

## **BLAENHIRWAUN. Cross Hands, Carmarthenshire. 6th. September, 1955.**

The Blaenhirwaun Colliery was situated near the village of Cross hands about 16 miles north west of Swansea and was near the extremity of the coalfield. It had been working since 193 producing high grade anthracite with an output of about 350 tons per day. 360 people were employed below ground and 80 on the surface. It was served by two vertical shafts sunk to the Green Vein. The No.1 shaft was 10 feet in diameter and 155 yards deep and as the upcast. It was equipped with a Walker Paddle fan which produced about 55,000 cubic feet of air per minute at a water gauge of 3.125 inches. The No. 2 shaft was 13 feet in diameter and 212 yards deep and was the downcast and winding shaft for men and materials.

The mine was in the No.1 Area of the South Western Division of the National Coal Board and the principle officers were, Mr. J.G. Tait, B.Sc., Area General Manager, Mr. J.D.H. Davies, Area Production Manager, Mr. D.J. King, Deputy Area Production Manager (Operations), Mr. I.R. Jeffreys, manager and Mr. J.H. Morgan, undermanger.

The seams that were worked at the colliery in descending order were the Big Vein, the Stanllyd and the Lower Pumpquart. Safety lamps had always been required throughout the mine and automatic firedamp detectors were required by the Coal Mines (Ventilation) General Regulations, 1947 had to be provided on the longwall faces where electric power was used. The lamps throughout the mine were Nife N.C. 113C electric cap lamps with E. Thomas and Williams Cambriam No.1 flame safety lamps and Naylor Spiralarms Type M, for the use of workmen as firedamp detectors. Prestwick Patent Protector Type 6 flame safety lamps were used by the officials for their official inspections.

The Lower Pumpquart seam had an average thickness of about three feet with a roof of clift and a fireclay floor. The volatile content of the coal was 5.5 per cent and it had been reached by driving cross measure drifts from the Green Vein about 26 yards before. Since then it had been extensively worked by the longwall method and the whole of the working area was generally disturbed with numerous faults, patches of barren ground and steep and variable gradients. At the time of the explosion the workings in the seam consisted of two longwall, single-unit faces, known as 'P' and 'Q'. These faces were ventilated in series, the air current first entering the 'P' face.

The 'Q' face was advancing north in a virgin area. It was about 80 yards long with the intake loading gate at the right and the return supply gate at the left. The gates were advancing to the rise at gradients of 1 in 2.5 in the loading gate and 1 in 2.1 in the supply gate. On the face there was rise from right to left at a gradient of 1 in 3.5. The face started production in January 1955 and had advanced about 90 yards. It was the intention to advance it a further 20 yards and then to replace it by a face formed by the ribside of the loading gate, to advance to the east.

The coal was hand got by pneumatic picks and shots fired in the flanking holes drilled into the solid coal. It was filled onto a retarder conveyor on the face and taken to a tub-loading pint by means of two belt conveyors in tandem in the loading gate. The face conveyor was driven by compressed air and the belt conveyors by electricity. Top rippings were taken in both gates with an additional floor ripping in the supply gate. Shots were fired in all the rippings. Both gates were supported by steel arch girders.

Dust was suppressed by the pneumatic picks being water fed, hand sprays were used on the face and fixed sprays at the transfer and loading points. Water infusion of the face had been tried but had proved of little use due to the fact that the face was advancing on the ends of well defined cleats in the coal.

The face was worked on a 48-hour cycle and the operation usually performed by each shift was as follows. The morning shift, 7.30 a.m to 2.30 p.m. were employed in coal getting and filling, ripping and packing in the supply gate. The afternoon shift, 3.0 p.m. to 10.30 p.m., ripped and packed in both gates. The withdrawal of supports and the advancing off the strip packs on the face and the moving forward of the conveyor on alternate days. The night shift, 11.0 p.m. to 6. 30 a.m., drilled shot holes and fired

shots in the coal. The face formed a deputy's district on each shift, except at weekends when each deputy made the per-shift inspection for the succeeding shift. The 'P' and 'Q' faces together formed an overman's district on each of the three shifts.

The roof at the face was supported by wooden bars set at right angles to the face on wooden props. Each of the gates had solid coal on one side and a pack on the other, about 10 yards wide, built from stone from the rippings. Along the face, strip packs about 6 yards wide were built from stone from the intervening wastes and were about 9 yards wide. Two hardwood chocks were maintained at the edge of each waste, the roof control had always been satisfactory on this face and there was no history of roof weighting or falls of ground.

The 'Q' face was ventilated by an air current of about 8,000 cubic feet of air per minute which had already ventilated the 'P' face and according to all the evidence the ventilation had always been adequate. On two occasions only had gas been detected and reported by the deputies. These were on the 5th. May and the 27th. June 1955. On each occasion a trace of gas was reported at the ripping face of the supply gate. After the first report on the 5th. May, the manager gave instructions for a hurdle sheet to be erected and maintained across the roadhead of the supply gate so as to divert a flow of air into the ripping face. The deputies foresaw difficulties in maintaining a hurdle sheet on this steep gradient and suggested a small fan to be installed so as to blow air on to the ripping face. The manager accepted this idea and a 12-inch diameter Mecor, compressed air turbine fan was installed. This fan, with a 6-foot length of steel ducting attached on each side, was suspended by means of a wire from the steel supports so that the ducting was approximately at the same gradient as the roadway and with the outlet ducting pointing to the ripping face. The fan with the ducting was moved forward as the ripping face advanced made this method of ventilating the ripping lip was still in operation when the explosion occurred. Samples of the air taken in accordance with the Regulations showed a percentage of methane in excess on 0.4 per cent on only three occasions. There were 0.55 on 28th. May, 1.10 on 27th. June and 0.70 on the 19th. August.

The morning shift of the 6th. September, stated at the normal time, the per-shift inspection had been made by the deputy on the night shift and everything was found to be in order. The face conveyor had been moved forward in the afternoon shift of the previous day and the strip packs and waste edge chocks had been advanced. The roadside pack of the loading gate had also been advanced, but the roadside pack of the supply gate was about yards back from the coal face. Over a length of a few yards at the return end of the face, the seam had thickened from its normal 3 feet to about 7 feet and the slip of what appeared to be a downthrow fault had been exposed, running roughly in line with the ribside of the supply gate.

There were 13 colliers engaged in getting coal and two advancing the top rippings in the supply gate. Also at the face were two conveyor attendants, one at the drive of the retarder conveyor at the return end of the face and one at the transfer point at the intake end. There were two men getting supplies of timber to the face in the supply gate and seven men outbye of the face on the loading gate and haulage road. These men, with the deputy and the shotfirer, brought the total in the district to 28.

The deputy commenced his first inspection from the face about 8 a.m. and he was accompanied by the overman. Between 9 and 11.30 a.m., the deputy made another inspection of the face during which time four shots were fired in the coal. He was making his third inspection when the explosion occurred at about 1. p.m. The deputy said that through all the tests he had done he found no gas and this was confirmed by the overman who was with him.

The shotfirer employed on the face fired about 22 shots between 7.45 a.m and 12. 20 p.m. He fired 20 of these shots in the coal on the face and two in the supply gate top rippings shortly before noon. The last coal shots to be fired were at the intake end

of the face at about 12.20 p.m. All the shots were fired singly. The shotfirer said that he tested for gas and found none for any of the shots.

At about 1. p.m. the deputy was making his third inspection and travelling with the air current, he reached the return end of the face and had found work proceeding normally and everything apparently in good order. He was one of a group of nine persons in or about the supply gate roadhead who were suddenly enveloped in flame and blow off their feet by the explosion. They all sustained severe injuries, from which two of them subsequently died but they were not injured by the blast. Two colliers working together about 25 yards down the face from the supply gate were buried under a large fall of roof which occurred as a result of the roof supports being displaced and blown downhill by the blast. When they were recovered from beneath the fall both bodies showed evidence of burns caused by the passage of the flame before the roof fell. The men working further down the face were badly burned and must have died instantly from the multiple injuries caused by the blast. Those men working further down the face at the roadhead of the loading gate were blown downhill and three of them sustained burn injuries but in no case were they of serious nature. The only person in the supply gate outbye of the roadhead was one of the two men engaged in getting timber to the face and his body was found burned and severely injured by the blast. He was found about 90 yards outbye from the face.

The alarm was immediately raised by those who were uninjured in the loading gate and help with additional first aid equipment and stretchers quickly arrived on the scene. The emergency organisations of rescue and ambulance services was quickly put into operation. Despite the difficulties created by the fall which blocked the face, all the injured were soon brought out, given efficient first aid at an emergency dressing station in the district and sent to the surface and then to hospital. It took until the following day to clear sufficient of the fall for the recovery of the bodies on the men beneath and both must have been killed instantly.

Arrangements were made for additional first aid men and equipment to be sent to the 'Q' face where the emergency dressing station was situated. Within half an hour Dr. Ivor Evans who was in practice in Penygroes and Dr. Sheeman at Cross Hands arrived at the colliery. They immediately went down to the 'Q' district where they gave their services at the dressing station. As the injured were brought to the surface they were seen by Dr. R. Thomas of Penygroes assisted by Dr. Schofield who was in charge of the first aid room and nursing sisters from neighbouring collieries before they were taken by ambulance to the Morriston General Hospital. The last of the ambulances left the colliery at about 5 p.m.,. During the night the nine most serious cases were transferred to the Plastic Surgery Unit at St. Lawrence Hospital, Chepstow.

The victims of the disaster were-

Those killed-

J. Davies, N. Howells, R. Morris and W.H. Richards.

Those fatally injured-

D. Pennington and A.C. Phillips.

Those injured-

B.R. Burton, W. Cooper, C. Davies, H. Davies, S. Davies, S. Evans, V. James, M. Jones, D. Phillips., D.H. Rees and W.J. Wilson.

Four were killed in the explosion and 13 others injured. One of the injured died in hospital on the 18th. and another on the 30th. September 1955 which brought the final death toll to six.

The report on the causes of and the circumstances attending the explosion which occurred at Blaenhirwaun Colliery, Carmarthenshire on 6th. September 1955, was

conducted by Mr. T.A. Jones, O.B.E., H.M. Divisional Inspector of Mines and reported to The Right Honourable Lord Mills, K.B.E., Minister of Power in October, 1957.

The inquest was held on 23rd. November 1955 by Mr. W. Locke Smith, H.M. Coroner for the Three Commontts District of the County of Carmarthen who sat with a jury, who recorded a verdict to the effect that the six men had died from injuries accidentally received in a coal gas explosion, the cause of which had yet to be ascertained.

The inquiry looked into all the factors relating to the explosion and all interested parties were represented. The nature of the explosion, the source of the gas and the means of ignition were all closely looked at. The explosion occurred in the top corner of the face near the supply gate roadhead and the only gas was present after the disaster was from a blower in the roof about 20 yards down the face from the supply gate which was so great that it had to be piped into the return air way and it was estimated that 400 cubic feet per minute were issuing forth. It was concluded that gas came from this blower and it had commenced to come out only a minute or so before the explosions.

As to the source of ignition, all the safety lamps were tested and found that none could ignite the gas and there was no electricity in the face. Contraband was discovered in a jacket after the disaster but it was thought that no men had been smoking. Frictional heat was ruled out as the only fall was on the face after the explosion and there was nothing to support the theory that shot firing had been the source of ignition, Even though there were two patched leaks on the compressed air hoses, they were tested at the Mines Research Establishment and this was ruled out as a source and attention focused on the Meco, Type CF3 compressed air driven fan. When this was examined it was found that the four blade showed signs of damage by rubbing on the trailing edge. In experiments at the Mines Research Establishment it was found that at speeds less than those which would be the running speed of the fan sparks were produced that could ignite gas.

The inquiry came to the following conclusions-

“At a time when work was proceeding normally with the ventilation taking it's normal course, a blower of firedamp of considerable magnitude suddenly issued from the roof some 20 yards down the face from the supply gate. The rate of emission was such that within a minute or so the methane content of the air current on the return side of the point of issue was raised above the lower explosive limit. Simultaneously, migration of the firedamp caused a richer and more highly explosive mixture to accumulate in the top corner of the face. As soon as the mixture drawn through the fan became inflammable, it was ignited by sparks produced by friction between the trailing edges of the fan blades and pieces of stone which had been projected by the ripping shots into the outlet ducting and were now fouling the path of the blades. Flame instantly spread throughout the inflammable atmosphere and reached the highly explosive accumulation at the top corner of the face, whereupon flame and blast were projected down the face and outbye along the supply gate. The men at the top end of the face were enveloped in flame but were too near the seat of the explosion to be affected by blast.

It may be asked why, with the fan continuing to run after the explosion, this sequence of events was not repeated. The answer seems to be that before the ventilation current could resume it's normal course after being interrupted by the blast down the face, the fall of roof occurred. This obstruction caused by this fall so reduced the quantity of air flowing that, with the issue of firedamp continuing undiminished, the methane content of the atmosphere throughout the area on the return side of the point where the issue was above the upper explosive limit. This state of affairs continued until the fan was stopped before steps had been taken to restore the ventilation.”

**LEWIS MERTHYR. Trehafod, Glamorganshire. 22nd. November, 1956.**

The colliery was situated in the village of Trehafod about 18 miles from Cardiff. The winding shafts for men and materials were known as the Bertie Pit and the Trefor Pit and were sunk about 1878 but high class steam coal had been produced for ten years before this from shafts that were still contained within the mine. There were six vertical shafts serving the mine. Of these, the House Coal shaft and the Cymmer shaft were used for pumping, the Lady shaft for ventilation and was the upcast shaft, the Hafod shaft was the downcast and was the third means of egress. The output of the colliery was 1,250 tons per day. The mine employed 936 persons underground and 226 on the surface.

