

OXCROFT. Creswell, Derbyshire. 6th. April, 1919.

The colliery was worked by the Oxcroft Colliery Company, Limited, Bolsover, near Chesterfield. the agent for the colliery was Mr. George Anderson with Mr. R.M. Percy, the certificated manager who had been in charge of the colliery for only ten weeks when the explosion occurred on the 6th. April at about 12.30 p.m. in the No.1 or Creswell District of the High Hazel Seam. Mr. James Brailsford was the undermanager.

The colliery had two shafts, a downcast and an upcast, both 495 feet deep to the High Hazel Seam which was about three feet thick. The Creswell District was a cul-de-sac about 800 yards long by 60 yards wide, worked on the longwall system to the rise with gates about 15 yards apart. The Mine Level was an endless rope engine plane and the coal face between 80's and 90's gates had been standing for some weeks and about 50 or 60 yards back from the level had been fenced off for some time because of gas.

The longwall face was worked by electrical coal cutters and the level had been extended from time to time by a heading machine which was also electrically driven but on the day of the explosion electricity was used in the Creswell Level only for an auxiliary fan.

The ventilation of the colliery was from a fan at the surface of the upcast shaft which normally produced 34,000 cubic feet of air per minute at a water gauge of 2.3 inches for the 642 men normally employed in the mine. Of this quantity, 5,760 cubic feet branched to the Creswell Level at a pint where the road branched of the engine plane about 500 yards from the pit bottom and where 50 men were normally employed. On the 7th. March, 517 of the 5,760 cubic feet were passing 60 yards from the face of the level heading.

In addition to the main fan there was a small auxiliary fan some distance along the Creswell Level which was in the intake airway and the return for a considerable length went along the coal face. There were only single doors in the gates and the air was often short circuited during the working shift by the tramming of coal through the doors to the Creswell Level. Mr. Mottram commented-

"In these circumstances the layout of the entire district at the time of the explosion was not in accordance with best mining practice, as with a fall of roof on the face the air could not be coursed down one gate and up the next past the fall, thought it should be stated that according to the evidence at the inquest, the extension of the counter level, by means of crossgates, was contemplated by the management."

Electricity was used underground at the colliery for lighting, pumping and coal cutting. The current was three phase at 440 volts carried by armoured cables and used by different circuits on or near the face for coal cutting and diving auxiliary machinery. On the day of the explosion an auxiliary fan was installed in the Main Level between gates 27 and 28 and another, smaller fan, which been removed the previous month from the level at 88's road, was moved further along the intake on the morning of the disaster and this work was completed or near completion when the explosion occurred. This fan was driven by a 10h.p. motor controlled by switch gear formed of a coal cutter gate end box adapted for the purpose.

Firedamp had been occasionally found in the workings and both safety lamps and electric lamps were in use. Firedamp was last found in the workings on the 4th. April but was removed after falls of roof were cleared the day before the disaster. After an inspection on the day of the disaster, the fans were switched off and not switched on again until about 7 a.m. on the morning of the explosion.

A certain amount of coal dust was produced by the coal cutters and the Creswell Section was dry with the exception of some pools of water on the low side of the Main Level near the face. There was not much coal dust and it did not play a prominent part in the disaster.

On the morning of the explosion, 75 men descended the pit between 6 and 6.30 a.m. Of these only 21 went to work in the No.1 Creswell section. Among these men were

Samuel Barke, and electrician and his assistant, Eli Hunt who were there to supervise and assist in the removal further inbye by a small electrically driven auxiliary fan in the Main Level. The remainder of the men were to do cleaning up and repair work which was usually done on a Sunday. The deputy for the section was Elisha Whitehouse and he, instead of descending earlier than his men to make an inspection of the workings, as was his custom on weekdays, descended about the same time at the station which was near the pit bottom. He instructed the men to walk on the Main Level where he later joined them and admitted them to the further inbye after making his inspection. Whether he found the whole of the workings clear of firedamp, there was no way of saying as Whitehouse made no statutory report and was killed in the subsequent explosion.

The fan to be moved was that had worked in the level and it was intended to move it to 90's gate, nearer the face of the level. In addition to this fan there was another auxiliary blowing fan working in the level near the bottom of 28's gate and this was to assist the ventilation beyond this point. To make this fan operative, a door was placed in the 28's level at 28's gate and air was forced through the aperture and taken forward in pipes. If this door remained closed when the fan was blowing, an effective current was produced through the pipes but if the door remained closed when the fan was stopped, the air course was practically closed and no appreciable current would pass beyond that point. It was the practice to stop the fan at the end of the shift on Saturday and to prop open the door so that a current of air could circulate freely in the level beyond by the aid of the surface fan alone.

The clearest account of what happened in the level after work started on that morning was given by William Brailsford, one of the men who was injured, who, along with William Clark was gobbing in 28's gate near to where the fan was being installed. It seemed that when they started work at 7 a.m., the fan was not running but Eli Hunt, the assistant electrician, soon came and started it and it continued to run for about two and a half to three hours, when it was temporarily stopped by Hunt so that the other fan could be disconnected from the circuit. The door was left closed.

During this time several men went through the door and left it closed, apparently without realising the danger. About 12.15, the deputy who had been inspecting other parts of the workings, arrived at the scene and was very concerned to find the fan stopped and the door closed. He immediately exchanged his oil lamp for an electric lamp and passed through the door in the direction where the fan was being relocated. Immediately after this Hunt started the other fan and he and Barke, the electrician, followed Whitehouse into the level. A few minutes after, not longer than a quarter of an hour, the explosion occurred. The blast came outbye from the direction of the relocated fan and it was later discovered that the explosion had taken place somewhere in the neighbourhood of 87's or 90's gate.

News of the disaster reached Mr. Mottram, the Inspector by telephone but as he was ill in bed, Mr. H.A. Abbott, the Senior Inspector but later Divisional Inspector for the Midland and Southern Division went to the pit with all possible haste, descended and helped with the rescue operations. Meanwhile rescue teams arrived from various stations and with the aid of the officials and the men on the spot and the assistance of local managers and miners' agents, everything was done to recover the bodies and attending the injured. The conduct of these men was highly commended in the report.

The men who died were-

Samuel Barke aged 25 years, electrician,
Eli Hunt aged 35 years, assistant electrician,
Elisha Whitehouse aged 52 years, deputy,
James Taylor aged 31 years, stallman,
John Chappell aged 26 years, stallman and
George Randell aged 31 years, stallman.

Those who were injured-

Frank Hallam aged 34 years, stallman,

William Clark aged 43 years, ripper,

Steven Barlow aged 29 years, roadlayer,

George Stones aged 34 years, roadlayer and

William Brailsford aged 29 years, ripper and timberer and

Thomas Longden aged 42 years, overman who suffered from carbon monoxide poisoning during the rescue operations.

A thorough inspection of the day of the explosion was impossible because of inflammable gas and afterdamp but on the 8th. April a thorough inspection was carried out by Mr. Nelson, H.M. Electrical Inspector of Mines and Mr. Abbott. The region of the explosion was found to have been confined to the inner half of the level and a few of the gates branching off it. The force of the explosion was found it was outbye of 87's gate bottom but in 87's till 90's gate where it was inbye. The force was noticed up the gates towards the coal face in the gates from 90's back to 84's. In 83's there were distinct indications of force both ways.

It was considered that coal dust had played very little part, if any, on the explosion and inquiries were directed to consider the possible sources of ignition. No blasting had been done and all the lamps were found to be in good order and these sources were eliminated. As electrical apparatus was installed between 88's and 91's, special attention was directed to see whether this was the source of ignition of the firedamp which apparently had accumulated in the level.

The first inspection was made by Mr. Nelson accompanied by the manager, Mr. Percy, Messrs. Hall and Lee of the Miners' Association, the managers of several local collieries and some others. Mr. Nelson described what he found at the inquest-

"I went down the engine plane and then along the level and the first thing we saw was the site of the smaller fan before it had been removed from 25's. We went further and saw the larger fan in its present position at the bottom of 28's. We went a little further to the bottom of 81's gate, and then Mr. Brailsford, the undermanager, went on with a canary in order to test the quality of the air with a lamp, and it was reported that there was gas present. After Messrs. Brailsford, Percy and Abbott had gone forward and the air reported sufficiently cleared, the whole party advanced with electric lamps.

We saw the indications of force. my chief mission was to inspect the electrical apparatus and to offer an opinion as to its condition, or as to whether sparking had occurred. I got to the switch which operated the fan between 90's and 91's and was told it was there for me to examine. I gathered that no one had disturbed it since the rescue men had brought away the bodies of Hunt and his mates. I found that the switch handle was partly in and partly out. Further, that the switch cover was not properly fastened down. I drew attention to these points and then with the concurrence of everybody I opened the switch box. It was then seen, I was in the best position to see, that the switch was making contact in part, and in part only. This is a 3-phase system and there were three blades in each switch. Two of these three blades were making contact but the third was not making contact. This was clear, it indicated to me that the switch might have been in the course of being operated. If the switch had been in the process of closing or opening, there would have been sparks and the fact that the switch cover was not properly fastened down would make that spark open to the outside air. Such a spark would ignite and explode the mixture. The cover should have been bolted down but this may have been due to the fact that the job was not finished. Another point is where the cables led to the switch box, there were three holes which were five eighths of an inch, only leaving one eighth or so around the cable. I left the pit with the impression that there might well have been some opening at that spot.

I paid a subsequent visit to the pit on the 19th. April after additional electrical apparatus had been found in the heading and on this second occasion I was shown a switch in 87's gate. What I saw there absolutely convinced me that there had been a fall of stone on the switch and that that fall of stone had occurred when the switch was live. This was clear from the fact that the terminals inside the switch box was clearly fused and the cover which had been forced on top of them had corresponding points which showed that it had been forced on top of the live terminals. My evidence is that whatever happened at the fan, quite certainly there was an open spark here which would have ignited gas if gas had been present."

When the dirt had been cleared away, three bare leads were found, probably from the former connection to the fan. Mr. Nelson thought that if they were live they could have made a spark when they came into contact with the ground. The explosion originated about this point but it was thought it would have been incredibly careless for an electrician to start the fan in the condition in which he found it and he was prepared to believe that Hunt and Barke had not made such a grave error.

The inquest was conducted by Mr. M.S. Brodhurst, Deputy Coroner for the Hundred of Scarsdale at the Oxcroft Colliery Institute, near Clowne on the 29th. April and continued until the 12th. May. Several points were exposed at the inquest. The manager was not aware that the small auxiliary fan was being removed on the day of the explosion. The arrangements had been made by the undermanager who was absent from the colliery for the day and in these circumstances the undermanager ought to have seen that the manager knew of the arrangements that had been made.

The usual weekday practice of the deputy descending the pit and inspecting the workings and reporting the result at the Station before allowing the men to pass that point was not carried out on a Sunday. This was a breach of the Coal Mines Act, 1911, Section 63 and of the General Regulation 50.

In the event of a fall of roof in any of the stalls, the ventilation was interrupted throughout the district through the want of a counter head or crossgates to act as a return airway. The manager, Mr. Percy, had not long held the post gave evidence to show that previous to the explosion he had made arrangements to extend the crossgates further outbye. It would have been better to have preserved the counterhead when it was driven in the solid, or to have formed a new one through the waste at an earlier date. Had this been done the use of the auxiliary fans in the Level would not have been necessary.

The men moving and installing the fan were working entirely with electric lamps. It was said that this was because they gave a better light. It was not easy to explain why the deputy, who, after ascertaining that the ventilation had been off for some time in the Level through the closing of a door and the stopping of the fan, should leave his safety lamp and go into a place that was liable to contain firedamp with just an electric lamp.

It was found that certain electrical sub-circuits used for cutting coal and the auxiliary fans were taken off by smaller cables in the level. There was no protection for these smaller circuits. Mr. Nelson stated that fuses would have prevented the disaster. The absence of such protection measures was a contravention of the Coal Mines Regulation Act, 1911.

After the jury had deliberated for three quarters of an hour they returned the following unanimous verdict-

"1. That Whitehouse was skilled between 84's and 85's gates from the force of the explosion Hunt, Chappell and Randell from CO poisoning in the Level at 90's gate Taylor in the Level between 28's and 29's gates and Barke at the coal face in 28's stall both from the force of the explosion caused by an electric spark igniting gas which had accumulated in the district, but we are unable to fix the definite point of origin, but the probability is that it occurred in the switch box in 87's gate.

2. The jury are of the opinion that the Coal Mines Regulation Act should be strictly adhered to on Sundays as well as other days. We also think that all switch boxes should be inset, and we are also of the opinion that the crossgates should be completed as soon as possible and thus obviate the necessity of using auxiliary fans. We are unable to fix the blame on anyone."

As a result of the investigation proceedings were taken against the following officials of the mine, Mr. George Anderson, Agent, Mr. Robert M. Percy, manager and Mr. James Brailsford, undermanager for violations of the Coal Mines Regulation Act. The cases were heard at the County Court in Chesterfield but no convictions were obtained.

After the disaster the electrical apparatus at the colliery was improved to include sub-circuits. Counter heads and crossgates to act as independent return air courses, were constructed and the use of auxiliary fans discontinued. Additional air doors were provided in the gates to conduct a larger quantity of air to the inbye workings.

LEVANT TIN MINE. Pendeen, Cornwall. 20th. October, 1919.

The mine was near Pendeen, Cornwall and was owned by the Levant Mining Company. The Accident was the worst in the annals of Cornish mining. It occurred at about 3 p.m. on Monday 20th. October and was caused by the braking of the man-engine by means of which the men were raised and lowered into the mine.

The mine was one of the oldest in Cornwall and was on a cliff facing the Atlantic Ocean in the Parish of St. Just in Penwirth, jusy over six miles from lands End and about one and a half miles north of Cape Cornwall. It was established over 100 years before. Major Oats of the Company gave a description of the geological features of the mine.

"The mine is worked on two systems of lodes, the one system of bearing about W. 28 deg. N. and underlying South about 20 deg, the other system having a bearing of about N. 30 deg. W. and an underlie of N. 20 deg. These lodes are in granite in the inland section, but pass into killas or shale before reaching the face of the cliff. The junction of the killas and granite is approximately parallel with the cliff, and at the surface about 150 levels inland, but the junction dips towards the sea and the 278 fathom level is almost under the face of the cliff.

Also almost parallel with the cliff in the killas is a greenstone dike which can be traced from Gurnard's Head to the North, to the Longships Lighthouse off the Land's End to the south, and at different depths in the mine. This greenstone dike, which is of considerable width, is very hard and not congenial, the lodes in every instance being squeezed up and not very productive in passing through it.

The lodes have now been worked on to a depth of 350 fathoms and for a distance or rather over half a mile under the sea, but the productive part is west of the greenstone so that to obviate driving numerous levels through this non-productive part, the bottom of the mine is worked through land shafts which are down 278 fathoms along a main 278 fathom level, and below this by means of an underground shaft known as the submarine shaft about half a mile out under the sea and sunk from the 278 fathom level to the 350 fathom level.

It is probable that the lodes were worked to a certain extent earlier, but there is no record until the mine was taken up by a local company which started work in 1820.

This company, which was said to have started with a capital of £400 worked until 1871 during the first twenty years profits amounting to £170,000 were made and divided from the production of copper."

There were several shafts sunk into the lode, one of which the was equipped with a man--engine. it was the collapse of this engine which caused the accident and resulted in death and injury to the men. At the time of the accident it was the only man-engine that was at use in the County.

The manner in which the engine was introduced into Cornwall is described in Hunt's British Mining, p.684 and it is seen that the first engine of this type was installed in the

Tresavean Mine in 1842, the second was installed in the United Mines in 1845 but it was not until 1857 that the man-engine at the Lenant Tin Mine was installed. At that time it was installed at a depth of 170 fathoms and was worked by a Cornish beam single acting engine.

The man-engine shaft was further sunk to the 230 fathom level and a new balance beam was installed at 200 fathoms level to help the beams above take the extra weight. The man-engine extended to that depth in 1888-9 and in 1897-8, it was further sunk to the depth of 266 fathoms and it was at this depth when the accident occurred. The original Cornish engine had been replaced by a compound tandem engine in March, 1893.

The design of the men-engine was similar to the working of the Cornish pumping engine and consisted of an engine at the surface operating a quadrant or T-bob, to the nose of which was attached to a long pitch pine rod 9 inches square, joined in sections and traversing the length of the shaft. The rod had a reciprocating motion from the engine in a slightly inclined axis, up and down. The stroke of the rod was 12 feet but instead of being used for raising water, it was adapted for raising and lowering men. They stood, one at a time on steps fixed at uniform intervals to the rod when the rod was moving in the direction they wished to go, or on platforms called sollars fixed in the shaft when the rod was moving in the reverse direction. The distance of the steps and sollars was governed by the length of the stroke of the rod. The platforms were arranged so that at the top and bottom of the stroke they coincided with the steps of the rod. In travelling the shaft, the men stepped alternately from one step to sollar or from sollar to step. The rod normally made five up and down strokes per minute and the men could be raised and lowered at the rate of 60 feet per minute, the time taken to ascend or descend being 300 fathoms in half an hour.

The weight of the rod was balanced by balance bobs attached to the rod. Three of these were placed in the shaft at 24, 110 and 200 fathoms and two, which weighed 20 tons, were at the surface where fine adjustments were made by putting on or taking off weight. It was arranged so that there was always an unbalanced weight rod hanging on the quadrant at the surface in order to ensure that the rod was always in tension and to stop any tendency of the pitch pine buckling.

The steam engine at the surface was a horizontal single compound condensing engine with a 5 foot stroke. the high pressure cylinder was 18 inches in diameter cutting off the steam at five eighths and the low pressure cylinder 30 inches in diameter. The vacuum averaged 25 inches. the motion of the engine was communicated to rod by a pinion wheel on the crank shaft with 14 teeth meshing into a spur wheel with 96 teeth. On the spur wheel there was a crank pin to which was attached a connecting rod which was also attached to the top of the quadrant. the stroke of the connecting rod was 12 feet.

The engine usually ran with a condenser in operation but when the men were on the rod, the condenser was cut out. The engine was just able to operate the rod with 30 lbs. of stem per square inch. The balanced load amounted to about 14 tons. When the shift of 150 men were on the rod their weight increased the unbalanced load to about 24 tons.

There were provisions to catch the rod in the event of it breaking. Eight catches or 'sills' which were made from stout pitch pine beams were fixed in the shaft and eight catch pieces or 'wings' were securely fixed to the rod and so disposed throughout the length of the shaft so that when the rod was at the bottom of its stroke, there was a uniform small space between the catches and the wings.

The rod was attached to the quadrant beam at the surface by two strap plates 16 feet 3 inches long, 6 inches wide and one and three quarters thick, called 'caps', bolted with 11 inch bolts to the rod. the 'caps' extended through a space in the end of the beam and were secured by a gib and cotter above the snout pin fixed in a pedestal on the beam. The rod ended about one inch below the pin.

In the report of the Royal Commission of Metalliferous Mines and Quarries, 12th. June, 1914, the Commissioners state-

"Then old-fashioned men-engine by which men ascend and descend on platforms fixed to a moving rod, from which they stepped on to another series of small platforms at corresponding levels on the sides of the shaft, is still used in one or two cases, but we understand that it is regarded as a survival from the past, and those which are still working at the Levant Tin Mine in Cornwall and at the Great Laxey Mine in the Isle of Man, are the only ones brought to our notice.

The use of man-engines for raising and lowering men is, as we already observed, almost obsolete. The following provisions on the subject are included in the Special Rules in force in the Cornish district-

78. In all future man-engines or additions to existing men-engines, whenever it is reasonably practicable, there shall be a fixed platform or sollar, not less than 2 feet long by 2 feet wide, one each side of the shaft, and immediately opposite each step of the men-engine, when it is at the top or the bottom of its stroke. Where the sollar in any existing men-engine is less than 2 feet long and 2 feet wide there shall be a handle or bar to hold on by while standing on it.

79. There shall be a height of 6 feet 6 inches without any obstructions above each sollar, so that men shall not require to stoop when standing on it.

80. Where there is any hole or trap-door at a sollar a handle or bar shall be provided to lay hold of.

81. No person shall leave a trap-door open at any of the sollars.

82. There shall be easy means of signalling to the engine-man from every sollar.

83. No person shall signal to the engine-man, save in case of necessity.

84. Every fixed platform or sollar shall be provided with fend-off boards or funnel boards underneath, or a hinged board to lift.

85. A handle shall be fixed to the rod above each step, so that it can be conveniently grasped by man or a boy.

86. Not more than one person shall ride on a step at one time.

87. No person shall be allowed to carry tools when riding, save for the purpose of repairing the man-engine or man-engine shaft, except the pitmen and timberman.

88. A competent person shall be appointed to examine the men-engine frequently, and see that all the catches, steps, sollars, fend-off boards, trap-doors, fences and handles are kept in a fit state of repair.

We consider these provisions adequate and we understand that accidents are extremely rare. It is, in our opinion, hardly necessary to make any general regulations by statute regarding men-engines, but we think that the prohibition against carrying tools except for purposes of repair and inspection might be inserted in the Act, and that there should be a daily inspection of the machine and that as part of the inspection should be made in the same way as in the case of other means of ascending and descending the shaft."

In 1889 a Dry Changing-house was brought into use together with a connecting tunnel to the man-engine shaft. This tunnel enabled men to get off the men-engine, four fathoms below the surface, instead of at the surface and walk into the dry without exposing themselves to the weather after coming from the hot mine.

