UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

District D

# FINAL REPORT OF COAL-MINE EXPLOSION
# DEKOVEN NO. 6 MINE
# THE PITTSBURG & MIDWAY COAL MINING COMPANY
# DEKOVEN, UNION COUNTY, KENTUCKY
(Post Office - Sturgis, Union County, Kentucky)

November 17, 1967

by

William M. Craft
Federal Coal-Mine Inspector

and

Paul Wills
Coal-Mine Inspection Supervisor

Originating Office - Bureau of Mines
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H. A. Schrecengost, District Manager
Health and Safety District D

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## INTRODUCTION

This report is based on an investigation made in accordance with provisions of the Federal Coal Mine Safety Act (66 Stat. 692; 30 U.S.C. Secs. 471-488) as amended.

A gas explosion occurred about 2:20 a.m., Friday, November 17, 1967, at the belt feeder in No. 4 belt entry of 2 west section, DeKoven No. 2 mine.

Of the 35 men in the mine at the time, 3 employees in 2 west section perished, and a fourth was burned severely. The 31 men working in other parts of the mine were not affected, and some assisted in the recovery operations. The names of the victims, their ages, occupations, experience, and the number of their dependents are listed in Appendix A of this report. Property damage consisted of 10 completely dislodged drywall and 3 temporary stoppings. An accumulation of methane in a large roof cavity over the belt feeder in 2 west section was ignited by the flame of an acetylene torch that was used to remove tramp iron and detonator leg wires, which had collected around the rotary drum of the coal breaker.

## GENERAL INFORMATION

The mine is opened by an air shaft and three sloped drifts into the Kentucky No. 6 coalbed which dips 4 to 6 degrees in a northerly direction. Of the 282 men employed, 260 worked underground and produced a daily average of 7,500 tons of coal.

The operating officials are:

| | | |
|---|---|---|
| Arnold E. Lamm | President | Kansas City, Missouri |
| John Plump | Vice President | Kansas City, Missouri |
| F. J. Foresman | Director, Public and Employee Relations | Kansas City, Missouri |
| T. H. Strunk | Manager, DeKoven Mines | Sturgis, Kentucky |
| Mitchell E. Mills | Superintendent | Sturgis, Kentucky |
| William L. Meadows | Safety Director | Sturgis, Kentucky |
| Charles Perkins | Mine Foreman | Sturgis, Kentucky |

The immediate roof was fragile shale overlain with a thin coalbed known locally as the Kentucky No. 7, above which lies the Benoist sandstone, which is known to liberate unusually large quantities of methane.

The coal is high-volatile bituminous with a volatile-to-total combustible ratio of 0.35. Numerous tests by the Bureau of Mines have shown that coal dust having a volatile combustible ratio of 0.12 is explosive, and that the explosibility increases with an increase in the volatile ratio.

The preceding Federal inspection was completed November 7, 1967.

## MINING METHODS, CONDITIONS, AND EQUIPMENT

### Mining Methods

The room-and-pillar method of mining was used, but pillars were not extracted. Entries and crosscuts were generally driven 20 feet wide, rooms 30 feet in width, and crosscuts were made at intervals of 60 feet.

The 2 west entries, originally started off the main north in a set of eight, were increased to nine entries for a distance of about 1,700 feet starting inby 2 north (see Appendix C). As faulty areas were encountered, the Nos. 6, 7, and 8 entries were discontinued on the north side and two additional entries were started on the south side. The two additional entries on the south side were numbered 0 and 00.

The original No. 5 entry was later stopped temporarily, at which time the remaining Nos. 0 to 4 entries were driven for several shifts, until Tuesday, November 14, 1967, when a crosscut connecting Nos. 4 and 5

entries was completed. After this connection was made, the return air from the split, which previously had passed over and by the belt feeder, was coursed through the No. 5 entry, bypassing the belt entry. (See Appendix B.)

Ventilation and Gases

The mine is classed gassy by the State.

Ventilating air was induced by an axial-flow fan, installed properly on the surface and equipped with the necessary safety devices. The fan was operated continuously, and exhausted approximately 190,000 cubic feet of air a minute.

A split system of ventilation was conducted through the mine with incombustible stoppings, overcasts, air-lock doors, check curtains, and line brattices.

The split of air used to ventilate the 2 west section also ventilated the 2 north section off 2 west. The quantity of air passing through the last open crosscut in the intake side of 2 west, the day before the explosion, was 10,920 cubic feet a minute according to mine records. The No. 4 or belt entry, enclosed by two rows of stoppings (see Appendix B) was a so-called "neutral" entry as concerns ventilation.

Check curtains to form an air lock were installed just inby the belt head near the main north, which permitted the passage of a limited volume of air through the belt entry. However, as each additional extension was added to the belt, an additional check curtain was installed, and, consequently, at the time of the explosion, 11 such check curtains restricted the positive movement of air in this entry.

Air samples collected during the last Federal inspection, which showed that 547,000 cubic feet of methane was being liberated in a 24-hour period, are listed as follows:

| Location in Mine | Volume of Air C.F.M. | Methane Percent | Cubic Feet of Methane in 24 Hrs. |
|---|---|---|---|
| Immediate return, 2 west entries | 21,000 | 0.14 | 42,000 |
| Split return, 1 north, 2 west | 25,000 | 0.36 | 130,000 |
| Immediate return, north parallel entries | 18,200 | 0.16 | 42,000 |
| Immediate return, main north entries | 15,000 | 0.21 | 45,000 |
| Main return at fan | 190,000 | 0.20 | 547,000 |

Preshift examinations were made by certified persons before the first coal-producing shift each day, and preshift examinations for succeeding shifts were made by on-shift section foremen as part of their regular duties. However, the mine records showed that preshift examinations prior to the 8 a.m. to 4 p.m. shift were started as much as 6 hours before that shift entered the mine.