The colliery was part of the No.3 Area of the South Western Division of the National Coal Board and the principle officials were Mr. M.J. Davies, the Area General Manager, Mr. A. Hudson, Assistant Area General Manager, Mr. G. Tompkin, Area Production Manager, Mr. C.H. Hodkin, Area Production Manager (Operations), Mr. D.N. Simpson, Deputy Area Production Manager (Planning), Mr. J. Murphy, Group Manager, Mr. A.R. Fox, Manager who was killed in the explosion, Mr. E. Moore, Undermanager of the Trefor Pit and Mr. W. McDonald, Undermanager for the Bertie Pit.

The seams worked at the pit in descending order were the Two Feet Nine, the Six Feet and the Gelli Deg. All the seams were worked by the advancing longwall method and the coal was won by pneumatic picks and had loaded on to conveyors. The only seam affected by the explosion was the Two feet Nine which lay at 328 yards below the surface. The seam had an aggregate thickness of seven feet and contained four dirt bands of varying thickness. The roof was a good cliff and the floor was of fireclay and the seam had been extensively worked in the area.

At the time of the explosion the N4 district was the only district being worked in the Two Feet Nine seam. The coal was raised at the Trefor pit and comprised the total output of that pit which was about 320 tons per day. The district consisted of a double unit longwall conveyor face served by two end supply roads and a centre loading road. The gradient was negligible. Each side of the face were 105 yards long. The coal was hand got with pneumatic picks and the face advanced four feet six inches on a 48-hour cycle. The coal was full only on the morning shift with the cycle of operations arranged so that the face conveyors were moved forward on alternating afternoons. There was a similar alteration in the waste drawing and packing operations done on the afternoon shift. The three roads were ripped on the afternoon and night shifts, the rippings being taken entirely in the roof.

Traditionally the working section of this seam had been the lower four feet of the seam with a bed of coal one foot six inches thick forming the roof and the N4 panel had been opened in this way. In September 1956, it had been decided to try to work the full thickness of the seam. By doing this no coal would be lost and better material would be obtained for the packs. By November the whole of the left hand face was being worked to the full thickness of the seam but the right hand face remained as originally developed.

All the machinery was driven by compressed air and no electrical power was installed in the district. On each of the three shifts there were two deputies. One was responsible for the working face, the end roads to the junctions with the intake airway and for the centre road to it's junction with the return airway. The other deputy was responsible for the intake and return roads outside these junctions. An overman was in charge of the morning shift and the night shift was similarly supervised.

The support of the left hand face was by Dowty hydraulic props set to heavy section corrugated steel bars. The bars were set at eight feet intervals with rows of props four feet six inches apart. Strip packs were built eight yards wide leaving wastes ten yards

wide. In each waste Walton quick release steel chocks were set along the edge of the waste. On the right hand side of the face, where the work was carried on in the old way, the roof was carried on H section steel props, with both ends closed, set to corrugated steel bars. Wood compression pads were used between the props and the bars. The rows of props were set at four feet six inches apart with the bars four feet apart. On the face, strip packs, five yards wide were built leaving wastes six yards wide. Opposite each waste two hard wood chocks fitted with quick release devices were built.

The coal face at the roadhead of the centre road was kept about 12 feet in advance of the general line of the face, and the rippings were taken to the coalhead. The roof was supported by means of steel arches, 14 feet wide, set at intervals of four feet six inches to correspond with the advance of the face conveyors. These steel arches were a temporary means of support from the span of the roof, about 20 feet long, between the coal head and the permanent roadway supports, which consisted of steel arches of similar dimensions but had the straight portion of each leg cut off and a curved steel plate welded on. This rested on a soft wooden cog which formed part of the ten yard wide roadside packs. These permanent supports were set three feet apart and the cogs were erected to the height of the face working. The end supply roads were supported in the same way but the interval between the inbye permanent support and the face did not exceed ten feet as these roadways were not advanced in front of the general line of the face.

The district was ventilated by air from the Hafod downcast shaft which returned direct to the Trefor upcast shaft. The end roads served as intakes and the centre loading road as a common return. Air measurements were made on the 5th., November, 1956 showed 7,828 cubic feet of air per minute entering the left hand face, 7,201 cubic feet entering the right hand face and 15,442 cubic feet returning on the centre road. Air samples showed methane content in the centre road as 0.06 per cent. The reports made by the deputies showed that inflammable gas had been found on four occasions since the district started production in February 1956. All the reports were 'of blowers diluted at the point of issue' at the waste edge.

Explosives were not normally used in the district. The roof rippings in all three gate roads were got down by pneumatic picks. The only case of a shot being fired anywhere in the district was on 16th. November 1956 when one shot was fired in the floor at the centre road. The shot was necessary to grade the road through a fault. To suppress dust the seam was systematically infused with water and this proved satisfactory. The roadways were regularly treated with limestone dust and the most recent samples taken before the explosion occurred showed the incombustible content of the dust on the floor to be 78 per cent and on the roof and sides 75 per cent.

On the night of the 8/9th. November 1956, an extensive fall of roof occurred in the roadhead of the centre road from the inbye permanent support practically at the face of the roadhead, a length of about 16 feet. One steel arch was left standing between the inbye end of the fall and the coal face. The cavity was the full width of the roadway and exposed the Three Coal seam some 24 feet above. For some time earlier a small fault had been working down the left hand face towards this road. At the time of the fall this fault was less than ten yards from the left hand side of the road. There was no evidence of the fault in the cavity but it was obvious that the thick bed of clift above the seam had changed to become weaker than normal.

The fall was cleared and 14-foot steel arches were erected beneath the cavity. These arches were covered with wood lagging which in turn was covered with a 'cushion' of rubbish about four feet thick. The top of this would have been eight feet from the top of the cavity. The roof and side of the cavity above this packing were not supported in any way. The production of coal was resumed on Monday 12th. November, 1956 and work proceeded without incident until the night of the 19/20th. November when a second fall occurred in the roadhead which was an extension of the earlier fall. The cavity had now extended to the coal head and was about 30 feet long

and 30 feet high. It had also widened to about 30 feet and exposed a slicken-sided slant about 10 feet to the left of the fault which was now covering the middle of the road and there had been no previous indication of this slant.

This second fall made coal production impossible and this was the state of affairs on 21st. November. By the afternoon shift of this day, the fall had been cleared and the erection of steel arches under the cavity commenced. This work was being carried out on the night shift when at about 3. a.m. on the 22nd. November, four of the six newly erected steel arches were displaced by a stone weighing about three tons which fell from the cavity. The colliery manager accompanied by the morning shift overman arrived at the colliery about 5.30 a.m. He decided to erect an 'umbrella' of ten feet arches covered by wooden lagging beneath the gate of the conveyor could run. These arches were erected without disturbing the 14-foot arches displaced by the fall. The stone that had fallen was broken up by pneumatic picks and the work of erecting the arches begun.

By this time the men employed in the morning shift had begun to reach the meeting station at the junction of the left hand supply road with the intake airway. A few of these men were brought forward to assist with the work and the remainder told to stay at the meeting station until they received further instructions. The men at the meeting station noticed a 'puff' of wind and a cloud of dust. A collier who had passed into the left hand face returned to say that he had seen flame in the centre road. The work of rescue was quickly organised.

Those killed-

E. Howells aged 37 years, turbine attendant and  
S. Thomas aged 69 years, overman.

Those fatally injured-

A. Atkins aged 40 years, collier,  
T. Davies aged 38 years, chargeman,  
A.R. Fox aged 41 years, the manager,  
C. Jones aged 36 years, overman,  
R. Jones aged 57 years, repairer,  
J.H. Mills aged 35 years, repairer and  
P. Profitt aged 27 years, repairer.

Those injured-

H. Bryant aged 46 years, chargemen,  
W. Childs aged 43 years, repairer,  
F. Crump aged 39 years, repairer,  
W.H. Davies aged 50 years, packer and  
I. Humphries aged 35 years, deputy.

The inquiry into the causes and circumstances attending the explosion which occurred at the Lewis Merthyr Colliery, Glamorganshire, on 22nd. November 1956, was conducted by T.A. Jones, O.B.E., H.M. Divisional Inspector of Mines and reported to the Right Honourable Lord Mills, K.B.E., Minister of Power on the 8th. November 1957.

The inquest was conducted by H.M. Coroner for North Glamorgan, Mr. T. Alwyn John on 1st. March 1957, who sat with a jury. A verdict was recorded that all nine men who died that-

"They had died as a result of burns accidentally received in an explosion at the roadhead of the centre road in the N4 district of the Two Feet Nine Seam at Lewis Merthyr Colliery on 22nd. November 1956."

From all the evidence it was concluded that an explosion of firedamp had taken place in and beneath the cavity. The flame had travelled about 70 yards outbye along the centre road, for about 15 yards along the left hand face and 25 yards along the right hand face. The severe nature of the burns that the men received suggested that the flames had persisted for some time in the vicinity of the cavity. There was no sign of violence and no indication that coal dust had played a part on the disaster.

Tests were made to determine the source of the firedamp and it was found that there was 80 percent firedamp at the top of the cavity although the presence of gas had not been detected prior to the explosion. Immediately after the fall on 20th. November, the undermanager and the deputy climbed up on the debris and examined the top of the cavity and found it clear. At this time the mound of debris was deflecting the air into the cavity. No steps were taken to direct an air current into the upper part of the cavity and when the fall was finally cleared the cavity was left entirely unventilated and could not be examined. About two hours after the explosion, the night shift deputy stood on the tops of the steel arches and tested for gas as high as he could reach but this was about 15 feet from the floor and 18 feet from the top of the cavity.

All possible means of ignition were investigated and it was concluded that none of the safety or electric lamps in use at the time could have been responsible. After the explosion it was found that the compressed air hose from the manifold of the centre road to the turbine on the right side of the face conveyor was found to be leaking from a hole but this was dismissed as a source of ignition. Except for two mining telephones electricity was not used in the district and it was disclosed, in evidence, that the telephones had not been in circuit for some days before the explosion. Nothing was found to suggest that the explosion was caused by contraband and the only possible source of ignition that was left was frictional heating.

There was definite evidence that the none of the conveyors had run during the night and the survivors stated that the explosion was coincident with the fall of roof. This led to a careful examination of the possibility of incendive spark being produced by the fall. The tests did not produce conclusive results but it was considered that this was the source of ignition.

Mr. Jones came to the following conclusions-

- “1). After the fall had been cleared and while the steel arches were being erected, the upper part of the cavity contained a high concentration of methane.
- 2). The stone falling from near the top of the cavity brought down enough methane to produce an explosive mixture at the horizon of the steel arches.
- 3). The impact of the stone striking the steel arches produced an incentive spark which ignited the explosive mixture, whereupon the flame spread to the extent described earlier in this report and persisted until all the methane was consumed.”

### **SUTTON. Mansfield, Nottinghamshire. 21st. February, 1957.**

The colliery was near Mansfield, Nottinghamshire and there were two shafts each 15 feet in diameter which were sunk in 1874 to the Top Hard seam by the Skegby Colliery Company and deepened during 1896 to 1897 to the Low Main seam at 467 yards deep. The Top Hard, Deep Hard, Deep Soft, Low Main and Piper seam had all been worked and the Top Hard had been exhausted many years before. At the time of the explosion the daily output was 1,200 tons of which 850 tons were from the Low Main seam which had been worked for 40 years. The remainder of the output came from the Piper seam.

The district in which the disaster took place was known as 28's and was one and a quarter miles inbye in the Low Main seam 580 yards below the surface. Up to a month before the disaster, the seam had been worked by machine cutting at floor level,

blasting and hand filling onto conveyor belts which fed a trunk conveyor. The system was changed when an Anderson shearer coal getting and loading machine was stated on the 28's face on the 28th. January 1957. The district usually employed 30 men on the day shift, 12 on the afternoon shift and 10 on the night shift but on the 21st. February during the day shift when the explosion occurred there were 40 persons in the district including an electrician, a fitter and the undermanger.

The mine was ventilated by an exhausting direct coupled steam driven Davidson Sirocco double inlet fan which was situated at the surface and circulated 115,000 cubic feet of air per minute at 3.3 inches water gauge. A new fan, driven by a diesel engine which was designed to circulate 175,000 cubic feet per minute at a water gauge of 7.7 inches. This had been installed and was ready to use. The fan was first used three days after the explosion. The workings in the colliery were not particularly gassy but firedamp was found and safety lamps were used throughout the colliery. Those in general use were Oldham G.W. electric cap lamps. as firedamp detectors, Protector Type No.6 flame safety lamps, fitted with pyrophor bar internal igniters. Gauzes of all the flame lamps were of 28 mesh. Automatic firedamp detectors, Ringrose 47/125 Type, were provided but there was some reluctance on the part of the men to use them. There were only two in use in the mine at the time and neither of them were in the district involved.

The colliery was in the National Coal Board No.4 Area of the East Midlands Division and the principle officers at the time were Mr. F.D. Severn, Area General Manager, Mr. T. Wright, Area Production Manager, Mr. C. Round, Deputy Area Production Manager (Operations), Mr. J. Atkinson, Deputy Area Production Manager (Planning), Mr. T. Frith, Group Manager, Mr. A. Stone, Acting manager and Mr. W. Bacon Acting undermanager. The previous manager, Mr. E. Maiden, had left the pit to take charge of another colliery on the 1st. February 1957 and the undermanager Mr. Stone, was temporally appointed as manager.

The officials in the low Main No. 28's district, day shift were Mr. T. Buckley, overman, Mr. J.W. Kirk, deputy, Mr. S. Derbyshire, shotfirer. On the afternoon shift, Mr. W. Warren, overman, Mr. J. Aldred, deputy and on the night shift, Mr. A. Walker, overman and Mr. M. Cox, deputy. as was customary on these mechanised faces, the face work was spit up into stints, each about 30 yards long. ten men working in pairs were employed for advancing the conveyor and for setting and withdrawing supports, five men were employed to fill the coal at the loader gate stable hole, remove the original left side pack of the loader gate and take up the floor of the loader gate so that the conveyor driving engine could be advanced. Four men were employed filling out the coal at the return gate stable and two additional men were working at the left end of the face where it was slowly being extended. At the time there were 34 men, a shotfirer, a deputy, an acting undermanger, two electricians and a fitter making a total of forty men in the district at the time of the disaster.