At the start of the shift, a record of names of all the men descending was made by a clerk stationed at the entrance to the tunnel through which the men passed to get to the man-engine.

The accident occurred when the man-engine was almost fully loaded with men ascending from the mine. The breakage occurred on the upstroke when the man-engine rod was within 18 inches of the top of its stroke. Up to that time the man-engine had worked smoothly and nothing occurred that caused the slightest alarm or indicated that anything was wrong.

The rod fell with its load of men a distance of 10 feet 6 inches to the catches. Unfortunately, owing to the swaying of the top portion which was the loose, the rod, in falling, got out of line and this resulted in the wings only partially engaging in the sills. The supporting timber fixed across the shaft carrying the top sill failed to hold, the second wing at the 38 fathom level only partially engaged the catch and sheered the front portion off, leaving no support for the wing, the 3rd., 4th., 5th., and 6th. catches failed but the 7th. and 8th. at 210 fathoms and 230 fathoms, held the rod but were severely compressed. At the same moment the rod was also brought to rest by striking the floor at the bottom of the shaft.

Unfortunately, when the 'cap' broke, the rod broke at a point 60 fathoms below the 'cap' and the 60 fathoms of rod, carrying 30 men fell 46 fathoms to the 70 fathom level destroying all the platforms as it fell. Had this rod not broken, it is possible there might have been no fatalities.

The rod broke at a point 14 feet below the 24 fathom balance bob and a few feet above the connection bob to the rod. The rod at this point was 9 inches square and the fracture showed that the wood was of perfect quality. The only reason for its breakage was the upper portion swaying free by the braking of the cap near the quadrant at the surface.

The bodies of the men were recovered in the following positions in the shaft, seven just above the adit level at 24 fathoms from the surface, 4 from just below the adit level, one on the first step above the 24 fathom level, two just below this step, two at the 38 fathoms level, nine above the 60 fathom level and three below this level and one at each of the 70, 80 and 110 fathoms levels.

The last body was recovered on the morning of the 25th, October. The uninjured men were able to get put by the ladders in the shaft to the levels and then to the surface by the ladders in the pumping shaft

Those who were killed were-

- Mathew Newton aged 61 years,
- Peter Branwell aged 58 years,
- Thomas Branwell aged 60 years,
- Sampson Osborne aged 48 years,
- Henry Andrews aged 46 years,
- W.J. Hocking aged 41 years,
- J.T. Angwin aged 61 years,
- W.E. Waters aged 31 years,
- William Henry Tregear aged 57 years,
- Stephen J. Brewer aged 18 years,
- John Tomkin aged 52 years,
- G.H. Eddy aged 45 years,
- Thomas Rowe aged 46,
- Benjamin Hocking aged 43 years,
- John Ellis aged 34 years,
- William Henry Ellis aged 47 years,
- Edwin Francis Pascoe aged 22 years,
- W.L. Harvey aged 43 years,
- Nicholas J. Mathews aged 36 years,
- John Kevern aged 44 years,
- James Maddern aged 47 years,
- Nicholas H. Thomas aged 20 years,
- John Wearne aged 29 years,
- W.J. George aged 47 years,
- M.E. Mathews aged 36 years,
- J.V. Trembath aged 25 years,

W.J. Murley aged 29 years,
E.T. Trathen aged 41 years,
J.H. Oats aged 39 years,
J.E. Grenfell aged 52 years and
Leonard Semmens aged 25 years.

Those who were injured were-
William Rickard aged 41 years,
W.J. Lawry aged 14 years,
A. Nankervis aged 44 years,
Sydney Branwell aged 20 years
Lionel Angwin aged 27 years,
W.J. Nicholas aged 19 years,
C.A. Freestone aged 24 years,
John Semmens aged 15 years,
Thomas Maddern aged 45 years,
Joshua Hosking aged 32 years,
Gilbert Semmens aged 25 years,
Thomas Ninnis aged 30 years,
Joseph Semmens aged 56 years,
T.G. Williams aged 24 years,
Martin Murrish aged 15 years,
J.H. Johns aged 25 years,
Sydney Dennis aged 22 years,
Richard Warren aged 53 years and
Thomas Agwin aged 32 years.

A full investigation took place and the caps which were made of faggotted iron wee tested at the Sheffield Testing Works was found to be not uniform in quality owing to the method of manufacture.

The inquest and inquiry was opened in the Levant Mining Company's Offices an occupied two full days and conducted by Mr. Edward Boase, H.M. Coroner for the Western District of the County. All interested parties were represented and the jury brought in the verdict that the men died due to-

“Accidental Death, the cause being the breaking of a strap plate due to fatigue of a defective part of the metal.”

The method of raising and lowering men by this method at the mine was abandoned and the men went in and came out by the ladders in the shaft, pending the sinking of a vertical winding shaft the Company were thinking of installing.

The Report of the disaster was by Mr. H.A. Abbott, one of His majesties Inspectors. It was presented to The Right Honourable Edward Shortt, M.P., His Majesty's principle Secretary of State for the Home Department in December, 1919.

EAST PLEAN. Bannockburn, Stirlingshire. 13th. July, 1922.

The colliery was about four and a half miles S.S.E. of Stirling in the Parish of St. Ninians and was the property of the Plean Colliery Company, Limited in 1895 and provided employment for over 500 men underground. The daily output of the mine was above 500 tons.

Originally Nos. 1 and 2 Pits were developed but these had not been worked for many years. As the workings extended, the No.3 Pit was sunk and this was the downcast shaft at the t me of the accident. in 1901-2, the No.4 Pit was sunk, 1,100 yards from No.3 and served as an upcast and coal winding shaft. The No.4 Pit passed through the Lower twenty-Inch Seam at about 166 yards from the surface and cut the Main Coal Seam at

194 yards. Both these seams were coking coal and two ranges of bye-product coke ovens were operated in connection with the colliery.

At the time of the disaster, Mr. James Hamilton had been the certificated manager for almost three years. Before that he had been the undermanager of the colliery. Mr. Robert McAlpine was the undermanager and he held a 2nd. class Certificate of Competency under the Coal Mines Act, 1911. At the date of the explosion there were four overmen, including Mr. John McEwan for the Carbrook section. Mr. Wallace Thorneycroft was the managing partner of the Colliery Company and was responsible for the original plans for the development of the colliery but he did not interfere with the details of the underground work.

The total number employed in the mine, excluding the officials was 520 which were divided into three shifts, the day shift of 340 men which descended between 6 and 6.45 a.m. and ascended between 1.45 and 2.30 p.m., the afternoon shift of 100 men descended between 2 and 2.30 p.m. and ascended between 9.30 and 10 p.m. and the night shift of 16 to 20 machinemen and 60 others who descended between 10.45 and 11 p.m. and ascended between 6 and 6.15 a.m. The number employed in the Carbrook district, in which the explosion occurred, was about 72 of the day shift, 30 on the afternoon shift and 10 to 12 on the night shift. At the moment of the blast there were 71 men in the district.

The firemen were organised in three shifts, six on the day shift, five on the afternoon shift and five on the night shift. the day shift firemen descended at 6 a.m. and came up at 2 p.m. the afternoon shift firemen descended at 2 p.m. and came up at 10 p.m. and the night firemen went down at 10 p.m. and came up at 6 a.m.. To comply with section 64 of the Act, the inspections and reports were made by the firemen of the preceding shift and the fireman admitted the next shift with each fireman responsible for making two inspections and reports per shift.

The firemen in the Carbrook District were William Wark on the day shift and James Watt on the afternoon shift with Andrew McLean on the night shift. The day shift was the coal drawing shift with the shotfiring done by a shot-firer but during the afternoon and night shifts, the fireman in charge did the shotfiring.

Under Section 35 (2) of the Coal Mines Act, 1911, a search was required for matches etc. of all persons employed underground on a system that was to be approved by the Divisional Inspector of Mines. A system had been approved by which 25% of the underground workers were examined with the search being carried out by the fireman before the men were allowed to pass the Station to go to their work.

The seams that were worked were the Bannockburn Main Coal and the Twenty-Inch Seams, the latter was 14 fathoms above the former. they were worked through cross-measure drifts from the Main Coal. From No.4 shaft, the main haulage road, and an approximately parallel air and travelling way, extended at an average gradient of 1 in 12 for a distance of 1,073 yards where they met a downthrow fault. from here, two parallel cross measure drifts, dipping one in three and one in two and a half, across the fault and cutting the Twenty Inch Coal to end in the Main Coal. Continuations of these drifts, driven level in the Main Coal were known as the Torwood Levels and formed the leading places of the Carbrook District. it these levels that were affected by the explosion.

The inbye ends of the Torwood Levels were 2,030 yards from the shaft and the depth of the coal seam from the surface at this point was 347 yards. In this district the Main Coal dropped 1 in 3 and was made up of 3 feet 10 inches of coal, 5 inches of dirt and 2 feet six inches of coal.

All the districts in the colliery had been worked by longwall with the exception of the Carbrook Main Coal which had been opened out on the stoop-and -room method. On the rise side of the Top Torwood Level a few narrow places had been opened out and to the dip of the Lower Level, stoops had been and were being formed. Parts of the formed stoops were in the course of extraction. No coalcutters were employed in the Main Coal. The coal was holed by hand and blasted down by means of permitted explosives.

The mine was ventilated by a fan forcing air down the No.3 shaft and the last measurements which were taken on the 30th. June, showed that 65,643 cubic feet per minute passed along the North Dook and 42,350 cubic feet down the South Dook. Of the quantity going down the South Dook, 27, 378 cubic feet were measured passing down the Carbrook Main Coal Level. Part of this current ventilated the Torwood Levels before ventilating the Glenside District. The other part descended the dook, rejoined the Glenside air and then passed in to the Carbrook section. Arriving there, it circulated, first through the rise places above the Upper Torwood level where it was conducted to the faces by screens. The air then passed into the Lower Level and then outbye to ventilate the stoop section in the Main Coal and the workings in the Twenty Inch Seam.

The colliery was worked partly with naked lights and partly by oil safety lamps which were used in the Carbrook District from the top of the Carbrook mines. the lamp that was used was the Prestwich Patent Protector which was type which was approved by the Secretary for Mines. Firedamp had been known in the mine for many years and it appeared more frequently as the workings got deeper. For this reason safety lamps were introduced in the Carbrook Section.

During the twelve months preceding the explosion the finding of inflammable gas was recorded in the firemen's report books o 43 separate occasions. the reports indicated that the men wee not allowed to enter the places where gas had been found until it had been cleared. the last record was a small quantity found i the No.3 heading, Torwood District and was cleared by ventilation on the afternoon of the day before the explosion. Coal dust was produced in working the Main Coal in the Carbrook section. Some stone-dusting was done to control the dust but not to a great extent

On the morning of Thursday, 13th., July, 315 men went into the mine and 71 of these entered the Carbrook Section. At 1.25 p.m., during the seventh hour of the shift, when the shotfirer was in one of the Torwood Levels, an explosion occurred in that area, beginning inbye end and extending outbye for a distance of 300 to 450 yards.

The noise of the explosion was described by the undermanager who was just entering the Lower Torwood Level at the time, as a 'rushing noise like steam blowing out of a pipe' while others described it as 'a hissing noise' or a 'prolonged boom'. The blast did not destroy the ventilation doors in the Torwood levels, though it destroyed canvas and wood stoppings between the Upper and Lower levels. It was a local explosion and men in the stooping section immediately on the return side of the explosion area were called upon to come out of their working places.

The undermanager detailed some of the workers to clear everyone out of the workings on the return side of the affected area. It so happened that a number of men were on their way to the pit bottom at the end of their shift and this helped to empty the working places very quickly. The undermanager and other officials went as far along the Top Torwood Level as possible and were successful in getting five men out who had been overcome. Unfortunately one of these men died later even though artificial respiration was administered.

It was the realised the fresh air would be required to be conducted inbye before the explorers could make further progress and to this end the broken stopping were repaired as quickly as possible.

Three bodies were recovered but at about 3 p.m., before any further advance had been made, a Rescue Brigade fro Larbert Rescue Station arrived and two of its members, wearing breathing apparatus went in to find out about the conditions. When they returned they said that they had seen three bodies and that there was no fire inbye and no gad could be seen burning.

As soon as the fresh air was carried forward, it was only matter of hours before both Levels were explored ands all the bodies found. Three bodies that lay between the Top Level and the Lower Level were recovered. by the Rescue Brigade.

Twelve men died and four other me were affected by carbon monoxide and shock, whilst one sustained injury to the head when assisting in the rescue operations. The

manager, undermanager and Day firemen were later taken ill with carbon monoxide poisoning as a result of their efforts to rescue the men and recovering the bodies.

The men who died were-

Bernard McCann aged 30 years, miner of East Murrayfield, Bannockburn,
William Minnock aged 35 years, miner of Station Road, Bannockburn,
David Minnock aged 21 years, miner of Douglas Street, Bannockburn,
James McEwan aged 35 years, miner c/o William McLelland, 63a, New Road
Bannockburn,
John Barlow aged 29 years, miner of New Road, Bannockburn,
Thomas Bryden aged 50 years, c/o Albert Farthing, Station Road, Bannockburn,
William Roberstson Lennie aged 50 years, miner of Newlands, Bannockburn,
Daniel Forsyth aged 17 years, miner of Borestone Crescent, St. Ninians, Burgh of Stirling,
John Hunter aged 31 years, miner of Milton, by Stirling,
Alexander Henderson aged 20 years of 29, Red Row, East Plean, in the Parish of St.
Ninians and
James Murdoch Jarvie aged 19 years, miner of Denny Road, Larbert.

The inquiry into the disaster was held in the Sheriff Court House at Stirling and the proceedings were opened at 11 a.m. on the 17th. October and lasted until 21 when a full and detailed investigation of the circumstances and causes of the disasters was made. The Report, by Thomas H., Mottram, C.B.E., H.M. Chief Inspector of Mines was presented to Lieutenant-Colonel George Richard Lane-Fox, M.P., Secretary for Mines on the 6th. January, 1923.

The explosion area was inspected immediately after the bodies had been removed by officials and Messrs. Hudspeth and Frazer, Senior Inspectors but no cause was found and a more detailed inspection was made the following day when all the gas had been cleared. There was a consensus of idea that the explosion originated at the face of No.12 heading. Two days after, when work to restore the ventilation was going on, a shot-firer's firing key and a cable stretching out up the heading was found. One of the wires had been attached to the battery and the other had apparently been held on to or under the fixing nut and had slipped off. The body of Wilson, the shot-firer, was found 30 feet further inbye.

When the coal was reached, the inner end of the cable was found lying on the floor with part of one detonator lead attached to it. There were two shot holes in the upper part of the coal, one on the left and one on the right. The hole on the left was 29 inches from the roof and had been fired but it was evident that the shot had blown out. The right hand shot had not been fired. All the evidence pointed to the explosion being caused by this blow out shot. After hearing all the evidence, Dr. Richard Vernon Wheeler, Professor of Fuel technology at the University of Sheffield and the Director of the Mines Department Experimental Station, said -

"I have heard nothing mentioned in evidence and seen nothing that had been recorded on the plans and heard nothing from individual with whom I have talked which conflicts with the idea that this has been a coal dust explosion. Whether or not the initial ignition of that dust has been aided by the presence of firedamp it is difficult, if not impossible, to say, but I would suspect that it has been, because of the difficulty with which the dust itself is ignited. As I say, I have heard nothing in evidence which conflicts with this being a coal dust explosion, and to my mind it was a simple instance of what the inflammation of coal dust can do and would do underground."

HAIGH. Whitehaven, Cumberland, 5th. September, 1922.

The Whitehaven Collieries were situated on the outskirts of Whitehaven and close to the seashore. They were the property of the Whitehaven Collieries Company, Limited who acquired the property in 1913. The Collieries comprised four mines, Wellington, William, Ladysmith and Haigh Pits.

Owing to the distance of the working from the shafts, about 4 miles, a scheme was formulated to reorganise the ventilation of the Wellington Pit and the Haigh Pits. The Haigh Pits were sunk with the intention that should eventually replace the Wellington shafts and drifts connected to the Wellington workings were in the course of being driven. The sinking of Haigh No.5 was started in August, 1914 and completed in May, 1916. The No.4 pit was started in October, 1916 and completed in March, 1918. They were 40 yards apart. No.5 pit was 21 feet and No.4, 18 feet in diameter and both were walled throughout. The shafts were 720 yards south west of the Wellington Pits and 300 yards above the high water mark.

To avoid the old workings in the Six Quarters Seam, which were driven from the old Salton Pit, which contained water, the Haigh shafts were sunk to a depth of 40 fathoms below the Six Quarters Seam, which made the total depth of the No.5 shaft, 200 fathoms and the No.4 Pit 191 fathoms. The winding level was at 189 fathoms and the shafts were designed to raise 3,000 tons of coal per day, though the quantity that was raised at the present stage of development was about 250 tons per day.

All the mines were under the supervision of an agent and works manager, Mr. R. Steel. Separate managers were appointed for the Ladysmith and William Pits, but the Wellington and Haigh Pits were under the charge of one manager, Mr. A. Kirkpatrick. There were also undermanagers with 2nd. Class Certificates at each pit, Mr. A. Millar being the manager of the Haigh pit.

Before the explosion, 245 persons were employed at the Haigh Pit including 192 underground and 53 on the surface. The mine was worked in three shifts. The night shift went down between 9.45 to 10 p.m. and came up between 5 and 5.15 p.m., the day shift went down between 5 and 5.15 a.m., and came up between 12.15 and 12.30 p.m. and the back shift descended between 12.15 and 12.30 and ascended between 7.30 and 7.45 p.m. and workmen were underground from 7.30 to 7.45 p.m. to 9.45 to 10 p.m.

The deputies' shifts were arranged as follows, the night shift descended between 8.30 and 9 p.m. and ascended at 4.30 a.m., the day shift deputies went down at 4.30 a.m. and came up between 11.30 a.m. and 12 noon and the back shift deputies went down between 11.30 a.m. and 12 noon and ascended between 6.30 and 7.30 p.m. The Haigh Pit was divided into two deputies' districts called the North District and the South West District and for the purpose of inspection, the drifts which were being driven formed a separate district. For the North and South West Districts there were six deputies, two on each shift and in the North District there was in addition an authorised shotfirer who descended at 7 a.m. and generally ascended at 3 p.m., so overlapping the day shift and the backshift.

On the 24th. August, one of the deputies in the North District went on holiday and from that date up to the morning of the explosion, the two remaining deputies worked his shift between them. These men were working 12-hour shifts and not the eight hours fixed by the normal order under the Coal Mines Regulation Act, 1908, and the Coal Mines Act, 1919.

The total number of men underground on the morning of the 5h. September when the accident occurred was 82, of who 39 were in the North District to which the explosion was confined.

The winding engine was fixed at No.4 shaft which was used for coal drawing. At No.5 shaft the engine was almost completed but the engine used for sinking that shaft formed an emergency winding engine. The steel headgears at both shafts were completed and a small screening plant was in temporary use.

Until the completion of the ventilation scheme the Haigh and Wellington Pits, Haigh No.4 shaft was used as the downcast and No 5 shaft was temporarily converted to an

upcast. A 60-inch single inlet Sirocco fan, electrically driven was erected at the surface. Its drawing power was 48,555 cubic feet per minute at a water gauge of 2.4 inches through the workings of the Haigh Pit. The fan was fitted with arrangements for reversing the current.

An ambulance and a lamp room, stores, offices were provided but were only temporary at the time of the disaster pending the completion of permanent structures.

Each workman was provided with a numbered token and unless he produced this, no lamp was issued to him without written authority from the manager. Each man, when he started work, handed in his token at the lamp cabin and a lamp bearing the same number was issued to him. When they came to the surface after completing the shift they handed the lamps back and the tokens were given to them.

No special system to search the men for prohibited articles before they went underground had been approved by the Inspector and so all persons had to be searched by the onsetter but he had to search about 80 men in 15 minutes and there were grave doubts as to the thoroughness of the search. During the course of the inquiry it merged that a cigarette had been found underground and the jury thought it fit to recommend a stricter method of searching.

From the winding levels, drifts were being driven due west and practically parallel with the Wellington main haulage road for 27 yards from each shaft, these drifts were the width of the shaft, 15 feet and arched. They then tapered down to 13 feet wide and 9 feet high and were supported by brick side walls and girders. The drifts were being driven seaward in order to connect the Haigh shafts with the workings in the Saltom area of the Wellington Pit. The drift from No.5 pit holed at a distance of 1,400 yards into a similar drift driven towards the land from the Wellington Pit workings on the 19th. July, 1922. The drift from No.4 pit was still under construction and had not yet holed through.

On the Wellington side, winnings were being driven both towards the land to hole into Haigh Pit and also seaward to win an area of the Main Band Seam. The total distance to the face after holing was 3,900 yards in a direct line from Haigh Pit. As the winnings advanced, it was intended to make connections to the more remote districts of the Wellington Pit. In driving towards the land in the Main Band Seam, a series of faults were passed through and eventually the Six Quarters Seam was cut in December, 1921 at 830 yards from the shafts and on the south side of a large fault which ran on the north side of the drifts and almost parallel with them. The drifts were continued in the Six Quarters Seam for a further 570 yards, when they holed into the drift driven from the Wellington workings

A small area to the south in the Six Quarters Seam, known as the South West District, was opened from the main drifts and was being worked at the time of the explosion. Three hundred and fifty yards from the Haigh Pits, a pair of drifts were driven northwards through the fault mentioned, and the Six Quarters Seam was cut in December, 1919 and was subsequently opened out. this was the only area affected by the explosion.