Ignitions and explosions investigated by Bureau of Mines personnel which have occurred in this mine since its opening in 1964, are as follows:

| | |
|---|---|
| September 3, 1964 | Methane ignited by frictional sparks caused by the cutting bits of a continuous-mining machine striking the hard draw rock, locally called the "iron band," which overlies the coal seam. One man injured. |
| February 3, 1965 | Methane ignited by frictional sparks caused by the cutting bits of a continuous-mining machine striking the draw rock. One man injured. |
| July 16, 1965 | Methane ignited by frictional sparks caused by the cutting bits of a continuous-mining machine striking a 1-1/2-inch-thick hard rock intrusion located about 14 inches below the roof in the coal seam. Two men injured. |
| January 24, 1966 | Methane ignited by a blasting charge in the face of a working place. No injuries. |
| March 11, 1966 | Methane ignited by a blown-out shot of permissible-type explosives. One man injured. |
| June 14, 1967 | Methane-gas feeder in the kerf was ignited by cutting-machine bits striking sulphur or a pyrite band in the bottom of the coalbed. No injuries. |

Dust

The mine surfaces ranged from wet to dry. At the time of the last Federal inspection, 114 dust samples (32 spot-location samples and 82 samples in 2 surveys), were collected. Of the 114 samples, 13 or about 11 percent contained less than the required minimum of 65 percent incombustible matter. One of the dust surveys at that time was made in the 2 west (affected) section starting at the centerline of 1 north entry plus 5 feet and

collected on a pattern at 200-foot intervals for distances of 1,000 feet. The incombustible content of 7, or about 16 percent, of the 45 samples was less than the required minimum. However, the defective samples were from scattered locations and the greatest length of entry deficient in rock dust was 200 feet in the Nos. 2 and 6 entries. Additional rock dust was applied in all the deficient areas promptly during that inspection.

Transportation

Coal was transported from the faces in shuttle cars to belt conveyors, which extended to the surface. Employees were transported in covered man-trip cars under the supervision of certified officials. All track haulageways were installed in intake air. Roof rock was "brushed" to provide height along track haulageways.

Electricity

Electric power, purchased at 13,200 volts alternating current, reduced to 440 volts alternating current, and converted to 300 volts direct current, was used to furnish power for face equipment and belt drives. Power wires were properly installed on insulators. Substations were installed properly underground. Distribution boxes, used near the face regions, were equipped with proper safety devices. The trailing cables, of the flame-resistant type, were provided with overload protection.

The electric face equipment was in permissible condition at the close of the last Federal inspection, completed November 2, 1967.

Illumination and Smoking

Permissible electric cap lamps were used for portable illumination, and smoking was prohibited underground. Daily searches for smoking materials were made, and the results were recorded.

Mine Rescue

Two well-trained and equipped mine rescue teams were maintained by the company, one at the DeKoven No. 6 mine and another at the DeKoven No. 9 mine. Both teams were present during recovery operations.

## STORY OF EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations

Officials of The Pittsburg & Midway Coal Mining Company, representatives of the Kentucky Department of Mines and Minerals, the United Mine Workers of America, and the United States Bureau of Mines participated in the investigation.

## Activities of Bureau of Mines Personnel

William M. Craft, Federal coal-mine inspector, was notified of the occurrence at 3:20 a.m., November 17, 1967, by Lawrence Risley, district supervisor, Kentucky Department of Mines and Minerals. After reporting the incident to H. A. Schrecengost, district manager, Craft and Federal Inspectors James R. Laird, F. E. Roberts, and Hudson Sorrel proceeded to the mine, arriving at 5 a.m. Before going underground, Bureau personnel were informed that the injured man and two bodies had been recovered, but that one man was unaccounted for, and that ventilation had been temporarily reestablished with brattice-cloth stoppings.

H. A. Schrecengost, Paul Wills, and James Westfield arrived at the mine about 11:45 a.m., on the day of the occurrence, and participated in the underground investigation and official hearing.

Two withdrawal Orders covering explosion and mine fire dangers were issued under Section 203(a)(1) of the Federal Coal Mine Safety Act on November 17, 1967, debarring all persons from the mine except those needed for exploratory and investigative work. Before the Orders were issued, however, all persons, except those mentioned above, had been withdrawn and debarred from entering the mine.

## Mine Conditions Immediately Prior to Explosion

Normal mining operations, including operation of the mine fan, were started on the day shift on Thursday, November 16, 1967, and continued without incident until the explosion occurred on the third shift at about 2:20 a.m., Friday, November 17, 1967. Although slight variations were recorded in the atmospheric pressure during the preceding 24-hour period, the pressure did not fall below 29.80 inches Hg., and therefore was not considered a factor in the occurrence.

## Evidence of Activities and Story of Explosion

The 25 employees on the third, or maintenance, shift entered the mine at 12:01 a.m., November 17, 1967. Two men, James Norvell, shuttle-car operator, and Hershel Brasher, loading-machine operator, were assigned the work of loading graded material and a rock fall about 12 feet outby the face of No. 1 west entry. Joseph Hagan, mechanic, and James Murrell, greaser, were instructed to remove scrap material from the rotary breaker on the belt feeder at the end of the conveyor belt in the same entry (see Appendix B). Lloyd Harrel, third-shift foreman, and Douglas Gates, maintenance foreman, issued the work orders at a mechanic's shack along the 2 west track haulageway near 1 north panel.

The first indication of the explosion was detected about [illegible] a.m. by Josh Waters, fire boss, who was in 2 north off 2 west, making a regular preshift examination. Waters stated that he experienced a "change of pressure in his ears." He immediately went to a nearby telephone to contact the third-shift foreman. On arriving at the telephone he heard Darrel Shoulders, mechanic, calling "there is something wrong on No. 1" (the 2 west section). Waters proceeded by personnel carrier to the 2 west entries. Enroute he was joined by Larry Williams, Leonard McMain, and Garry Daniels.

