first near the bottom of the belt drive, and as the belt was running toward the working faces, the underside would probably ignite first because the drive pulley would be pulling on the return side of the belt. Other fires of this nature have proven that the friction created by a drive pulley running against a stalled belt will quickly cause the rubber to become a molten mass. The pulley then runs freely in a bath of molten rubber, which quickly ignites and give off dense clouds of smoke. People with experience in this type of fire proclaim that such a fire can reach raging proportions in a very few minutes.

The fire at the main belt drive in 3 butt entries on December 6, 1952, indicated that it is possible to stall the belt and the drive pulleys will continue to run and cause the belt to burn without putting an excessive overload on the 40-horsepower drive motor.

A control switch used on many belt installations which will automatically open the drive-motor control circuit when the belt slows or stops was not used in this mine. The switch contacts open and close by centrifugal action initiated by the rotation of a belt roller. The present type control can be used with the addition of a time relay in conjunction with a centrifugal-action switch. The contacts of the centrifugal-action switch close as the roller to which it is attached comes up to normal belt speed at which time the regular control switch opens and the centrifugal switch takes over in the motor control circuit. When the belt slows down to a predetermined speed, the roller speed is likewise decreased and the roller switch or centrifugal switch contacts open the motor control circuit and the motor stops. It has been found in practice that an effective place to install such a switch is on a roller on the return or underside of the belt about 20 to 30 feet in by the belt head; a point at which the belt exerts fairly constant pressure on the rollers and is not too far from the motor or control compartment. Such a switch would prevent a recurrence of the type of fire caused by friction of a drive pulley running against a stalled belt. The switches are adjustable to operate at any desired percentage of decrease in belt speed in order to take care of belts having adjustable speeds. The belt in this case had such an adjustable speed arrangement between 225 feet a minute to 175 feet a minute. The speed variation was accomplished through a manually operated rheostat in the shunt field circuit.



Cause of Fire. Representatives of the United States Bureau of Mines who investigated the fire are of the opinion that although there is a remote possibility of electrical origin the fire was caused by friction created by the drive pulleys continuing to turn against the stalled belt. Because of the destruction of evidence caused by the fire and by extensive roof falls, it was impossible to determine what obstruction or condition caused the belt to stop.

#### RECOMMENDATIONS

The following recommendations are submitted with the belief that compliance with them will minimize the number and severity of belt fires at this and other mines.

1. Centrifugal or roller switches should be installed in the control circuits of all belt conveyor drive motors in order to open the control circuit and stop the motor if the belt should slow down or stop because of obstructions.
2. Circuit breakers with overcurrent trips should be installed in all butt entry feeder circuits to assure excessive overload and short circuit protection on butt entry feeders.
3. Plan for procedure in event of fire or other emergency should be adopted, and all officials and employees should be instructed accordingly.
4. All employees and officials should be cautioned concerning the dangers of mine fires and the necessity for locating sources of smoke and fumes immediately. Men should move to safe locations in intake air as quickly as possible when smoke is observed in air current, rather than wait for the smoke to clear or the burning material to be located.
5. Where feasible in present belt conveyor sections, air coursed along the belt entry should be moved directly to the return airway without passing through working places, and power cables should be installed in an intake airway other than the belt entry.
6. Water lines should be installed along the full length of belt conveyors with water taps and valves and fire hose and fire-hose connections provided at suitable intervals not exceeding 300 feet.
7. Self-rescuers should be carried on the person of all underground employees and officials, and all officials and employees should be trained in the care, use, and limitations of the self-rescuers.

# ACKNOWLEDGMENT

The cooperation of the company officials and employees and the representatives of the Kentucky Department of Mines and Minerals, United Mine Workers of America, Big Sandy Elkhorn Mining Institute, and the Bituminous Casualty Company during the recovery and fire-fighting operations and the investigation as to the cause of the fire is gratefully acknowledged.