The coal in the Low Main seam was 3 feet 3 inches thick with a medium clunch floor and a roof of 9 inches of clunch, 4 feet 6 inches of coal and 35 feet of grey bind with 60 feet of sandstone above. There was a variable but thin section of sandy material between the grey bond and the sandstone. A double until coal face, 280 yards long, and was known as 30's face had been advanced 1,250 yards to the north-west, rising at about 1 in 100, by orthodox machine cutting, blasting and hand loading on to a face conveyor belt. There were three roads or gates of this face, the middle and right hand gates were the intake airways and the left gate was the return. The middle gate was the loader and conveyor gate. Electricity was used to operate the machinery in the district.

On the 11th. June 1956, at a point 120 yards inbye from the junction of 30's loader gate and old 28's face trunk road, a scouring was started from 30's loader gate, driven through the waste to 30's right side gate and for a further 15 yards to the solid coal on the right of 30's right side gate. this road continued in the coal for about 10 feet and as

about 12 feet wide. The face was then widened to about 30 feet and the road, still 12 feet wide, was carried forward with stone packs about 9 feet wide on each side. It was dipping about 1 in 8 and was supported by 12 foot steel arches which were 9 feet high. The ventilation came from an auxiliary fan 18 inches in diameter driven by a 5 H.P. electric motor which forced air through canvas ducting to the face. By 14th July 1956, this road had reached a point 63 yards from 30's right side gate where it stopped.

A coal face, now called Old 28's face, had been worked to the north-east but had been abandoned owing to difficulties in maintaining the roads. It was intended to develop a new face to replace Old 28's face advancing in the same direction but leaving solid coal 80 yards wide between the ends of the Old and the New 28's faces and also 50 yards of coal to the right of the 30's right side gate to protect the gate from damage. Plans were changed two or three times both on the layout and the direction of advance of the New 28's face and also as to the scheme of ventilation. Eventually it was decided to open New 28's face 150 yards long, immediately to the right side gate, leaving no coal for protection of this road and extending to the left of the original development road.

The face was opened out by driving a road in the coal about 12 feet wide from the left side of the developing road for 150 yards to the north-east in the same direction as the 30's face and then to make a connection through the pack back into 30's right side gate. This was completed on 29th December 1856 and this the new face was arranged to be ventilated with the original development road at the right end as intake, the air passing along 28's face, along 30's face and out along 30's left gate as a return airway. This meant that 28's and 30's were ventilated in series. At the time the Coal Mines Act, 1911 was still in force and therefore under the Electrical Regulations under the Act notice was required to be given of intention to introduce apparatus into the mine or any ventilating district of the mine, but in this case 30's and 28's districts were part of the same ventilating district and electricity was already in use in that district.

After 28's face had been advanced 10 feet by hand getting, and Anderton shearer coal getter loader, mounted on an armoured chain conveyor, both of which were electrically driven, was installed with what was known as the prop free front method of support to allow the conveyor to be advanced broadside following each cut of 20 inches by which the face advanced.

The roof at the face was supported by coupled 3 feet 3 inch long bars set to a triangular system on hydraulic props fitted with castellated heads. The system required rows of bars to be set at maximum intervals of 3 feet with 6 feet maximum intervals between props in the same row. The necessary authorisations and exemptions had been granted under the provisions of the Coal and Other Mines (Support) Regulations. The maximum interval between the front row of props and the face was authorised to exceed 3 feet but not to exceed 5 feet. Alternate bars were to be advanced after each cut of 20 inches.

The original development road was both intake and loader gate, with the face conveyor discharging into a stage loader and then into the gate conveyor which extended to a common trunk road conveyor at the junction with 30's face loader gate. To enable the original loader gate to function as loader gate it was necessary to remove a 3 yards wide pack at the face on the left side of the gate to allow the face conveyor and its driving machinery to be advanced after each cut. This roadside pack was rebuilt behind the face conveyor after each day's coal getting, the original road having to be remade by taking up the floor and ripping the roof and putting in new steel arches, 12 feet wide and 9 feet high. The return gate at the left side of 28's face was also roof ripped and packed on each side as the coal face advanced. 12 feet by 9 feet steel arches were set 3 feet apart, but within 20 feet or so of the face a similar sized arch was used. Strip packs, 3 yards wide, were built 9 yards apart in the waste between the two gate ends for the first 15 feet of advance of the coal face with the Anderton shearer.

Mr. Maiden was the manager at the time and he informed the Inspector for the District that he intended to stop the intermediate packs once the face had advanced far enough establish proper control of the roof. The full caving system extended from the left side of the pack, 9 feet wide, of the loader gate to the right side of the pack of the return gate, a distance of about 130 yards was started on 11th. February 1957 and was continued up to the time of the accident during which time the coal face had advanced a further 44 feet. The management claimed that full caving between the roadside packs was introduced earlier than originally intended because the roof wastes between the intermediate packs was not breaking down regularly to provide packing material. The waste edge support by chocks was doubled and the roof at the face improved.

The loader gate was already difficult because of the need to take out the 3 yards wide left side of the pack to enable the face conveyor and its driving machinery to discharge through to the stage loader and to rebuild it behind the conveyor. As might have been expected, these difficulties became much more serious after caving was started. Indeed large falls of roof occurred in the loader gate and continued as the coal face advanced. the road was widened to 17 feet by extending on the left side as the cavity left by the falls widened on this side. To cover this width, 5 feet long horizontal joists were inserted between the steel arches sections. For several days before and also between 6 and 7 a.m. on the morning of the explosion, falls occurred and had left a cavity about 36 feet long, 9 to 12 feet wide and 10 to 12 feet high, above the steel arches of the roadhead. to top and sides of this large cavity were only partly and inadequately secured by two wooden chocks built on the wood lagging pieces laid over the steel arches.

People had to work at the face under the edge of this cavity and the electric cables from the driving gear of the face conveyor were under it with only steel arches covered by boards to protect them against the a danger of further falls. A fall occurred between 6 and 7 a.m. and partly buried the face conveyor engine and closed access to the coal face, so that the miners had to withdraw for a time and under the supervision of the undermanager and the deputy they helped to remove enough debris to enable the face conveyor to run again. This fall was liable to damage the machinery including the electrical gear in the roadhead. The fall was also liable to injure workmen but an electrician and a fitter examined the machinery and found it safe and it was agreed that it was safe to restart work. This was done without anything being done to secure the roof.

Regulation 12 of the Coal and Other Mines (Support) Regulations, 1956 required that-

“If any a fall of roof or side involving the displacement or breakage of any support had occurred at a place where any person had to work or pass, it shall be the duty of the person for the time being in charge of that part of the mine forthwith to ensure that any roof or side exposed thereby is, if necessary, dressed and is secured by supports and that any such dressing and securing is done before any work of clearing debris is begun, other than such work of clearing debris as is necessary for the setting of supports.”

At about 11 a.m., the Anderton shearer loader arrived back at the stable to the left of the loader gate, having completed it's second cut. P. Smith and D. Reeves, loader gate stable hole men, were instructed by Mr. Bacon, acting as undermanager, to clean up on the face side of the face conveyor engine to enable it to be advanced 20 inches. They were doing this when a stone, about 3 feet by 3 feet by 18 inches fell from a height of 10 to 20 feet from the cavity above the arches and struck the conveyor motor. Immediately there was flash and a bang and they were thrown forward onto the floor. a ball of flame, which appeared to be red and blue in colour, passed over them and they felt the heat. There was also thick dust and smoke.

The flame travelled at least the greater part of the loader gate to its junction with the 30's loader gate. It also travelled most of the length of the face. Evidence of the flame passing along the face was given by J., Hill, return gate ripper. He said that at about 11.30 a.m. he and J. Flay were instructed by S. Derbyshire, shotfirer, to go 30 or 40 yards up the face to act as sentries while he fired two ripping shots in the return gate. Both shots were fired. Hill said he was in a kneeling position facing the loader gate. A few minutes after the second shot was fired, he felt a gust of hot dust-laden air and saw flame coming from the loader gate. This turned him completely round until he was facing the return gate. His left arm and neck were scorched. He had the impression that the flame travelled along the coal face to the left hand end and returned along the waste side edge.

The men on the face made their way out, together with the men in the return gate, by groping their way in the dust to 306 right side gate, through the door and sheet on this gate, to 28's loader gate. There was evidence that these men found difficulty in opening the door on 30's right gate and found it could only be partly opened. The men employed in the loader gate made their way out by groping along the 28's gate conveyor to 30's loader gate where the air was cleaner.

First aid was rendered to the injured men with what material was available. Eight of them were carried out on stretchers and the remainder either ran or were assisted out by colleagues. Some were naked to the waist. All 25 men received burns of varying degrees. Two were allowed to go home after treatment and 23 were admitted to Mansfield General Hospital. Most of the men had arrived at the Medical Centre about 12.25 p.m. The National Coal Board's Area Medical Officer, Dr. Fernandez arrived at the colliery at 12.25 p.m. and found 15 men awaiting attention. Dr. Round, the Assistant Medical Officer arrived at 12.30 p.m.. The first ambulance arrived at 12.50 and was quickly followed by others. The injured men were taken to hospital where a team of surgeons were ready to give attention. All the victims suffered multiple burns.

Those who died from their injuries-

W. Savage aged 29 years. Coal getter,  
J.W. Betts aged 55 years. Ripper,  
J. Lemm aged 35 years. Shearer assistant,  
L. Reeves aged 45 years. Coal getter and  
J. Godber aged 16 years. Supplies hand.

Those seriously injured-

G. Atterby aged 28 years. Faceworker,  
S. Brewer aged 46 years. Shearer driver,  
F. Bradley aged 32 years. Faceworker,  
W. Bacon aged 37 years. Acting undermanager,  
F. Clayton aged 33 years. Faceworker,  
G.I. Deakin aged 16 years. Supplies hand,  
W. Fudge aged 23 years. Faceworker,  
C. Fudge aged 29 years. Faceworker,  
J.W. Kirk aged 52 years. Deputy,  
T. Lindley aged 30 years. Faceworker,  
W. Middleton aged 33 years. Shearer assistant,  
W. Riley aged 45 years. Faceworker,  
H. Sage aged 17 years. Belt driver,  
S. Wilson aged 32 years. Faceworker and  
S. Ward aged 39 years. Faceworker.

A call was made to the Mansfield Rescue Station and they called the Chesterfield station for assistance. The Mansfield men descended the pit by noon and the

Chesterfield team was at the colliery by 12.12 p.m. A fresh air base was established at the junction of 30's loader and 28's loader gates at 12.55 p.m. The teams were informed that all the men had been accounted for but two ponies had been left 200 yards along 30's loader gate. They were brought out by the rescue team at 1.26 p.m. The rescue team explored 28's loader gate and face and returned to the base at 2.30 p.m. They reported 3.5 per cent firedamp at 28's return gate ripping and 2.5 per cent in 28's return gate. The smouldering clothes and conveyor belting was suppressed with extinguishers. Mr. Firth, the Group Manager, arrived at the fresh air base at 2.40 p.m. and he instructed the rescue team to examine 28's and 30's faces and come out by 30's return gate to the fresh air base. They reported the whole of the district clear and the canary which they carried was not affected.

The report of the causes of and the circumstances attending the explosion which occurred at the Sutton Colliery, Nottinghamshire on 21st. february 1957, was conducted by A. Winstanley, C.B.E. D.Sc. H.M. Deputy Chief Inspector of Mines, and reported to The Right Honourable Lord Mills, K.B.E., Minister of Power on 11th. November 1957.

The inquest was delayed so that the injured men could recover to give evidence. At Mansfield on 7th. October 1957, Mr. Winstanley attend the inquest before H.M. Coroner and a jury. On open verdict was returned on the dead. The inquiry examined the circumstances of the roof falls and said that steps should have been taken to control the movement of the strata and support the roof and sides where necessary for keeping the workplace secure and was required by the Mines and Quarries Act, 1954. With regard to e ventilation, it was found that there were difficulties with the new Davidson diesel driven fan and it was not possible to start the fan until after the explosion. There had been difficulty in in getting anerometer readings and there were many places that restricted the air flow. Little regard was taken to these restrictions and along with leakage it was agreed that the ventilation was insufficient to prevent firedamp accumulating.

There were no reference to firedamp having been detected in the statutory reports. T. Buckley, the day shift overman made test in the loader gate on the 20th. February but he made no tests in the cavity because Mr. Bacon, undermanger, and Mr. Kirk, deputy were in the district and he wanted to get away to 30's district. The afternoon shift overman, W. Warren, said he tested for gas on the 20th. February in the cavity in the roof. He found no gas and a ripper, W. Adams confirmed this. J. Aldred, the night shift overman also tested for gas in the cavity. He found no gas and two rippers H. Camm and H. Coleman saw him make the test. A. Walker the night shift overman had spent most of the time on the shift before the explosion, supervising the work in the loader gate. He saw a shot fired and tested for gas in the cavity along with N. Cox, the night shift deputy and no firedamp was found. S. Derbyshire, shotfirer, fired shots in the coal at the loader gate stable hole at about 6 a.m. on 21st. February. He did not test in the cavity as he considered it too high and dangerous as small pieces of dirt were falling from the sides. There was no doubt that the cavity contained firedamp before the explosion and the overflow may had flowed off as a thin layer near the roof. It was also find that he management failed to have air samples and measurements taken as required by the Coal and Other Mines (Ventilation) Regulations, 1956 and the ventilation along the 28's intake loader gate failed to dilute and render harmless the inflammable gas which eventually filled the cavity.