At a further 180 yards a similar pair of drifts were driven and the Little Main Seam, lying 12 fathoms above the Six Quarters was cut in April, 1920. This seam was 2 feet 3 inches thick, and a small longwall area was worked by compressed air coal cuttings machines but was suspended on 11th. March, 1922 because of a shortage of men.

The section of the Six Quarters Seam in the inbye area was a roof of Black Shale, the Upper coal 1 foot 4 inches to 1 foot 10 inches thick, 2 feet of Black Shale and the portion worked was 3 feet 5 inches to 3 feet seven inches of coal, three quarters of an inch to ten inches of Band and coal 2 feet to 2 feet four inches.

In the area outbye of the district, which was to the rise, the band was so thick that only the upper portion of the seam was worked by the longwall method. the gateways were 13 yards apart and height for the tub roads was made in the roof. Where the band was thinner, in the inbye area, the whole of the seam was extracted by the bord and pillar method. The workings were 4 yards wide and the pillars were 40 to 50 yards

square. The seam had a general dip to the north west of 1 in 9 but owing to local variations, roadways which had been set on the level, dipped near the face. The district made a certain amount of water and there were three compressed air pumps and the management stated that the workmen at the face were encouraged to fill water into tubs with the coal.

The floor of the haulage plane was wet from below the No.1 air crossing to the face of the dip and there were pools of water in some places. The floor of No.1 level was also wet and water stood for several yards at various points. It is also possible that leakage of water from filled tubs tended to keep the floor of the roadways damp, if not wet, except some of the roads to the rise of the longwall area.

No coal cutting machines were in use. The coal was undercut by hand to a depth of 2 feet to 2 feet 6 inches but it was clear that the holing was not always made to that depth. The undercutting was done in the shale band where it was done in the shale band where it was of sufficient thickness but in one or two places in the bord and pillar and the longwall face, the holing was done in the upper section of the seam. The coal was then got down by blasting, usually three shots fired in the upper section and three in the lower section. The dirt from the holing in the band was thrown back to the sides of the workings, the tub road being in the centre.

The roof of the seam was of a friable black shale intersected by a large number of slippery partings, which necessitated the use of props and bars. The timbering distances were fixed by the manager in accordance with the Coal Mines Act, 1911. Four feet between each row of props, five feet between adjacent props in the same row, four and a half feet between the front row of props and the face and six feet between the holing props or sprags. The timber at the face was set by the hewers, while the backbye timber was set by the shifters.

The engine plane had brick side walls which carried steel girders for a distance of 230 yards and for the remaining distance, steel girders and wooden bars supported by props. The plane averaged 11 feet wide by 6 feet 6 inches high.

The men worked together in each working place and got, filled and trailed or hauled, their own tubs to the haulage plane. There were no putters' flats or siding in the district. No horses were employed at any of the Whitehaven Pits. this necessitated the use of jack rolls in the dip places and small compressed air hauliers (windy putters). In the rise places, self-acting inclines of dillies were used. The main haulage plane was worked by endless rope which extended to the bottom level, the return wheel being situated just below the level and placed horizontally on the floor. Two sets of rails were laid nearly to the bottom of the dip, but the empty road was being extended to form a double track over the entire distance.

Before the holing to the Wellington Pit was completed in the previous June, the total quantity of air passing down the downcast shaft was 40,800 cubic feet per minute. Of this quantity 16,800 cubic feet passed into the North District of the Six Quarters Seam, the measurement within 100 yards of the first working place was 6,000 cubic feet while 9,250 cubic feet went into the Little Main Seam and 13,600 cubic feet into the Drift District.

After the holing, the total quantity of air passing through the downcast shaft was 76,635 cubic feet per minute with 20,240 cubic feet passing into the North District of the Six Quarters Seam with the measurement within 100 yards of the first working place being 7,300 cubic feet, 5,000 cubic feet into the Little Main Seam, 9,120 cubic feet into the South West District of the Six Quarters Seam and the remainder travelled through the Wellington Pit.

Up to July, 1922, the North District of the Six Quarters Seam was ventilated by one continuous split of 16,800 cubic feet per minute passing down the main engine plane, round the workings and over the No.1 air crossing. After the holing, it was found that the pull exerted by the Wellington fan interfered with the ventilation of the Six Quarters Seam in the Haigh Pit to some extent. a second overcast was constructed and the air

was then taken down the main engine plane and after passing round the lower bord and pillar workings, 10,395 cubic feet per minute of air were allowed to pass over the No.2 air crossings, the remainder passing into the longwall workings joined by the leakage along No.1 level and after coursing round the longwall workings, passed over the overcast into the return. A canvas regulator was placed in the drift leading to the Wellington Pit and the quantity of air passing after these alterations showed an increase of 3,080 cubic feet per minute passing into the North District which made a total quantity of 223,320 according to the notes made by the manager at the time of the alterations. The barometer and hygrometer were read and recorded in the prescribed book as required by the General Regulations 104 and 105.

No naked lights were allowed in the mine, even in the downcast shaft. Oldham electric safety lamps, Type C, fitted with magnetic locks were issued to the workmen. The only flame lamps in use were those carried by the officials making inspections. These were Patterson E1 types fitted with lead rivet locks. The lamp station was on the surface and on the date of the explosion there were 243 electric lamps and 8 flame lamps were issued.

No spare lamps were issued to the workmen but each deputy carried both a flame lamp and an electric lamp. The lamps were examined at the shaft bottom by the onsetter and also at the compressed air house which was the meeting station under Section 63 of the Coal Mines Act, 1911 by the deputies before the men were permitted to go inbye. The lamps of men not forming the shift were examined by the onsetter and a record of damaged lamps was kept.

The management claimed that the mine was worked by a succession of shifts, commencing for the purpose of inspection with the night shift. The deputy in each district descended, made his inspection and reported on all the working places prior to the night shift commencing work at 10 p.m. He made the inspection during the shift and also the inspection and report before the morning shift and then passed in the incoming shift. The same procedure was used for the succeeding shifts. Despite the view of the management that the mine was worked in successive shifts, the deputies' shifts were so organised that inspections could be commenced and completed within two hours of the start of work in a shift. The evidence showed that the inspection before the start of work on the day shift was sometimes begun at least three hours before the miners on the shift actually started work at the faces.

As previously mentioned, the shotfirer overlapped the day and the back shifts and while his duties were solely in connection with shotfiring, the Manager instructed him to make a report in the prescribed firemen's report book at the end of his shift. This did not interfere in any way with the statutory duties of the deputy in charge of the district but was solely for the information of the manager.

An examination of the deputies' report books for the 12 months ending 5th. September, 1922 showed that gas had been reported on 28 days in one or more places. The withdrawal of the workmen report book revealed the fact that no men had been withdrawn on account of gas and there were only three entries in the book showing the withdrawals that were due to the state of the roof.

It was stated by the officials, that when gas was found in any working place during the deputies' examination prior to the entry of the workers, that place was '*laid idle*' and the men were sent to work elsewhere. Consequently there were no withdrawals to put on record. No mention was made of the percentage of firedamp found but it was understood that when any indication of gas, however slight, was seen, the place was fenced off until it was found to be clear.

It appeared from the reports that the detection of gas was not recorded for a long interval until 20th. July and subsequent dates, when gas was reported in the last two working places on the return side of the district. Later reports showed that gas was found in Pattinson's, Lanery's and Goulding's places which were the ones furthest outbye. The main dip and its companions had not been worked for some weeks.

Electrical power for the Haigh Pits came from the Company's generating station at the Ladysmith Pit. Three phase alternating current at 3,300 volts was sent by an underground cable to a substation at the surface and from there it was carried down the No.4 downcast shaft by an armoured cable to a distributing station 150 yards from the shaft bottom. This station contained the transformers used for the lighting of the shaft siding as far as the Six Quarters junction and motor rooms. A 100 h.p. endless rope haulage engine was placed 45 yards from the shaft and a 160 h.p. air compressor 350 yards from the shaft. A centrifugal pump driven by a 195 h.p. motor moving 500 gallons per minute was in the Six Quarters inset in the shaft, 158 fathoms from the surface and delivered the water to an adit 30 fathoms from the surface.

An underground telephone system was installed as far as the Six Quarters junction and motor rooms. The haulage signalling extended to the No.7 level. The signalling was done by short circuiting the wires and no special pushes were provided. The bell and relay that were used had been tested and found incapable of producing a spark that could ignite firedamp even when 15 Leclanché cells were used. The relay and bell were fixed at the junction to the main haulage road opposite the compressor house.

There was considerable amount of blasting in the mine and only 'Permitted' explosives were used. Viking Powder No. 2 was generally used for shots in coal and Dynobel No.3 for brushing shots which were fired with No.6 Low Tension Detonators. During June, 2,727 shots were fired in coal which gave an average of 105 shots per day over a period of 26 working days. In drifts and coal together, 4,242 shots were fired and the explosives issued during the month amounted to 2,035lbs.

It was the usual practice to hole or undercut the coal in the middle band of shale to a depth of 2 feet or 2 feet 6 inches and to fire three shots in the top coal each shot being charged with 4 to 6oz. of explosive. Each shift prepared just as much coal as they were able to send out during their shift and there was no 'marrowing' with the next shift. This system led to far more blasting than was really necessary to get the 200 to 220 tons of coal per day. The stemming used was of surface clay which was sent down in pit tubs and taken to the workings by the trailers from the sidings when required.

Stone dusting had been carried out in the pits except where the workings were considered to be naturally wet. Six months before, a stone crushing machine had been erected at the Haigh Pit and no stone dusting had been carried out in the North District beyond the point where the roadways were considered to be wet.

On the morning of 5th. September, 82 men and boys descended the mine at 5 a.m. Thirty eight went into the Six Quarters North District, fourteen to the South West District and nineteen into the drifts. The remainder were engaged on the main haulage road and at the shaft bottom. The deputy in charge of the North District was W. Weightman and the deputy of the South West District and drifts, D. McKenzie. the shotfirer, C. Brewster, descended at 7 a.m and went to the North District. The undermanager, Alexander Millar also went down the pit. The manager, Mr. Kilpatrick, was on holiday from the previous day and Weightman was staying for part of an extra shift.

A few minutes before 9 a.m., the banksman saw a cloud of dust coming from the downcast shaft. The agent, Mr. Steel, who was at the William Pit, was immediately informed by telephone and he and Mr. Brodie, the manager of the William Pit, went at once to the Haigh pit. On his way, Mr. Steel telephoned the Rescue Station at Brigham and Mr. Cook, H.M. Inspector of mines, who lived in Whitehaven. These men at once made their way to the pit and when Messrs. Brodie and Steel arrived at the pit, they found that the engineer, Mr. Parker and the storekeeper, Mr. Rothery, who was an old undermanager, had already gone underground and they caught them up at the compressor house. The downcast shaft was not damaged in any way but the light wooden planks covering the upcast shaft were displaced. This caused an overload on the fan motor which tripped the switch.

They found no damage had been done to the shaft siding as far as the compressor house and on meeting the engineer, Mr. Steel instructed him to go to the surface and

make preparations to start the fan. The air was then travelling along the drifts to the Wellington Pit.

At the time of the disaster, Mr. Millar the undermanager and the rope splicer, Travaskis, were standing near the compressor house when they felt the blast coming from the North District of the Six Quarters Seam and both were blown off their feet. Mr. Millar was not injured but Travaskis had some ribs broken and shortly after had to go to the surface. The undermanager went towards the junction and found Telford, a boy, lying dead between some tuns and the side wall of the drifts. He made his way into the North District and found that the first air crossing was blown down but he continued further inbye.

In the meantime, Messrs Steel, Brodie and a deputy named Thompson who had been at the shaft top and was to have relieved Weightmen, had reached the air crossing and heard Millar call for help. They went to his assistance and found him unconscious 120 yards further down the dip. They carried him out to the junction and afterwards he was taken to the Infirmary.

The men in the South West District and drifts, having felt the blast, made their way outbye and several were called upon to give assistance. A hewer, W. Carter, was found badly injured and unconscious under some empty tubs that had been derailed under the No.21 air crossing. he was take out of the pit but died on his way to the Infirmary.

Mr./ Cook by this time had reached the Six Quarters junction and after consultation with Mr. Steel and an inspection of the return airway at the No.1 crossing which showed that there was no apparent danger of fire, it was decided to re-start the fan. This was done about 10.30 a.m. They found the return airway full of afterdamp and a white vapour, which destroyed any hope that men could live in that atmosphere.

After the fan was re-started, an attempt was made to go down the main engine plane, when it was found that the No.2 air crossing and the stoppings to the left hand side of the plane between the two air crossings were also blown out.

On reaching the No.2 air crossing the air was found to be so foul that no progress could be made. The Rescue Team had arrived by this time and they were sent forward to investigate the engine plane beyond this point. After proceeding a short distance, they returned to report that there were large falls which had prevented them from going further.

The air was short circuiting at the air crossing and stopping and it was impossible to continue with the exploration until these had been repaired. The party was then withdrawn, and with the additional help that was available, a start was made to restore the air crossings. While this work was in progress, the agent, Mr. Steel, was overcome by afterdamp and had to be carried out and taken to the Infirmary and Mr. Brodie was affected and taken to the surface.

In the meantime the undermanager of Wellington Pit had travelled through from this pit and reported that all was right on his way. By the early afternoon the air crossings had been completed and a stopping erected in place of the one that had been blown out while a further stopping was put in place of the wooden door which had been blown out of the No.1 level. Stoppings were also erected in the drift to Wellington Pit and at the Little Main Drift to put more ventilation pressure on the Six Quarters section.

The air then began to take its normal course. This enabled a party to get further down the main engine plane where they found a number of bodies and many large falls but were still unable to reach the faces until further stoppings were put in on other levels to the right. While this work was going on, a party attempted to get along the No.1 level and reach the men in the longwall district. The afterdamp impeded progress and stoppings had to be put in the openings on the right hand side. Eventually the ventilation was restored sufficiently to enable rescue parties to enter the working where they found no one alive. The Rescue Brigades were used to explored the dead ends where they found several bodies. Between 2 and 3 a.m. on the 6th, all twenty five bodies who were not buried in falls had been recovered. It was Sunday, 10th September before all the

bodies were recovered and brought to the surface owing to the heavy falls which made their location very difficult.

Those who lost their lives were-

Thomas Parker Telford aged 19 years, shifthand of 7, Low Harras Moor,
Robert Routledge McCreddie aged 19 years, coal hewer of 4, Thwaite Ville,
Robert Denwood aged 21 years, coal hewer of 13, Quay Street,
Joseph Moore aged 29 years, shifthand of 22. Thwaite Ville,
Albert Powe aged 19 years, shifthand of Low Harras Moor,
James Greaves aged 46 years, shifthand of Goosebutts, Hensingham,
Moses Huddleston Tyson aged 24 years, coal hewer of Birley Court, Duke Street,
John Kirkpatrick aged 32 years, coal hewer of 1, Hills Place, Church Street,
Gordon McCreddie aged 17 years, coal hewer of 4, Thwaite Ville,
William Hope aged 25 years, 10 School House Lane,
John Moore aged 25 years, of 10, Bransty Road,
George McCreddie aged 47 years, of 4, Thwaite Ville,
Robert McDowell aged 44 years of High Hensington,
Thomas Moore aged 29 years, coal hewer of 3, Garden Villas, Hensingham,
Thomas Gilhooly aged 39 years, coal hewer of 40, Keekle Terrace, Hensingham,
Leonard Ixon Hellon aged 27 years of 3, Thwaite Ville,
Bernard Murphey aged 24 years, coal hewer of 56, Bowthorn Road, Cleator Moor,
Sylvester McAvoy aged 34 years of 29, Thwaite Ville,
Thomas Haig aged 37 years of 2, Cooks Court, Scotch Street,
Albert Shepherd aged 39 years, coal hewer of 135, Main Street, Parton,
William Weightman aged 32 years, deputy and shotfirer of 16, Thwaite Ville,
Samuel Coulter aged 28 years, coal hewer of Main Street, Hensingham,
George Stevenson Parkinson aged 26 years, coal hewer of Low Harras Moor,
William Carter aged 26 years, coal hewer of 30. Thwaite Ville,
Thomas McDowell aged 19 years, trailer of Streetons Terrace,
Hensingham, Jackson Sparks aged 19 years, coal hewer of 4, Williamsons Lane,
Hensingham,
John Pattison aged 36 years, coal hewer of 13, Williamsons Lane, Hensingham,
William John Sparks aged 23 years of Williamsons Lane, Hensingham,
Thomas Robinson aged 29 years, coal hewer of 53, Main Street, Hensingham,
John Carson Brewster aged 39 years, shotfirer of 17, Lonsdale Place, Whitehaven,
John Bennett aged 26 years, coal hewer of 28, Arrowthwaite,
Thomas Henry Cooper aged 28 years, coal hewer of 28, Auction Yard, New Town,
Henry Goulding aged 32 years, coal hewer of 2, Ravenhill,
Richard Denver aged 58 years, shifthand of 2, Low Road, Whitehaven,
Isaac Osborne aged 26 years, coal hewer of Crookdale, Brayton,
Douglas James Michael Fell aged 20 years, mining student of Holy Trinity Vicarage,
Whitehaven,
John Casson aged 37 years, coal hewer of Low Harras Moor and
George Watson aged 37 years, coal hewer of 5, Brookbank, Hensingham.

The inquiry was held concurrently with the inquest and the proceedings were opened at 10 a.m. on Monday, 9th. October in the Congregational School Room, Scotch Street, Whitehaven for six days when all interested parties ere represented.

The explosion are had been examined by Mr. Thomas Mottram, H.M. Chief Inspector of mines who made the official report on the disaster.

The only two flame lamps which were used in the affected area, that of Weightmen, the deputy and Brewster, the shotfirer were recovered and examined. Brewster's lamp was found to have been damaged by a fall of roof but both lamps were found to be in good condition as were all electric lamps and the signalling apparatus and incapable of

igniting gas. The match and cigarette which had been discovered in clothing was also ruled out as a source of ignition.

Blasting was being carried out at the time of the disaster and Mr. Mottram came to the conclusion that-

“The evidence was so overwhelming that I have no hesitation in coming to the conclusion that the explosion originated at the flame of a shot fired at the face of Moore’s heading.”

The shot was fired in the bottom coal which had been previously holed in the shale practically to the full length of the shothole.

Mr. Steel gave the Inspectors an assurance that blasting would be suspended in the Six Quarters Seam and would substitute holing and shearing machines and the question of producing a flameless explosive was being looked at by a Committee appointed by the Secretary for Mines on the recommendation of the safety in Mines Research Board.

At the inquest the jury made several recommendations on which Mr. Mottram commented in the report. They recommended that the term ‘*wet throughout*’ relating to stone dusting should be defined and the Inspector thought the point should be referred to the Safety in Mines Research Board. The jury did not feel justified in making an recommendation about safety lamps but the report commented-

“The question of installing safety lamps in places where electric lamps are in use has been the subject of much controversy among mining men. The problem was some time ago referred to the Miners’ Lamps Committee who have taken much evidence on the point and will shortly issue their report.”

The jury also recommended that there should be a spare deputy on each shift, that no deputy should be allowed to work overtime and that there should be greater inducements to men to take up deputies’ positions. The last two recommendations of the jury concerned a more careful method of searching and that as far as the Haigh Pit was concerned, no explosive should be used to get coal.

ST.HELENS No.3. Workington, Cumberland. 27th. November, 1922.

The St.Helens Collieries were situated to the north of the town of Workington and were close to the sea shore. The owners were the St.Helens Colliery and Brickworks Company Limited who acquired them in 1921 during the national stoppage of that year. There were originally two mines, the no.2 Pit And the No.3 Pit, but owing to the 1922 stoppage, the lower seams at No.2 Pit were flooded and were not re-opened and the upper seam abandoned.

Both the shafts at the No.3 Pit were used as winding shafts. the downcast was sunk to the Six Feet Seam at 220 fathoms and the upcast was sunk to the Lower Three Quarters Seam at 203 fathoms. The down cast shaft cut the following seams, the White Metal at 66 fathoms, the Upper Yard at 67 fathoms, the Slatey Band at 74 fathoms, the Ten Quarters at 85 fathoms, the Metal Band at 115 fathoms, the Channel band at 117 fathoms, the Yard Band at 1439 fathoms, the Little Main at 150 fathoms, the Lickband at 196 fathoms, the Upper three Quarters at 198 fathoms, the Lower Three Quarters at 203 fathoms and the Six Feet at 220 fathoms. The downcast shaft was 10 feet 9 inches in diameter and the winding level was at the Lickband Seam. The upcast shaft was 11 feet 8 inches in diameter and winding was carried out from the Cannel and the Lower Three Quarters Seams.

The mine was under the control of the agent, Mr. T. Banks and Mr. C.D. James was the manager. there were two undermanagers, Mr. J. Spence who was the undermanager for the area in which the explosion occurred. There were nine overman, one on each shift for each section of the mine. There were 38 deputies, one in each shift for each district. The Ten Quarters Seam, in which the explosion took place, was divided into two districts, with a deputy in charge of each and their duties did not overlap in any way. In addition of their statutory duties, the deputies also did the shot firing.