Recovery Operations

Company officials were notified, and rescue teams from both DeKoven Nos. 4 and 2 mines were summoned. Waters, Harrel, and other men in the mine erected temporary stoppings and advanced toward the faces of the 2 west entries. While enroute, 25 or more scattered fires, consisting of feeder boards, paper cartons, and brattice cloth, were extinguished. Smoke impeded the progress, and after about 40 minutes, the party arrived at surveyor's station No. 330, in 2 west entry (see Appendix B) near where the injured man, James Murrell, was discovered standing near a coal rib, with the waterline cut in two, spraying water on his body. Murrell told the rescue party, "my buddy is in the 'Roscoe' (belt feeder) with a cutting torch." Waters and Harrel then made their way to the end of the belt conveyor in No. 4 entry, where they discovered the body of Hagan, mechanic, in a crosscut about 6 feet from the belt feeder.

An acetylene and an oxygen tank, with the gages connected and the valves open, were then noted in a shuttle car immediately inby the feeder. Waters closed the valves on the tanks. The cutting torch was found in the belt feeder with the flame extinguished; however, a hole was burned in a connecting strap in the feeder chain, apparently after the torch had been dropped or was blown out of Hagan's hand. Tests were made by Waters in the roof cavity over the feeder with a permissible flame safety lamp, but methane was not detected at that time.

Heavy concentrations of coke and soot were present on the cribbing over the belt feeder. The rescue party then proceeded to the loading machine, where methane in excess of 5 percent was detected in a cavity. At about this time, members of the mine rescue team from the company's No. 2 mine arrived to assist in the recovery work. Tests were made at the faces of the entries, and methane was detected in a crosscut near the face of No. 4 entry. Further search was conducted in the face areas, and the body of James Morrell, shuttle-car operator, was found in a crosscut between No. 2 entry and No. 1 entry, about 340 feet outby the face. The shuttle car was in No. 2 entry, loaded with rock, about 40 feet inby the area where rock had previously been dumped. The controls of the shuttle car were in the "on" position.

At about 5:15 a.m., Federal and State inspectors arrived in the 7 west section and assisted in examinations and recovery operations in attempts to locate the fourth man known to be in the section at the time of the explosion. The body of this man, Hershel Krasher, loading-machine operator, was found by members of the rescue party at 6:05 a.m., in No. 30 entry directly south of the loading machine. After all men in the area had been accounted for, and ventilation temporarily established, the rescue party returned to the surface, preparatory to reestablishing permanent ventilation in the explosion area.

## INVESTIGATION OF CAUSE OF EXPLOSION

### Investigation Committee

The underground investigation of the explosion was started and completed on the day of the occurrence, and interviewing of the witnesses was concluded on December 19, 1967. Members of the investigating committee were:

#### The Pittsburg & Midway Coal Mining Company

| | |
|---|---|
| Thurston Strunk | Manager, DeKoven Mines |
| Mitchell E. Mills | Superintendent |
| Charles Perkins | Mine Foreman |

#### United Mine Workers of America

| | |
|---|---|
| Allan Combra | International Representative |
| Charles Head | International Representative |
| James Thorp | Safety Committeeman, Local Union No. 1290 |
| Joseph Davis | Safety Committeeman, Local Union No. 1290 |

#### Kentucky Department of Mines and Minerals

| | |
|---|---|
| J. H. Mosgrove | Director, Mining Division |
| Lawrence Risley | District Supervisor |
| Edwin McCaw | Inspector |
| James Brantley | Inspector |
| T. C. Stone | Inspector |

#### U. S. Bureau of Mines

| | |
|---|---|
| James Westfield | Assistant Director - Coal-Mine Safety |
| H. A. Schroeengost | District Manager, District I |
| Paul Wills | Coal-Mine Inspection Supervisor |
| William M. Craft | Federal Coal-Mine Inspector |

The Kentucky Department of Mines and Minerals conducted an official hearing in the company's conference room on November 18, 1967. The hearing committee, headed by J. H. Mosgrove, Director, Mining Division, Kentucky Department of Mines and Minerals, included Allan Condra, International Representative, United Mine Workers of America; James Westfield, Assistant Director-Coal Mine Safety, U. S. Bureau of Mines; and William Meadows, Safety Director, The Pittsburg & Midway Coal Mining Company. Sixteen company officials and employees were interviewed, and James Mirrell, who was burned severely in the explosion, was interviewed at the University of Kentucky Medical Center in Lexington, Kentucky, on December 19, 1967. Due to the condition of Mr. Mirrell at this time, information pertinent to this report was not obtainable.

Pertinent information disclosed during the hearing is as follows:

1. The fire boss who conducted preshift examinations for the incoming 8 a.m. shift began his duties at midnight by cleaning and assembling about 16 permissible-type flame safety lamps to be used by the oncoming shift. Following completion of this work, he then entered the mine about 1:30 a.m. and began his examination (about 6-1/2 hours before the workmen entered the mine).

2. Several mine officials had detected methane issuing from a roof cavity at the [redacted] west belt feeder on various days prior to the explosion.

3. The 4 p.m. to 12 p.m. section foreman in the [redacted] west section, whose duty was to conduct preshift examinations for the oncoming midnight shift, did not make tests for gas at some working faces nor in the roof cavity at the belt feeder within the 4-hour period prescribed by the Federal Coal Mine Safety Act.

4. Tramp metal, such as roof-bolt components, even roof bolts, machine bolts, and leg wires of detonators often became entangled around the rotary breaker of the belt feeders. Although it was frequently necessary to use oxy-acetylene torches to remove this material, the mine officials had never instructed the repairmen to make tests for gas before doing so or even to carry flame safety lamps.