Contraband was not found in the district and smoking or naked lights could be ruled out as a source of ignition. All the lamps from the district were examined and found to be in good order. It was undoubtedly the electrical flash that was the source of ignition. The terminal box was smashed and forced into contact with another part of the earthed casing causing the flash and the resulting explosion.

The Inspector recommended that-

- “1). Falls of ground which result in large cavities such as occurred in this case can and should be prevented by well known methods of strata control and support. Small falls of ground shown the need for more intensive support which is usually necessary also to prevent the falls from spreading. The top and sides of the activities left by such falls should be supported and packed and until this has been completed they should be ventilated to prevent accumulations of firedamp.
- 2). Any large cavities in the roof should never be concealed by supports and cover boards, which act as an umbrella and are unable to prevent danger from further falls and from accumulations of firedamp.
- 3). A minimum of 20 feet of packing should be stipulated between a road used for ventilation of transport and any waste exceeding 100 feet in width.
- 4). Electrical apparatus and cables should be effectively protected against damage such as might cause incendive open sparking, or, where this is impracticable, the electrical apparatus or cables should be moved to a safe place.
- 5). The possibility of elimination of incendive sparking, by reducing the time of acting of automatic devices for cutting off electricity in the event of excessive earth leakage or short circuit, should be investigated.
- 6). Section 55 (1) (a) of the Mines and Quarries Act, 1956, requires the manager of every mine to take such steps as are necessary for the securing that there is constantly produced in all parts of the mine below ground ventilation adequate for the purpose-
- Diluting gases that are inflammable or noxious so as to render them harmless and removing them.
- In this connection ventilation standards on the planes suggested in National Coal Board Bulletin No. 55/153 entitled "Planning the Ventilation of new and reorganised Collieries" should be applied to all mines and efforts should be made without delay to bring these below the standards at least up to the minimum suggested.
- 7). Where two intake roads are provided to any coal face without a return airway between them, they should not be more than 30 yards apart to avoid unreliable ventilation of that part of the face between them.”

After the disaster it was decided by H.M, Inspectors and the National Coal Board officials that the cavities should be drained of firedamp by means of pipe columns and if necessary the use of a venturi ejectors. Further work in the panel was stopped until it was sure that there was no residual burning in the area and the work on the cavities was completed by the 7th. March 1957 when an inspection was carried out and work resumed.

#### **CHANTERS. Atherton, Lancashire. 6th. March, 1957.**

The colliery was at Atherton about 10 miles to the west of Manchester. The down cast shaft was No.1 and 14 feet in diameter. It was sunk in 1850 and deepened to the Arley seam at 600 yards in 1901. The upcast No.2 shaft was 16 feet in diameter and sunk to the Rams seam in 1876 and was finally deepened to the Arley in 1902. The mine had been extensively worked and most of the best seams had been extracted. At the time of the disaster the Five Quarters, Victoria, Haigh Yard and Plodder seams were being worked. The Haigh Yard and the Plodder were wound at No.1 shaft from 489 yards which was approximately the level of the Haigh Yard seam whilst the Five Quarters and Victoria were raised in a skip plant at No.2 shaft from 435 yards which was an intermediate level between the Victoria and Plodder seams. The average daily saleable output of the mine was 1,879 tons of which 75 tons came from the Plodder seam and it was in this seam that the explosion occurred. The total number of people working in the mine was 1,318 of whom 1,043 worked underground.

The National Coal Board owned the colliery and Mr. G.F. Hiller was the manager with two undermanagers, Mr. J. Haslam for the No.1 pit workings and Mr. J. Charlton for the No.2 pit. Mr. J. Benjamin was the electrical manager of the mine. The colliery was in the No.2 Wigan Area of the North Western Division of the National Coal Board with Mr. H.E. Clegg as the Area General Manager, Mr. E. Small, M.B.E., the Area Production Manager, Mr. S. Hay the Deputy Area Production Manager (Operations), Mr. R. Talbot the Deputy Area Production manager (Planning) for the 1st. March 1957 and Mr. E. Charlton as the Group Manager.

The Chanters colliery had worked for well over 100 years and along with the neighbouring colliery was nearing the end of its useful life and over the reorganisations that had taken place in the industry it was taking over the workings of neighbouring collieries. Whenever a connection is made between two collieries and parts of the ventilation are common to both the mines can not be deemed separate mines without the permission of the Inspector for the Division and following the making of a connection between Chanters and St. George's collieries in 1941, a new instrument was drawn up by Mr. E.H. Frazer, Inspector of Mines on the 1st. August 1941 under the Coal Mines Act, 1911, which consented to five mines, Nook, St. George's, Gin, Chanters and Gibfield being divided into five parts and being worked separately despite that each part did not have a separate ventilation system. All these mines with the exception of Gin pit were in operation at the time of the accident and connected. Coal was not being drawn from St. George's but it was used as one of the training pits in the No.1 (Manchester) Area.

There was no record of there having been an explosion in the mine previously and none of the seams that were being worked were particularly gassy, probably because the previous workings had drained off the gas. The Plodder seam gave off approximately 110 cubic feet of gas per ton of coal mined. safety lamps and permitted explosives were used throughout the mine and for general lighting, Oldham-Wheat G.W. electric cap lamps were provided. Prestwich Patent Protector Type 6 relighter lamps were used by the deputies and senior officials and Protector MC 40 lamps issued as gas detectors to certain appointed workmen. Although automatic gas detectors were not required by regulation at the faces, about 20 Naylor Spiralarm Type M detectors were in use in the No.2 pit.

The ventilation was provided by a fan at the No.2 pit which was an electrically driven double inlet Sirocco, 98 inches in diameter which ran at 231 revolutions per minute and produced just less than 200,000 cubic feet of air per minute in the fan drift at a water gauge of 4.1 inches.

The Plodder seam lies in the lower part of the productive coal measures and in the area of the Chanters Colliery it was worked to a thickness of 5 feet 1 inch which included two bands of dirt, one three inches thick and one four inches. It was the practice to leave about 7 inches of top coal. The roof is of a medium strength shale and the floor a strong warrant or fireclay. The seam dipped at a gradient of 1 in 5 due south and the coal was not first class but found already market as locomotive fuel.

The seam was to be the last exploited at the colliery and serious development began in 1956 and a short heading had been driven and abandoned in 1928-9. This heading was 50 yards long had been reached by a cross measure drift started from a road in the Haigh Yard seam at a point 350 yards from and approximately level with the bottom of the No.1 downcast shaft. When this project was abandoned, a brick stopping was built across the bottom of the stone drift.

Early in 1956 it was decided to reopen the Plodder seam and the stopping was removed. Firedamp was encountered behind the stopping but it was cleared by the installation of a fan placed outbye at the foot of the drift with the appropriate tubing. The stone drift was found to be in good condition but the heading in the seam was almost closed. It was cleaned up and a drivage to prepare a face 110 yards long to

advance to the dip and another used as a return airway, which was known as the Gibfield Stret, were started.

During the development period the narrow places were ventilated by a fan placed on the Haigh Yard level outbye of the foot of the stone drift. Firedamp was never detected. The coal was conveyed along a system of conveyors to the foot of the drift, where it was loaded into tubs. When the drift had originally been driven, a brick wall had been built up the middle for ventilation purposes. The conveyor was laid in the right hand passage going up hill whilst a tub track for the taking in of supplies was laid up the left side. The haulage for the supplies was an electrically driven 10 h.p. Pikrose engine fixed in a recess at the side of the roadway on a short piece of level road at the top of the drift in the area where the Plodder seam had been exposed by the driving of the drift. The roads leading from the short level roadway had a dipping gradient of in both and inbye and an outbye direction. The drum of the engine faced inbye but the placing of a pulley in the floor a few feet away enabled the haulage to be used both on the coal heading dipping towards the face and on the stone drift outbye.

The development programme was carried out without any serious difficulty and a ventilating circuit was established on 12th. September 1956 when the Gibfield Stret made a connection with an existing roadway in an old district of the Plodder seam workings of the neighbouring Gibfield Colliery. After this connection had been made another drivage in the coal was started back towards the pit bottom from a point about halfway along the dip development face. This was to serve as a loader gate and as a second air intake. This heading joined up with the new stone drift, No.1, set off the Haigh Yard level about 120 yards inbye of the foot of the 1929 drift which was then called the No.2.

Towards the end of October the Plodder development face to the dip was started as a double face unit with two face belts delivering to a centre loading belt in the No.1 drift intake and the coal loaded into tubs at the foot of the drift. There was no urgency for the face to move quickly and the average advance of about 4 feet 6 inches per cut was made each week. Preparations for opening up the flank face to work towards Gibfield proceeded. Later the enlarging of the Gibfield Stret with a view of returning to the Chanters No.2 shaft was started. A start to this work was made in February 1957 with the ripping of the bottom 10 yards of No.2 drift in preparation for building an air crossing over the Haigh Yard level. The 10 h.p. Pikrose hauler at the high point of the No.2 intake had been in action only after the No.1 drift had been completed and this was used to deal with the dirt made at this ripping.

The Haigh Yard seam was worked at Chanters about 3,500 yards from the Chanter's shafts and since the main haulage road and the return airway of the Haigh Yard workings passed quite close to the shafts of St. George's Colliery, the opportunity was taken to use these shafts, both upcast and downcast to ventilate the Haigh Yard workings. The air for the Plodder district this came from St. George's and Bedford downcast shafts and returned to the Gibfield upcast shaft. In the district itself intake air travelled up both Nos. 1 and 2 drifts, along the face advancing to the dip and returned up Gibfield Stret and the newly developed flank face into Gibfield No.1 East old district. Air measurements on 22nd. February 1957 showed that 3,182 cubic feet of air per minute was entering the face at a left hand intake, 3,996 was entering the face at the left hand intake and 2,422 was leaking from the No.1 intake through the connection between it and the return. This amount of leakage was due to the fact that a gate belt was installed in the connection. Sampling at both ends of the airway showed that the dip face contained .1 per cent methane.

When the air reached the old Gibfield district, two paths were available to it. The first by the bottom of the Gibfield No.1 East district, on which a loosely built stopping which acted as a regulator was built. It was possible to travel through this stopping and close it and a board indicated that this was the dividing line between the Chanters and Gibfield. The second went by a length of old face and the middle road of the same

district which could not be travelled. Following an inspection at Gibfield by officials on 22nd. February it was decided to divert about 6,000 cubic feet by the installation of an 80-yard length of tubing from the loosely built stopping through some ventilation doors to 21's intake. This was to try to lower the temperature in the 21's district. The installation of the air tubes which were partly metal and partly canvas was completed on the 27th. February. No attempt was made to force air through these pipes and a measurement of the air coming out of the pipes on 28th. February showed 1,581 cubic feet of air per minute was passing through them into the 21's intake.

The electrical apparatus in the Plodder district was supplied from a 150 KVA 2,000/600 volts transformer in the no.2 Plodder substation which was 340 yards from the No.1 pit bottom. On the occurrence of an earth fault, an earth leakage device was arranged to trip out the switch and lock it out mechanically with an indicator flag to show that it had operated. A paper covered, double wire armoured 600 volt feeder cable from the switch passed up No.1 drift to a flame-proof gate-end switch board in the connecting road between Nos. 1 and 2 drifts which controlled the conveying and cutting apparatus at the face. A similar cable was looped from busbars at this gate-end switch outbye to supply the switch controlling the 10 h.p. Pikrose haulage in No.2 drift. This control switch and the haulage motor were both of the flame-proof type and were connected by armoured cables with bolted connectors at each end. The haulage unit and its control switch were about 90 yards from the section switch in No.2 Plodder substation.

During the night of 28th. February/ 1st. March a fall about 20 yards long occurred on the east side of the dip on the development face. The next morning an inspection of the face was made by Mr. Haslam, the undermanager, whilst the air measurements were taken by Mr. K. Middleton, the ventilation officer. It was found that the quantity of air passing on the left of the face had reduced slightly from the measurement taken the previous week and with the possibility that the face could be come further blocked to raise the screen fastened on two wooden frames in the connection between Nos. 1 and 2 intakes about 20 yards back from but parallel with the face. The openings of both these frames had an area of 18 square feet.

Until the 5th. March the Plodder district was supervised by one deputy on each shift but with the growth of the district, in particular the need for a flank face to be started as soon as possible, it was desirable for extra supervision to be provided. On the 6th. March, the day of the disaster, and extra deputy J.E. Houghton was appointed on the day shift. He took charge of the dip development face, the two intakes and the Haigh Yard level while H. Dickenson who was formerly in charge of the whole of the Plodder concentrated towards Gibfield.

On the morning of the day of the explosion, eight men were employed on the east side of the dip development face, preparing to take a coal buttock past the fall. The deputy in charge, Houghton, found no gas when he tested at the face rippings and in the general body of the air. The two brattice sheets in the connection between the two intakes were in the raised position but only a slight current of air was passing and only a small amount was flowing past the fall on the face. Houghton made his pre-shift inspection between 1 and 2 p.m.. No one had been working at the Pikrose haulage at the highest point of the No.2 intake during his shift and although he visited the place he did not test for gas. After telephoning a satisfactory report on the condition of the district to the pit bottom, Houghton went to the coal face to supervise the moving of a coal cutter and remained there for about an hour.

The afternoon shift was admitted by deputy V, Robinson. Five men, P. Socha, J. Howcroft, E. Nutter, T. Dzundza and W. Beckett were sent to work at the ripping, 10 yards up the No.2 drift where the air crossing was being enlarged. Normally only three of the men worked there but the place where Dzundza and Beckett were usually employed was not available on that shift. Other men whom Robinson passed in were two bricklayers, E. Williams and R. Sutton who were to work in the Haigh Yard level. F.

