EXPLOSION AT THE NO. 1 MINE
OF THE
CITIZENS COAL COMPANY
SULLIVAN, INDIANA

February 20, 1925

At about 10:45 A. M., February 20, 1925, an explosion occurred in the No. 1 Mine of the Citizens Coal Company, Sullivan, Indiana, resulting in the death of fifty-one men and the serious injury of one other.

LOCATION

The No. 1 Mine is located on the C and E I Railroad, about three-quarters of a mile east of Sullivan, Indiana.

OWNERSHIP

The No. 1 Mine is owned and operated by the Citizens Coal Company of Sullivan, Indiana.

The officials are as follows:

John Lowery, President - Sullivan, Indiana.
Everett Ingleman, Vice President - Sullivan, Indiana.
Walter Barr, Secretary-Treasurer and General Manager, Sullivan, Indiana.
John Moseby, Mine Foreman - Sullivan, Indiana.

COAL BED

The No. 1 Mine is operating in the No. 5 bed of the Indiana Series and at this mine is reached at a depth of 284 feet and is about 4 feet 8 inches thick. The coal is also locally known as the Glendora seam.

The composite of two face samples collected in this mine gave the following results on the as received basis:

Moisture	Vol.	Fixed C.	Ash	Sulphur	B. T. U.
13.0	33.9	47.3	5.8	1.0	11810

The No. 5 coal at this mine and in the other mines near Sullivan is of much higher quality than at any other place in Indiana where it is now being mined. The character and appearance of both the coal and the roof is unusual for the No. 5 bed. The coal instead of having the usual square fracture has a conchoidal fracture and is more lustrous.

The roof characteristic of No. 5 coal is a hard dark grey shale with numerous dolomitic concretions known as boulders or nigger heads.

At the No. 1 Mine the roof is a soft smooth grey shale, with very few concretions or boulders and requires careful timbering both in the room and the entries.

In the rooms the roof is supported by closely set posts and on the entries by 60-pound steel railroad rails set on about 5-feet centers.

FLOOR

The floor is a hard dry fire clay.

MOISTURE

The mine is dry. No moisture was observed in any portion of the mine visited.

GAS

While the No. 5 coal does not liberate a great deal of face gas, severe inrushes of gas are sometimes experienced when the overlying roof is broken.

SYSTEM OF MINING

The mine is worked on the room and pillar method; entries are driven 12 feet wide on 55-foot centers. The rooms are supposed to be driven 25 feet wide on 55-foot centers, leaving a 10-foot pillar between rooms, but owing to a controversy between the men and the company as to the number of rooms each two men should have, (the company allowing two rooms and the men demanding three) the men had been gouging the room pillars until in many places there was no pillar left at all. As a result the company has had a great deal of trouble from squeezes. The rooms are driven to a depth of 200 feet.

The coal is all undercut by electric chain mining machine.

BLASTING

The coal is all shot with Hercules Red H 4 permissible coal powder, fuse and No. 6 detonators. The shooting is all done at night after the men are out of the mine. The holes are drilled and tamped by the miner.

HOISTING

The coal is hoisted in the cars on self-dumping cages by an electric hoist.

HAULAGE

Five storage battery locomotives are used for gathering the coal and one trolley locomotive for the main line haulage.

The cars are of the lift end gate type and hold about two tons when topped six or eight inches.

The mining machines and trolley motor are operated on 250 D. C. This same circuit furnishes light for the bottom.

LIGHTING

The bottom and partings are lighted by electricity from the trolley circuit. The men all carry open carbide lamps.

VENTILATION

The mine is ventilated by a motor driven Jeffrey fan, located on the surface at the air shaft and is run primarily blowing, but is so constructed as to be reversible. The air is split at the bottom of the air shaft, the north and south sides being aired by a separate and continuous current of air.

The following samples of mine air were taken in March subsequent to the explosion:

Sample Bottles Nos. 520 and 511, Laboratory No. 41837 and 41838, taken on 1st East South 20 feet inby 2nd South.

Sample Bottles Nos. 517 and 527, Laboratory No. 41839 and 41840, taken on Main East 40 feet inby 4th South.

Sample Bottle No. 522, Laboratory No. 41841, taken on South side of main shaft, 20 feet inby shaft from the main return for the South side of the mine.

Sample Bottle No. 525, Laboratory No. 41842, taken on the North side of the main shaft 20 feet inby the shaft, from the main North return.