Before the stoppage, both mines were worked practically as single shift pits, but when No.2 Pit was stopped, nearly the whole of the men were transferred to No.3 Pit, the greater part of which was then put on a double shift. The workings in the Little Main, Three Quarters and the Six Feet Seams continued with only one shift of hewers, but in the remainder of the mine, two shifts of hewers and one repairing shifts were employed.

For the purposes of inspection, starting with the night shift, the mine was worked in three shifts, except the Little Main, Three quarters and Six Feet Seams. The deputy in each district descended, made his inspection and reported on all the working places prior to the night shift commencing. He also made the inspection during the shift and the inspection and report before the start of the morning shift and he passed in that shift. The same procedure was followed on the two other shifts. In the Little Main and other seams working one shift only, the deputy descended before the men, made his inspection and passed his own men.

The day shift deputies descended at 5.30 a.m. and came up at 1.30 p.m., the afternoon shift deputies went down at 1 p.m. and came up at 9 p.m. and the night shift deputies went down at 9.45 p.m. and came up between 5.45 to 6 a.m. The men on the day shift went down between 5.20 and 6 a.m. and came up between 1 and 1.40 p.m., the afternoon shift went down between 1 and 1.30 p.m. and came up between 8.30 and 9 p.m. and the night shift went down between 10.30 and 11 p.m. and came up between 5.30 and 6 a.m. The number of men employed in the mine was 1,623, of whom 1,354 were employed underground. There were 700 hewers. At the time of the explosion there were 619 men in the mine. In the Ten Quarters Seam there were 49 hewers, 36 datal hands, two deputies and one overman.

No naked lights were used in the mine and the Prestwich Patent Protector Flame Safety Lamps with lead rivet locks and electric safety lamps of the Ceag were used with magnetic locks. There were 1, 194 flame lamps and 257 electric lamps. It was a local rule at the colliery that there must be at least one flame lamp in every working place, and in particular places affected by the explosion there were no electric lamps in use at the time.

The lamps were numbered and each man received the same lamp daily. This formed part of the checking system. The workman handed in a numbered check and in return received a lamp bearing the same number. On returning the lamp at the end of the shift, he received his check back in exchange. A register was kept of all the lamps issued, as well as a record of damaged lamps which was required under Section 34 (1) (ii) of the Coal Mines Act, 1911. The lamps were examined at the meeting station by the deputies before the men went inbye.

As many men as possible were searched at the bottom of the shaft by persons appointed to do so under the order, dated 21st. May, 1912 in force under the Act. At least 10% of the men were searched each day, and once an month a surprise search of all the workmen descending the mine was made. This was a procedure approved of by the Divisional Inspector. There was a properly equipped Ambulance Room at the surface and various first aid stores were kept at places underground.

The explosion occurred in the Ten Quarters Seam, which was one of the upper seams in the coalfield. Owing to a series of faults, the seam was entered by the Lickbank Level and after following the Lickbank Seam for 384 yards, the haulage road cut the Cannel Band through a fault and then followed the Cannel Band for 284 yards until it reached a point where the Ten Quarters Seam was reached by crossing another fault.

The haulage, which was by endless rope, extended a further 500 yards in the Ten Quarter Seam. From this point there were 100 yards of level road with pony haulage before the start of a series of four self-acting inclines, or brakes, in a north westerly direction. The first or No.1 Brake was 163 yards long. This was followed by another level stretch of 66 yards to the bottom of No.2 Brake, which was 208 yards long. No.3 Brake was 300 yards long and finally the no.4 Brake extended for 112 yards up to Ditchburn's

level which led to the section where the explosion occurred. Ditchburn's Level was 2,017 yards from the shaft and 179 yards long from the top of the incline to the face.

Electrical signalling was used to the end of the endless rope and ordinary mechanical signals on each of the inclines. There was no electric power in the Ten Quarters Seam. The nearest pint at which electricity was used for power or lighting purposes at the shaft siding which was lit by electricity.

The ventilation of the mine was produced by a Walker Indestructible Fan which worked at a water gauge of 4 to 4.2 inches and was driven by a direct coupled steam engine. The measurements at the downcast shaft showed that a total of 84,260 cubic feet per minute were passing through the mine on the 26th, November, 1922 of which 26,800 cubic feet passed into the haulage road leading to the Ten Quarters. Here it was further split, 17, 200 cubic feet going to the Ten Quarters Seam and the remainder passing into the Rattler Band and New Main Band Seams. The measurements within 100 yards of the first working place in the Ten Quarters was 7, 920 cubic feet. The air passed round the whole district in one current with no splits in the seam, a point which was taken up at the inquiry.

The Ten Quarters Seam had a section as follows, a roof of Light Blue Shale and the portion that was worked consisted of 6 inches of Rattler, 3 feet of coal, a dirt band of 4 inches Coarse Coal, 2 feet 2 inches and Black Metal, 6 inches. The floor was of fireclay and shale. The seam was worked on the stepped longwall system, with gateways 13 yards apart driven on the level course and the main gates or brows 80 to 100 yards. The face at the time of the disaster was under the sea just below low water mark and rose to the west or seawards at a gradient of 1 in 6 to 1 in 7. Height was made in the gate roads partly by taking down the roof and partly by taking up the course coal at the bottom of the seam. The latter was left under the packs. Two men usually worked in a working place and filled their own tubs from the coal got down, but the trailing or putting was done by pony drivers.

An examination of the Deputies Report Books for three months prior to the explosion showed that gas had been reported on many occasions, with the percentages of 2 or 3% reported and no other percentages were shown. The records showed that the workmen had been withdrawn because of gas on one occasion in the Ten Quarters Seam No.2 District from the place of the explosion on 17th. October, 1922. Coal dusting was practised in the mine but only where the inert dust produced naturally was considered insufficient.

The deputies fired the shots which were of Samsonite No.3 and Tees Powder, both which were permitted under the Act and they were used in coal as well as stone. The shots were fired electrically with No.6 detonators and the explosives and detonators were carried by the deputies only, except in stone drifts where one man was specially authorised and was allowed to carry explosives.

From examination of the records for the month preceding the explosion, it was found that the average number of shots fired by each deputy in the district was between 11 and 12 per shift. Shots in the coal usually consisted of one cartridge and those in stone of two or three cartridges but the cartridges used may be 2, 4 or 5 ounces. Surface clay was used for stemming and this was sent down the pit in tubs and taken into the workings by the hewers as required.

Of the 619 men and boys who descended the mine on the morning of the 27th. November, 88 entered the Ten Quarters Seam including two deputies. The working so the right of the four main self-acting inclines were in the charge of James Johnstone who descended the pit about 5.30 a.m., the inspection before the commencement of work in the day shift being made by the night shift Deputy. Johnstone had about three places on the left side of the incline but the remaining places on the this side were under the charge of the second deputy.

All seems to have gone well until noon, when a stoneman named Farish, who was working with three others making ready to put up a wooden door at the top of the No.4

Brake, heard the sound of an explosion coming from the direction of Dixon's gateway in Ditchburn's Level. The report appeared to him to be something like a shot but when he saw reek and 'stume' (dust) advancing, he concluded that something extraordinary had occurred. The explosion put out his lamp but the party had an electric lamp which continued to burn so they went down the incline where they met the overman, Fell. Fell was at the No.3 Brake top at the time of the explosion and felt a gush of wind. After taking some panic-stricken boys down to the bottom of the No.3 Brake, and getting some canvas door open to clear the brake of dust, Fell proceeded to the top of the No.4 Brake and came across Robert Nicholson, and George Davidson jnr., who had come out of Ditchburn's Level seriously injured. He placed them in the charge of two other, Edwards and Thompson and them after failing in an attempt to get into the e affected area by Ditchburn's Level where the air was too foul, he retraced his steps down No.4 brake and entered by the level below. By this time he had been joined by William McMaster, a hewer and another workman named Thwaites. This party went into Davidson's place from the intake side and found another victim, Johnstone, the deputy. Johnstone was placed in fresh air under the charge of McMaster and Thwaites, while Fell went for further assistance. he succeeded in organising two other parties, each of four persons, On party entered by Wilkinson's Level and the other by Ditchburn's level (in which the air had become clearer) and they found the bodies of the three remaining victims, J, Davidson, T.G. Featherstone an G, Davidson snr. Three workers who had been rescued alive later died fro their injuries.

Those who died were-

George Davidson snr. aged 48 years, hewer of 102, Main Street, Elenborough, Maryport,

John Davidson aged 14 years pony driver of 19, Old Row, Netherport, Maryport,

Twentyman Graham Featherstone, aged 24 years, hewer, Skiddaw View, Dearham,

James Johnstone aged 34 years deputy of 14, Siddick, Workington,

Robert Nicholson aged 29 years, hewer of Crosshill, Main Street, Dearham and

George Davidson jnr. aged 20 years, hewer, of 102, Main Street, Elenborough, Maryport.

Mr. Thomas H. Mottram, C.B.E., H.M. Chief Inspector of Mines arranged with the Coroner, Colonel D.J. Mason, D.S.O., that the inquiry into the disaster should be held concurrently with the inquest into the men's deaths. The proceedings took place in St. Michael's Parish Room, Workington on the 11th. December, 1922 and continued for the next two days. All interested parties were represented.

The jury found that-

"1) That the explosion was caused by firedamp alone.

2) That it was caused by the firing of a shot in Dixon's level.

3) That the firing of the shot was a negligent act on the part of the person who fired it.

4) That the evidence was insufficient to fix any person with manslaughter."

They added the following recommendation and observations-

"We are of the opinion that the work performed by Fell, McMaster and Thwaites at the time of the accident is to be highly recommended and is worthy of recognition.

We are of the opinion that more care should be taken in the filling in of the various reports by the deputies and the other officials."

The flame safety lamps involved in the explosion and recovered were tested and found that they could not have caused the explosion and no matches or cigarettes were found. There was a consensus of opinion that the explosion originated in blasting operations in Dixon's road and it was clear that there shots of Tees Powder were fired on the morning of the explosion. Two had been fired in the top and one in the bottom brushing.

The sequence of events in Dixon's road following the firing of the No.1 shot could only be deduced from the inspection of the place after the disaster. Another shot had been fired in the bottom brushing. It had been drilled to 4 feet 6 inches in coal 2 feet thick and had done its work well, just loosening the coal.

An overhanging stone had been left by the first shot which was partly displaced by a further shot. Although the amount of explosive was unknown, it was evident that it was overcharged. The inquiry thought that-

"The primary cause of the disaster was the firing of a top brushing shot by the deputy, Johnstone, when firedamp was present in the vicinity. That shot was the last of three fired by him. It was an unnecessary shot and at the same time overcharged, with the result that it emitted flame which caused the explosion."

Mr. Mottram suggested that the efforts of Fell, McMaster, Thwaites, Richard Edwards and R. Thomason were brought to the notice of the trustees of The Carnegie Hero Fund with a view for them to get recognition for their efforts following the disaster,

WHEDALE. Castleford, Yorkshire. 22nd. February, 1923.

The colliery was the property of the Airedale Collieries Limited and was just to the east of Castleford. The Company also owned the Allerton Byewater and Fryston Collieries, Whedals Colliery being connected to the latter by an underground road.

Two seams were worked at the Wheldale Colliery were the Silkstone and the Beeston, both of which produced gas and household coals. The Silkstone Seam, in which the explosion occurred, had been worked since about 1883 and at the time of the disaster produced about 4,500 tons per week.

There were two shafts, a downcast, 13 feet in diameter and an upcast, 12 feet in diameter. The downcast cut the Silkstone Sea, at 477 yards and the Beeston at 567 yards. Coal was drawn from each level alternately by means of a specially designed drum.

q All the mines in the Company were under the supervision of a general manager, Mr. H. Smithson who held a First Class Certificate of Competency under the Coal Mines Act and had held the post since February, 1919. Mr. C.S. Greaves, who also held a First Class certificate was the assistant manager.

There were three separate managers for each of the collieries. Mr. Hubert Hinchcliffe was in charge of the Wheldale Colliery and had held the post for the previous four years. Mr. Hinchcliffe's undermanager was Mr. W. Astley who had been at the colliery for four years and Mr. W. Mowley acted a spare undermanager.

There were 1,864 people employed at the colliery with 662 in the Silkstone Seam, 859 in the Beeston Seam and 344 at the surface. The mine was worked on a three shift system. The night shift went down between 10 and 10.20 p.m. and came up between 5.20 and 5.40 a.m., the day shift went down between 5.15 to 6.0 a.m. and came up between 1 and 1.45 p.m. and the afternoon shift which went down between 10 to 1.45 p.m. and ascended between 8.45 and 9.25 p.m. This meant that the workmen were underground continuously except for a period between 9.25 and 10 p.m.

The deputies were organised into four shifts with the evening shift descending at 5 p.m. and ascending at 1 a.m., the night shift descending at 11 p.m. and ascending at 7 a.m., the day shift descending at 6 a.m. and ascending at 2 p.m. and the afternoon shift descending at 10.30 a.m. and ascending at 6.30 p.m. The Silkstone seam was divided into three deputies districts known as Nos. 1, 2 and 3 and for each District there were 4 deputies. The explosion occurred in the No.2 District and there were no shotfirers as the deputies fired the shots that were necessary in his own district.

The number of people below ground in the Silkstone Seam on the morning of 22nd. February, 1923 was 243 of whom 69 were in the No.2 District.

At the surface here were two permanent winding engines, one for the downcast and one for the upcast and both the headgears were made of steel joists. Although there

wee connections to other collieries, the Silkstone Seam at Wheldale was self-contained. The air that went down the downcast shaft traversed the workings and returned to the upcast.

The ventilation was produced by a Walker 'Indestructible' Fan made by Messrs. Walker Brothers of Wigan and was first put to use on 4th. June, 1922. it was 16 feet in diameter And was driven by a pair of horizontal non-compound engines. it was capable of producing 240,000 cubic feet per minute at a 6 inch water gauge and was equipped with the proper arrangements for it to reverse the air current.

An ambulance room was provided at the surface and motor Ambulances were provided for the three collieries of the Company. One was stationed at Fryston Colliery and two at Allerton Byewater Colliery. There was also one horse ambulance stationed at Wheldale Colliery. Each colliery could be serviced by these ambulances in a few minutes.

Each workman was provided with a numbered lamp check and he could not get a lamp without one of these except on the managers or undermanager's written authority. On going to the pit the man left his check at the lamp cabin and received his lamp in exchange.

Twenty percent of the men descending were searched fro prohibited articles and one a week a complete search was made of all persons descending the pit. The results of the searches were recorded in a book. In addition all persons not forming a complete shift were searched when they descended.

The Silkstone Seam was worked on a system of advancing longwall. In the section where the explosion occurred there was s panel of eight stalls and the face was about 3,100 yards from the pit bottom, the coal being worked on the bord. The roof of the seam was Bind with ironstone nodules, 4 feet of coal And roof of strong fireclay, 2 feet deep.

The seam was divided by at thin parting of dirt one foot three inches of Tops and two feet nine inches of Bottoms. below the floor there was ten inches of coal which was not worked.

The gateways were driven, 10 feet wide and from 7 feet to 10 feet high, 10 feet being the height of the main gates. The timbering distances were fixed by the manager in accordance with Section 10(4) of the Coal Mines Act, 1911 at 5 feet between each row of props, 5 feet between adjacent props in the same row, 5 feet between the front row of props and the face and 6 feet between the holing props or sprags. The timbering at the face was done by the coal getters while the heavy timbering in the roadways was set by byeworkmen.

The seam was dry and the only water that was taken into the pit was for watering the ponies. No coal getting machines were used and conveyors had not been installed, the coal being worked entirely by hand. as a rule, eight men worked in each stall, four on the day shift and four on the afternoon shift, but in certain stalls, ten men were employed four on the days shift, four on the afternoon shift and two on the night shift.

Horses were used for the haulage between the coal face an the main or auxiliary rope.. The main rod form the face dipped inbye at an average gradient of 1 in 34, and the coal was hauled out along this road by an endless rope which was motor driven at one a quarter miles per hour.

The ventilation going to the Silkstone Seam was 33,800 cubic feet per minute and of this, 4,725 cubic feet per minute went into that part of the district where the explosion occurred. The main return airway was used as travelling road by the workmen and ponies.

No naked lights were allowed in the mine and the safety lamps were of the approved Hailwood's Combustion Tube Safety Lamp made by Messrs. Ackroyd and Best and fitted with magnetic locks. On the date of the explosion 597 of these lamps were in use in the Silkstone and Beeston Seams, The pit was also provided with nine Oldham Emergency type Electric Lamps, fitted with lead rivets which were used for special

purposes. The lamps were examined at the insets to the shaft by the onsetters and also at the meeting stations inbye by the deputies.

The inspections required to be made within two hours before the commencement of work in each shift were carried out in the Silkstone Seam by the afternoon deputy examining for the afternoon shift between 1.40 a.m. and 1.30 p.m., the evening deputy examining for the night shift between 8.30 p.m. and 10.20 p.m. and the night deputy examining for the day shift between 3.50 a.m. and 5.40 a.m. Two inspections were made by the deputies during the course of each shift. Gas had been reported on three different occasions and the men withdrawn, There had also been thirteen occasions on which the men had been withdrawn for 'weighting' of the roof.

There was no shotfiring in the coal but a certain amount was done in ripping and only permitted explosives were used. All shots were fired electrically by No.7 High Tension detonators. During the twelve months prior to the accident, 3,541 shots were fired in the Silkstone Seam, 3,006 lbs. of explosive were used with an average shot weight of 13.58 ozs.. Out of this number, two shots mis-fired. The explosives were arrived by the colliers to the working places in tin canisters numbered the same as their motty numbers. Only the deputies carried detonators in properly constructed leather cases attached to the waist belt. Surface clay was used for stemming and this was taken into the workings in tubs and emptied into heaps at convenient places.

Stone dusting had been practised at the colliery since 1920. Until December, 1922, the stone was ground at Fryston Colliery and sent in bags to Wheldale. The material that was used was the bind from the ripping measures and showed on analysis 7.1 per cent of combustionable matter. The dust was distributed along the roadways by means of the 'Oldham' automatic travelling tub and by hand. The records showed that from December to February, 1922-3 approximately 294 tubs of stone dust were sent to the Silkstone Seam. Dust sampling was in compliance with the General regulations of 30th. July, 1920.

The explosion occurred near the coal face in the Silkstone Seam and the effects were confined to a small area of workings in a panel of eight stalls at the top of the 190's main bord and 3,100 yards from the pit bottom. The area affected was on the rib side of the panel which was made up of three lengths of roadway, 26 yards, 18 yards and 8 yards respectively and about 67 yards from the coal face.

On the morning of 22nd. February, 1922, out of the 662 men and boys employed in the Silkstone Seam, 243 descended the pit between 5.15 and 6 a.m. to work. The deputies in charge of the districts were Alfred Hopton, in charge of the No.1 District, Enoch Holmes, the No.2 District and Walter Smith in No.3 District. The workings were examined by the night shift deputies before the day shift came down and all the day deputies did not descend until 6 a.m.

Work went on as usual until about 10 a.m., when the noise of shot was heard coming from the 109's gate in the No.2 District. Following this, a second shot was heard from the same direction. The second report was followed by an explosion of firedamp and a blast of wind which, mingled with dust, blew out the lamps in the three adjoining workplaces. Flame was also seen by some of the workmen in these places. The report of the explosion was described by some of the hewers as being like the 'roar of thunder' followed by a crash, while another spoke of a 'sort of rumble' and then a bang, 'a terrible bang'. The interval of time between the report of the first shot and the report of the second was estimated by different persons at from 4 to 10 minutes.

After the explosion the workers in adjoining 190's and 181's made their way out as best they could into the 27th. East Bord. which was the main road from the pit bottom and Main South Ending into the affected area. In this road Enoch Holmes, who had fired the shots, was seen on his way to the pit bottom. He was terribly burned and subsequently died in hospital. meanwhile Walter Smith from the No.3 District, who had heard the explosion and had seen a cloud of dust, appeared on the scene and, after making arrangements to assist some of the injured put of the it. He, along with others,

started to explore the workings to rescue the others who and not been unable to get out. They entered the 190's and 181's and after administering First Aid and rescuing the men they found injures, they found the body of J. Bibb who was the only victim who was killed outright.

On approachig the affected area, Walter Smith and hiss assistants found smouldering a cap and several pieces of paper, as well a the men's clothes. On 147's gate they also found a prop on fire, as a result of the explosion. Bibb's body was recovered and the eight men who worked in the 181's and 190's stalls but had congregated in 181's gate while blasting operations were in progress, were so badly burned that they subsequently succumbed to their injuries.

Those who died were-

J. Bibb aged 14 years, shotfirers' boy of 41, Wellington Street, Castleford,
C. Booth aged 19 years, filler of 99, Hugh Street, Castleford,
E. Holmes aged 35 years, deputy of 269, Castleford Road, Normanton,
W. Hall aged 32 years, collier of 9, Kershaw Avenue, Airedale,
J. Anson aged 33 years, miner of 4, Ferrybridge Road, Castleford,
E. Baker aged 33 years, collier of 11, Wainwright Street, Castleford,
J. Lowe aged 30 years, collier of 35, Heald Street, Castleford,
A. Marsden aged 37 years, collier of 3, Welbeck Street, Castleford and
J.H. Moreton aged 54 years, collier of 27, William Street, Lock Lane.