Woodward was to operate the Pikrose haulage at the top of the No.2 drift which was used by the rippers to lower dirt they were to fill a short distance down the drift and some pit bottom and general oncost workers. Since the haulage which Woodward was to operate was situated more than 300 feet from the nearest coal face, it was not a requirement of the Coal and Other Mines (Ventilation) Regulations, 1956 that a firedamp detector should be placed there.

Several sets of men who had started work at 10 a.m. had not completed their shift when the afternoon men arrived. While he was going to the pit bottom after finishing work at the face Houghton met Robinson at the foot of the No.2 intake. Together they examined the lip of the ripping where Socha and his men were at work and found no gas. They parted at the foot of the drift Houghton making his way to the pit bottom and Robinson went to the No. 2 drift to the Pikrose haulier. Since Woodward was to work there during the shift, he made several tests for gas and found the place clear. Woodward was not there and Robinson came down the drift and went inbye along the Haigh Yard level, taking a look at the men employed there. While he was near the foot of No.1 drift he was called to the telephone and at about 3.30 p.m. was speaking to Houghton about a routine matter when Woodward came up that he wanted the electrician because there was a fault which he had found on the Pikrose panel. When he had put the switch in there was a buzzing sound and the smell of burning. Houghton, at the pit bottom overheard the conversation but told Robinson that Woodward had already telephoned him from the 'phone 30 yards outbye the foot of No. 2 drift and added that he had just examined the lamps of two electricians, L. Inman and K. Tryner who had descended the shaft for a routine examination and he had told them of Woodward's message. As there was some doubt as to the cause of the trouble in the panel and two mechanics W. Pearson and T. Morris who happened to be at the pit bottom also decided to go to the Pikrose though they in fact paid a short visit to the haulage on the Haigh Yard level before following the electricians and Woodward. Robinson then went inbye up No.1 drift and Houghton went out of the mine.

Just before 4 p.m. F. Wolstenholme, an oncost man working near the No.1 pit bottom felt a strong blast of air which appeared to come from the direction of the Plodder district. The blast was followed almost at once by a cloud of dust. Wolstenholme went inbye and found five men, Socha, Howcroft, Nutter, Dzundza and Beckett, who had been working near the foot of the No.2 drift and one of the bricklayers, E. Williams. All these men were badly burned and they were making their way to the pit bottom. A little further on he met the second bricklayer R. Sutton who was guiding a man who was badly burned, the mechanic, W. Pearson.

At the time the fumes were so thick that Wolstenholme could get only as far as the top of the St George's clip brow so he got to the telephone and informed the undermanager, Mr. Haslam, that something had happened in the Plodder district and that help was needed at once. Later Wolstenholme managed to get in as far as the foot of the No.2 intake where he found some timber, clothing and brattice cloth on fire. He tackled the fire with fire extinguishers. Other workers from the pit bottom joined Wolstenholme and a short time afterwards men from the No.1 intake in charge of deputy Robinson arrived. Most of the party went out to the pit bottom but a few stayed to help deal with the burning material until the arrival of the undermanager a little later.

R. Sutton, a bricklayer was working 15 to 20 yards outbye of the foot of the No.1 intake when the explosion occurred. He was blown over and burned slightly on the right cheek and forehead but he was able to get out through the dust and smoke. Just as he was passing the foot of the No.2 intake he heard cries for help and turned to find Pearson badly burnt groping his way about. Sutton took charge of Pearson and led him to the pit bottom where he met the rest of the burnt men.

A number of oncost men had been working at the foot of No.1 intake. They were blown over and enveloped in dust when the blast occurred. One of them, R. Littler, managed to ring the surface to say that he thought an explosion had occurred between

there and the pit bottom. After a short examination of the Haigh Yard level when a lot of smoke and dust had been seen, it was decided to go inbye up the No.1 intake with a view to escape by the Gibfield colliery as it was feared that there was a fire on the Chanters side. At the junction of No.1 intake and the crosscuts the party met the men from the dip face under H. Ashton and soon afterwards were joined by deputy Robinson and the workmen from the flank face. After a telephone conversation between the men and the manager at the surface the 21 men formed a crocodile and on the manager's advice, set off back to the Chanters pit bottom by way of No.1 intake. The atmosphere was thick with smoke and dust until they got to the foot of the No.2 drift, where they came across the men who were dealing with the burning material.

Deputy Robinson had just charged two holes in the roof ripping in Gibfield Stret when he felt the rush of air created by the explosion. He thought a three inch compressed air pipe had broken and proceeded to fire the shots. The air became thicker with dust and from a nearby leak in the compressed air Robinson saw that it was not caused by a pipe breaking. He got all his men to make their way to the junction of the connecting road and the No.1 intake where H. Ashton and his men were. After a conversation with the manager by telephone, the party of 21 made their way safely down No.1 intake and along the Haigh Yard level to the foot of No.2 intake.

Soon afterwards, Haslam, undermanager, arrived down the pit and it was understood at that time that only Woodward was missing. It was thought possible that he might have escaped towards the face on the inbye side of the haulage so Mr. Haslam and deputy, Houghton, went up the No.1 intake, along the connection and back up No.2 intake for about 20 yards. They could get no further on account of the smoke and fumes and did not find Woodward. When they returned, they found that Mr. Hiller, the manager, and a rescue team had just arrived.

While Mr. Haslam was in the district he opened two doors between No.1 intake and the return to try to get rid of the smoke. It was realised that other men besides Woodward were missing. A rescue team wearing self-contained breathing apparatus went up No.2 intake and located one body, that of Inman, the electrician. Further visits were made up the drift and by 6 40 p.m. four bodies had been brought out. T. Morris was hard to find since he was lying in that part of the road behind a brick wall where the conveyor had originally ran and it was a part that was not usually used for travelling. Inman's body was five yards inbye of the Pikrose panel and those of Tryner and Woodward were about five yards further inbye.

The men who died were-

Leslie Inman aged 40 years, electrician,  
Thomas Morris aged 23 years. mechanic's mate,  
Kenneth Tryner aged 31 years, electrician's mate and  
Fred Woodward aged 45 years, engine driver.

Those who died from their injuries-

Wilfred Beckett aged 29 years, repairer,  
Eric Nutter aged 21 years, repairer,  
Walter Pearson aged 36 years, mechanic and  
Pawel Socha aged 46 years, contractor.

Those who were injured-

Taras Dzundza aged 27 years, contractor,  
Jack Howcroft aged 19 years, repairer and  
Ernest Williams aged 48 years, bricklayer.

The inquiry on the circumstances and causes attending the explosion which occurred at Chanters Colliery, Lancashire on 6th. March 1957, was conducted by G. Hoyle, C.M.G., H.M. Divisional Inspector of Mines and presented to the Right Honourable Lord Mills, K.B.E., Minister of Power on the 8th. October 1857.

The inquest into the men's deaths was held at Tyldesley on the 25th. July 1957 by Mr. R. Barlow, H.M. County Coroner for Lancaster, Bury District and a verdict of 'Misadventure' was recorded in each case.

After the disaster the mine was thoroughly inspected and the evidence was presented at the inquiry. Coal dust played no part in the explosion since there was almost complete absence of dust on the road. The inspector concluded that the gas had accumulated at the top of the No.2 drift through a progressive reduction in the amount of air flowing up the drift, following a fall on the east side of the dip development face five days before. It was exploded when an arc was struck as an electrician twisted the cover plate of the busbar chamber of the switch from the Pikrose haulage and the earthed flange of the cover plate came into contact with a live busbar. The source of the gas was the Plodder seam where it was exposed by driving of the No.2 drift.

The Inspector concluded that-

"My investigations showed that the explosion was caused by an electric arc which was formed during the examination of the workings switch to which power was still connected when the top cover of the switch was twisted around and came into contact with the live busbar in the prescience of a body of inflammable gas."

He went on to comment-

"The majority of electrical accidents occur when men work on exposed live apparatus either deliberately or accident and the high number of accidents indicates the presence of these dangerous practices. There is no need to provide more regulations. What is required on the part of some electricians is a greater sense of responsibility. Comparatively recent legislation requiring electricians to have higher qualifications should be a stimulus towards this end."

### **BARNBURGH MAIN. Doncaster, Yorkshire. 26th. June, 1857.**

The colliery was situated at Barnburgh in Yorkshire about six miles from Doncaster. There were two shafts at the colliery, the No.5 upcast was 18 feet in diameter and the No.6 downcast 16 feet in diameter. The shafts were sunk to the Parkgate Seam at 775 yards and intersected the Newhill Seam at 340 yards and the Barnsley Seam at 508 yards. Both shafts were regularly used for winding men and materials. The mine produced nearly 4,500 tons of coal per day with 2,000 men employed underground and 379 on the surface. Ventilation was provided by an Aerex fan which produced about 328,000 cubic feet of air per minute at a water gauge of 4.7 inches and there was a Walker Indestructible fan of equal capacity as a standby.

The mine was in the No.2 Area of the North Eastern Division of the National Coal Board and the principle officials were Mr. H. Heap, Area General Manager appointed 1st. June 1957, Mr. C.A.S. Moore, Area Production Manager, Mr. F. Darley,, Deputy Area Production Manager (operations), Mr. W.T. Marsh, Deputy Area Production Manager (planning), Mr. J. Ford, group Manager, Mr.S. Beaumont, Manager, Mr. R. Edwards, Undermanager Parkgate Seam and Mr. W. Hayselden, Undermanager Newhill Seam who had been promoted from overman on 26th. April 1957.

The seams worked at the colliery in descending order were the Newhill and the Parkgate. The Barnsley Seam was between them and had been extensively worked and was not in production at the time of the disaster. The Barnsley and the Parkgate had been extracted below the area of the explosion. Lamps were in general use throughout the mine and were Ceag Type G.C.L. electric cap lamps with Ringrose Automatic Detectors, and Protector, Type 6, flame safety lamps as firedamp detectors.

The Newhill Sea, had been worked for 12 years and was four feet thick overlain with a fairly strong well laminated shales and underlain by strong clunch. At the time of the explosion there were seven producing districts in the seam, one single and six double units with a total length of face of 1,336 yards. They were worked by a longwall advancing face with the coal machine cut and after blasting by sheathed explosives and hand filled onto a face belt conveyor. Trunk belt conveyors took the coal from the face to a spiral chute from which it was loaded into mine cars for transportation to skip bunkers.

The North West 1 District was made up of a double unit face with a left side 41 yards long which was gradually being cut off by a seven feet down-throw fault and a right side, 127 yards long. The gradient on the face was 1 in 28 dipping to the right. Three roadways communicated with the face. The left side gate branched in the middle loading gate and formed the main intake, with the right side gate as the return. The loading gate had two regulator doors a few yards inbye from the junction and served as a leakage intake. The roadways were formed about 12 feet by 14 feet by taking a roof ripping at the face and using the ripping material to build six yards wide gate side packs. Roadway supports consisted of wooden 'cockers' set about four feet apart to the strong roof and sides. Shots were bored in the front rippings and in the main gate back rippings as required using Ajax sheathed explosive and in the coal using Viking sheathed explosives. On the coal silling shifts the shots were fired by shotfirers and on the ripping shifts by the deputies.

The face worked on a twenty four hour cycle. The day shift worked 6 a.m to 1.30 p.m and was engaged in coal getting. the split shift 12 noon to 7.30 p.m. bored shot holes in the coal, turned conveyors and back ripped in the main gate, the afternoon shift 2 p.m. to 9.30 p.m., built waste packs, drew off the wastes and extended the main gate conveyor, and the night shift 10 p.m. to 5.30 a.m., cut coal and worked in the main rippings. The face normally yielded about 430 tons per shift. The roof condition at the face were good, the roof unbroken, the convergence slight and supports were set to a fair standard. A three feet thick bed of roof stone fell in the wastes, providing a plentiful supply of packing material but leaving the wastes open.

The district was ventilated by a separate split from the main intake, the air travelling along the main belt gate for about 200 yards and then splitting at the junction with the greater part going into the left side tailgate. About 7, 000 cubic feet per minute travelled down the left gate and 4,000 feet per minute along the main gate after passing through two regulators placed a few yards inbye of the junction. as a safeguard against firedamp accumulating at the face ripping lips, a brattice cloth hurdle was maintained at each. An examination of the Firemen's Books showed that firedamp had not been reported in the district during the previous three months. An Inspection by the Safety Board Inspector accompanied by Mr. T. Burke, the local Workmen's Inspector was made on the 19th. June 1956 and found an explosive mixture in a cavity in the roof on the left side of the main intake.

The electrical supply was by alternating current at 3,300 volts and was taken to North West No.1 District Sub-station where it was transformed down to 550 volts for use in the district. The transformer was fitted with a 3,300 volt off-load isolator and 550 volt oil circuit breaker to form a transwitch unit. The oil circuit breaker had two over current trips with time lags and an under voltage release trip. The main gate feeder cable was 3 core, 3.3 KV grade, paper insulated, lead covered, double wire armoured but the 50 yards length in the first back rip was 660 volt grade. For the greater part of the roadway the cable was slung from roof supports but it was buried in the floor in the back rippings. The feeder cable supplied a bank of five gate end boxes, two of which were spare. The other three were arranged for the control of a coal cutter and the face conveyors but there was no evidence that these were in use at the time of the explosion.

On the afternoon shift of the 26th. June, the deputy in charge of the North West 1 District was Robert Ashton, the regular deputy. The pre-shift inspection was made by J. Triffitt, a spare deputy who was on duty for the regular deputy who was absent that day. Triffitt was well acquainted with the district reported that everything was in order except the telephone near the face was out of order.

Coal filling had been completed about mid-day and when the conveyor turners arrived at the face about 12.30 p.m. They were able to uncouple the belts and began to remove them onto their new track to be ready for the waste side men to start their work when they arrived at 2.30 p.m.. The men who formed the split shift were admitted by the day shift deputy, Triffitt. There were six back rippers, three conveyor turners, one steel checker and two gate belt extenders. In addition there were two surveyor's assistants, J. Charlesworth and B. Silcock. They were near the face extending the roadway centre lines. Charlesworth was the only man in the district with a flame safety lamp.