5. Although the mine officials knew that the volume of air ventilating the [redacted] west section had been diverted from the roof cavity in practically established inby air connections and closing the crosscut near the cavity, and knew that methane was being liberated within the cavity, none made tests for gas at this critical point during the 4-hour period preceding the explosion.

## Methane and Dust as Factors in the Explosion

During the early stages of rescue work, methane, in excess of 5 percent, was detected in the roof cavity over the belt feeder and in the cavity over the loading machine positioned inby the belt feeder. After ventilation was restored and at the time of the investigation, the methane at these locations was reduced to 0.4 and 0.6 percent, respectively.

Coal dust had very little, if any, effect in this explosion. The incombustible content in 29 of the 101 samples, collected in a survey of the 2 west entries in their entirety after the explosion, contained less than 65 percent incombustible material. Eight samples indicated traces of coke, seven showed small amounts, and 12 samples collected in the vicinity where the explosion occurred showed large amounts of coke (see table 1). The dust samples were collected primarily to determine the extent of flame and the presence of coke in the area, and were not necessarily representative of mine-dust conditions prior to the explosion.

### Flame

Burned papers, brattice cloth, and charred timbers indicated that flame was present in all the 2 west entries for a distance of approximately 1,[illegible] feet outby the ignition point (see Appendix C).

### Forces

Forces developed by the explosion were determined by damage to ventilation facilities. Ten permanent and three temporary stoppings were blown out, and part of the line brattice was torn down at the face area. Two air-lock doors at the mouth of 2 north, 2 west were blown ajar and damaged. The extent and direction of forces traveled about 2,700 feet outby the point of origin, where a protective hat was blown from the head of a motorman, as shown on the attached Appendix C.

### Probable Point of Origin

The explosion originated at the belt feeder in No. 4 entry, [illegible] west [illegible].

### Factors Preventing Spread of Explosion

The application of ample rock dust in the ignition area was the major factor in preventing the spread of the explosion. Dangerous accumulations of loose coal or coal dust were not present in the area.

Summary of Evidence

Conditions observed in the mine during the investigation following the explosion, together with information available from previous Federal coal-mine inspection reports and that obtained from a hearing and from company officials, workmen, and mine records, provided evidence as to the cause and origin of the explosion. The evidence from which the conclusions of the Federal investigators are drawn is summarized as follows:

1. Except for a flame safety lamp left at the repairman's station by someone on the preceding shift, flame safety lamps were not present in the 7 west section at the time of the explosion.

2. Although it was common practice to use a cutting torch to burn tramp iron and detonator leg wires off rotary drums of the belt feeders, the employees, whose job it was to use cutting torches, had never been instructed to make gas tests before lighting torches.

3. Methane was frequently detected in cavities after roof falls occurred, but tests for gas were not always made during preshift examinations at such places.

4. The recording chart at the fan indicated a slight disruption in the ventilating current at 2:20 a.m., November 17, 19[illegible].

5. Ventilation had been changed in the 7 west section when check curtains were relocated, and a new inby connection had been made from No. 4 to No. 5 entry. This arrangement of the ventilation short-circuited the air from the roof cavity over the belt feeder.

6. Evidence indicated that slag accumulated on the burning tip of the torch temporarily stopped the flow of acetylene and oxygen from the tanks being used for burning purposes.

7. Methane had been detected in the roof cavity over the belt feeder in 7 west mains on several occasions, but none was reported on the previous shift.

8. An explosive mixture of methane was detected in the roof cavity over the belt feeder, and where the caved material was being loaded, a few hours after the explosion.

9. Although several fires in the area had been extinguished after the explosion, it was difficult to ascertain the amount of firefighting equipment available. Only about six water-filled stemming bags, normally used for stemming shot holes, were observed in the belt feeder. It is believed these were taken there to be used for firefighting purposes during the burning operation.

Cause of Explosion

The explosion occurred when an explosive mixture of methane and air in the roof cavity over the belt feeder was ignited by the flame of an oxy-acetylene torch being used to make repairs on the belt feeder.

RECOMMENDATIONS

The following recommendations are made to prevent similar occurrences.

1. Tests for methane shall be made immediately before welding, cutting, or soldering with arc or flame is done in underground face regions.

2. Preshift examinations shall be made within 4 hours immediately preceding the beginning of each coal-producing shift, and should include tests for explosive gas over accessible falls, at high places, and other places where gas accumulations and other hazards may be found in active working sections.

3. When ventilation changes are made that affect areas where methane has been detected, precautions should be taken to assure that such areas are ventilated adequately.

4. Ventilation in so-called "neutral" belt entries should be conducted in a positive manner to guard against accumulations of methane in roof cavities and other high places.

5. Rock dust, or suitable fire extinguishers, shall be immediately available during welding, cutting, or soldering.

6. Flame safety lamps should be returned to the surface at the end of each shift to be cleaned, examined, refilled and assembled.

7. Where methane accumulates in roof cavities and normal methods of ventilation are difficult to maintain, the use of bleeder pipes connected to the return should be used.

## ACKNOWLEDGMENT

The writers gratefully acknowledge the courtesies, cooperation, and assistance extended by officials and employees of the Pittsburg & Midway Coal Mining Company, the Kentucky Department of Mines and Minerals, and the United Mine Workers of America.