Two inquests were held, one at Leeds on the eight men who died in that city by the Coroner, Mr. William Henry Clarke and the other at Castleford by Major W.B. Arundel, Coroner for the Honour of Pontefract. Major W.B. Arundel, adjourned the hid inquest until proceedings at Leeds had been completed and the inquiry into the disaster was held concurrently with the inquest at Leeds. The proceedings took place in the West Riding Justices Court in the Tow Hall, Leeds where all interested parties were represented.

The site of the explosion was thoroughly examined by Mr. Thomas Mottram, H.M. Chief Inspector of Mines. The inquiry came to the conclusion that the explosion originated in the ripping of the 190's bord and that it was caused or initiated by the flame produced by the shot fired by Holmes, the deputy.

MEDMOSLEY. Consett, Durham. 24th. February, 1923.

The colliery was about two miles north of Consett and was owned by The Consett Iron Company, Limited. It had a shaft called the 'Busty' shaft to the Brockwell Seam and it was in this shaft that eight persons lost their lives when ascending in the cage. The shaft was ten feet in diameter and lined with fireclay lumps except for 95 feet. The openings from the shaft were at 114 feet, to the Main Coal and 365 feet, to the Busty seams. The shaft was 453 feet deep.

As the cages ran in the shaft, there were guide rails constructed from steel rails in 18 feet lengths that weighted 41 pounds per yard, to keep them in vertical alignment. It was twenty years before that the original guides had been installed and these were in regular use until January 1921 when part of the north west guide had become severely worn and was renewed for seventy feet from the shaft bottom to the meeting, where the cages passed.

There was a problem with the materials that were to be used for the replacement. The Company could not get rails of exactly the same cross section as the original rails. To make then fit at the joint the old rails were tapered down to make the joint.

The winding apparatus was a Ward Leonard Ilgner Type with a direct current motor rated at 350 horse power which was completed in 1914.the drum was 10 feet in diameter and 6 feet wide. The ropes were of 'Special Improved Plough Steel' three and

a quarter inches in circumference, Lang's lay, with a breaking strain of 408 tons. The 'capel' or socket on each winding rope was a 'Reliance' type and between it and the bridle chains, of which there were four, was a four ton Ormerod Deatching Hook. The pulleys were 11 feet in diameter.

The North side winding rope was first used on 11th. November, 1922 and that on the South side on the 30th. September, 1922. The North cage was installed in October 1922 and the south cage a little before this date. The chains on the cage were annealed and installed in September 1922.

All the ropes, detaching hooks, cages and chains were inspected by the enginewright, Joseph Simpson and the leading blacksmith, John Wilson who also examined the cage shoes daily. the shaft, guides and buntions were examined and reported on nightly by the shaftsman, Timothy Collinson and were examined weekly by the enginewright. The examinations were made between 8 and 8.30 a.m. The weekly examination was made at weekends and took from three quarters of an hour to an hour. the enginewright was always accompanied by a blacksmith or a shaftsman when he made his inspection. The guides were greased with thick black grease, at least once a week, by the shaftsman, usually during the Sunday night shift.

The last examination of the shaft and fittings before the accident was made by Timothy Collinson between 12.30 and 1.30 on the morning of Saturday 24th. February and everything was found to be in good order. He recorded in his report book 'All in working order'. The last examination of the cages shoes, chains, detaching hooks and winding ropes and their capels and sockets was made by Joseph Simpson and the blacksmith, Wilson between 8 and 8.30 a.m. on Friday 23rd. February. This examination found that all was on good order with the exception of two cages on the North West guide which was found to be worn. Simpson told Wilson that it would have to be changed on Saturday but his entry in his report book said, 'In good order.' This point was taken up at the inquiry into the accident.

On the day of the accident, the hewers who worked on the back shift, went down between 6 and 6.20 a.m. and after they had descended, coal was wound until 7.25 a.m.. Nothing unusual took place during tis time. The North cage was sent down with two empty tubs and the South cage brought up empty.

Mr. J.W. Southern, the banksman at the colliery, signalled to the onsetter that it was time to to bring up the foreshift men. The two foreshift onsetters and six youths who had been working at the shaft bottom siding got into the North cage, four on the top deck and four in the bottom. The bars at the two ends of each deck were put into position and the illfated wind began.

There was nothing in the descending cage and the men had no tools with them, nor had they any lights. The cage was wound to about 80 feet from the surface when the banksman heard a crash which he described by saying 'bu-r-r-r-rup and lasting as long as it takes to say it.' The cage was ascending at about 15 to 18 feet per second, when he noticed a sudden shock, the engine partially stopped and the winding rope flew up. He had started to slow the engine and stopped it as quickly as he could. The end of the upcoming winding rope stopped level with the surface.

Mr. Joseph Simpson, the enginewright at the colliery was soon on the scene and he found a steel erector, Joseph Malpass, and some men including a blacksmith trying to put up a temporary headgear to go down the shaft. This was completed and bos'uns chair was made. Mr. Simpson descended the shaft with the hauling engine rope used for winding. He went down 150 feet and found the ascending cage stuck fast in the shaft with no one in it.

He returned to the surface and Malpass went into the chair and descended to look at the cage. He returned, and took a chain down the shaft and secured the cage. He was lowered further and made an inspection as he went. He went as far as the South side cage which he estimated was 30 feet from the shaft bottom. He them made

measurements to see if the South cage would pass the broken cage in the shaft if it was wound up.

He returned to the surface and reported that he had been bodies on the top of the South side cage, that there were broken pipes in the shaft and that a length of the north East guide rail was broken. The south side cage was then lowered to the bottom of the shaft and the bodies removed. They were taken to the surface by way of a travelling drift.

After the two pieces of broken pipe had been taken out of the shaft, the north side winding rope was attached to the damaged cage by Malpass and it was drawn to the surface

The onsetter at the bottom of the shaft, Mr. D. Marshall, thought the cage had been wound a good way up the shaft when he heard a bump and immediately he heard debris falling down the shaft.

Those who lost their lives were:-

Thomas Cant aged 48 years of Leadgate.

James Horsnby aged 31 years of Consett.

Thomas William Thorburn aged 16 years of Consett.

Denis O'Neil aged 17 years of Consett.

Clarence Pogue aged 17 years of Consett.

Francis O'Hanlon aged 18 years of Consett.

Thomas Anthony Cooper aged 16 years of Consett.

James Smith aged 17 years.

George Scarr was killed in the same pit on Thursday 22nd. February.

The Coroner's inquest took place on the 26th. February and was conducted by Mr. John Graham who sat without a jury. He came to the verdict that-

"The men were killed by falling out of the ascending cage, consequent upon the cage coming out of the guide rails following the breakage of one or more of the cage shoes."

The Inquiry into the disaster was opened at the Police Court in Consett on the 20th. June by Mr. Henry Walker, C.B.E., H.M. Deputy Chief Inspector of Mines.

After an examination of the shaft after the accident it was found that little had been broken or displaced and the damage that was done was confined to the East side. It was found that a bunton, the cast iron girder which had been used to support a column of pipes, was fractured in the middle. At another bunton, a double headed rail was fractured and bent downwards. Pipes carrying water to the stables were broken and dislodged and other rails were broken and bent.

The cage was badly damaged but the chains, although strained were not broken. The detaching hook had two outer plates broken across the jaws and it was the breaking of these jaws that allowed the cage to fall down the shaft. The winding rope had been drawn two inches out of the socket. A cage shoe had broken in half at the bolts, one was intact, another was not on the cage when it was brought to the surface. It was found later on the guide, in the sump and was undamaged.

The attention of the experts turned to the shoes. They showed wear and were examined at the National Physical Laboratory which were found to have been made from a bad casting which made them hard and brittle. The evidence to the inquiry was very technical and centred on the quality of the materials that the bolts and the guide shoes were made. The quality of the casting of the shoes was condemned by Dr. Rosehain of the National Physical Laboratory. Mr. Herron, of the Laboratory said that the cage shoes became mixed up in stock and that it was impossible to say who had supplied them.

The enginewright, Joseph Simpson, had never rejected a shoe and the blacksmith consider that they were all good and he had never known one to break. With regard to the bolts, he had never known one to break or come out.

Mr. Henry Walker came to the following conclusions as to the cause of the accident-

“1. The accident was due to the cage shoes on the north west guide coming off that guide rail and allowing the ascending cage to turn out of it’s proper position in the shaft and so to come into contact with the cast iron girder plates north south in the shaft at a depth from the surface of 80 feet.

2).The cage shoes in the north west guide came off that guide consequent upon their having been allowed to remain in use too long.

3.) The cage shoes on the north west guide were allowed to remain in use too long because the method adopted by the enginewright to examine them was faulty in respect that he could only roughly estimate the amount of wear on the point of the lugs, and he could not estimate, much less measure, the wear caused by the new section of guide rail on the inside surface of the lugs.

4). That, to adverse conditions already existing in the north west portion of the shaft, a further and more serious adverse condition was introduced by replacing part only of the north west guide by a rail differing in section from the section of the original guide.”

There were several recommendations made after the inquiry and Mr. Kirkup welcomed the suggestions for the Consett iron Company and said that they were most anxious at all times to do anything that would preserve the life and limbs of their employees and all the recommendations were acted upon by the Company.”

TRIMSHARAN. Pembrey, Carmarthen. 26th. April, 1923.

The Trimsharan colliery was situated on the northern outcrop of the western side of the South Wales Coalfield in of Parish of Pembrey.

The Cadean Slant, which formed a portion of the workings of colliery was opened in 1908 to work the Yard and Big Vein Seams from the outcrop downwards. On the date of the accident the main slant had 1,350 yards long with an average inclination of 10 inches per yard but with lengths where the inclination was as much as 15 inches per yard in of neighbourhood of faults. The seam that were developed dipped in a southerly direction and were worked by the longwall method, the greater part of the workings being on the east side of the slope.

The colliery produced about 200 tons of Anthracite coal per day by three shifts of men. The morning shift of 110 men, the afternoon shift of 45 and the night shift of 75. The morning and night shifts were the coal drawing shifts. generally approved flame safety lamps were used in of workings and the traffic men also used a few electric cap lamps.

Level headings turned off of main slant at varying distances apart, the average being from 45 to 50 yards. The coal was brought by ponies to landings at the mouth of these headings and from there transferred to bank by of main haulage. The slant itself was in good condition and was from 9 to 10 feet 6 inches wide with an average height of 6 to 7 feet. the only workings that were producing coal at the time were in of 15 and 17 Levels in of Yard Vein and in the 10 Level in the Big Vein. The Slant was laid with T-head steel rails which weighed from 30 to 35lbs., laid on wooden sleepers. The set or journey which went u and down of slant usually consisted of 18 trams and it was hauled by a powerful steam engine of the Robey Drop Valve Type, which had cylinders of 20 inches in diameter, 40 inch stroke and worked at a steam pressure of 120lbs per square inch. the engine was positioned 400 yards from the mouth of Slant and at right angles to it with a sharp bend at the entrance to of mine at the surface.

The signals between of mine and the enginehouse were electrical worked from a transformer. the signals were given to of engineman by an electric bell coupled to a small bulb which illuminated each signal as it was given. There were a pair of lamps connected in the circuit to tell the engine driver of any defect in the electrical circuit and if power was cut to the signalling circuit. The code of signals in use was that called for by

the General Regulations 98 to 101 and these regulations were complied with in all details.

The speed of the journey was in hauling coal was 6 m.p.h. and when hauling men 3 m.p.h. The speed had been fixed by the manager and posted in the engine house and these limits had been in operation for a considerable time. The rope was of the best plough steel, flattened stand one and one eighth inches in diameter. the haulage engine was 7 feet in diameter and took in all four and half laps of the rope, making 226 coils from the surface to the slant bottom. The coupling of the rope had always been satisfactory.

The train of carriages used to convey the men to and from their work in the mine and was known locally as a 'spake'. consisted of 11 carriages and a tool tram which was sat the end of the journey when ascending. The carriages, when new, consisted of 2 longitudinal and 3 cross members braced by three iron rods. They were usually made of pitch pine, but some were of oak, 6 inches square. The cross members were also made of wood, 6 inches square which were connected to the longitudinal by tenon and mortice, the mortice being two and a half inches wide by two and half inches deep and were six inches long. Immediately behind these cross members were 3 tie bolts three quarters of an inch in diameter which were secured by nuts and washers.

The carriage was 10 feet long and 2 feet 3 inches wide and was mounted on Rowebotham wheels with a gauge of two feet six and a half inches. the body of the carriage was placed 15 inches above the rail level and a had rail which extended the whole length of the carriage was 20 inches high. The carriages were connected by a draw bar or hitching plate which was fastened to the cross members by three quarter inch bolts and nuts, one bolt for each of the three cross members.

The draw bar was four and a half inches by one and a quarter inches at the eye ends and tapered out at the centre to four by one and was made of the best grade iron. The draw bars were connected to each other in the 'spake' by shackles made of 2 'D' links one and half inches in diameter with pins one and three quarter inches in diameter slotted at the bottom to receive a split pin or cotter and three connecting links made of one inch diameter. To comply with the Act, there was also a pair of chains of nine links, connected to two end links. The chains were connected by the last link to a one inch diameter bolt, passed through the cross members and secured on the inside of the cross member by nut and washer. The flooring of the carriage consisted of one inch woodwork nailed to the seats so they remained approximately horizontal as the carriage ascended the roadway.

At the end of the day shift on the 26th. April, the spake was standing at 14 East ready to transport the mine to the surface from Nos. 15 and 17 Levels. The signal was passed to the engineman and the spake started its journey to the surface. The journey stopped at the No.10 West heading to pick up 18 men and the signal was given to proceed with 103 men on board.

At about 850 yards from the entrance to the mine, a link of the second shackle from the front journey gave way and the weight of 9 carriages and the tool tram fell on the side chains which gave way and all but two carriages ran away. After travelling 130 yards they crashed into the side of the heading which released a great fall of roof. Most of the men jumped off the sides and many received slight injuries in doing so but others were caught and dragged by the carriages and 10 were killed and a great number injured. Fortunately only two were very seriously injured.

Those who lost their lives were-

William Jenkins,
Harold Parry,
Harold Probert,
Morgan Davies,
Thomas Williams,

Thomas John,
David Tom Davies,
William John Rees,
Sidney Williams and
Thomas Rogers.

Those who were injured were-
Thomas Jenkins and
David Thomas.

The report on the accident was made by Mr. J.M. Carey and all interested parties were represented at the Coroner's Inquest when it was found that the prime cause of the accident was the failure of the one link of the second shackle due to faulty welding and the side chains failed to hold. After the accident, some defects were discovered in the woodwork of the carriage which was thought to be the primary cause of the accident.

The inquiry came to the conclusion that the Company had not considered the design of the spake as being weak and only cursory examination of it had been made. The shackle that broke was about 9 years old and it was supposed that it had been manufactured by Messrs. David Bros., of Pencoed but they were unable to say definitely that it had been made by them. The shackle had been on the spake for about three years but had been annealed, with others in October, 1922 and again five weeks before the accident. There was a record of the first process but none of the second. The welding was fatigued and had broken. These facts led the inquiry into came to the conclusion that the mechanic and manager had failed to make inspections that were required by the Act. The manager and mechanic were subsequently prosecuted for a breach of the Act and recommendations about the constriction of spakes were made.

GARTSHORE. Twechar, Dumbartonshire. 28th. July, 1923.

The colliery was about four miles east of Kirkintilloch and was owned by Messrs. Baird and Company. It included an upcast shaft, No.3, which was 98 fathoms deep to the mouthing 50 feet below the Ironstone Seam. At 70 fathoms from the surface there was another mouthing by which the air returned from the Anthracite or Haughrigg Seam entered the shaft. The Ironstone Seam had not been worked for many years but it was ventilated by a split of air which was taken direct from the No.1 or downcast shaft and coursed round the old workings. no mineral was wound at the No.3 shaft. From the bottom of the No. shaft there was a road which was known as the South Mine which branched to the left, 33 feet from the shaft into a cross drift measure which was known as Barries Mine. This was being driven to the rise to cut the Anthracite Seam. At a further 35 feet, a drift 8 feet wide and 6 feet high to be used a lodgement for water had been driven to the right.

The driving of the drift to form the lodgement was commenced in February, 1923 and completed on the 21st. July. The work was carried on three shifts. a fireman was present on each shift and the manager, Mr. Neil McAlpine and the undermanager, Mr. Peter Hlaket made frequent inspections. The drift was driven level across the measures, with its pavement about six feet below the pavement of the South Mine. For 24 feet it was kept approximately at right angles to the South Mine but after that it followed the line of lease resistance, turning first one way the other until at about 360 feet it struck a whin dyke after passing through the coal seams. it was not the advanced further but a few back from the dyke, an extension turned to the left and continued for 230 feet. It was in connection wit the completion of the work on the outbye end of the lodgement that the accident occurred.

To ventilate the lodgement drift as it was being driven, a door frames with two doors in it was erected across the South Mine just inbye of the lodgement entrance and 17

inch diameter air tube was passed through the brickwork between the frame and the side of the road. an air current, measure at 3,000 cubic feet per minute, was passed through the tube and by addition of further tubes, into the face. a similar arrangement of tubes led for the opposite side of the South Mine which ventilated Barries Mines.

Naked lights were used by the workmen but a safety lamp was kept hanging near the roof of the face. Several months prior to the work on the lodgement drift being started, the air current of about 12,000 passing along the South Mine to the upcast No.3 shaft, had been found to contain 0.24 percent methane.

The lodgement was intended to be a permanent job and in order to support the roof and sides, steel girders were placed on brick side walls, the walls being at least 14 inches thick and the girders two and half feet apart. This formed a substantial piece of work which was expected to last for a number of years. When the work in driving the lodgement and the support of the roof and sides was completed the air tubes were withdrawn drawn from the face outwards, on 21st. July.

The manger had gone on holiday, but before doing so he had instructed the undermanager by word of mouth that during the withdrawl of the air tubes, and after, until the lodgement was completed, safety lamps alone were to be used within the area of the lodgement, that was to say, named lights could be used in the No.3 shaft and in the South Mine. The individual workmen were warned and a 'caution' board was erected near the entrance to the lodgement. The air tubes were successfully withdrawn on the 26th. July and the undermanager made an inspection of the lodgement to see if any materials had been left behind. He made several tests for gas but found none. One of the firemen mad a similar examination and also did not find any gas.

The manager had given instructions to the undermanager that, towards the outer end of the lodgement, girders were to be placed across 6 inches above the pavement, and on these a brick wall, 2 feet tick, was to be built 'hard to the roof and side.' This was built in the lodgement at 20 feet from the west side of the South Mine and was completed at 5 a.m. on the 27th. July. Two walls then remained to be built, retaining walls on each side of the excavation, outside the cross wall.

At the inquiry no convincing reason was given for the building of the wall near the outer end of the lodgement. Mr. Neil Monro, assistant to the general manager, said it was so a sot make a good substantial job, but that it would not be exposed t pressure either form the roof or sides. Mr Buchanan, general manager, who followed Munro, said that the roof, although it look fairly smooth and safe, was of a dangerous nature, having gassy lypes in it and so the wall was built up to it.

On the afternoon shift which started at 2 p.m. on the day of the disaster, Saturday, 28th. July, one fireman, three miners, one roadsman. four bricklayers, two bricklayers labourers an one bottomer were employed in connection with the building of the side walls on the outbye side of the cross wall.

The undermanager, Peter Halket, was at the spot from half past two to three o'clock. he saw the contractor, William McSavony, who had been working during the morning shift, the fireman, Alexander Paterson and the roads man John Patrick. Paterson reported that everything was in order and the undermanager saw that the bricklayers and miners had safety lamps, but did not notice if they were any naked lights other than the acetylene lamp carried by McSavony. as this lamp was not in use in the area in which safety lamps were required, he made no remark about the lamp. When he left a few minutes before three, two of the miners were completing the redding out of the excavation to allow the bricklayers to begin building the side walls.

Samuel Sloan, one of the miners, gave an eyewitness account of the events up to and including the explosion. He said that he knew of the instructions about naked lights and said that they were not taken into the hole. When they wee building the wall, they had a plank supported by barrels. When the explosion occurred he heard a slight report and-

“the whole show came down on to of us. Everything was rattling about, bricks hitting steel tubes And the noise was deafening. I got blown on my face. I remember hearing the two Kellys roaring. I picked myself up and got to the shaft bottom. I was almost suffocated by the heat.”

At the time of the accident, about 5.45 p.m., the bottomer, Andrew Arlie, heard a heavy report and the paraffin lamp at the bottom went out. he called out but there was no answer so he promptly got into to the cage an signalled the engineman to wind him up the shaft. Just as the cage lifted off the bottom, Sloan came out, but Arlie, being in a hurry, told him the cage could not stop but he would send the cage down for him. This was done and Sloan came to the surface but not before he had gone down as far as the lodgement and dragged one of the injured men, Melvin Kelly jnr., out towards the pit bottom.

Arlie found two men James S. Leishman, a fireman in the Anthracite Seam and John Comrie, electrical engineer at the shaft top. When he arrived at the surface, Leishman asked him what was wrong and he told him that there had been an explosion, everything was in darkness and everybody had been killed. Leishman asked for volunteers and Arlie and Comrie went down with him. Leishman tested the air at the Anthracite Level and could find nothing wrong. He signalled the cage to be lowered to the bottom And Melvin Kelly jnr. was put in and taken to the surface, Comrie going with him.