The main gate conveyor belt stopped before 1.0 p.m. and two outbye sets of back rippers were engaged in setting wood chocks. On the back rip nearest the face and 82 yards from it, J. Hill and B. Holliday bored three shot holes by compressed air machine in the 2'6" ripping lip. On the afternoon shift there were ten waste men for waste packing and support withdrawal and two men for main belt conveyor maintenance about 500 yards from the face. At the time of the explosion work was proceeding normally at the face and no electric power was being used.

The afternoon shift deputy, R. Ashton, entered the district about 2.30 p.m. and travelled along the main belt gate. After inspecting the two outbye back rippings, where men were at work, he went inbye to the back rip, 82 yards from the face where J. Hill and B. Holliday had bored three shot holes. These were four feet deep and six inches from the strong, smooth roof one in the middle of the roadway and the others close to the side. he told the men that he would take his clothes further inbye and gave the men instructions to cover up the armoured electrical cable that was lying on the floor about two feet from the side of the road. The men covered the cable with a piece of old conveyor belting, 56'6" inches long and 19 inches wide which was laid length wise over the cable immediately beneath the roof that was to be blasted. The men also said they used several pieces of timber as additional protection.

On his return, Ashton tested for firedamp at the ripping lip and along the gate outbye. He then prepared the charges for the shots, using 7 ozs. of Viking sheathed explosive and a Npo.6 L.T. detonator for each hole. He allowed two workmen to stem the centre and right hand holes while he stemmed the left. The stemming used was good quality clay sent from the surface and each hole was stemmed to within nine inches of the mouth. After the deputy again tested for gas in the immediate vicinity of the shothole, he sent J. Hill to the face to act as guard and took B. Holliday with him to the firing position about 25 yards outbye.

The shot was fired and the usual sound of falling material was followed by a further fall and almost at once by a hissing sound and a spurt of flame. The flame travelled inbye and was followed by a blast which raised clouds of dust. Ashton told the back rippers to crawl outbye along the conveyor belt which was the easiest way out considering the bad visibility and he went outbye along the conveyor to the junction with the left side intake where he told workmen to go as quickly as possible to the pit bottom and get assistance. He then went along the left intake gate and met some injured men who were walking outbye. He went all round the face and return airway to assess the situation. He then made his way outbye and reported to the manager that he had been all round the district, that the ventilation was normal and there were no falls or fires.

The first official outside the affected area to realise that something was wrong was the afternoon deputy, R. Nelson, who noticed a sudden blast of air as he travelled the North district. He telephoned the afternoon overman F. Allsop who was in the office at

the pit bottom. The overman told him to go to the overcast while he went around the pit bottom. Nelson found the overcast was all right and after meeting men who told him of the incident on North West 1, he reported to the manager and then went to the end of the North West 1 return airway to see what conditions were like and if possible to travel to the face. He found the air thick with dust and decided not to go.

When Allsopp heard of the incident he gave orders for all the men to withdraw from the seam and then taking an electrician, Colin Rogers, with him, they set off into the district. At the shaft bottom sub-station he gave orders for all the switches to be turned off and gave the electrician instructions that they were not to be put on until instructed by him. As he passed the shaft sides some of the men from the district were there and he was told by one of the back rippers who was not injured that the incident was in the face and the conveyor gate. Taking Rogers with him, he went along the conveyor gate. The roadway was full of dust and with difficulty, they reached the back ripping where the shot had been fired. There were no signs of burning but there was strong smell which Allsopp described as like bitumen. From there they went along the face and found injured men on the right hand side of the face. The air was thick with dust and visibility was only two or three yards. The inbye telephone was not working and he sent Rogers with a message to the manager. He told Rogers to travel out along the left side of the face and roadway. At some distance along the left roadway Rogers found several injured men making their way out of the pit and he continued with them until they were met by the first aid party.

In the meantime Allsopp had been joined by a deputy named Jones and they proceeded to give morphia to the injured men. The rescue work and first aid was promptly organised and efficiently carried out. All the people working in the main conveyor gate inbye of the seat of the explosion and along the two faces suffered burns, a total of twenty casualties. The last injured man was taken to the surface at 4.50 p.m., less than two hours after the explosion. All the injured were taken to hospital and of the nineteen detained, six subsequently died.

Those who were killed in the disaster-

Derek Smith aged 28 years, wasteman,  
Charles Trevor Scott aged 32 years, belt turner,  
Joseph Hill aged 55 years, back ripper,  
David Lunness aged 48 years, wasteman,  
Herbert Fells aged 41 years, wasteman and  
Richard Corbridge aged 35 years, belt turner.

The injured-

William Knox aged 53 years, belt extender,  
Jack Charlesworth aged 20 years, linesman,  
Brian Silcock aged 20 years, linesman,  
Herbert Edwards aged 37 years, belt turner,  
Samuel Gratton aged 35 years, wasteman,  
Robert Turner aged 43 years, wasteman,  
Thomas Wright aged 42 years, wasteman,  
John Hemsworth aged 37 years, wasteman,  
Martin Quigley aged 32 years, wasteman,  
Ernest Towing aged 43 years, wasteman,  
John William Scott aged 54 years, wasteman,  
Albert Staniforth aged 46 years, steel supervisor and  
John Thomas Auty aged 61 years, back ripper.

On the 17th. September 1957, Mr. A.P. Lockwood, H.M. Coroner for the Rotherham Division of the West Riding of Yorkshire sitting with a jury, held the inquest on the

bodies of five men who were injured in the explosion and died in his ward. The jury returned the following verdict-

“Deceased was by misadventure burned on 26th. July 1957, underground in the North West 1 District of the Newhill Seam at Barnburgh Main colliery, Barnburgh, in the county of York when he was involved in an explosion of firedamp that the explosion followed immediately after a shot was fired on the back ripping of the main gate bringing down a large stone which fell on a power cable with the result that the cable was damaged and a flash occurred at the damaged point that the said flash is the only discoverable cause of an ignition of firedamp that the only discoverable source of an emission of firedamp was from a break in the roof of the main gate some 73 yards inbye from the flash.”

The jury recommended to the Minister of Power that the regulations should be altered to make it compulsory for protection of a rigid nature to be afforded to any power cable liable to be damaged by a shot.

A second inquest was held on 24th. September 1957 by Mr. N.S. Robson, H.M. Coroner for the Borough of Rotherham on the body of man who died in his ward. The verdict was-

“Misadventure and the jury at the second inquest recommended that definite instructions and regulations should be laid down regarding the type of protection for the cable, and that more extensive examination for gas should be made immediately before shot firing in the immediate vicinity.”

The inquiry into the causes of and the circumstances attending the explosion which occurred at the Barnburgh Main Colliery in the County of York on 26th. June 1957 was held by Mr. C.W. Scott, C.B.E., H.M. Divisional Inspector of Mines, who presented the report of the inquiry to The Right Honourable Lord Mills, K.B.E., Minister of Power, in October 1957. All interested parties were represented.

The explosion area was thoroughly investigated after the disaster. There had been no disruption of the ventilation system which resumed its normal course which dispersed the dust clouds by the time the casualties were removed. There was evidence of the passage of flame along the whole length of the face and for about 40 yards outbye along the left side of the intake and the right return airways and in the conveyor gate from the front ripping to about 50 yards outbye from the place where the shot was fired. There was no evidence of violence, only a slight coking at widely scattered points. All indications were that this was an explosion of firedamp and that dust played no part in it. During the inspection, firedamp was found in explosive quantities in the conveyor roadway and at the left hand side roadway ripping lip against a fault slip. On the outbye side of the ripping the quantity of gas increased near the roof near the face. At 40 yards from the face ripping there was an explosive layer of gas about six inches thick which increased to more than two feet at the ripping lip. It was found that the gas was coming from a break nine feet from the ripping. Since the brattice hurdle, hung near the face was not good enough to disperse the gas, it accumulated in the ripping lip.

The explosion occurred on firing a shot but all the evidence showed that the shot had done its work and there was no evidence that the shot firing had ignited the gas. The electric cable was damaged and tests showed that the cable feeding from the transformer to the switch gear near the face was faulty. The fault was located at the point where the cable had been buried by debris. A short circuit had resulted between phases and had blown a hole in the outer casing of the armoured cable. Other electrical equipment was investigated as a source of ignition but the conclusion was arrived at that only the damaged cable could be the source of ignition.

Mr. Scott came to the following conclusions-

“1). It is obvious that there was large body of very rich firedamp mixture in the top part of the loading gate between the face ripping and the inbye back ripping immediately before the explosion. The source of this gas was a break in the roof

nine feet back from the face of the ripping which probably opened into a gas reservoir sometime after the pre-shift inspection.

The quick make of firedamp was obviously too much for the low velocity air current. I consider the ventilation close to the roof would be very sluggish and would offer little resistance to the tendency of the low density methane to layer next to the roof, against the general ventilation.

2). There was strong evidence that the deputy tested for gas ten to fifteen minutes before firing the shot. I feel that careful examination should have revealed gas.

3). I consider that the flash from the damaged cable was the cause of the explosion. This would have been avoided if the cable had been properly protected in accordance with Regulation 10 of the Coal and Other Mines (Electricity) Regulations 1856 in which the legal requirements are clearly set out.

4). Examination afterwards showed that the 550 volt switch, because of a mechanical defect of the tripping gear, could not trip on earth fault and the overload protection was unreliable.

5). Large roadways are required in modern mining and there may be occasions when leakage intakes are difficult to avoid. However, the quantity of air passing along the roadways should be such that velocities near the roof are sufficient to prevent layering firedamp."

#### **KAMES. Muirkirk, Ayrshire. 19th. November, 1957.**

The colliery was situated about two miles east of Ayr at Muirkirk. There were two shafts, Nos. 1 and 2 which were sunk about 1870 to a depth of 840 feet. The mine employed 510 men below ground and 130 on the surface. At the time of the explosion there was a daily output of 650 tons of which 400 tons came from the West Mine area. The colliery was in the East Ayr Area of the Scottish Division of the National Coal Board. The Area General Manager was Mr. G.W. Kirkwood, the Area Productions Manager, Mr. A. Gardener, the Deputy Area Productions Manger (Operations), Mr. P. Milligan, the Group Manager, Mr. A.H. Walker, the manager Mr. T.W. Turner and the Undermanager Mr. D.B. Hill. Mr. Turner was ill when the disaster occurred and had been off work for some time previously so from December 36h 1957, Mr. A. Harley, Manager of the Douglas castle Colliery in the same group had acted as manager.

The seams that were worked at the colliery in descending order were ten Ell, Seven Feet, Thirty Inch, and Six Feet but at the time of the explosion the Ell Seam was not being worked. The colliery worked the stoop and room method and coal was produced on the day and afternoon shifts with repair work being done on the night shift. The place advanced about forty feet per week. The coal was won by 'grunching', blasting off the solid. At the time of the disaster both capped fuses ignited by 'Fusee' matches and short delay detonators, fired electrically by Beethoven exploders were in use. The explosives used were 'Unigel Eq.S' an sometimes, in the bottom of the seam, 'Polar Ammon Gelignite was used. The mine had always been a naked light mine and before the disaster there had been no reports of firedamp. Open lights were used until December 1956 when electric cap lamps were introduced according to the National Coal Board policy and in agreement with the National Union of Mineworkers to provide the lamps free for the workmen. These lamps were Edison L and L.5 types. The change made the mine subject to the Coal Mines Act 1911. Smoking, which had been allowed at the mine was prohibited and only permitted explosives cold be used. The management after consultation with the Mines Inspector, did not fill the shrouds of the head screws with a hard wax and the lamps were not 'locked lamps' as specified in the meaning of the Act. Locked flame safety lamps were issued to the deputies for their statutory inspections and this had been done for some time before the 1951

regulations. The deputies also used cap lamps in which the wax seal had been retained.

The mine was ventilated by an axial flow fan on the surface at the No.1 Downcast Shaft and was designed to produce 120,000 cubic feet per minute. Dust samples were collected each month and were all collected in the West Mine, six in the Pony Level of the Six Feet Section and six more inbye in the Nine Feet Seam next to the junction with the West Mine haulage road. The sample from the Pony Level were not shown as a dust zone on the plan. The analysis of the samples from the Pony Level during the six months prior to the disaster showed that there was between 75 to 98 per cent of incombustible matter. Stone dust was applied and for some months previous to October the word 'wet' had been entered in the record book for the West Mine haulage road and the outbye end of the West Nine Intake. There were water sprays as a precaution against air borne dust at certain transfer and loading points and firedamp had been found in small quantities only on three occasions prior to the explosion.

The West Mine area was about a mile and half from the shafts and it was served by an endless rope haulage near its inbye end which passed along a drift known as Connor's Dook and then by another endless rope haulage which extended into the Nine Feet Seam. The haulage road was known as the West Mine haulage road and formed the main return airway for all the workings in the West Mine area. At a point 2,183 yards inbye it struck the Six Feet Seam, at the Six Feet Bench and 30 yards further inbye the Thirty Inch Seam. The main intake airway ran to the north west of and roughly parallel to the West Main haulage road. At a point 2,053 yards from the shaft there was a booster fan with a capacity of 32,000 cubic feet per minute at a water gauge of 2.5 inches which was installed following a ventilation survey at the end of 1950. Beyond the booster fan the air split to the Six Feet and Nine Feet Seams, the latter being split again to provide ventilation for the No.2 Thirty Inch Section. The return air from the Nine Feet Seam and the No.2 Thirty Inch Section joined the West Main Haulage road just inbye of the Six Feet Bench and that from the Six Feet Seam joined it just outbye of that point. Further outbye along the haulage road there was a small section known as No.1 Thirty Inch which was ventilated by a shunt split.