Respectfully submitted,

/s/ W. R. Park

W. R. Park, Chief  
Barbourville Section  
Accident Prevention  
and Health Division

/s/ F. J. Gallagher

F. J. Gallagher  
Mining Electrical Engineer

/s/ J. D. Farris

J. D. Farris  
Coal-Mine Inspector

Approved by:

/s/ J. B. Benson

J. B. Benson, Chief  
Norton Branch  
Accident Prevention  
and Health Division

APPENDIX A

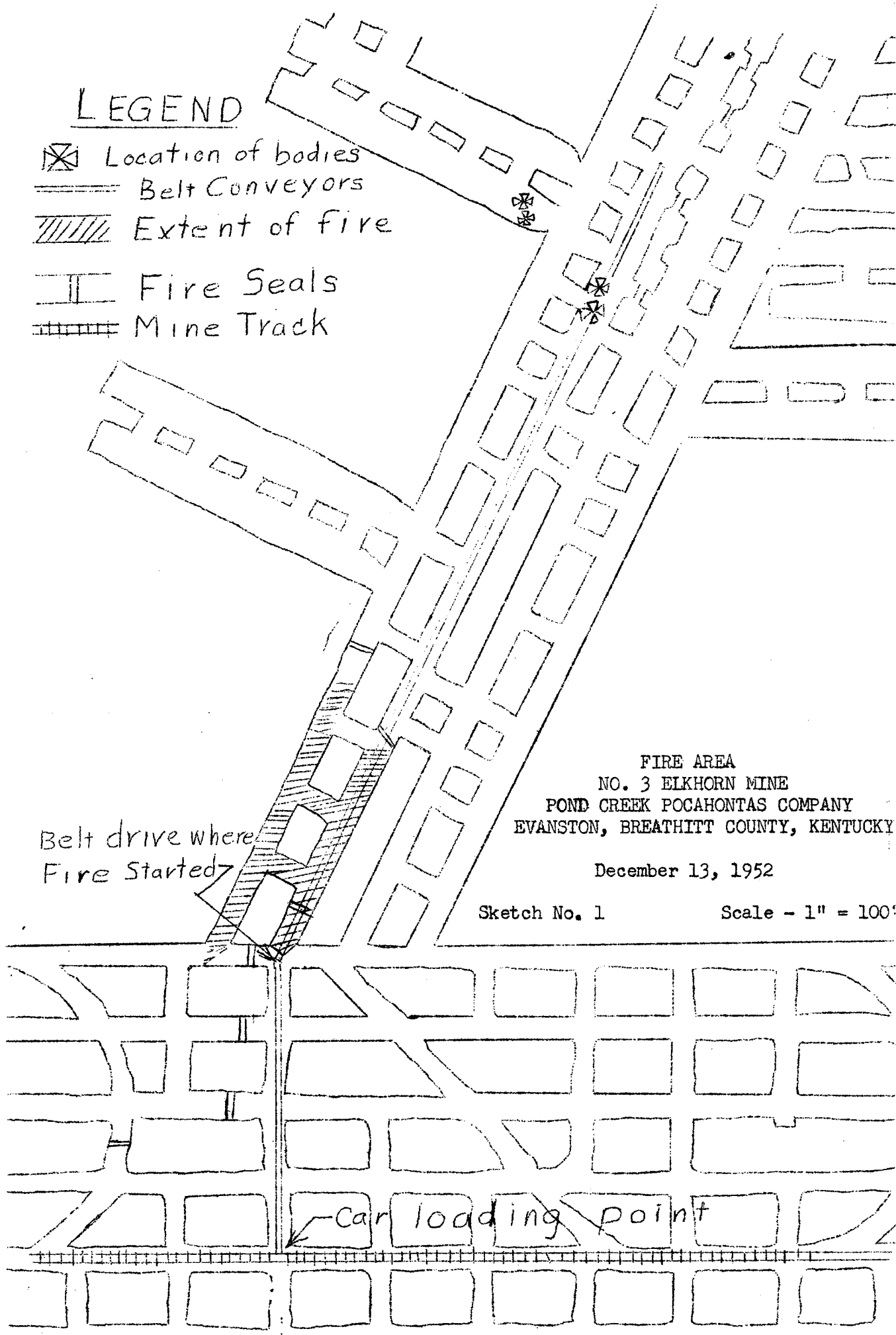
VICTIMS OF FIRE, NO. 3 ELKHORN MINE  
POND CREEK POCAHONTAS COMPANY

December 13, 1952

<u>Name</u>	<u>Age</u>	<u>Marital Status</u>	<u>Dependents</u>	<u>Estimated years experience</u>	<u>Social-Security Number</u>
Monticello Neace	26	M	4	5	258-20-8652
Burgess Neace	30	M	4	5	400-20-6329
Roland Grigsby	33	M	2	8	406-34-9320
Edgar E. Horn	40	M	9	16	405-07-6332

# LEGEND

- ⊗ Location of bodies
- ==== Belt Conveyors
- //// Extent of fire
- || Fire Seals
- |||| Mine Track