The cries of Melvin Kelly snr. could be heard but it was not before two bodies had been recovered and another man who was alive found, that Kelly was found and taken out of the mine. The bodies of the five remaining men were recovered. James Campbell, John Campbell, George Young ands Melvin Kelly snr. were found i the excavation in the pavement of the South Mine. Samuel Garrie, Alexander Paterson and John Patrick were found in the left side of the South Mine. Robert James Gray, Daniel Coyle and Melvin Kelly jnr, were found just on the outbye or north side of the excavation.

A cap with an acetylene lamp attached and a cap with a naked light attached were found about twenty feet in the lodgement of the south mine and a tin containing calcium carbide.

Those who lost their lives were-

John Patrick aged 31 years, pit roadman of 27, Croy Row Croy,
Alexander Paterson aged 49 years, fireman of 33, Parkfoot Street, Kilsyth,
Samuel Garrie aged 20 years, bricklayer of 1, Monisborough Road Kilsyth,
Robert James Gray aged 22 years, bticcklayer of 15, Charles Street, Kilsyth,
Daniel Coyle aged 18 years, labourer of 28, Westport, Kilsyth,
James Campbell aged 52 years, labourer of 7, Newtown Street, Kilsyth,
John Campbell aged 47 years, bricklayer of Findlay Street, Kilsyth and
George Young aged 18 apprentice bricklayer of 25, William Street, Kilsyth.

Young died from in juries received in Kilsyth Cottage Hospital ant 9 p.m. on the day of the disaster.

The inquiry into the disaster was held in the Sheriff Court House, Dumbarton, on the 24th. October, 1923 before Alexander John Pople Menzies, Advocate, Sheriff Substitute for Stirling, Dumbarton and Clackmannan and a jury. The verdict of the jury was as follows-

“That on the 28th, July, 1923, the workmen after named all in the employment of Messrs. Wm. Baird & Co., Ltd., Coal Masters, Twechar, were engaged in the course of their employment or occupation within Gartshore No.3 Colliery, Twechar, constructing and undeground level stone water lodgement in preparation for altering the pumping arrangements in connection with a new shaft - Gartshore No.12 - then being sunk near to No.3 Gartshore, when, about 5.30 p.m. on the said date, an explosion took place resulting in the instantaneous deaths of eight men.”

The inquiry started at the Justiciary Buildings, Glasgow on 22nd. January, 1924 and was written by Henry Walker, C.B.E., H.M. Deputy Chief Inspector of Mines when all interested parties were represented. the report was presented to E. Shinwell, Esq., M.P., Secretary for Mines, on the 30th. April, 1924.

Mr. Walker stated-

"I have not the slightest test doubt that the accident was due to an explosion of firedamp accumulated in the lodgement. When the air tubes were taken out for the lodgement, that part of the mine ceased to be ventilated. firedamp gradually accumulated and finally, percolating through or over the cross wall, became ignited at the naked lights used by the bricklayers.

I do not imply that the lodgement was necessarily filled with an explosive mixture of firedamp and air, but that somewhere within that area there was such a mixture and that from it, to and beyond the cross wall, there was tail of firedamp, which, on being lighted on the outside of the cross wall, continued to burn until the explosive mixture within the lodgement was reached and an explosion caused. this explosion was of sufficient violence to blow out the cross wall and it, falling n the men caused their deaths. None of the men were burnt in any way."

Every effort was made at the inquiry to find out, which after the drivage had been completed, the use of naked lights in the lodgement drift was not forbidden but none of the witnesses would admit that it was because firedamp might accumulate. The manager stated that he had no fear that the gas would accumulate. When he was asked why he was afraid of working with naked lights, he replied-

"Well, we had been advised by one of the Inspectors t work with a lamp in the highest part of the working during the operations, and we considered we would go further at the termination of the job. That was the only reason."

There was evidence that firedamp had been found during the driving of the drift and the inquiry came to the following conclusions-

"The use of naked lights at the cross wall was contrary to the instructions given by the manager. that. by the and after the withdrawl of the ventilation pipes, safety lamps only were to be used in the lodgement drift. This precaution was not properly enforced by the officials or carried out by the workmen.

The lodgement was not ventilated for two or three days prior tote accident. the crucial mistake was made when it was decided to withdraw the air pipes and to erect a close wall at the other end of the lodgement. ventilation was this cut off and any gas given off within the lodgement was bound to accumulate ad eventually find its way to the outside wall.

Generally, the number of accidents in Scotland from explosions of firedamp due to the use of naked lights can only be reduced by closer attention to the ventilation of places where firedamp is liable to be given off or accumulate, and by the more general use of safety lamps. the rooted objection to the use of safety lamps should be met now by an electric safety lamps are obtainable which cane be carried on the cap in the same way as it is customary, in Scotland, to carry naked lights."

MALTBY MAIN. Maltby, Yorkshire. 28th. July, 1923.

The colliery was in South Yorkshire, about a mile to the east of the village of Maltby. There were two shafts which were sunk to the Barnsley bed which was the only seam that was worked at a depth of 820 yards fro the surface. Both shafts were 20 feet in diameter and the output of the colliery prior to the disaster was between 14,500 and 16,000 tons per week. Coal was wound at one shaft, the downcast No.1 and the upcast No.2 Pit Bottom was in the process of being equipped for coal winding.

The section of the Barnsley Bed, in the District where the explosion occurred, was a roof of bind, inferior coal and dirt about 1 foot 5 inches thick, the seam which was the section that was worked, 1 foot 3 inches of Top Softs, about 6 inches of dirt, 1 foot 5

inches of Top Brights, 2 feet 7 inches of Hards, 4 inches of Bottom Brights and 4 inches of coal and dirt, making the total section that was worked about 6 feet 4 inches. The floor had 1 inch of parting dirt and 2 feet 6 inches of inferior coal and dirt bands. The seam was a gassy one and inclined to give to sudden eruptions of gas. At the time the seam was not considered to be liable to spontaneous combustion and only four gob fires had occurred since the coal was first reached in 1911.

The general direction of the dip of the seam was to the east at about 1 in 20. The workings were divided into eight districts, the Low East, The Middle East Left District, The Middle East Right, South East, South West, West, North West and Top East Districts. The coal was worked on an advancing longwall system with the distance between that gate road usually of 40 yards. Packs were built on either side of the gateroads to 3 yards wide with the crossgates packs 4 yards wide. eighty five percent of the coal was won by hand, the remainder worked by compresses air driven coal cutting machines. no shots whatever were allowed to be fired in the mine,

The haulage was of the endless, main and main tail systems. The East and West Main Endless Ropes were driven by electrical haulage engines, situated close to the intake pit bottom. The remaining haulage engines were compressed air driven main and tail and main rope engines and 19 ponies worked in mine.

The ventilating current was produced by a Capel fan, 12 feet 6 inches in diameter, running at 177 r.p.m. The fan was driven by a steam engine with an electrically driven stand-by fan. the quantity of air entering the mine recorded on the 13th. July, 1923 was 114,271 cubic feet per minute going into the Main Intake, 82,464 cubic feet to the split intake, 116,056 in the Main Return and 91,272 in split return. There was no record of the quantity of air that was actually finding its way at the time of the explosion into area affected.

No naked lights were allowed in the mine and there were 2,223 Oldham Electric Lamps and 250 'Marsic' double gauze oil lamps made by Messrs. John Davis and Son Limited, of Derby. All the lamps were fitted with magnetic locks. An electric lamp was issued to each workmen and in the normal course of working each stall, they were supplied with a flame lamp. the station for re-lighting flame lamps was at the surface.

The colliery was under the control of the managing Director, Mr. W.B.M. Jackson with Mr. B.H. Pickering as manager and Mr. M. Gabbitas, undermanager. There were two overmen on each shift, one on the West side and the other on the East, who held Second Class Certificates. In addition there were 35 deputies.

Before the explosion there were 2,689 men employed, 2,214 underground and 475 on the surface. The day shift from Monday to Saturday descended between 6.25 to 7 a.m. and ascended between 2 to 2.30 p.m., the Saturday day shift descended between 5.25 and 6 a.m., the afternoon shift descended between 2 and 2.30 p.m.. and ascended between 9.30 and 10 p.m. and the night shift descended between 9.45 and 10 p.m. The deputies were also organised into three shifts, the day shift worked from 6.30 a.m to 2.30 p.m., the afternoon shift from 2.30 p.m. to 10.30 p.m. and the night shift from 10.30 p.m. to 6.30 a.m. There were 122 workmen below ground on the morning of the 28th. July employed in building stoppings and related work.

In the normal course of work, the morning shift deputy descended at 6.30 a.m. and allotted work to his men at the pit bottom when he descended. he made the inspection prior to the start of the afternoon shift between 12.15 and 2.15 p.m. and after the inspection, set the afternoon men to their places in co-operation with the afternoon deputy which descended at 2.30 p.m. The afternoon deputy made his inspection of the district before the start of work on the night shift between 8 and 10 p.m. and then allotted the night shift men their duties.

Extensive stone dusting was carried out at the colliery and for some time prior to the date of the explosion, 24 tubs of stone dust per week had been found sufficient to keep the roadways in compliance with the requirements of the regulations as to the precautions

against coal dust. the stone dust used consisted of Dinnington bind, ground in a stone crusher at the surface.

In 1921-2 there had been two fires and heatings in the West and North West Districts. These were dealt with either by digging out the heated material or the erection of stoppings. On the 26th. April, 1922, there was trouble from a gob fire in the Low East District. The gob stink was reported in the 60's airway and to deal with it dirt packs were built at the entrance to 60's stall and at the end of the airway leading to 21's level. When this had been done, the manger thought that the trouble had been contained.

Meanwhile, owing to this occurrence, certain alterations were made to the ventilation. The long ventilating current which passed along the faces of the Middle East, Low East and Top East Districts was shortened and instead of passing on to the Top East District, it was short circuited down 60's cross gate into 29's slant and back to the upcast pit bottom. This alteration, agreed by the agent and the manager required the Top East District being ventilated by a separate volume of air entering from 7's by the North East intake and passing along the faces into 21's were, with the air passing out of the Low East, it travelled to the upcast shaft.

On the 7th. May, even with the previous efforts, gob stink was discovered about 80 yards further outbye at 52's on the one side and on the other at 102's near the end of 21's level. Further packing was carried out and 102's was 'gobbed up solid'. In 52's airway 8 feet of sand was placed between two 14 inch brick walls.

After this there were no disturbing reports were made until the 16th or 17th. May, when the manager received a report that smoke had been found coming from the left hand bank in 60's at 1 a.m.. He went to the pit straight away and gave instructions for a dirt and sand pack to be put on the left side of 60's to dam back the smoke. He superintended the work for 5 hours but became ill from the effects of the noxious smoke and fumes along with an overman, Nathan Gill and both had to be given assistance to get out of the mine. As a result of this, the manager was not able to return to work until 23rd. May. In the meantime additional packing was done and the place sealed off under the superintendance of the agent, Mr. Pickering. While this work was in progress it was arranged for the air to be coursed or short circuited along old 25's gate and from there into 60's cross gate.

On Sunday, 20th. May, smoke was again discovered coming from the left hand pack side opposite the East Gate in 60's cross gate. Some more sand was rammed into this place which stopped the smoke for the time being. At this time there was 2% firedamp present and it had increased to 3.5% by the time the agent left the mine at 4 p.m. It was later recognised that all the work that had been done had not finally extinguished the fire and Mr. Jackson, the General manager, and Mr. Joseph Humble, the Consulting Engineer, were sent for. This was at 6.30 p.m. and after 4 hours' discussion, it was decided that nothing could be done until they could go down the mine the following morning.

Accordingly an inspection was made on Monday 21st. May by Mr Jackson, Mr. Pickering. Mr. Humble and others, who descended the pit about 10.30 a.m. On arriving at 60's cross gate they found evidence of a certain amount of heat on the left hand side of the pack of 60's cross gate. the firedamp had reduced to just under 2% but the god stink was still evident in 21's right hand bank. After this inspection a conference was held and it was considered that if the packs and stoppings were thoroughly and strongly made, that would be enough to stifle the fire.

A further conference attended by the Miners' Representatives, was held on the 22nd. may, when the general situation was discussed. Another underground inspection was made. Smoke was gain issuing at the same place in 60's cross gate and men were trying to stem it off by ramming sand into the crevices. This operation proved difficult for as the sand dried quickly it dribbled out. Some heat had also been located during the night at a right hand gate pack in the same cross gate. Sand had also bee applied there. it was the agent's opinion that the work of stowing up the cross gate should

proceed with all possible speed. The men engaged in this operation were working in relays. the air was very warm and the percentage of firedamp present was 2%.

On the 23rd. May, the manager returned to duty and an inspection was made by him accompanied by the Alderman E. Dunn and Mr. Hugh Ross, the Miners' Representatives. They found the blocking up of the old cross gate in 21's completed and it looked like a satisfactory job. In the 21's bank they found the sand packing making good progress. As there was still evidence of gob stink just outbye of 102's, it was arranged to raised up 21's road to bury the packs and also, if possible, to bury a break out from which gob stink was issuing. 60's crossgate was then inspected. It was found that the road had been stowed up to 25's gate and it was arranged to stow as much of 25's face gate as possible. The conditions wee considered to be favourable and this work was continued during the 24th. to the 27th. May.

On the 28th. May, the manager found definite evidence of fire in the 60's cross gate. The ground was hot on the left hand side of that gate. On pulling put some bricks, he discovered the bottom coal, which was not worked, and an old wooden chock on fire. He dug out a tub load of bottoms, really ashes, and , after removing some of the burning timber, quenched the material with water. He filled the hollow made by the removal of the ashes with sand, And as these operations seemed to stop the fire for the time being, the work of gobbing up the roads continued. On the fire being found in the bottom coal it was decided to dig a trench further outbye to stop the fire spreading in that direction. The trench was dug and filled up with sand behind an 18 inch brick wall. the digging of this trench, disclosed for the first time, that the bottom coal 2 feet 6 inches thick which was abnormal. When the trench was completed the management continued removing timber and allowed the roof to collapse and gobbing up the roads. This was hoped to arrest the fire.

These efforts continued throughout June and were still in progress on 2nd. July when fire was again discovered to have broken out in the right hand outbye side of 25's old gate, close to the face. A worker, John Proctor and the overman, Nathan Gill, travelled a circuitous route to avoid smoke which they had discovered and reported to the overman, found *'about a yard circle of fire burning round a clog'* (chock). They applied buckets of stone dust to the fire and leaving this operation to be repeated by Proctor and another workmen, Gill retired to change his clothes which had become wringing wet. during his absence, while one of the workmen was emptying a bucket of stone dust on to the fire, something went off or exploded with a report and the force of it blew him out of the hole. They carried on until there was another report and they then decided that the place was not safe. The hole was about 3 feet high and 2 feet wide and was a confined airway left in 25's during gobbing operations and left until orders were given to gob it up completely.

During Gill's absence a deputy, Sturdy, arrived, and after going to the fire soon came down again. On his return Gill was surprised to find that, despite all that had been done, the fir had increased to 12 to 14 yards in length and the chocks on the left hand side of 25's gate were burning. These chocks were formed of old broken timber and had been put in to support the roof. Gill found that further applications of stone dust to be useless in checking the fire, ordered the men to pack up the airway in 25's in order to stop the air current to the fire. He sent at once for Mr. Butler, who arrived, quickly followed by Mr Pickering. This operation to close 25's airway was continued and by the manager's and agent's orders, another pack on the opposite side of the fire was built in 60's cross gate.

These packing operations included the packing of the 52's gate side and continued for several days. Just when it was thought the work was successful, smoke started to come from a slip, 20 feet above the pack on the left hand side. An unsuccessful attempt was made to seal the smoke by throwing sand into the opening. After this stoppings were erected in 52's gate and while this work was going on, an air pipe 18 inches to 28 inches in diameter was built in to allow ventilation for the men to work. Following this, another trench a yards wide was cut in the bottom coal up the centre of 52's gate and

filled with sand. At this point the coal was found to be 2 feet 6 inches thick and when exposed in the trench, its temperature was found to be normal.

On the 13th. July, the work was continuing and the manager reported a heavy weighting of the roof in 52's. this weight fractured the air pipe in the stopping and smoke was again coming through the pipe in such quantities as to make work impossible. They did, however, succeed in stopping off the pipe. Trenching in the bottom coal was the continued and preparations were made for another stopping at the entrance of 52's gate. While this was progressing a tremendous fall of roof occurred there.

Owing to the foulness of the air some of the men became unconscious, the manager among them, and had to be helped out into fresh air. These men were obviously suffering from carbon monoxide poisoning and work was suspended at 60's cross gate, the men with drawn and the cross gate fenced off.

As the agent considered it 'of exceedingly great importance' that 60's cross gate should be stopped off outbye of 52's junction. Stoppings were erected there by men wearing rescue apparatus and this operation was completed at 4 a.m. on Monday 16th. July and sealed that side of the fire area. Meanwhile, on the 14th. and 15th July, further attempts were made to seal the area more securely in the intake side and a dry brick stopping was commenced at 44's gate. When the stopping was nearly completed a tremendous leakage of air was discovered going over the top into the gob fire area. Nathan Gill, the overman, who was in charge of the work, at once built up this opening and arranged for dirt and sand packs to be places against the stopping.

By the 16th July, when 7 yards of packing and brick walls had been put in 44's gate and some 10 yards along the face side, an explosion of firedamp took place in the region built off and blew off the upper part of each of the stoppings. The men at the packs withdraw at once and reported the occurrence to overman Gill. At 10 p.m. the same night Gill visited the stopping and finding *'the place was absolute clear, fit for anyone to work in'*, he set the men to work to build a brick stopping to strengthen everything that had already been put in but finding that he had not sufficient material, he went to the pit bottom to order some more. When he was there a telephone message reported that there had been another explosion while he was away. After realising the seriousness of the situation he left the mine to consult with the manager. as the result of the second explosion, all the men were withdrawn from the mine in the early hours of the 17th. July by order of the agent and manager. This meant that coal getting was discontinued at the colliery and after this all operations were directed solely for fighting the fire.

No work was resumed until midnight on the 22nd. July. Gill duly talked over the seriousness of the situation with the manager and said that the best thing that they could do was to flood the mine to put out the fire. The manager agreed and by arrangement Gill went down the mine on the morning of 17th July under orders to get down what pipes he could on to the seat of the for this purpose. Meanwhile, the mangers orders to carry on with the flooding of the mine were countermanded as a result of a conference of mining engineers.

On 18th. July, during explorations following the withdrawal of the men, definite indications of at third explosion were found in the face outbye of the stoppings in 44's. Later the effects of a fourth explosion were felt at 21's level by a party of explorers, including the undermanager, Mr. Gabbitas, who, on their way out of the pit, saw the doors in the slit at the end of that level opened by a reversal of the air current. This place was about 700 yards from the site of the stoppings built in 60's crossgate and 44's gate and face, but, having regard to these subsequent explosion, this plan was not carried out.

On 18th. July, it was arranged to reduce the water gauge by slowing the face. The gauge was accordingly reduced from 4.5 to 2.5 at 4.30 p.m. and later down to 1.5. On the 20th. and 21st. July underground inspections were made by Mr. Jackson, the Managing Director and other officials. After consultation it was decided to put a regulator

in 9's back bord so that the speed of the ventilating fan could be increased without sending more air to the fire and at the same time sending an increased amount of air to the North West District where a considerable quantity of firedamp had been detected. A suggestion made by Mr. W.H. Chambers to put inert gas into the area of the fire was adopted and the gas was to be forced through pipes in one of the stoppings.

On the 22 nd. July after an inspection of the East side and the North West District by the miners' representatives and the colliery officials along with H.M. Inspectors of Mines a conference was held and it was agreed that the men should go down the pit, or be asked to go down immediately the conference had finished. It was estimated that 50 men would be required to carry on the work.

Mr. Herbert Smith, of the Yorkshire Miners' Association, held a meeting of the men the following day at which they were told about the conditions prevailing and in order to obtain the number of required the following notice was circulated among the men.

"We have today examined the Maltby Man Colliery and have arranged after careful examination to advise at once getting ready to stop off the affected area, namely the Low East and 53's Slant and we ask you to attend tonight at 12 midnight as we are satisfied you will work in as little dangers as possible.

(Signed)
EDWARD DUNN,
HUGH ROSS,
HERBERT SMITH."

At midnight on the 22nd. July within a very short time of the notice, 46 men, apart from the officials had turned up to work and their number gradually increased up to and including Saturday morning the day of the disaster when there 122 workers employed in building the stoppings and related work.

For the guidance of the officials the following instructions were issued to them by Mr. Basil H. Pickering, the agent of the colliery.

"A decision has now been arrived at in regard to the procedure to be adopted to deal with the gob fire and the following information if for the guidance of all concerned.

In general principle it has been decided to isolate the area from the face end of 53's cross gate to the top of old 7's by the erection of stoppings, and then to pump inert gas into the area with the object of quenching the fire that is burning.