There were the deputies districts in the West Mine, the Nine Feet, the Six Feet and No. 2 Thirty Inch and the No.1 Thirty Inch which also included the Pit Bottoms and Bell's Mine Locomotive Road in the East Mine. On the day shift there was an overman for the Nine Feet and No.1 Thirty Inch districts and the other for the Six Feet and No.2 Thirty Inch district. On the afternoon and night shifts there was only one overman for the whole colliery.

The explosion occurred in the Six Feet Section. The seam here was 9 feet 6 inches thick. In the Rooms, the top 2 feet 8 inches of coal was left to and recovered, where possible, during stooing operations. In the main roads, which were supported by steel girders, only the top 8 inches of coal was left. The main haulage and return airway for the section was the No.2 Dook which dipped in a southerly direction at a gradient of 1 in 5 from the Pony Level. The intake airway was known as the Companion Dook and ran parallel with and to the west of the No.2 Dook. At the time of the disaster there were three connections between the two Dooks, Walker's Fan crossing, Wylie's Fan Crosscut and Casagranda's Level. The only places where coal was being got were the Stooing Section, Walker's Dip and Wylie's Level but there were several places standing open which had been discontinued or abandoned within the previous six months and which had no means of conducting air into them.

From west to east there were, an old heading running north-west from the Companion Dook opposite Walker's Fan Crosscut which was known as the Right Hand Road Off Intake, which stopped on 3rd. June. There was a north-west extension of Casagranda's Level which stopped beyond No.2 Dook which was known as Wylie's Slope. This stopped at a fault on 19th. October. A heading ran eastwards from No.2 Dook between Wylie's Slope and Wylie's Fan Crosscut which was stopped on 21st.

September and Walker's Fan Crosscut which ran eastwards from No.2 Dook opposite Walker's Fan Crosscut was stopped on 26th. October. There was a second place running north from Walker's Level which was known as Walker's Rise which stopped on 2nd. November.

The main ventilating current passed down the Companion Dook, through Casagranda's Level and up the No.2 Dook. It then went down the Belt Level to ventilate the Stooping Section and reached the main return airway which was the West Mine haulage road just outbye of the Six Feet Bench. Two screens paced across No.2 Dook a little way above the Belt Level and rejoined the main return airway at the Six Feet Bench. Four auxiliary fans in the Walker's Fan Crosscut, Wylie's Fan Crosscut, the Companion Dook and the Belt Level were used to ventilate the working places.

The coal was transported from the working places by scraper conveyors to loading points at which it was transferred to tubs for transport to the No. 2 Dook by main rope haulage, and from there along the Pony Level by horse haulage. The only exception was in the Stooping Section where the scraper conveyors from the faces delivered on to a belt conveyor for transport along the Belt Level to the loading point near No.2 Dook.

The explosion occurred during the afternoon shift on Tuesday 19th. November. The men on that shift descended between 2.30 and 3 p.m.. Thirty four went to work in the Six Feet and No.2 Thirty Inch District with James Brady as deputy, twenty nine to the No.1 Thirty Inch District with David Casagranda as deputy and nine to the Nine Feet District where Hugh Parker was the deputy. James Marshall, Junior was the acting overman and was in charge of the whole colliery below ground.

Work in the Six feet Section proceeded normally until about 7.30 p.m. when the explosion occurred killing three men who had been working in the Belt Level and all 14 men who were in the workings to the south of the level. At the time the deputy Brady was with Scott Davidson, an engine driver, at the over-rope haulage engine in the West Mine haulage road. Deputy Parker was adjusting a ventilation door about 50 yards inbye from the Nine Feet telephone. R. McLaren, the engine driver, was at his engine at the top of the No.2 Dook near the junction with the Pony Level and A. Smith, rope changer, was at the junction. W. Queen, conveyor switch attendant and R. Hannah, a collier, were at the Stooping Section conveyor. Henry Casagranda and J. Cook, both colliers, and W., Bradford, shotfirer from the Nine Feet District, were in the Stooping Section and J, Bennie, pony driver was in the Six Feet Bench.

Brady and Parker both realised that something serious had happened and made their way to the Six Feet Bench. Near the Bench, Brady who was with Scott Davidson and two others, found Bennie and his pony lost in fumes and dust. Davidson took the lad through the dust and fumes to the stable and then went to look for his cousin George Davidson, who worked in the top of Connor's Dook. At the Bench, Parker attended to two injured men, A. Smith and McLaren, who had come from the top of the No.2 Dook. He assured himself that rescue arrangements had been set in motion and gave instructions for his men in the Nine Feet District to be withdrawn. He then went into the intake airway and blocked off the main intake to the Nine Feet and the No.2 Thirty Inch Sections at the overcast over the Pony Level so as to restrict the flow of air into those sections and increase the amount going into the Six Feet Section. He also arranged for the Six Feet Regulator to be knocked down.

Meanwhile, Brady, accompanied by one workman, tried to enter the section by the intake airway but was topped by dust and fumes about 30 feet below the junction at the innermost end of the Pony Level and had to return. In the Stooping Section, Henry Casagranda thought there had been an explosion and so with Bradford and Cook, he joined Queen and Hannah in the Belt Level. Queen, was elderly and Cook and Hannah took him towards fresh air while Bradford and Casagranda went along the Level to try to reach the men working near the loading point. They were beaten back by fumes and went along the return airway to the Six Feet Bench.

The party at the Bench now consisted of Parker, Bradford, Casagranda and Cook. Bradford got in touch with the surface and was instructed to remain at the Nine Feet telephone. The others went to look for Brady and met him near the inbye end of the Pony Level and they all made their way to the Companion Dook. They were stooped by by fumes about 150 feet from the top and returned to the end of the Level. Brady and Casagranda made another attempt to get into the affected area by going along the Pony Level into No. 2 Dook but again had to retreat. brady and others did manager to get down the No.3 Dook and through the Belt Level and Througther to the No.2 Dook where they saw the bodies of J. Dalziel and A, Findaly. These two bodies had earlier been discovered by Cook who had been joined by Joe Casagranda, a repairer who was working near the pit bottom and had gone inbye to give help. Brady retraced his steps to the Six Feet regulator where he met the rescue brigade men and did what he could to help them.

James Marshall, Junior, the acting overman, was in the East Mine at the time of the explosion. He was told about it by telephone at the pit bottom and arranged for emergency calls to be made to the surface. Realizing that the men in the No.1 Thirty Inch Section would be in danger since that section was ventilated from return air from the Six Feet Section, he made his way there and told the deputy, David Casagranda, brother of Henry and Joe, to withdraw his men. He then attempted to reach George Davidson at the top of Connor's Dook but collapsed into unconsciousness about half way down the dook. He was later rescued by men with breathing apparatus and taken to the pit bottom where, with several others, he was treated by Dr. Weir of Muirkirk.

Meanwhile, David and Joe Casagranda had gone inbye to see what they could do, John Dempster, shotfirer in the No. 1 Thirty Inch District, tried to help J, Frew and T. Makin, two workmen from the district, through the fumes in the main return airway to the pit bottom. They had travelled only 150 yards when Frew collapsed. Dempster tried unsuccessfully to revive him then and in spite of being greatly distressed himself, first dragged and then carried and finally threw him into a tub and pushed him as far as the airlock where he too collapsed. Makin had also collapsed but all three were rescued by willing helpers.

While all this was going on underground, people at the surface had not been idle. The first indication of a serious accident having occurred was received at the surface at 7.50 p.m. Mr. Harley, the acting manager. and a doctor and ambulance from Muirkirk were promptly summoned and the Rescue Station at Kilmarnock was asked to stand by for instructions. At 8. 30 p.m., Mr. Dock, the Superintendent received a call from Dempster, the day shift overman. He immediately sent a rescue van with the Assistant Superintendent. Mr. Morran, and asked Dempster to call out the Kames Brigade. He also arranged with the Superintendent of the Auchinleck Rescue Station to call out the Highhouse Colliery Brigade and with Coatbridge Rescue Station to sent two brigades.

Morran arrived at the mine at 9. 40 p.m. and with two members of the Kames Brigade descended at 9. 45 p.m. Others followed and a fresh air base was established in the No. 3 Dook just above it's junction with the Belt Level Througther, about two miles from the shaft at 11.05 p.m. At 11.15 p.m., a brigade of three men, W. Shaw and R M. Boland of Kames Colliery and three men from the Coatbridge Rescue Station were sent into the affected area. They returned at midnight and reported that they had found 16 bodies but no signs of life. Steps were taken to restore the ventilation and by 3.0 a.m. it was possible to undertake a more thorough inspection.

This was done by a party consisting of Mr. P. Milligan, Deputy Area Production Manager (Operations), Mr. F.H. Baker, H.M. District Inspector, Mr. R.J. Evans, H.M. Inspector and at a later stage, Mr. W. Widdas, H.M. Divisional Inspector. Except for the north west extension extension of Casagranda's Level when the rescue team had found the bodies of two men, the inspection was made without apparatus. Besides one

of these men lay a box of matches. All 17 bodies were located and brought to the surface at 1.20 p.m. on the 20th of November and taken to Ballochmyle Hospital.

Those who lost their lives were:-

Thomas Burnside aged 58 years, ripper.

Thomas Casey aged 18 years, bencher.

Alexander Brown Crawford aged 37 years, shotfirer.

John Dalziel aged 33 years, repairer.

Timothy Dillon aged 44 years, mechanical assistance man.

Andrew McGarry Findlay aged 20 years, loaderman.

Ronald Carruthers Grant aged 20 years, loaderman.

William Aird Hendry aged 30 years, loaderman.

Robert John Stark Lowe aged 53 years, collier.

James Boston Marshall aged 69 years, repairer.

Donald Morrison McGarry aged 18 years, bencher.

William McKay aged 43 years, collier.

John McKean aged 53 years, repairers.

James Samson aged 37 years, collier.

Robert Watson Parker Smith aged 33 years, loaderman.

William Davidson Smith aged 47 years, ripper.

John Brown Walker aged 37 years, collier.

The inquiry into the causes and circumstances attending the explosion at the Kames Colliery, Ayrshire, on the 19th. November 1957, was held by Sir Harold Roberts, C.B.E., M.C., B.Sc. in the Council Chamber of the County Buildings, Ayr from the 5th to 11th. February 1958. All interested parties were represented and the report was presented to The Right Honourable Lord Mills, K.B.E., Minister of Power on the 12th. June 1958.

It was found that there were burns on the four bodies found near the junction between No.2 Dook between Wylie's Level and Wylie's Fan Crosscut and on the two found in the north west extension of Casagrande's Level. None of the other bodies were burned. A detailed investigation of the explosion area was made and it was accepted by all parties that the blast came from the foot to the top of No.2 Dook. The only source of firedamp discovered after the disaster was in the rise heading at the foot of the No. 2 Dook. Dust samples were taken and all the electrical apparatus and lamps from the affected area was examined at the safety in Mines Research Establishment but no defect likely to have caused the explosion was found.

It was thought that the firedamp originated somewhere south of Wylie's Fan Cross cut and that the firedamp was ignited by a match but there was a divergence of views about the cause and the spread of the explosion and the inspector came to the conclusion that the two men who were found in part of Casagrande's Level went into the heading to look at the job and in a naked light mine, it was natural for them to light a match to smoke while they considered the job. This was the cause of the explosion.

The Inspector concluded that-

"Kames had always been from from firedamp and the workings were thought to be so damp that the coal dust could not be raised as an explosive cloud, No body had complained about the possibility of an explosion and the workmen were allowed to smoke.

The inescapable conclusion to be derived from this disaster is that no coal mine can be regarded as immune from danger of an explosion. I therefore recommend that the National Coal Board should, as a matter of policy, forthwith prohibit below ground presence of naked lights in any form and by 31st. December 1960 make

all their mines safety lamp mines in every sense. Such a step to be fully effective, would need the co-operation of the workmen, but I am confident that the National Union of Mineworkers would give their full support.

I also recommend that the phrase 'dust ... which can be raised in the air' in the Regulations 1956 must be given a more liberal interpretation. Following from that the managers must ensure full compliance with the requirements of the Act and Regulations about dust suppression and the use of incombustible dust and stone dust barriers."

The Inspector referred to the actions of the people who were in comparative safety when the explosion occurred yet risked their lives to do what they could to help their workmates. He said-

"to them, and to others who took an active part but are not mentioned, I offer my most sincere admiration and thanks."

### **LINDSAY. Cowdenbeath, Fife. 14th. December, 1957.**

The Lindsay Colliery was at Kelty, about two miles north of Cowdenbeath. It had been in production since 1875 and at the time of the disaster comprised one vertical shaft and two surface mines. Coal was raised through the shaft and No.1 Surface Mine and the No.2 Surface Mine was used for ventilation and man-riding. At the date of the disaster the output from the colliery was about 1,100 tons a day, of which 400 tons came from the Glassee Seam. Seven hundred and ninety men were employed below ground and 170 in the surface.

The Colliery was in the West Fife Area of the Scottish Division of the National Coal Board and the principle officers were Mr. G. Milin, Area General Manager, Mr. J. Hutchinson, Area Production Manager, Mr. R.B. Dunn, Deputy Area Production Manager (Operations), Mr. J.C.B. Haynes, Group Manager and Mr. W. Reid as the Manager of the colliery. There were two undermanagers, Mr. W. Orr who was in charge of the workings of the No.1 Surface Mine and Mr. A. Bell who was in charge of the remaining underground workings.

The mine was worked in three shifts. In the Glassee Seam coal was filled on the day and afternoon shifts during alternate weeks, the deputies changing with their men. The night shift deputies, however, remained permanently on that shift and so for one week had the first preparatory shift and the following week the second preparatory shift.