Bottle No.	Lab. No.	CO_2	O_2	CO	CH_4	H_2	N_2	Cu. ft. air per minute.	Cu. ft. CH_4 per 24 hours.
520)duplicates.	41837	0.15	20.84	0.0	0.51	0.0	78.90	4384	19570
511)duplicates.	41838	0.14	20.66	0.0	0.51	0.0	78.69	4384	19570
517)duplicates.	41839	0.08	20.72	0.0	0.49	0.0	78.71	8640	60965
527)duplicates.	41840	0.08	20.69	0.0	0.51	0.0	78.72	8640	63452
522	41841	0.09	20.72	0.0	0.26	0.0	78.95	11055	41389
525	41842	0.10	20.73	0.0	0.25	0.0	78.94	15470	51238

During the recovery work following the explosion a large motor was installed at the fan and the speed of the fan practically doubled. This larger motor was still in operation at the time the samples were taken. It is therefore reasonable to assume that the normal methane content of the mine air prior to the explosion was approximately double that shown by the analysis of the above samples.

The analysis of the sample taken at the head of the East entries shows one half of one percent methane. A sample taken at this same point prior to the explosion would therefore doubtless have shown a methane content of about one percent and would indicate that there probably was not enough ventilation for an open light mine prior to the explosion.

HUMIDITY

The mine is generally dry and dusty. One pump running part time takes care of all the water, most of which is made by the two shafts.

DUST CONDITIONS

Following the explosion standard roof and rib samples were taken on the 1st East off the Main South about 20 feet outby the 1st South. This entry was in no way affected by the explosion and it is thought the samples would be representative of what the conditions were in the area where the explosion occurred.

Road Dust Sample As Received

Can No.	Lab. No.	Moisture	Vol.	Fixed C.	Ash	Through: 48-mesh	100-mesh	200-mesh.
B-879	A-10045	6.2	19.8	24.2	49.8	80.9	55.8	24.2

Rib Dust Sample As Received

Can No.	Lab. No.	Moisture	Vol.	Fixed C.	Ash	Through: 48-mesh	100-mesh	200-mesh.
B-875	A-10044	2.4	30.0	44.6	25.0	62.1	39.0	37.5

Experiments in the Experimental Mine in Pittsburgh have shown that to be safe, the roof, rib and road dusts must contain from 60 to 70 per cent incombustible matter. The above analyses indicate a dust of very dangerous character. The rib dusts are very fine and dry and would be easily blown into the air, and to be rendered inert, an application of about six pounds of suitable rock dust per running foot of entry must be made.

RECOVERY WORK

Shortly after the explosion occurred the Vincennes office received a call for assistance. Messrs. Herbert and Davies responded at once with the Vincennes truck and rescue equipment, arriving at Sullivan shortly after twelve o'clock. S. T. Powell of the Evansville Station, and Matthew Kerr of the Vincennes Station arrived later in the day.

By the time the truck arrived at the mine volunteer crews under the leadership of John Boyle, Superintendent of the Ehnwvale Mine, Sullivan, had erected temporary stoppings along the main East entry and as far as No. 5 Room on the 3rd and 4th North, recovering several bodies. It was clear by this time that in order to make any speed at all in the recovery work it would be necessary to increase the ventilation and to tighten up the temporary stoppings already built.

Everyone was therefore withdrawn from the mine and a larger fan motor installed. This required about two hours' time. During this interval an organization was effected. The volunteer rescuers were divided into crews with leaders and each assigned definite tasks and definite times to report for work. The crews were supposed to work for two-hour periods although most of them stayed in for longer periods, as it was hard to get them to quit work after they had gotten below. As there were any number of able men volunteering to help it was thought best to work in two-hour shifts in order that the men might feel no ill effects from carbon monoxide poisoning, as the advance crews hanging curtains and exploring rooms were working in an atmosphere that contained an appreciable amount of this gas.

Because of the low roofs it was decided not to attempt to use apparatus in either restoring ventilation or in exploring the rooms for bodies. Gas masks, however, were used to good advantage in restoring ventilation on the 3rd and 4th North entries.

The explosion occurred Friday morning and the last bodies were removed and recovery operations completed about 6:00 A. M. Sunday morning.

At the time of the explosion a squeeze had started in the 3rd and 4th North entries and such evidence as was obtained in these entries as to the origin of the explosion and the direction of the forces was obtained during the recovery work and as a result is rather meager. At the time of the investigation it was impossible to get beyond Room No. 8 on the 3rd North and at that time Rooms Nos. 5, 6, 7 and 8 were squeezing.

INVESTIGATION

Arrangements had been made with the State Inspection Department to make a joint investigation on Monday following the explosion. On arrival at the mine Monday morning, word was received of a mine explosion at Wheatland, Indiana. As it was impossible to obtain any details as to the seriousness of this latter explosion it was decided best to postpone the investigation at the Sullivan mine until the following Wednesday and to all drive over to Wheatland.

Because of this delay in making the investigation and the fact that the 3rd and 4th entries were squeezing, it was impossible to get beyond Room No. 8 on the 3rd and 4th North entries on Wednesday the 25th, following the explosion.