Respectfully submitted,

/s/ William M. Craft

William M. Craft
Federal Coal-Mine Inspector

/s/ Paul Wills

Paul Wills
Coal-Mine Inspection Supervisor

Approved by:

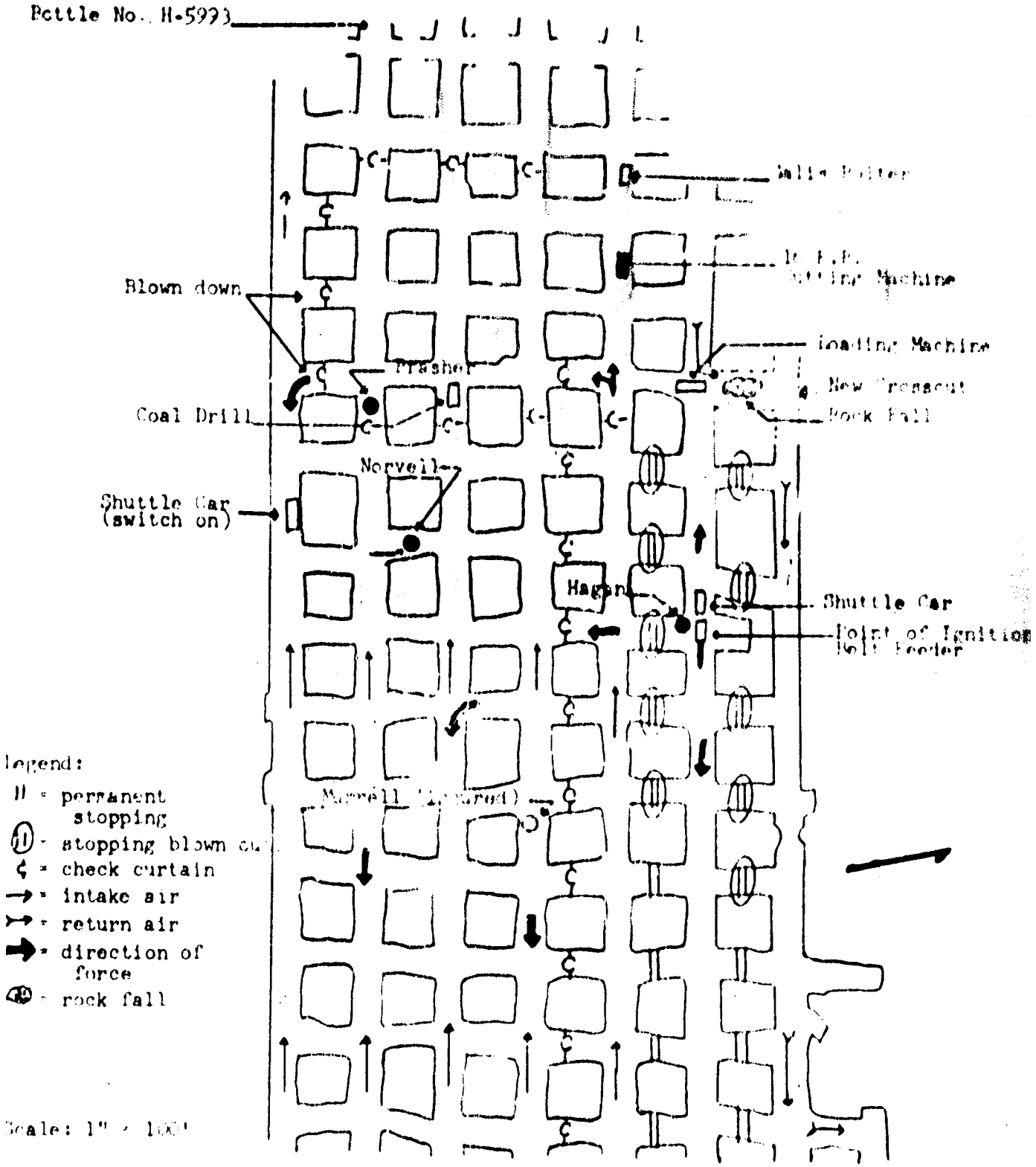
[signature]
District Manager
Health and Safety District D

## APPENDIX A

Victims of mine explosion, DeKoven No. 6 mine, The Pittsburg & Midway Coal Mining Company, November 17, 1967:

| Name | Age | Number of Dependents | Occupation | Mining Experience |
|---|---|---|---|---|
| James Norvell | 45 | 5 children and wife | Shuttle-car operator | 7 years |
| Hershel Ross Brasher | 40 | 5 children and wife | Loader operator | 21 years |
| Joseph G. Hagan | 24 | 2 dependents | Mechanic | 15 months |
| (Injured man) | | | | |
| James Morrell | 39 | 3 dependents | Mechanic helper | 11 years |