The seam that had been worked in the life of the colliery were, in descending order, the Little Splint, Seven Feet, Main Coal, Upper Jersey, Lower Jersey, Low Bank, Glassee, Mynheer, Five Feet and Dunfermline Splint. At the time of the explosion, the Seven Feet and Glassee Seams and development in the Mynheer Seam were being worked from the shaft, and the Little Splint and Jersey Seam from No.1 Surface Mine. There had been an ignition of gas at the colliery on the 4th. May 1955, which injured two men and before that one man had been fatally injured in an explosion in 1930. The mine was worked by locked safety lamps. The workmen used Oldham Wheat electric cap lamps, type GW and the deputies were provided with Wolf flame lamps, types 7 RMBS and 7S, for the use of the statutory inspections. In November 1955, 73 workmen were trained to recognise gas caps on flame lamps with a view to compliance to statutory regulations governing the use of firedamp detectors. Workmen employed in development sections carried flame lamps for this purpose, but they were not used elsewhere. Not a single detector was in use in the No. 3 Unit at the time of the explosion.

The explosive used in the mine was "Unigel Eq.S.". Shots were fired by No.6 low-tension detonators and Davis-Derby single shot exploders. The system of searching for contraband was approved by the Divisional Inspector and required that 10 percent of the men forming a shift should be searched and that there should be a general

search at quarterly intervals. All persons descending the mine other than on a shift were to be searched on each occasion. In addition, it was the practice to search a proportion of men at the deputy's meeting station and surprise spot checks were made.

The ventilation of the mine was by the shaft and No.1 Surface mine which served as intakes and the No.2 Surface mine was the return. Ventilation was provided by a axial flow exhausting fan designed to deliver 125,000 cubic feet of air per minute at a water gauge of 2.5 inches. This was operated at 1000,000 cubic feet per minute at a water gauge of 2.1. inches.

The workings in the Glassee Seam comprised two advancing longwall single-unit faces called Nos. 3 and 4 Units. They were at a depth of 1,260 feet below the surface. They were worked in conjunction with a development in the Mynheer Seam, 60 feet below the Glassee No.3 Unit which was started when No.2 unit was stopped in April, 1957 and No.4 Unit was started when No.1 Unit was stopped in September, 1957. The approach to these workings was through Hodge's Mine, stone drift, 1,650 yards long dipping at 1 in 11 and then through a level cross-measure drift 635 yards long. Coal from the faces was transported by a gate conveyor to a common loading point and from there in tubs by endless-rope haulage through Hodge's Mine to the pit bottom. Hodge's Mine formed the main intake airway from the area. The main return airway through Wilson's Mine to No.2 Surface Mine. Until the end of October 1957 these two Units were ventilated in series, air travelling round the No.3 and then round the no.4 Unit. Following the completion of an overcast in October, separate splints were provided for each Unit. Before the separation, the quantity of air measured in No.3 Unit main gate was approximately 5,000 cubic feet per minute. On 2nd. November, after the separation, the quantity measured was 4,422 cubic feet per minute, while in the No.4 Unit main gate it was 6,120 cubic feet per minute.

The explosion occurred in the No.3 Unit. The face was 120 yards long and was advancing across the line of the true dip. The gradient of the face was 1 in 3.3, dipping from the main intake gate towards the tail gate. The gates rose towards the face at a gradient varying from 1 in 4 to 1 in 5. The seam was about 3 feet 6 inches thick and as overlain by a blaes roof. The unit was bordered on the rise side by the abandoned No.2 Unit the waste of which was contacted from time to time, and on the dip side, by a fault from which ran igneous intrusions. There was 'burnt' coal from these intrusions in the lower part of the face. The face was supported by a mixture of wood and steel props set to corrugated bars. Intermediate packs were built and chocks were set along the edge of the waste to facilitate caving. Wet cutting was practice, the coal being undercut by machine to a depth of four feet six inches and hand loaded on to a bottom loading belt conveyor which conveyed it uphill to the main gate. In the main gate a short scraper conveyor carried the coal to the main belt conveyor.

The ventilating air entered No.3 Unit through the main gate and after passing down the face and through the tail gate, left by a return common to No.3 and 4 Units. Air sampling was regularly carried out and the highest firedamp content recorded before the separation was in the tailgate on 4th. October 1957 at .39 per cent. No samples wee taken in the wastes but a few tests were made at the waste edge by holding a flame lamp at arm's length into the waste. The machinery at the coal face was electrically driven and included the gate and face conveyors, coal cutters, drills and pumps.

One hundred and seventy four men were employed underground on the night of the 13th/14th. December 1957 when the explosion took place. Of those in the Glassee Seam, 13 men were employed in the No.3 Unit, under the charge of Robert Cook, deputy and William Masterson, overman both of whom were killed in the explosion. In No.4 Unit there were 16 men in the charge of Robert Smith, deputy. The work in No.3 Unit was to cut the face, brush the bottom gate and withdraw the supports from the waste. In No.4 Unit the work was that of the first preparatory shift.

When the men arrived at the No.3 Unit there seems to have been some difficulty in starting the brushing of the bottom road because loose coal and inability to get the face belt to run. The coal cutting machine was also held up for the same reason. By 2 a.m., however, the coal cutting machine had cut out the bottom corner and had passed the gate. Soon afterwards Cook, the deputy, is said to have fired three brushing shots. The brushers then cleared up, erected a girder and began packing dirt on the high side of the road. By 3 a.m., waste drawing had been completed and at about 3.30, the deputy asked one of the workmen, S. Fitzsimmons, to help tighten the face belt and get it running for the day shift. He then proceeded to do this, when in his own words, "the next thing I knew was man laying on top of me." This was at 4 a.m. and W. McAughey and R. Condie were on the No.3 Unit said they were blown over by hot air and dirt and that the air was thick with black smoke. W. Fleetham and W. Monoaghan were blown over but saw on flame. Another man said, "There was no terrific heat, just warm air.

The men working in the Mynheer Development did not hear anything but shortly after 4 a.m. They were told by Fleetham that something had happened in the No.3 Unit. Five of them, accompanied by another man from the No.4 Unit, immediately set off to see if they could rescue any of the man affected. They were unable to approach the Unit by the intake because of dust and fumes. David O'Donnell and Alex Moyes managed to enter the return airway and reach the face. They saw the bodies of T. Johnstone, J. Hughes, and D. Anderson and then they had to retreat. On the way down the face they met Davy Scott and Robert Muirhead and returned up the face with them. They were followed later by R. McCartney and Edward Tungate. O'Donnell and Moyes were soon overcome and had to be helped out by Muirhead and Tungate. Scott was then overcome, Muirhead did his best to help him out but found it physically impossible and had to make his own escape. Scott's body was later recovered.

On his way to the Mynheer Development, Fleetham had telephoned the surface to report the explosion. A.M. Sneddon, the deputy in the Mynheer Development had also phoned to inform the manager and summon the Rescue Brigades. The messages were passed on to the manager W. Ried at his home. He tried, without success to phone the Cowdenbeath rescue Station by way of the Area Office so he telephoned J.C.B. Haynes at his home at 4.10 a.m. and asked him to get the Rescue Brigades. The message was passed on at 4.35 a.m. The manager arrived at the pit about 4.25 a.m. and was soon joined by other National Coal Board Officials. All men not needed for rescue operations were withdrawn from the mine and it was found that nine were unaccounted for.

The Rescue Superintendent and two assistants arrived at the colliery with equipment at 4.40 a.m. The Station did not have a permanent Rescue Brigade of its own and a brigade had to be made from the trained rescue workers who worked at the colliery. At 5.30 a.m., a team was ready to go underground. Ten minutes were spent receiving instructions from the Coal Board Officials and the first team went down at 5.40 a.m.. They established a fresh air base just beyond the loading point at a place called the Old No.1, about one and a half miles inbye. They were followed by the Group Manager who took charge of the operations underground. The manager remained in charge at the surface.

The team left the air base about 6.40 a.m. and made a complete circuit of the affected district, staying in the return side and they had no difficulty in getting along the road to the face, though it was rather warm and the visibility was only twelve yards. During this operation they located the bodies of the nine missing men, all of whom were dead. About ten yards beyond the coal cutter they discovered a whole unsmoked cigarette lying on the ground at the foot of a prop. They found no other contraband and arrived back at the air base at 7.20 a.m.

Efforts were being made to restore the ventilation and temporary repairs were made to the overcast which had been slightly damaged by the explosion. sheets were

erected to divert as much air as possible to clear the district so that it could be entered without breathing apparatus. This was done by 9.20 a.m.

Those killed were-

Daniel Anderson aged 42 years, machineman,  
Robert Cook aged 64 years, deputy,  
John Hughes aged 37 years, machineman,  
Thomas Johnstone aged 39 years, packer,  
William Masterson aged 55 years, overman,  
William McCulloch aged 55 years, packer,  
Hugh McPherson aged 43 years, machineman,  
Bernard Pietrik aged 32 years, beltman and  
David Scott aged 53 years, developer.

Those injured-

Robert Condie aged 42 years, brusher,  
Samuel Fitzsimmons aged 49 years, prop drawer,  
William Fleetham aged 35 years, back brusher,  
James Hutchinson aged 49 years, brusher,  
William McAughey aged 58 years, repairer,  
Robert McGuinness aged 21 years, brusher,  
William Monaghan aged 20 years, back brusher,  
Jan Nitsch aged 35 years, brusher,  
John Rowley aged 49 years, haulage operator,  
David Smith aged 35 years, brusher and  
Robert Smith aged 53 years, deputy.

The inquiry which lead to the report of the circumstances and causes of the disaster was conducted by Sir Harold Roberts, C.B.E., M.C., B.Sc., and presented to The Right Honourable Lord Mills, K.B.E., Minister of Power in August 1958.

After the disaster the area was inspected by Mr. F.S. Pollard, H.M. Senior District Inspector of Mines and Quarries and representatives of all other interested parties. The only trace of firedamp was in a roof cavity at the extreme left hand corner of the face. There were only a few signs of visible violence at the outbye end of the No.3 main gate, the gearhead of the gate conveyor had been moved about 2 feet inbye and further inbye the conveyor structure had been moved. The air crossing at the No.4 intake gate was also damaged.

The waste drawing seemed to have been completed and there was a sylvester lying in the No.2 waste. The main haulage rope on the coal cutter had been newly extended and the control handle was in a position normally used for inching which suggested that they were tightening the rope at the time of the explosion. a drilling cable was seen to be hanging on hooks in the tail gate about 15 yards back from the face. There was also a deputy's re-lighter lamp hanging up in that gate. Shot firing exploders and shot firing cables were found hanging up in both gates and in various places Mr. Pollard found a total of 15 four-ounce cartridges of explosives, some cut in half concealed under stones.

A further inspection was made the following morning by Mr. C. Sharpe, H.M. District Inspector of Mines and Quarries and Mr. W. Linton, overman. They searched specifically for anything that might have cause the ignition of gas. They started at the intake road of the No.3 Unit and at the third refuge hole they found a spent match and others along the intake road inbye and cigarette butts on the roadway. On the face they found a spent match at the foot of the No.4 pack. This was near the place that the rescue brigade found an whole cigarette and he found butts in abundance and an empty cigarette packet in the return road.

When the bodies of the men were brought to the surface, police officers examined their clothing and in three cases found contraband-

- “1) an empty cigarette packet another packet containing a partly smoked cigarette another party smoked cigarette and three spent and four live matches:
- 2). a cigarette packet containing one cigarette one loose cigarette and three matches and
- 3). a small tin containing a partly smoked cigarette.”

Sir Harold Roberts came to the following conclusions-

- “1).the initial cause of the explosion was the ignition of firedamp on No.3 Unit by a match struck for the purpose of smoking
- 2).the firedamp came from the waste in the vicinity of No.3 Pack over a relatively short period, probably as the result of strata movement following drawing off operations
- 3).owing to the layout, inclination and system of ventilation, the velocity of the air was not high enough to prevent the accumulation of a dangerous quantity of gas even if the rate of emission was only moderate.
- 4).the primary explosion of firedamp was extended along the intake gate by the explosion of coal dust derived mainly from the transfer point and from the conveyor and
- 5).it was common knowledge that smoking was widely practised.”

The Inspector made the following recommendations-

- “1). (a).before deciding on the system of ventilation for a steeply inclined face, a careful analysis should be made of the particular circumstances. The National Coal Board should issue instructions to this effect, together with advice about the factors involved and the precautions to be taken.
- (b). Conditions on such faces now in operation should be reviewed on the same basis.
- 2). (a). The National Coal Board should investigate the way in which their directive dealing with dust barriers is carried out, and should take the opportunity of reminding all management of the need to minimise the deposition of coal dust on conveyor roads, and to clear up systematically any that may accumulate.
- (b). The National Coal Board should consider whether the terms of their directive on dust barriers are still appropriate, having regard to recent work on the operation of such barriers.
- 3). (a). The National Union of Mineworkers should combine locally and nationally to devise means of ensuring that workmen use firedamp detectors.
- (b). All officials in the line of management should be required to carry firedamp detectors when visiting parts of the mine to which Part III of the Coal and Other Mines (Ventilation) Regulations, 1956, applies.
- 4). Although the jettisoning of explosives is not causally connected with this explosion, the practice is potentially dangerous and efforts to stop it should be intensified. In particular, cross-checking of the various statutory records should be enforced.
- 5). Provision for snap searches, i.e. searches carried out in the mine working without warning, should be incorporated in every system approved under Section 66 (2) of the Mines and Quarries Act, 1954.
- 6). Finally, I will repeat what I said at the end of the Inquiry: ‘I must join in the appeals about contraband. The practice of smoking in safety lamp mines is not confined to Lindsay. The people who indulge in it are not being brave or clever but are, in fact, showing an utterly irresponsible, callous and selfish disregard for their lives of their fellows and the happiness of friends and relations. The possible consequences are so appalling that I appeal to the whole of the mining community, management, Unions, officials, workmen, and if I may, to their womenfolk, to try to stamp out this evil practice.’”