The investigation party consisted of Albert Dally, Chief Inspector, John Stevely and Sam Wilton, Deputy Inspectors, G. A. Herbert, G. T. Powell and Joseph Davies of the Bureau of Mines.

At the bottom of the hoisting shaft a trip of loads from the north side had been blown onto one cage and piled up in such a way as to make it necessary to use one cage for the early part of the recovery work until the wreck could be cleared away.

From the hoisting shaft inby along the 1st and 2nd East on the north side the direction of forces had all been outby as far as the 3rd and 4th North. From the 3rd and 4th North to the face of the East entries, the force had been inby. All stoppings on the main east entries were blown out. On the 3rd North the force had been outby as far as Room No. 12. In Rooms Nos. 12, 13 and 14 there was evidence of extreme violence, particularly in Room 13; in this latter room the track had been torn up. In these three rooms the force had been towards the face of the rooms, apparently having crossed over from the corresponding rooms in the 4th North.

From No. 13 Room inby towards the face, there was a rapid diminution of force. From Room No. 19 to the face there were heavy deposits of soot both in the rooms and on the entry. All steppings between the 3rd and 4th North except the one in the next to the last crosscut, were blown out.

On the 4th North the force had been outby and towards the 3rd North from No. 12 Room. In No. 12 Room the track was partly torn out,

the direction of forces being towards the entry and outby through the room crosscuts. From Room 15 on the 4th the direction of force was towards the face with deposits of soot from about No. 18 or No. 19 inby.

In Room No. 12 on the 4th North a man was found with two flame safety lamps. No one knows how he came to have them in his possession, as he was not employed as a fire boss at this time, although he was fully competent to act as such.

There were two mining machines in the 3rd and 4th North entries, one in a room neck on the 3rd and one in a room neck on the 4th. Neither had been in operation at the time of the explosion, as the controller on each machine was in the off position. Neither were there any bodies found in close proximity to the machines.

At the time of the explosion there was a storage battery locomotive at about No. 15 Room on the 3rd North and one at about No. 10 Room on the 4th North; apparently neither was in motion at the time of the explosion, as the controller on each locomotive was in the off position and from the direction of forces the one on the 3rd was inby the origin while the one on the 4th was outby the origin and it is therefore certain that neither was in any way responsible for the explosion.

The evidence of flame was very noticeable in the rooms in both the 3rd and 4th North entries, particularly in a line with the room crosscuts. The props that were in line with these crosscuts were all badly scorched.

Flame had also extended to the face of the East entries and outby along these entries to about the 1st and 2nd North entries.

The fact that all the stoppings between the 1st and 2nd East entries were blown out, short-circuited all the air from the East side of the air shaft directly along the main North bottom, making it possible for the men on the South side to reach the escapeway in safety.

CONCLUSIONS

The evidence would all seem to indicate that the explosion had its origin at about Room 13 or 14 on the 4th North entry and was propagated through the northeast section of the mine by fine coal dust.

Inasmuch as a squeeze in this seam of coal is frequently accompanied by an inrush of gas from the roof as soon as it is broken, it would lead to the conclusion that this had occurred in this case and that the gas had been ignited by the open light of a miner at about No. 12 or No. 13 Room, as apparently neither the mining machines nor the storage battery locomotives were in operation at the time of the explosion, the open light is the most probable source of ignition.

RECOMMENDATIONS

(1) The Bureau of Mines recommends that permissible electric cap lamps be used in all coal mines whether they are termed gassy or not. It is believed that this explosion was due to the ignition of an explosive mixture of methane by an open light and might possibly have been prevented if

closed lights had been in use. It is recommended, therefore, that the management try to overcome the opposition of the miners' organization to the use of closed lights, and install them if an arrangement can be made with the miners to use them.