A gas engine would be installed at the pit top and the inert gas will be conducted down No.2 shaft, along the East Plane

Mr. Pickering then gave details of the exact position of the stoppings that were to be built and how they were to be constructed. He continued-

"It is holed to start this work either Sunday night, the 22nd. July or Monday 23rd. July. At a time to be indicated later, men equipped with rescue apparatus will be sent into 21's level, and will, firstly, draw the road off at the junction of 29's slant with 21's and will then step back and draw off this road at two or three points in order to cause as heavy falls as possible. After this had been done work on stopping 'C' will be commenced, and it is hoped to ventilate this so that the work may be proceeded with in the ordinary way, and without rescue apparatus being required.

It must be understood that these instructions must be rigidly adhered to as the whole success of the undertaking depends upon work being carried out in a systematic and thorough manner.

(Signed)
BASIL H. PICKERING.
22/7/23.

On the morning of 28th. July a fresh shift of 122 men in addition to the officials, descended the pit Between 6 and 6.30 a.m. While work at the stoppings was proceeding a violent explosion occurred near A¹ and A² stoppings. The explosion killed 27 men who were working in the vicinity and blocked the approaches so that only one body could be recovered, that of Original Renshaw which was found in 95's crossgate about 130 yards from the East Main Plane.

Gallant and repeated efforts were made to reach the bodies of the remaining victims but owing to heavy falls of roof and the presence of noxious gases, that was impossible and it was recognised, in view of the conditions and the violence and burning to which Renshaw's body was subjected, that no person could possibly be alive beyond the point at which it had been found. It was also thought that another explosion could take place and it was considered foolish to stay in the area. In fact there were other explosions and a few days later it was mutually agreed by the owners, the Miners' Representatives and H.M. Inspectors that the safest method of recovery was to seal off the East side of the by erecting very substantial stoppings in the main roadways.

These stoppings were safely built by the united efforts of the workers under the superintendence of the officials, Miners' Representatives and H.M. Inspectors.

Those who died were-

John Stoker aged 30 years, overman.
George Perrins aged 37 years, deputy.
Harry Norwood aged 30 years, deputy.
Ernest Clixby aged 26 years, analyst.
Richard Ernest Dunn aged 28 years, collier.
John Henry Garratty aged 38 years, corporal.
William Emberton aged 27 years, collier.
George Hickling aged 47 years, ripper.
John William Green aged 38 years, byeworker.
Silvanus Turner aged 27 years, collar.
George Brierley aged 34 years, collier.
William Preece aged 24 years, collier.
Aaron Daniels aged 46 years, collier.
Bertie Bearshall aged 29 years, collier.
Leonard Meredith aged 22 years, collier.
Albert Smithson aged 28 years, collier.
Joseph Best aged 19 years, filler.
Richard John Brooks aged 24 years, collier.
Joseph Spibey aged 29 years, collier.
John Chandler Spilsbury aged 33 years, collier.
Raymond Clinton Bourne aged 18 years, haulage hand.
Harold Bourne aged 35 years, haulage hand.
Benjamin Jones aged 26 years, collier.
Alfred Leslie Fellows aged 15 years, haulage hand.
Original Renshaw aged 48 years, roadlayer.
Edward Mitchell aged 23 years, byeworker.

The inquest on the body of Original Renshaw was held before Mr. Frank Allen, H.M. Coroner for the West Riding of Yorkshire. The jury returned the verdict that he had been killed by an explosion and that his death was accidental.

The inquiry into the disaster was held in the Town Hall, Sheffield by Sir Thomas Mottram, C.B.E., H.M. Chief Inspector of Mines and was opened on Tuesday, 18th, September and lasted for seven days.

The evidence clearly showed that the disaster was caused by an explosion of firedamp ignited from the spontaneous combustion in the Low East district of the mine. It was known that there was gas in the mine while the work was going on to build the stoppings and it was not known whether the overman, Stoker, took any steps to withdraw the men as he was killed in the explosion.

As there were still 26 bodies in the pit and the workings had to be sealed off, the question of re-opening the workings to recover the bodies and the safest method to adopt when time arrived for such operations was left to the consideration of the owners.

Sir Thomas concluded the report by acknowledging the bravery of the officials of the mine and the rescue brigades.

REDDING. Falkirk, Stirlingshire. 25th. September, 1923.

Old plans that were produced at the inquiry into the disaster showed that mining had been carried on at Redding for over 100 years and there were sites of many old shafts. The newest shaft that was sunk was the No.23 which implied this fact. The colliery was the property of Messrs. James Nimmo and Company Limited and was in the Parish of Grangemouth, about a mile west of Polmount Station and was held under a lease granted by the Duke of Hamilton. Possession was granted to the Company in 1894 after the previous tenants Messrs. Salvesson who traded under the name of the Redding Coal Company. Messrs. James Nimmo and Co. Ltd. took over certain pit as a going concern and two years later proceeded to develop the unworked areas by sinking two shafts which were known as the Redding No.23 with the objective of working the Ball Coal and the Main Coal seams. The Union Canal and the London and Eastern Railway from Glasgow to Edinburgh ran close together and the shafts lay between them. The two shafts were fifty feet apart, rectangular and both equipped with winding engines. No.1 was 14 feet by 6 feet and No.2, 12 feet six inches by 5 feet six inches, both sunk to the Main Coal at 209 feet deep and passed through the Ball Coal at 171 feet.

The shafts passed through the wastes of old workings in the Coxrod Seam 33 feet from the surface and, being to the dip, drained this waste and the area of Ball Coal and Main Coal were worked to the rise as far south as 1,500 yards where there was a downthrow fault known as the Universal Dyke. To the rise of the shafts on the dip side of this Dyke, which was an ordinary fault and not an intrusive one of granite, there was known to be a large accumulation of water in the waste of the Coxrod coal working that had been abandoned many years before. This Dyke was regarded by the Redding management as a natural barrier against water and the workings of the Main and Ball Coal were in the course of time extended right up to the Dyke towards which the seams rose from 23 pit at an average gradient of 1 in 18, though owing to a series of shallow troughs, the actual gradients varied from nearly level to 1 in 9.

At the time of the disaster the working of the Main Coal workings known as the Dublin Section was stripping the dyke and it was in these workings that the accumulated water broke through the Dyke and caused the disaster. During the working of the Main Coal from the No.23, the waste workings from an old circular shaft called the Gutterhole had been stripped. This old shaft was 650 yards from the main shafts at the colliery and about 100 years before about eight acres of Main Coal were worked from the shaft but the Ball Coal above was left untouched. In the course of the years the shaft became filled with rubbish from the Main and Ball Coal. This was proved in 1917 when a small district of workings known as the Spion Kop was opened out in the Ball Coal seam from No.23 colliery and a road was made from there to the Gutterhole shaft. Towards the end of 1919 one of the roads in the Ball Coal became a return airway and in order to prevent interference with the ventilation of No. 23 Colliery. The only road to the Gutterhole shaft and the No.23 colliery was closed by a stopping made of boards nailed to props behind which a quantity of dirt was stowed. In this way, the Gutterhole Shaft at the time of the inrush of water into the No.23 workings was neither an air shaft nor an escape shaft,

though as events proved, it was the only way by which entry could be obtained to No.23 workings after the inrush and it was the shaft by which the 26 men who survived made their escape.

The colliery was under the general management of Mr. George Gibb, the Agent and he was also the agent for five other collieries belonging to James Nimmo & Co. Ltd. Mr. John Purdie was the certificated manager and also the manager of an entirely separate mine which was known as the Redding No.16 colliery and he had an undermanager at each colliery. Mr. William Donaldson was the undermanager at the Redding No.23. the colliery was generally free from firedamp and naked lights were used throughout the workings. Electricity at 500 volts D.C. were used for hauling, pumping and coal cutting. At the time of the accident there were four sections of workings in the Ball Coal and two in the Main Coal. Each were worked on the longwall system by disc coal cutters, one cutter to each section. There were also three small sections being worked or prepared for work by hand. The roof in both seams was a good strong sandstone. The holing and undercutting was done in the bottom of the seam and carried out during the night shift.

The output from the three Ball Coal Sections and one Main Coal Section was wound from the Ball Coal Level in No.1 shaft by means of one cage while the output from one Ball Coal Section and the other Main Coal Section was wound from the Main Coal Level 38 feet below the Ball Coal Bottom by the other cage. The winding engine had drums of different diameters in order to allow this to be done. In order to enable the coal from one of the Main Coal Sections, the Dublin Section, to be sent to the Ball Coal Level and so reduce the amount of haulage road to be made and maintained, a dipping mine or stone drift had been driven from the Ball Coal to connect with the Main Coal at a distance of 600 yards out from the shaft.

The day shift descended between 6.25 and 7 a.m. and came up 2 to 2 35 p.m., the afternoon shift went down 2.45 to 3 p.m. and ascended 10 to 10.15 p.m. and the night shift descended 10.45 to 11 p.m. and came up 6 to 6.15 a.m. There were usually 170 on the day shift, 92 on the afternoon shift and 73 on the night shift. In addition there were 7 shotfirers whose shifts were taken from 6 a.m. to 1 p.m. In the evening the machineman, runmen and gummerns of whom there were normally about 30 descended at irregular times from 8 to 11 p.m. The firemen's shifts were arranged with 5 on the day shift, 3 on the afternoon shift and 3 on the night shift. During the shift in which the disaster occurred there were 93 men underground including, two strippers, one of whom came up early, nine runner men who came out before the event, two onsetters, a youth who was sent by the fireman with a message, two bricklayers and a boy who fled before the water, ten men who came out of the lower level through the water, twenty six who were later saved in the Gutterhole shaft and 40 men who lost their lives.

Small feeders of water had been encountered as the workings developed in the Dublin Section of Main Coal. This water flowed out of the side of the roads into a shallow 'gauton' or ditch to run by gravity to the pumps. There was nothing to cause alarm in the Dublin Section until 4.30 a.m. on the morning of the 25th. September. According to the account of the sole survivor from the Dublin Section, a youth named Henry Thompson, a coal cutting machineman, William Donaldson, came out on to the main road early that morning to look for the fireman, Thomas Aitken whom he found and took him back to the Dublin Section. Thompson followed them and saw three machinemen trying to get rid of some water by letting it through the pack walls on the low side of the drawing road. He heard these men tell Aitken that they intended to continue cutting with the machine so as to get to a higher place. Apparently, even then there was no alarm felt.

The fireman took Thompson out with him down the main road and wrote two notes, one to the undermanager and one to the fireman in the Bar Run Section of the workings. As he was handing the notes to Thompson a slight 'thump' was heard and the air started to reverse. This was probably the moment when the water broke in in volumes. The fireman merely told the youth to deliver the note and then went back towards the workings. Thompson took one note to the Main Coal onsetter, asking him to take it to

the Bar Run fireman and then went up the pit to the undermanager's house. The message to the undermanager read-

"Mr. Wm. Donaldson, Under-Manager.

Dear Sir,

The water has broken into Dublin No.1 Branch and it is knee deep on the slope and there is more going to Bar Run haulage road than the pumps are able to manage. You might come by and see it and I will be at No.3 Bench. If not there I will be in Dublin.

PS. -- There is a very great danger of flooding out Bar Run haulage.

Yours,

T. Aitken.

I have sent word to J, Jarvie."

The reversal of the air was felt by the bricklayers working in the Main haulage road in the Ball Coal leading to the Dublin Section, Main Coal and about 15 minutes later at approximately 5.10 a.m. a rush of water came down the road. The bricklayers ran before it and got to the shaft just as the water reached the same point. This water had swept down the road in the Main Coal from the Dublin Section and up the stone drift connecting that seam to the Ball Coal and the had continued down the main road in the latter seam. When the water reached the shaft it poured down it in tremendous volume to the lower landing.

At this time there were several men in the lower or 'dook' workings of the Main Coal who had finished their shift and were on their way out when they met the water. James Jarvie, the fireman, who had received the note sent by Aitken encouraged some of the men to push forward through the water and ordered two men to go round by the return airway to warn the men in the Bar Run, Main Coal. These men lost their lights in the water and were unable to carry out the order. Jarvie himself, knowing that Dobbie's Mine Section was the lowest and would be flooded first, went back into that part to warn the men and was never seen alive again.

Eleven men managed to fight their way against the water to reach the pit bottom in the Main Coal. They found that the quantity of water coming down the shaft was too great to permit escape by the cage but there was a small shaft or blind pit, fitted with stairs from the Main Coal to the Ball Coal. Water was coming down the stair pit but not in great quantities and the succeeded in getting to the Ball Coal and from there to the surface by the ordinary winding cage.

By 5.45 a.m. the water had filled practically all the lower dook workings and by 6. 30 a.m., the upper seam was sealed at both shafts and no access could be obtained to the workings. At this time there were 66 men missing. Seventeen from the Ball Coal Nos.1 and 2 sections, 16 from the No.3 section, 10 from Dobbie's Mine Section, 11 from the Main Coal, Dublin Section and 12 from the Main Coal Bar Run section. None of the men from the last three sections was recovered alive. The men from the Nos.1, 2 and 3 sections of the Ball Coal and found their exits cut off and had travelled the airways and had gathered together. One man managed to get a message by telephone to the surface from the station on the Nos.1 and 2 Districts at about 6 a.m. and was told that they should try to escape by the old Gutterhole shaft.

At the surface of this shaft a windlass was erected but the shaft was found to contain blackdamp. Men in rescue apparatus went into the foul atmosphere and reported that nothing but water could be seen. The attempt to gain access was given up as hopeless at 8.30 a.m. Meanwhile 26 men out of the 33 from the Ball Coal Nos.1, 2 and 3 had in fact succeeded in reaching the Gutterhole shaft. The remaining seven failed to get there. This party expecting the shaft to be dry from past experience had been making a road by pulling put material and throwing it back but they soon found that water was coming in on them. They persisted but a wall of water 2 to 3 feet was rushing down the middle of the road. In addition they were subjected to blackdamp which had been forced out of the old wastes by the water. As a result several of them lost consciousness and were

rescued by their comrades but seven were swept away as they fell. Five of these were drowned and two were later recovered unconscious.

To judge by the height of the water in the main shafts, there should have been no water in the Gutterhole shaft but it was afterwards discovered that a block had occurred in the Main Coal airway which passed the foot of this old pit. The water was thus dammed back, rose to a greater height than in the remainder of the mine and came through the old filling of the bottom portion of the shaft. At 10.15 a.m., the water level in the main shafts was 113 feet above Ordnance Datum, and the men underground gathered at a place 129 feet above the datum. A measurement of the depth of water in the Gutterhole shaft taken at that time showed that its level was approximately 137 feet above the Ordnance Datum. Eventually the block in the main coal airway must have given way, since the water subsided 9 feet below the level of the hole which the men had made in the shaft. When the block did give way all the dirt filling the bottom of the Gutterhole shaft ran out, leaving 30 feet of clear shaft which was afterwards used in the pumping operations. When the water subsided underground the men shouted up the shaft and were heard at the surface. All efforts were then made to get them out and by 12.40 p.m. 21 survivors had been rescued. The heavy rush of water stopped at 12 noon but a considerable stream continued to pour into the pit for many weeks.

The task remained to drain the water from the colliery and recover the bodies of the victims. There were large areas of the working that were above the water and there was a possibility that some of the men who had failed to get to the Gutterhole shaft were above the water and alive. The main shaft was useless for rescue purposes as there was 60 feet of water above the highest working landing so only the Gutterhole shaft would be of any use.

Offers of assistance came from all quarters with offers of men and materials, in particular Messrs G. and W. Brunton, Riggers of Grangemouth, The Fife Coal Company Limited, The Kinneil Cannel and Coking Company Limited, The Shotts Iron Company, Limited, The United Collieries and Mr Waddell, Fire Master of the Glasgow Corporation, gave valuable assistance in the operations. Help was also offered to the officials of the mine by numerous agents, managers and engineers and by H.M. Inspectors of Mines, who with the workmen from the mine and from the area generally gave unremitting service so long as there was hope for any of the men trapped below.

Pumps were pulled from their positions in other collieries and rushed to the rescue attempts. Electrical equipment that would have taken months to manufacture appeared as if by magic. No pains were spared and no trouble that was encountered too great. In 36 hours from the time of the disaster the Gutterhole shaft had been fitted with a headgear, steam winding engine and an electric fan. The blackdamp was cleared and relays of men started to make a road into the workings while others erected a turbine pump in the shaft.

In the main winding shaft of the No.23 pit, chests were at work dealing with 350 gallons of water per minute, while in the upcast a turbine pump was sending out 550 gallons per minute. In spite of this the water continued to rise and it was not until noon of the 28th. September that mastery over the situation was obtained. Progress was at first slow, owing to the large quantities of water still draining into the pit. The water was only lowered 18 inches in four days, but after that progress was 2 feet a day since more pumps had been brought into action. As small fresh water fish had been brought into the tanks, showing that a surface stream was finding its way directly into the pit, the surface were searched and the likely places puddled. This was successful and the feeders were reduced.

The first efforts of the rescue parties was directed to clearing road from the Gutterhole shaft to give access to the Spion Kop Section where they expected to find some of the men who had not reached the Gutterhole shaft. The rescue party worked very hard and cleared out the stowing from 165 feet of old road in 36 hours. This was rate of 4.5 feet per hour. The Spion Kop was reached and explored but no one was found. The rescuers

suspected that the men might have lost their way to the shaft and gone into the No.3 section and been cut off by the rising water and efforts were then concentrated on reaching the No.3 section.

It had been anticipated that the road that already been cleared would give access to a large portion of the mine but a trough occurred in the workings and the road was found to be below the level of the water. Had there been a plan that was marked with contour lines this would have been known but no such plan was available. To overcome the difficulty the roof was blasted down into the water and a road made above the water level. An air compressor was erected to supply the drills used in making the road. A 4-inch diamond drill bore hole was started from the surface to reach a rise part of No.3 Ball Coal Section with the hope that light and food might be lowered to any men imprisoned. The hole was not completed before the necessity of it had disappeared because on the 4th. October the road which was being made above the water level had passed beyond the water and five men were found in the No.3 section who had been imprisoned 9 days without food. They were all in remarkably good health and walked out of the pit. They stated that they did not feel hungry after the first few hours and they had no sense of time. They had been living in a very damp space in which an oil lamp would not burn and they had difficulty in maintaining the circulation in their legs and as a result they developed rheumatic and bronchial troubles.

There were four or five men still unaccounted for in the Ball Coal workings and in the hope of finding them alive an attempt was made to drive 400 feet of coal heading in order to gain access to Nos.1 and 2 sections. This effort was outstripped by the lowering of the water level. In the meantime an attempt was made by divers to communicate with the imprisoned men. The divers had to travel 800 feet and at least 20 feet head of water, they were unsuccessful, not through lack of zeal or courage but through lack of mining knowledge. The task was not considered as an impossible one and the results that were achieved demonstrated that there were possibilities in recovery work for men with both diving and mining experience.

As the unwatering operations continued a series of heartrending breakdowns of the pumps occurred and it was not until the 18th. October, 23 days after the disaster that the rescue party penetrated into the No.1 section of the Ball Coal and found the bodies of two men. After, as of by an irony of fate, there was no further trouble with the pumps and the water was steadily lowered until the 21st. November when it was possible to examine almost all the workings in the mine.

Twelve bodies were yet unrecovered and it was expected that eleven of them would be in Dobbie's Mine Section which was the lowest district of the colliery. The bodies were not to be found there and it became necessary to go into the old workings. After an arduous search, eleven were discovered in the old Main Coal workings which had been abandoned for fourteen years. These eleven, who were led by the fireman, had managed to make a way through over 1,500 yards of old roads some of which had very badly fallen in. at one place they had made a passage 10 yards long through the waste from one road to the other, entirely without tools. Having reached this remote place they stayed there, near a small supply of water and ultimately they died of cardiac failure due to exhaustion.

Up to the day they were found it was believed that the men had been caught in Dobbie's Mine section 'like rats in a trap' and could not possibly have escaped drowning. It was never explained how they all contrived to get out of the dip side of the pit to the rise workings.

The order of the list is the order in which the victims were brought from the pit. All the victims died from drowning unless stated to the contrary. Thomas Brown recovered on the 25th. September 1923, 30 yards from the Gutterhole shaft to the dip.

John Forrester recovered on the 25th. September 1923, 10 yards from the Gutterhole shaft to the dip.

David Porteous recovered on the 25th. September 1923, 30 yards from the Gutterhole shaft to the dip.

Frank McGarvie recovered on the 4th. October 1923, against the motor house, top Main Coal Mine.

Michael McKenna recovered on the 4th. October 1923, at the corner of Easton's Mine, Main Coal haulage.

Andrew Anderson recovered on the 4th. October 1923, in the Main Coal haulage road between McGarvie and McKenna.

William Anderson recovered 10th. October 1923, in Easton's Mine, Main Coal.

Patrick Shields recovered 13th. October 1923, in Easton's Mine, Main Coal.

James Hannah recovered 10th. October 1923, in Easton's Mine, Main Coal.

Thomas Aitken recovered 10th. October 1923, in Easton's Mine, Main Coal.

Thomas Thomason jnr. recovered 14th. October 1923, in Slant off Sipon Kop main road, Ball Coal.

David Brown recovered 18th. October 1923, at the entrance to Slant off Spion Kop main road. Died from the effects of blackdamp.

Thomas Brown recovered 18th. October 1923, in No.2 Section Main road, Ball Coal. Died from the effects of blackdamp.

John Lennie Wright recovered 20th. October 1923 in the Main Coal airway, 20 yards to the rise of the Gutterhole.

Thomas Thomason (2) recovered 6th. November 1923 in the Bar Run Airway, Pick Section.