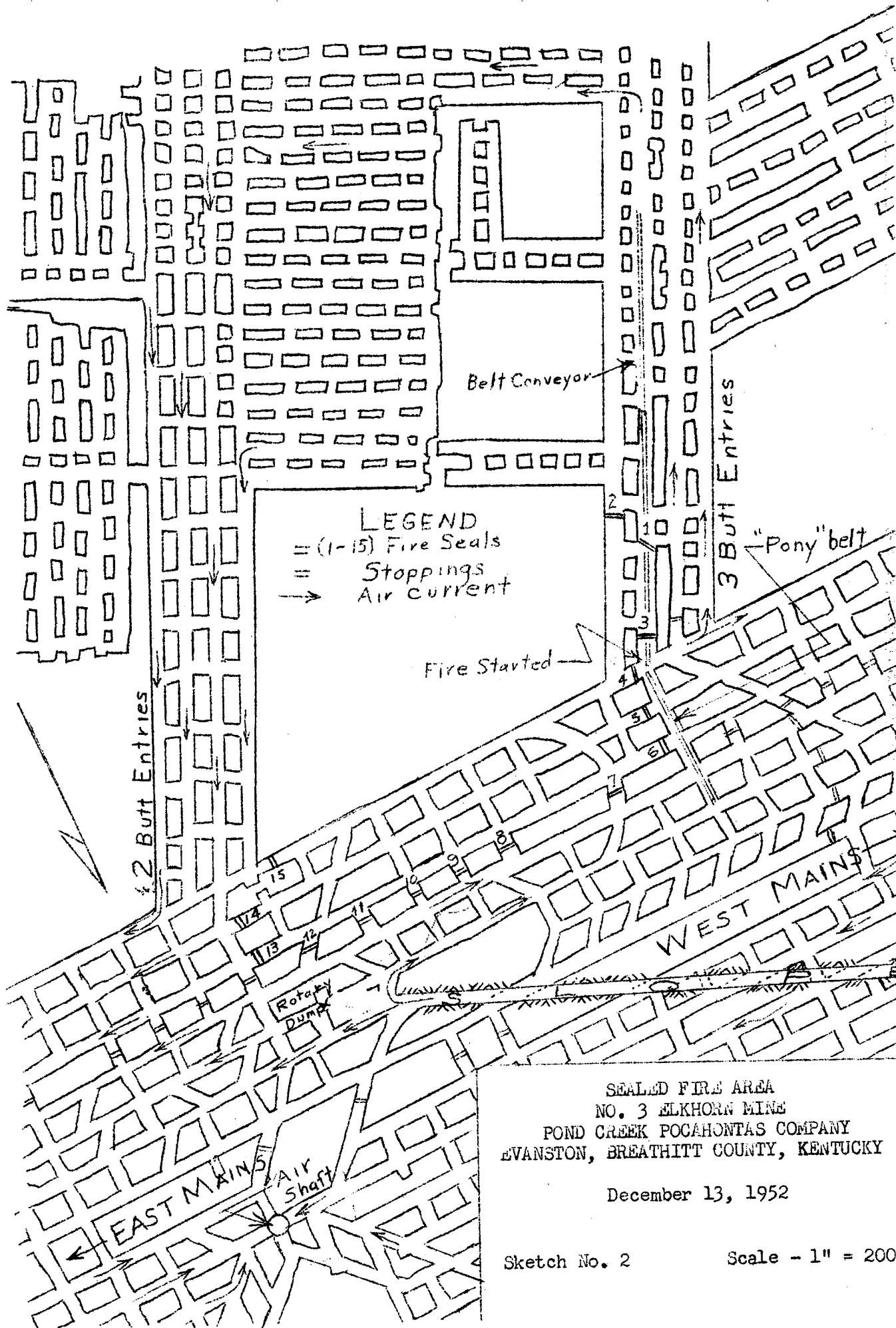


FIRE AREA  
NO. 3 ELKHORN MINE  
POND CREEK POCAHONTAS COMPANY  
EVANSTON, BREATHITT COUNTY, KENTUCKY

December 13, 1952

Sketch No. 1

Scale - 1" = 100'



SEALED FIRE AREA  
 NO. 3 ELKHORN MINE  
 POND CREEK POCAHONTAS COMPANY  
 EVANSTON, BREATHITT COUNTY, KENTUCKY

December 13, 1952

Sketch No. 2

Scale - 1" = 200'