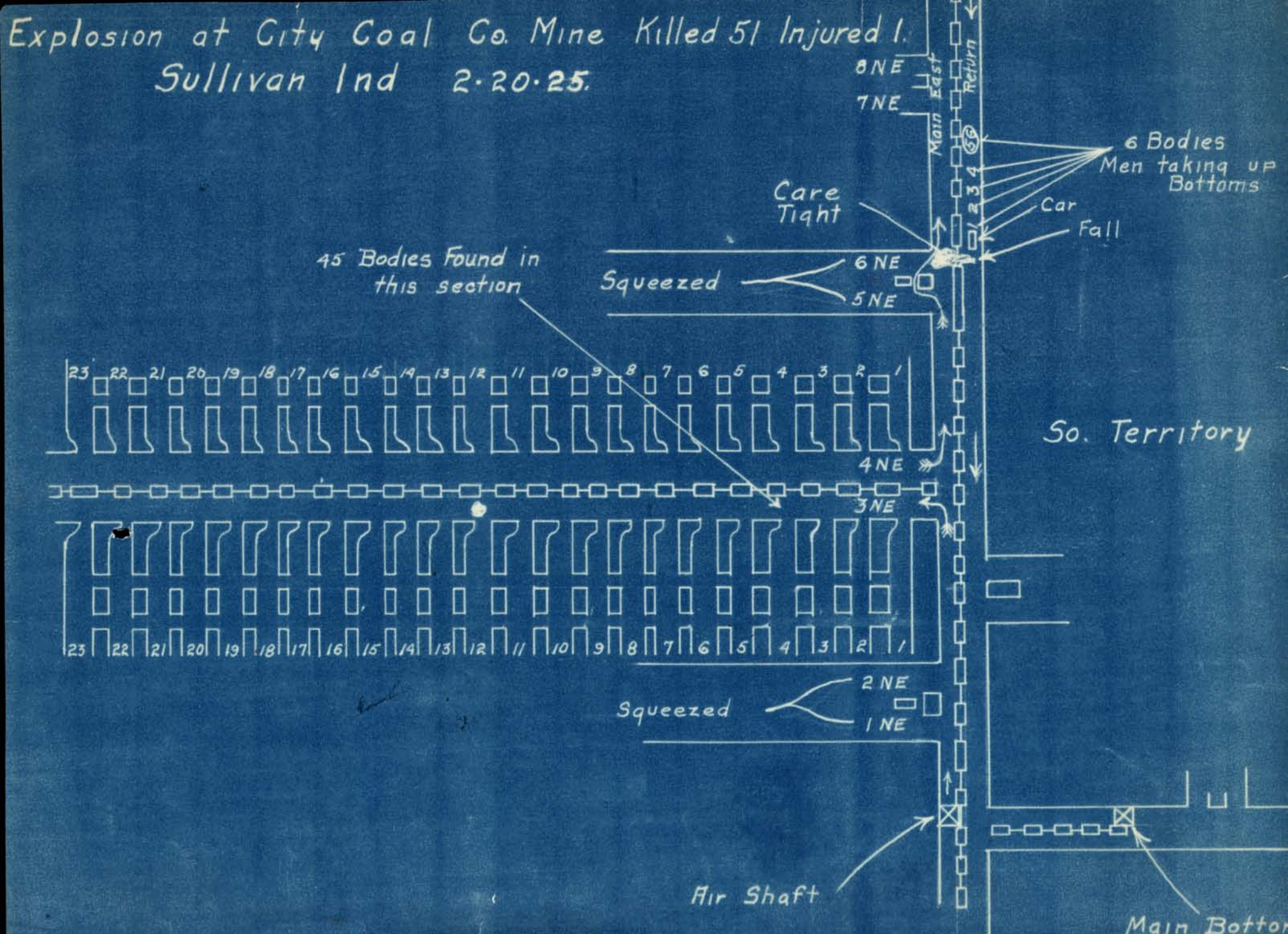
(2) Since the explosion the management has constructed a rock dusting machine and has given the entries a coating of rock dust. This is very commendable. It is believed however, that in order to prevent the possibility of a recurrence of a similar explosion to the one which occurred in February, the rock dusting must be extended up into the rooms, particularly in a line with the room crosscuts.

(3) It is also recommended that a fire boss be kept on during the entire day shift, so that all places might be given additional examinations for gas. This will doubtless require the employing of at least one additional man.

C. A. Herbert
C. A. Herbert
Dist. Engineer
Vincennes, Ind.

Approved:

J. W. Paul
J. W. Paul,
Chief of Coal Mining
Investigations.


Explosion at City Coal Co. Mine Killed 51 Injured 1.
Sullivan Ind 2·20·25.
8NE
7NE
Main East
Return
6 Bodies
Men taking up
Bottoms
Care
Tight
Car
Fall
1 2 3 4
45 Bodies Found in
this section
Squeezed
6 NE
5NE
23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
4NE
3NE
So. Territory
2 NE
Squeezed
1 NE
Air Shaft
Main Botton

B-654

AIR SHAFT

1ST No.

2ND N.

2ND EAST

3RD N.

4TH N.

5TH N.

6TH N.

STORAGE BATTERY LOCOMOTIVE

ORIGIN OF EXPLOSION

1ST EAST

ALL STOPPINGS BETWEEN MAIN EAST ENTRIES BLOWN OUT

AIR SAMPLE BOTTLES 517-528

AIR SAMPLE BOTTLE No. 523

HOISTING SHAFT

AIR SAMPLE BOTTLE No 522

COAL SAMPLE CAN No R-641

ROAD DUST SAMPLE CAN No B-879

RIB DUST SAMPLE CAN No B-873

AIR SAMPLE BOTTLES 511-520

N.

SECTION OF WORKINGS OF THE NO. 1 MINE CITIZENS COAL CO. SULLIVAN, INDIANA.

SCALE 1"=100'