Main Coal.

James Marrs recovered 6th. November 1923 in the Bar Run Airway, Pick Section, Main Coal.

Laurence T. Scobbie recovered 6th. November 1923 in the Bar Run Airway, Pick Section, Main Coal.

David Thomason recovered 6th. November 1923 in the Bar Run Airway. Pick Section, Main Coal.

James Scott Irving recovered 6th. November 1923 in the Bar Run Airway, Pick Section. Main Coal.

Alexander Hamilton recovered 6th. November 1923 in the Bar Run Airway, Pick Section, Main Coal.

Laurence Thomason recovered 8th. November 1923 in the Bar Run Airway, Pick Section, Main Coal.

William Donaldson recovered 12th. November 1923 to the dip of Gutterhole Shaft in the Main Coal.

Colin Maxwell snr. recovered 20th. November 1923 at 92 refuge hole, Bar Run Road, Main Coal.

Thomas Bonar recovered 15th November 1923 at 93 refuge hole, Bar Run Road, Main Coal.

John Baxter recovered 15th. November 1923 at 105 refuge hole, Bar Run Road, Main Coal.

Walter Maxwell recovered 20th. November 1923 in Dublin Return Airway, near the top and Archibald McNee recovered 21st. November 1923 in the Old No.1 Section, off Hen Farm Section, Main Coal, under Middlerig Farm.

Those recovered 21st. November 1923 in the Old No.1 Section, off Hen Farm Section, Main Coal, under Middlerig Farm, all the following victims died from cardiac failure and exhaustion-

David Bennie, Robert Thomason., Andrew Brown, Henry Thomason, Robert Beveridge, John Beekman, Thomas Thomason (1), James Adam, Colin Maxwell jnr., Michael

McLaughlin, James Jarvie and James Cochrane recovered 3rd. December 1923 to the top of the Bar Run Return Airway, Main Coal. He died by drowning.

The inquiry into the causes and circumstances attending the inrush of water which occurred at Redding Colliery, Falkirk, Stirlingshire on the 25th. September 1932, was conducted by Sir Thomas H. Mottram, C.B.E., H.M. Chief Inspector of Mines, in the Justiciary Buildings, Jail Square, Glasgow, from 5th. February and lasted for nine days when all interested parties were represented.

An inspection of the pit after the disaster showed that the flooding was caused by water breaking through the Universal Dyke at No.12 Branch in the Dublin Section, Main Coal seam. The fireman's message refers to water breaking in at the No.1 Branch but as there were 11 disused breaches to the left of the haulage road, No.12 branch was the first that was actually working and was commonly called the 'No.1'. The water came from the old workings in the Coxrod and Splint seams of a number of old collieries to the rise or south side of the Redding No.23 Colliery and the inrush came from a part of the Coxrod seam worked from Redding No.4 pit about 1842.

The old workings of Redding Pits Nos.4, 5, 6, 10, 12, 14 and 18 were inter-connected and there were also connections to Standrig, Blackraes and Shieldhill Collieries. Redding No.4 was sunk almost at the deepest part of the coalfield south of the Universal Dyke. It ceased to work about 1854 and a portion of the workings filled up with water to the level of the pumps at No.10, further to the east and to the rise. No.10 Pit continued to work the seams until it was abandoned in 1873. After that the water gradually rose in the Coxrod seam and in a part of the Splint Coal until it found its way out of a day level from No.10 Pit at a height of about 346 feet above the Ordinance Datum. Consequently in 1873 the old workings to the south of the Universal Dyke had been standing partially filled with water. The level of this water could be and had been measured at Redding No.4 Old Shaft. A plan in the Colliery Office at No.23, showed the water to be 346.9 feet above Ordinance Datum.

At the place in the Main Coal workings where the inrush occurred, it was calculated that the head of water above the working face in No.12 branch was equivalent to a pressure of 50 lbs. per. square inch. After the disaster it was discovered that the Coxrod Seam floor opposite the point of the inrush was only eight feet above the Main Coal floor and that the old workings in the Coxrod had stripped the main fault of the Dyke bare at this place. An excavation eight yards long, had been cut down to the pavement of these old workings to a depth of 4 feet 6 inches. The purpose of this excavation can only be surmised. Drains or 'gautons' from the east and west had been formed towards it and it may have been place where water was taken in chests to a storage chamber for the suction of a siphon or it may have been to allow the water to go through the strata. Whatever the object, the result was that the bottom of the excavation was brought within a foot vertically of the top of the Main Coal being worked by Messrs. Nimmo on the other side of the Dyke. The natural subsidence arising from the working of the Main Coal in the Dublin Section evidently caused the frail barrier to give way until finally an opening, approximately eight yards long, was left through which the water rushed.

In 1898, at the request of the late Mr. Thomas Nimmo of Messrs. James Nimmo & Co. Ltd., Messrs. McCreath & Stevenson, Mining Engineers of Glasgow, who had the old plans on Redding on loan from the Duke of Hamilton's Estate Office, marked and put a line of the old Coxrod workings south of the Universal Dyke on the Main Coal plan of No. 23 Redding. These plans showed that between 1841 and 1853 the Universal Dyke had been stripped in the Coxrod Coal a very considerable distance by workings from the old Nos. 4 and 5 pits on the south side of the dyke. A road was also shown on the plan that crossed the dyke west of the point where the inrush occurred. Whether this road existed or whether it was just projected there was no evidence to show. It was discovered after the disaster that the old plans were incomplete as the coal shown to

have been left in 1853 against the dyke had been removed without its removal having been shown on the plans.

With the information that the Coxrod had been worked on the far side of the dyke, the management in 1898 continued to push on their Main Coal and Ball Coal workings which at that time was a considerable distance from the dyke. They continued to extend the Main Coal workings until 1909 when a working face, 300 yards long was stopped at a point where a portion of it was 150 feet from the dyke. Two other faces, one of which was the Dublin section advancing almost parallel were stopped in 1914-15 due to war conditions when the shortage of workers necessitated the coal to be worked nearer the bottom. This statement was confirmed at Alexander Robertson who was the manager of the mine in 1909 and was confirmed by James Watson who was manager of the No.23 Pit in 1910 and remained in charge until 3rd, October 1922 when he was succeeded by John Purdie.

In 1917 the Agent instructed George Park who had been the Company's certified surveyor since 1911 to take a section correlating the seams on the North and the South side of the Universal Dyke and the position of the water in the Nos. 4 and 5 pits. This section was called the 1917 section. The position of the Universal Dyke was taken from the Main Coal working plan to which it had been transferred from the old Coxrod plans in 1898. North of the Dyke the levels in the Main and Ball Coal were apparently not taken at the time because levels were already on the working plans up to a point 600 feet back from the dyke. From these figures a line of level was assumed and transferred to the line of the section. From there to the Dyke the levels were entirely assumed.

South of the Dyke the water level was plumbed in No. 4 and 5 shafts and was taken from the working plans one which they had been marked in 1898 from the old plans. These levels could not be verified since both seams were under water and the old 'bench mark' was unknown. The fault shown on the section as a downthrow of 15 fathoms was marked on the plan as five fathoms but was taken by Mr. Park as 15 fathoms on the instructions of Mr. Watson who stated in evidence that he was fully satisfied on this point of the information of two old miners who had worked in the old pits. This information was that in the No.5 Shaft the Splint and Coxrod seams used to be worked from opposite sides of that shaft to the same drawing level. The dip of the seam from Nos.4 and 5 shafts towards the dyke on the south side was assumed to be the same as the average rise on the north side.

The 1917 section showed the Coxrod waste at the Universal dyke, at a point about 300 yards from the inrush, to be 66 feet above the position of the Main Coal but it was found to be only five feet measured from the top of one seam to the bottom of the other at the point where the inrush took place. The idea of driving through the Dyke was abandoned because of information from an adjoining colliery indicated that it might not be profitable. The 1917 section was put aside and no action was taken on it until two years later when the question of reopening the Dublin Section came up for consideration. According to the evidence of Mr. Gibb and, Mr. Watson they proceeded to get all the information they could with regard to the displacement of the seams at the Dyke and the thickness of the Dyke itself which they were looked at as a possible barrier against an inrush of water. They found, examining the geological plan that it showed the Universal Dyke to be 20 fathoms downthrow at Wallacetown 300 to 400 yards east of the point where their workings would and did strike the dyke. They also found on inquiring at the Callender Colliery, one a quarter miles to the west. That the dyke there had a downthrow of 13 or 14 fathoms and they had the section of 1917 which showed a downthrow of 19 fathoms.

With regard to the faulted ground at or near the dyke they found that at the Callender Colliery it had been driven into for a distance of 60 feet without being pierced entirely and that at Manuelrigg, about a mile to the east of Redding, a road had been driven for 80 feet with the same result. They also observed in a burn on the surface at Redding that the dyke was 60 feet wide with layers of sandstone all the way across. They

concluded from this information that the fault was a big sandstone dyke between the two collieries. They then considered it safe and proper to proceed with the workings in the Main and Ball Coal and to strip the Universal Dyke. In October 1922 when Mr. Watson retired, the workings had approached close to the dyke in the Main Coal and had reached it in the Ball Coal which according to the 1917 section was 38 feet vertically nearer the Coxrod waste than the Main Coal. The dyke was struck by the Main Coal in late November 1922. Mr. Purdie had been informed of the position by his predecessor and he inspected the 1971 section and saw no reason to see danger in stripping the dyke. This carried on and at the time of the disaster the dyke had been stripped in the Main Coal and Ball Coal for a distance of 900 and 500 feet respectively.

There was great deal of evidence at the inquiry which led to the question whether, when they were stripping the dyke in the Dublin section the danger was indicated by the feeders of water that were encountered. Sir Thomas Mottram came to the following conclusions-

- “1). that the cause of the disaster was the reliance of the management on plans and calculations that were inaccurate.
- 2). that the management made an unfortunate mistake in omitting to examine the plans of the old workings.
- 3). that, in view of the uncertainty inherent in the position, the management were at fault in omitting to take the precaution either of leaving a substantial barrier of coal on the dyke or of definitely ascertaining the location of the water by boring from the surface.
- 4). that the amount of water finding its way into the Dublin Section cannot reasonably be held to have afforded, in itself, an indication that the workings were approaching danger.
- 5). that it would be impracticable to treat Section 68 of the Coal Mines Act as applicable to cases in which the workings and the water are known not to be in the same plane.”

Sir Thomas went on to make the following recommendations-

- “1). That Section 68, which is generally understood by mining men to deal with dangers from accumulations of water lying in the same plane as the workings that are approaching them, should be amplified and strengthened, as far as it is possible to do so, to cover the various other circumstances in which danger from water may arise in mining operations.

This being a matter which you have already remitted to the Water Dangers Committee of which I am a member, I prefer not to express my views with regard to the exact form such amplification should take. But as it is practically impossible to cover by general legislation or general regulation all the multifarious circumstances in which danger from water may arise, it seems to me there is a need for some machinery for considering cases individually as that provided by No.29 of the General Regulations of the 30th. July 1920, for determining the precautions to be taken in respect of workings under moss and quicksand etc.

- 2). that notice should be given to the Divisional Inspector of Mines of owner's intention to approach within 100 yards of workings, in any direction, containing or likely to contain an accumulation of water or other liquid matter.”

At the end of the inquiry Sir Thomas recorded that-

“It was pleasing to hear from Mr. Aitchison that the relatives and dependants of those who lost their lives in the disaster were satisfied that nothing was left to undone that skill and ingenuity or energy could suggest or devise in order to effect the rescue of the entombed men. These remarks must have been gratifying to the owners, officials and workmen of the colliery and indeed to all who rendered all the assistance they could after the calamity had occurred.”

NUNNERY. Sheffield, Yorkshire. 3rd. December, 1923.

The colliery was on the eastern outskirts of the City of Sheffield and was owned by the Nunnery Coal Company Limited. It had been winding coal since 1866 from two winding shafts, both downcast, one of which was the No.1 or East Silkstone Pit. It was on the Main East engine Plane of the workings in that pit that the disaster occurred.

The shaft was about 307 yards deep to the Silkstone Seam which dipped to the north east at an average of about 4 inches to the yard. At the time of the accident all the workings were to the dip of the shaft and the coal had been worked in a succession of levels from the main incline as the Main East Engine Plane. This was driven straight for 1,156 yards before dividing due east and the other part, after going eastwards for 250 yards, turned due north with both planes reaching 1,950 yards from the pit bottom. Except for short lengths here and there the East plane an average height of five feet six inches and an average width of 7 feet.

The General Manager was Mr. W.H. Mascall who also acted as agent with Mr. C.S. Magee as certificated manager. The undermanager of the Silkstone workings in which the accident happened was Mr. J.T. Bradwell who held a Second Class Certificate of Competency.

Coal was halued up the inclines by a single main rope driven by steam engine at the surface. The rope served in turn the branches of Hewitt's Plane and the East Plane. Men were halued on the same rope at the beginning and the ends of each shift between the East Plane and Hewitt's Level, a distance of about one mile. The practice of transporting men in this way had gone on for six years.

The steam engine consisted of a pair of 24-inch cylinders, of 5 foot stroke coupled directly to a drum shaft with the cranks at right angles to each other. The cylinders were supplied with steam at 50 lbs. pressure and were fitted with slide valves operated by Stevenson's link motion. The drum was 6 feet in diameter and 2 feet 8 inches wide and ran free on the shaft unless the dog clutch on the shaft was thrown into gear. When the empty train was being lowered down the incline during coal lifting operations, the drum ran free and was controlled by the brake but when people were being lowered, the engine was kept in gear and no steam was let into the cylinder. Braking was applied by two drum straps actuated by a hand lever on brake paths fitted externally to the flanges of the drum.

The haulage rope was led from the drum on rollers to the top of the shaft and then diverted to a horizontal pulley and a vertical pulley into a range of 4 inch cast-iron pipes which ran down the brickwork lining of the shaft to the pit bottom. Here it passed through a third pulley into a horizontal wooden trough and from there to the top of the engine plane. From that point, the rope ran down the plane which consisted of a single track of fish-plated rails and to the various junctions in turn. In the plane itself it ran on rollers fixed at intervals between the rails and at each junction four or five rollers 10 to 12 inches high were set in frames to guide the rope round the curve. These frames had the double purpose of 'skating' rails to guide the tubs as they were passing round the curve.

An over-rope connected at one end of the shackle of the haulage rope and at the other to a draw bar of the last tub of the set was on the top of the train to prevent tubs from running back in the event of a break in the coupling had a back-stay drag was also attached to the last tub when the train was ascending to prevent the set running back. No person rode on the train while coal was being hauled but when men were riding, an authorised person accompanied them on a seat hung on the outside of the tub next to the rope.

In the ordinary course of coal handling people were stationed at the several junctions and were responsible for the turning pints. They saw that the train went safely round the corners and the rope stayed on the rollers. before an empty set started from the pit bottom the destination of the set would be notified by telephone to each junction. Electrical signals were used along the whole length of the haulage plane and these were

operated by rubbing a knife or something else, across the wire the number of times required by the signal. The code that was in use was-

For hauling persons-

Men in tubs, '8', To draw up steadily, '5', To lower steadily, '4', To stop, '1'.

For hauling coal or empties-

To draw up, '3', To draw up steadily, '5', To lower, '2', To lower steadily, '4', To stop, '1'.

Auxiliary haulages were in use at the top and bottom of the engine plane to feed the main haulage system but these played no part in the disaster.

Between 2 and 2.30 on the afternoon of December 3rd., 120 people were ready to descend the Main Haulage Plane in a set of tubs known as the 'Paddy Mail'. The train was made up of 44 tubs of which 42 were for the men to ride in and as many as four men rode in some of the tubs. The usual starting point of the 'Paddy Train' was opposite to the entrance to the First North level and while it was standing there an number of men entered the tubs.

A man had been injured in the workings during the afternoon and he was being carried up the plane of a stretcher. There was not enough room to allow the passage of the stretcher between the tubs and it was decided to draw up the Paddy Mail a short distance, to allow the stretcher to pass to the First North Level. The Paddy Mail was in the charge of Colin Chappell who was the main plane run attendant. He ordered the men who had taken their seats out of the tubs and signalled to the engineman '5' to draw up steadily and later '1' to stop and the train was drawn up about 40 yards. The one hundred and twenty men the entered the Paddy Mail and after the stretcher party had cleared the plane, Chappell signalled '8' to the engineman to signal that the men were in the Mail and then '4' for the Mail to be lowered steadily.

The engineman obeyed the instructing and the Mail ran normally at about three miles per hour at first but when it had travelled about 40 yards to seemed to be speeding up. The haulage man, Harry Scott who was standing by noticed this and shouted to Chappell to give the engineman the signal '4'. Chappell did this by drawing together the overhead signal wires and placing his knife across them. He had not realised, until Scott had alerted him that the train was going too fast. Both the engineman, Walter Stockton and his assistant, Walter Proctor, who was standing at the reversing level and operated when it was required when men were being lowered, stated that the signal '1' meaning stop was received in place of '4' which Chappell had tried to send. Proctor pulled over the reversing level and the engine smoothly pulled up by the brakes stopped in 18 feet. The engineman and his assistant then noticed that the rope was slack and that the load had come off it.

Chappell thought he had signalled '4' but the signal that was received at the enginehouse was '1' and that immediately as the signal was received the haulage rope broke. The Mail gathered speed down the incline and crashed in Cain's Junction, 377 yards from the starting place. Some of the tubs jumped the rails and seven men were killed, eight seriously injured and forty seven received minor injuries.

Those who died were-

William Thomas Birch aged 53 years, collier. Died from injuries to the body.

Charles Bowden aged 62 years, collier. Died from a fractured skull.

John Henry Turner aged 49 years, collier. He had fractured both legs.

Bernard Newton aged 18 years, haulage hand. Died from injuries to the head and body,

Charles Needham aged 60 years, collier. Died from a fractured neck and

Charles White aged 37 years, collier. Died from a fractured spine.

The inquiry into the disaster was held in the Council Chambers in the Town Hall in Sheffield and opened at 11 a.m. on the 7th. May. It lasted two days and seventeen witnesses were called. It was held by Sir Thomas H. Mottram, C.B.E. formerly H.M. Chief Inspector of Mines and presented to Mr. E. Shinwell, Esq., M.P. Secretary for

Mines on 11th. August 1924. All the interested parties were represented and evidence was presented that the haulage rope had been spliced several times. From the capel to the 1st. splice, a length of 300 yards was spliced on the 24th. April 1922, 1st. splice to 2nd. splice, 480 yards, 18th. September 1922. 2nd. splice to 3rd. splice 580 yards, 8th. January 1923, 3rd. to 4th. 480 yards, 9th. April 1923, and 4th. to 5th. 480 yards, 14th. June 1923. Ten yards were ignored and the total length of the rope was 2, 330 yards.

The use of appliances to stop trains ascending or descending an incline in the event of the rope failing were examined and since the disaster these had been installed at the colliery and the testing of haulage ropes apart from the manufacturers certificate were considered and the desirability of providing a separate road for the haulage of men was also considered. The signalling system was examined and the Inspector commented-

"The method of transmitting signals by bringing the two electric wires together appears to have been effective, though the carrying of an open bladed knife for this purpose was a practice which is by no means commendable. Some other form of instrument could easily be devised."

Sir Thomas Mottram summarised his conclusions and recommendations-

"1). The disaster was caused through the breakage of a part of the haulage rope which had been in use 19½ months, but as previous ropes of similar make and type had been used for a longer period without accident, and daily examination in addition to the statutory weekly examination had not disclosed to the officials any defects apart from ordinary wear and tear to be expected. I do not wish to attach blame to the Management in respect of the broken rope.

2). I am not satisfied that all the examinations of the haulage rope were as thorough as they might have been, nor do I consider that the weekly statutory reports made by appointed persons always complied strictly with the requirements of Section 66 of the Coal Mines Act 1911 in respect that defects discovered were not recorded, in other words, the statutory reports were not full and accurate. The explanation given was that when fractured wires were discovered, or when a splicing was found to be necessary, the defect was remedied and the rope made good, and thereafter a report was made that the rope was in good order. The omission to record defects was liable to mislead higher officials as to the true behaviour or state of the rope and it is possible that if the reports had been full and accurate the rope might have been suspected before the accident took place.

I am of opinion:

3). That the provisions of Section 66 of the Coal Mines Act 1911 should be amplified so as to require a daily examination of machinery, gear and other appliances of the mine used for hauling persons below ground, and that all defects, whether found during a statutory examination or at any other time, and the steps taken to remedy them, should be recorded in the book already required to be kept at the mine.

4). That splicing of ropes used for the haulage of persons on inclined planes should be prohibited.

5). That the maximum life of ropes used for the haulage of person on inclined planes should be limited to 18 months.

6). That an effective safety appliance to arrest the set in the event of the rope breaking should be installed on every train or set used in hauling persons on inclined planes underground.

7). That the question of a factor of safety for passenger haulage ropes, and as a corollary, the question of making inquiry into the use and manufacture of such ropes, should be referred to the Safety in Mines Research Board for advice.

8). That the provision of a separate road for the haulage of men is a matter deserving the consideration of mine managers.

9). That General Regulations should be made to cover Nos. 3, 4, 5 and 6 of the foregoing recommendations, and also to specify the type of tram or carriage to be

used, the maximum number of persons to be carried at one time in each tram, and the maximum speed at which the journey should run.”