APPENDIX B

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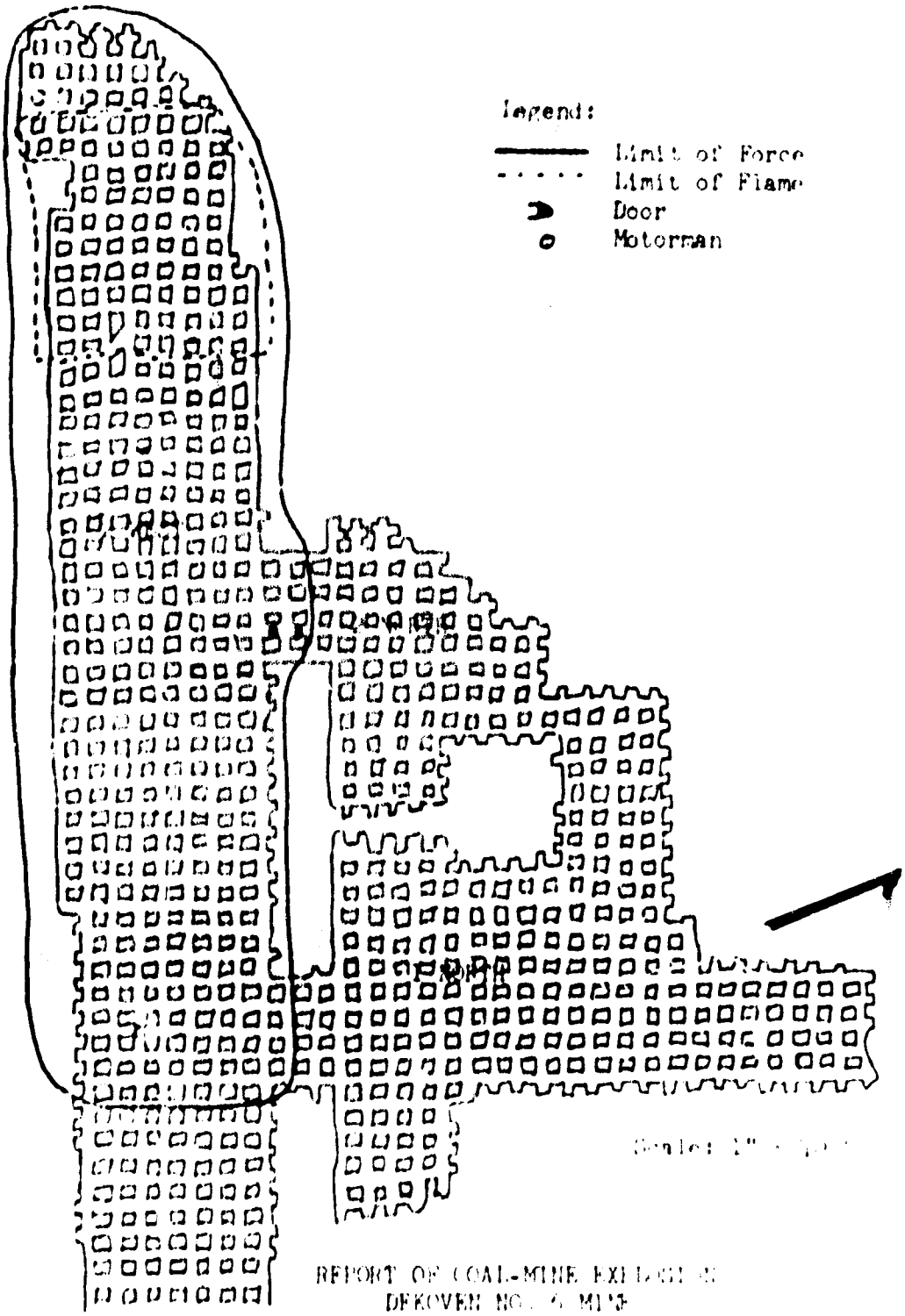
DEKOVEN, UNION COUNTY, KENTUCKY
November 17, 19[illegible]

APPENDIX C




REPORT OF COAL-MINE EXPLOSION
DEKOVEN NO. 6 MINE
THE PITTSBURG & MIDWAY COAL MINING COMPANY
DEKOVEN, UNION COUNTY, KENTUCKY
November 1[illegible], 19[illegible]

## ANALYSES OF AIR SAMPLES

TABLE 1 DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY James R. Laird and W. M. Craft

| BOTTLE NO. | LABORATORY NO. | LOCATION IN MINE | PERCENT IN VOLUME | | | | | CUBIC FEET AIR PER MINUTE | CUBIC FEET METHANE IN 24 HOURS |
|---|---|---|---|---|---|---|---|---|---|
| | | | CARBON DIOXIDE | OXYGEN | METHANE | CARBON MONOXIDE | NITROGEN | | |
| | | EXPLOSION SAMPLES | | | | | | | |
| H6037 | 83622 | split return No. 2 main west entries | 0.06 | 20.67 | 0.28 | none | 78.99 | 22,940 | 92,000 |
| H6036 | 83623 | immediate return last open crosscut between intake and return No. 2 main west entries | 0.07 | 20.81 | 0.38 | none | 78.74 | 18,000 | 98,000 |
| H5993 | 33624 | face No. 2 main west entry | 0.12 | 20.77 | 0.32 | none | 78.79 | | |

LAB. NOS. 245185-245218 Sheet No. 1

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|
| | | | EXPLOSION SAMPLES | | |
| | | | No. 1 survey<br>survey area = 2 west main entries<br>zero = centerline No. 1 north parallel entry + 40 feet | | |
| | | | No. 1 entry | | |
| | 1A1 | | 0 + 00 no sample - rock | | |
| 245185 | 1A2 | band | 0 + 360' | none | 87.5* |
| 245186 | 1A3 | " | 0 + 720' | none | 75.0* |
| 245187 | 1A4 | " | 0 + 1,080' | none | 71.0* |
| 245188 | 1A5 | " | 0 + 1,440' | none | 85.0* |
| | | | No. 2 entry | | |
| 245189 | 1B1 | " | 0 + 00 | none | 67.5* |
| 245190 | 1B2 | " | 0 + 360' | none | 45.0* |
| 245191 | 1B3 | " | 0 + 720' | none | 85.5* |
| 245192 | 1B4 | " | 0 + 1,080' | none | 83.0* |
| 245193 | 1B5 | " | 0 + 1,440' | none | 66.0* |
| | | | No. 3 entry | | |
| 245194 | 1C1 | " | 0 + 00 | none | 67.0* |
| 245195 | 1C2 | " | 0 + 360' | none | 66.5* |
| 245196 | 1C3 | " | 0 + 720' | trace | 61.8 |
| 245197 | 1C4 | " | 0 + 1,080' | none | 72.0* |
| 245198 | 1C5 | " | 0 + 1,440' | none | 73.0* |
| | | | No. 4 entry | | |
| 245199 | 1D1 | " | 0 + 00 | none | 70.5* |
| 245200 | 1D2 | " | 0 + 360' | none | 71.0* |
| 245201 | 1D3 | " | 0 + 720' | none | 86.5* |
| 245202 | 1D4 | " | 0 + 1,080' | none | 66.0* |
| 245203 | 1D5 | " | 0 + 1,440' | none | 73.0* |

LAB. NOS. 245185-245218

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|---|
| | | | No. 5 entry | | | |
| 245204 | 1E1 | brnd | 0 + 00 | | none | 77.0* |
| 245205 | 1E2 | " | 0 + 360' | | none | 48.0* |
| 245206 | 1E3 | " | 0 + 720' | | none | 44.5* |
| 245207 | 1E4 | " | 0 + 1,080' | | none | 79.5* |
| | 1E5 | | 0 + 1,440' | no sample - roof fall | | |
| | | | No. 6 entry | | | |
| 245208 | 1F1 | " | 0 + 00 | | none | 78.0* |
| 245209 | 1F2 | " | 0 + 360' | | none | 96.0* |
| 245210 | 1F3 | " | 0 + 720' | | none | 60.8 |
| 245211 | 1F4 | " | 0 + 1,080' | | none | 92.0* |
| | 1F5 | | 0 + 1,440' | no sample - roof fall | | |
| | | | No. 7 entry | | | |
| 245212 | 1G1 | " | 0 + 00 | | none | 93.0* |
| 245213 | 1G2 | " | 0 + 360' | | none | 95.0* |
| 245214 | 1G3 | " | 0 + 720' | | none | 48.0* |
| 245215 | 1G4 | " | 0 + 1,080' | | none | 85.0* |
| | 1G5 | | 0 + 1,440' | no sample - roof fall | | |
| | | | No. 8 entry | | | |
| 245216 | 1H1 | " | 0 + 00 | | none | 94.0* |
| 245217 | 1H2 | " | 0 + 360' | | none | 81.0* |
| 245218 | 1H3 | " | 0 + 720' | | none | 77.5* |
| | 1H4 | | 0 + 1,080' | no sample - roof fall | | |
| | 1H5 | | 0 + 1,440' | same | | |

*By Volumeter

LAB. NOS. 245219-245285 Sheet No. 1

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|
| | | | EXPLOSION SAMPLES | | |
| | | | No. 2 survey | | |
| | | | survey area = 2 main west entries | | |
| | | | zero = centerline of No. 1 entry in 2 north panel + 40 feet | | |
| | | | No. 1 entry (parallel) | | |
| 245219 | 2A1 | band | 0 + 00 | none | 54.0% |
| 245220 | 2A2 | " | 0 + 180 | none | 30.0% |
| 245221 | 2A3 | " | 0 + 360 | none | 53.0% |
| | 2A4 | | 0 + 540 no sample, gobbed out | | |
| 245222 | 2A5 | " | 0 + 720 | none | 34.5% |
| | 2A6 | | 0 + 900 no sample, not driven | | |
| | 2A7 | | 0 + 1,080 no sample, gobbed out | | |
| | 2A8 | | 0 + 1,260 same | | |
| 245223 | 2A9 | " | 0 + 1,440 | none | 74.5% |
| 245224 | 2A10 | " | 0 + 1,620 | none | 91.0% |
| | 2A11 | | 0 + 1,800 no sample, not driven | | |
| | | | No. 2 entry (parallel) | | |
| 245225 | 2B1 | " | 0 + 00 | none | 52.0% |
| 245226 | 2B2 | " | 0 + 180 | none | 84.5% |
| 245227 | 2B3 | " | 0 + 360 | none | 82.5% |
| 245228 | 2B4 | " | 0 + 540 | small | 64.2 |
| 245229 | 2B5 | " | 0 + 720 | small | 51.7 |
| | 2B6 | | 0 + 900 no sample, gobbed out | | |
| | 2B7 | | 0 + 1,080 same | | |
| | 2B8 | | 0 + 1,260 same | | |
| | 2B9 | | 0 + 1,440 same | | |
| 245230 | 2B10 | " | 0 + 1,620 | none | 80.5% |
| 245231 | 2B11 | " | 0 + 1,800 | none | 78.0% |

LAB. NOS. 245219-245285

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY P. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|---|
| | | | | No. 3 entry (parallel) | | |
| 245232 | 2C1 | " | 0 + 00 | | small | 54.1 |
| 245233 | 2C2 | " | 0 + 180 | | small | 48.1 |
| 245234 | 2C3 | " | 0 + 360 | | small | 55.8 |
| 245235 | 2C4 | " | 0 + 540 | | large | 82.6 |
| 245236 | 2C5 | " | 0 + 720 | | large | 65.0 |
| 245237 | 2C6 | " | 0 + 900 | | large | 71.5 |
| | 2C7 | | 0 + 1,080 | no sample, gobbed out | | |
| | 2C8 | | 0 + 1,260 | same | | |
| | 2C9 | | 0 + 1,440 | same | | |
| 245238 | 2C10 | " | 0 + 1,620 | | trace | 76.0* |
| 245239 | 2C11 | " | 0 + 1,800 | | none | 70.5* |
| | | | | No. 4 entry (parallel) | | |
| 245240 | 2D1 | " | 0 + 00 | | none | 75.5* |
| 245241 | 2D2 | " | 0 + 180 | | trace | 76.0* |
| 245242 | 2D3 | " | 0 + 360 | | small | 77.0 |
| 245243 | 2D4 | " | 0 + 540 | | small | 75.2 |
| 245244 | 2D5 | " | 0 + 720 | | small | 71.6 |
| 245245 | 2D6 | " | 0 + 900 | | small | 60.3 |
| 245246 | 2D7 | " | 0 + 1,080 | | small | 77.7 |
| 245247 | 2D8 | " | 0 + 1,260 | | large | 87.5 |
| 245248 | 2D9 | " | 0 - 1,440 | | small | 82.4 |
| 245249 | 2D10 | " | 0 + 1,620 | | none | 76.0* |
| | 2D11 | | 0 + 1,800 | no sample, wet | | |
| | | | | No. 5 alternate entry (parallel) | | |
| | 20E1 | | 0 + 00 | no sample, not driven | | |
| | 20E2 | | 0 + 180 | same | | |
| | 20E3 | | 0 + 360 | same | | |
| | 20E4 | | 0 + 540 | same | | |

LAB. NOS. 245219-245285 Sheet No. 3

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|---|
| | 20E5 | | 0 + 720 | no sample, not driven | | |
| | 20E6 | | 0 + 900 | same | | |
| 245250 | 20E7 | band | 0 + 1,080 | | large | 68.9 |
| 245251 | 20E8 | " | 0 + 1,260 | | large | 75.2 |
| 245252 | 20E9 | " | 0 + 1,440 | | small | 81.0 |
| 245253 | 20E10 | " | 0 + 1,620 | | small | 89.4 |
| 245254 | 20E11 | " | 0 + 1,800 | | none | 85.0* |
| | | | | No. 5 entry (belt isolated) | | |
| 245255 | 2E1 | " | 0 + 00 | | trace | 92.0* |
| 245256 | 2E2 | " | 0 + 180 | | none | 95.0* |
| 245257 | 2E3 | " | 0 + 360 | | trace | 45.0* |
| 245258 | 2E4 | " | 0 + 540 | | none | 82.0* |
| 245259 | 2E5 | " | 0 + 720 | | none | 96.0* |
| 245260 | 2E6 | " | 0 + 900 | | trace | 51.3 |
| 245261 | 2E7 | " | 0 + 1,080 | | large | 84.0 |
| 245262 | 2E8 | " | 0 + 1,260 | | large | 74.5 |
| 245263 | 2E9 | " | 0 + 1,440 | | large | 80.7 |
| 245264 | 2E10 | " | 0 + 1,620 | | large | 54.6 |
| | 2E11 | | 0 + 1,800 | no sample, not driven | | |
| | | | | No. 6 entry (back) | | |
| 245265 | 2F1 | " | 0 + 00 | | trace | 58.9 |
| 245266 | 2F2 | " | 0 + 180 | | none | 57.7 |
| 245267 | 2F3 | " | 0 + 360 | | none | 74.5* |
| 245268 | 2F4 | " | 0 + 540 | | none | 88.0* |
| 245269 | 2F5 | " | 0 + 720 | | none | 95.0* |
| 245270 | 2F6 | " | 0 + 900 | | trace | 52.3 |
| 245271 | 2F7 | " | 0 + 1,080 | | trace | 61.0 |
| 245272 | 2F8 | " | 0 + 1,260 | | large | 56.1 |
| 245273 | 2F9 | " | 0 + 1,440 | | large | 76.4 |
| 245274 | 2F10 | " | 0 + 1,620 | | small | 61.1 |
| | 2F11 | | 0 + 1,800 | no sample, not driven | | |

LAB. NOS. 245219-245285 Sheet No. 4

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|---|
| | | | No. 7 entry (back) | | | |
| 245275 | 2G1 | band | 0 + 00 | | none | 56.5 |
| 245276 | 2G2 | " | 0 + 180 | | none | 76.5* |
| | 2G3 | | 0 + 360 | no sample, rock fall | | |
| 245277 | 2G4 | " | 0 + 540 | | none | 68.0* |
| 245278 | 2G5 | " | 0 + 720 | | none | 45.5* |
| 245279 | 2G6 | " | 0 + 900 | | none | 45.0* |
| | 2G7 | | 0 + 1,080 | no sample, wet | | |
| | 2G8 | | 0 + 1,260 | no sample, not driven | | |
| | 2G9 | | 0 + 1,440 | same | | |
| | 2G10 | | 0 + 1,620 | same | | |
| | 2G11 | | 0 + 1,800 | same | | |
| | | | No. 8 entry (back) | | | |
| 245280 | 2H1 | " | 0 + 00 | | none | 74.0* |
| 245281 | 2H2 | " | 0 + 180 | | none | 95.5* |
| | 2H3 | | 0 + 360 | no sample, rock fall | | |
| 245282 | 2H4 | " | 0 + 540 | | none | 73.0* |
| 245283 | 2H5 | " | 0 + 720 | | none | 44.0* |
| | 2H6 | | 0 + 900 | no sample, gobbed out | | |
| | 2H7 | | 0 + 1,080 | no sample, not driven | | |
| | 2H8 | | 0 + 1,260 | same | | |
| | 2H9 | | 0 + 1,440 | same | | |
| | 2H10 | | 0 + 1,620 | same | | |
| | 2H11 | | 0 + 1,800 | same | | |
| | | | No. 9 entry (back) | | | |
| 245284 | 2I1 | " | 0 + 00 | | none | 93.0* |
| | 2I2 | | 0 + 180 | no sample, we* | | |
| | 2I3 | | 0 + 360 | no sample, rock fall | | |
| 245285 | 2I4 | " | 0 + 540 | | none | 73.0* |
| | 2I5 | | 0 + 720 | no sample, not driven | | |

LAB. NOS. 245219-245285 Sheet No. 5

TABLE 3 ANALYSES OF DUST SAMPLES DATE COLLECTED November 17, 1967

MINE Dekoven No. 6 COMPANY The Pittsburg and Midway Coal Mining Company COLLECTED BY F. E. Roberts

| LAB. NO. | CAN NO. | SAMPLE OF DUST FROM | LOCATION IN MINE | | ALCOHOL COKE TEST | AS-RECEIVED PERCENT INCOMBUSTIBLE |
|---|---|---|---|---|---|---|
| | 216 | | 0 + 900 | no sample, not driven | | |
| | 217 | | 0 + 1,080 | same | | |
| | 218 | | 0 + 1,260 | same | | |
| | 219 | | 0 + 1,440 | same | | |
| | 2110 | | 0 + 1,620 | same | | |
| | 2111 | | 0 + 1,800 | same | | |

*By Volumeter