

= Senghenydd colliery disaster =

The Senghenydd colliery disaster , also known as the Senghenydd explosion (Welsh : Tanchwa Senghennydd) , occurred at the Universal Colliery in Senghenydd , near Caerphilly , Glamorgan , Wales , on 14 October 1913 . The explosion , which killed 439 miners and a rescuer , is still the worst mining accident in the United Kingdom . Universal Colliery , located on the South Wales Coalfield , produced steam coal which was much in demand . Some of the region 's coal seams contained high quantities of firedamp , a highly explosive gas consisting of methane and hydrogen , and were prone to explosions .

In an earlier disaster in May 1901 , three underground explosions at the colliery killed 81 miners . The inquest established that the colliery had high levels of airborne coal dust , which would have exacerbated the explosion and carried it further into the mine workings . The cause of the 1913 explosion is unknown , but the subsequent inquiry thought the most likely cause was a spark from underground signalling equipment that could have ignited any firedamp present . The miners in the east side of the workings were evacuated , but the men in the western section bore the brunt of the explosion , fire and afterdamp ? a poisonous mixture of carbon dioxide , carbon monoxide and nitrogen left after an explosion .

Fires in the workings hampered rescue efforts , and it took several days before they were under control . It took six weeks for most of the bodies to be recovered and the fire to be extinguished . The subsequent enquiry pointed to errors made by the company and its management leading to charges of negligence against Edward Shaw , the colliery manager , and the owners . Shaw was fined £ 24 while the company was fined £ 10 ; newspapers calculated the cost of each miner lost was just 51 ? 2 pence .

In 1981 a memorial to the men who died in the disaster was unveiled by the National Coal Board , followed by a second in 2006 , to honour the dead of both the 1901 and 1913 explosions . In October 2013 , on the centenary of the tragedy , a Welsh national memorial to those killed in all Wales 's mining disasters was unveiled at the former pithead , depicting a rescue worker coming to the aid of one of the survivors of the explosion .

= = Background = =

= = = Welsh coal industry = = =

The Welsh coal industry employed 1 @, @ 500 workers in 1800 ; and as the industry expanded , the workforce rose to 30 @, @ 000 by 1864 , and to 250 @, @ 000 by 1913 . As employment became available , many people moved to the area of the South Wales Coalfield ; between 1851 and 1911 the population increased by 320 @, @ 000 . By 1913 the Welsh collieries were extracting 56 @. @ 8 million long tons of coal (63 @. @ 6 million short tons) a year , up from 8 @. @ 5 million long tons (9 @. @ 5 million short tons) in 1854 ; collieries in the region mined a fifth of all coal produced in the UK , and employed a fifth of its miners in the mid @-@ nineteenth century . In 1913 Britain was responsible for 25 per cent of world coal production and 55 percent of all world coal exports .

The South Wales Coalfield produced the sought @-@ after anthracite , bituminous and steam coals ? the latter a grade between the two comprising a hard coal without the coking elements . Some of the region 's coal seams contained high quantities of firedamp , a highly explosive gas consisting of methane and hydrogen , and were therefore prone to explosions ; firedamp rises into the higher points of workings , including cavities or , as at Senghenydd , when the seams were being mined in an upward gradient . An additional danger of firedamp is afterdamp , a poisonous mixture of gases left after an explosion , primarily constituted of carbon dioxide , carbon monoxide and nitrogen . They combine with haemoglobin in the bloodstream to stop cells carrying oxygen , which can result in suffocation by lack of oxygen or anoxia . If survivors from an explosion are not rescued quickly , they face the possibility of being killed by the gas . The presence of firedamp contributed to a higher

@-@ than @-@ average proportion of accidents : between 1880 and 1900 South Wales accounted for 18 % of Britain 's miners , but 48 per cent of all UK mining deaths occurred in the region . As coal output from British collieries reached its peak in 1913 there was a correspondingly large number of accidents around this time .

= = = Senghenydd and the Universal Colliery = = =

Senghenydd ? Senghennydd in Welsh ? is situated at the northern end of the Aber Valley , approximately four miles (6 @. @ 4 km) north @-@ west of Caerphilly and eleven miles (18 km) north @-@ west of Cardiff . When geological surveys for coal began in 1890 it was a farming hamlet of around 100 people . Coal was found , and sinking of the first mineshaft for Universal Colliery ? which was owned and developed by William Lewis ? began in 1891 ; the first coal was extracted in 1896 . The colliery 's two shafts were both 1 @, @ 950 feet (590 m) deep , the downcast Lancaster and the upcast York . Development of the pit coincided with the Boer War , and sectors of the underground workings were named after key places in the war , such as Pretoria , or the lifting of the sieges at Ladysmith , Mafeking and Kimberley .

South Wales miners , including those at Universal , were paid on a rate determined by the Sliding Scale Committee , which fixed wages on the price coal fetched at market . When the price of coal slumped in the late 1890s , low wages led to industrial unrest and , in 1898 , a strike that the men at Universal joined at the end of April . The Monmouthshire and South Wales Coal Owners ' Association refused to replace the scale , and the strike ended on 1 September with some small concessions granted by the owners . The colliery resumed production and in 1899 was producing 3 @, @ 000 long tons (3 @, @ 400 short tons) of coal a week .

The industrial historians Helen and Baron Duckham consider Universal Colliery to have been " an unlucky mine " . At approximately 5 : 00 am on 24 May 1901 three underground explosions occurred as the night shift was exiting the pit . Because the explosion damaged the pit winding gear , it took time to clear the debris from the pithead to allow rescuers to begin work . They descended at 11 : 00 am and rescued one man , an ostler , found alongside the corpse of the horse he was tending . There were no other survivors and 81 men died . Although the funerals for the victims started four days later , the rescue and recovery operations lasted for six weeks .

The Mines Inspectorate began an enquiry , chaired by the mining engineer Professor William Galloway . The report was published on 15 July . It stated that the mine was hot with high levels of coal dust present . The method used to load coal onto underground trucks created quantities of dust , which had aggravated a small explosion and created a chain reaction of related explosions throughout the workings . An inquest held in the October concluded that various safety precautions had not been followed , and that the mine had been insufficiently watered ? which would have reduced the coal dust held in the air . The colliery had further problems in October 1910 when a heavy roof fall in the Mafeking return released trapped firedamp , which caused the mine to be temporarily evacuated .

In 1906 a major explosion at a colliery in Courrières , northern France , caused the deaths of more than 1 @, @ 000 miners . The subsequent report blamed the accidental ignition of firedamp , exacerbated by coal dust in the air . Concerned that a similar disaster might happen in British collieries , the Royal Commission was formed , reporting back in 1907 , 1909 and 1911 . The reports led to the Coal Mines Act 1911 , which came force into December that year . Among other changes to the health and safety culture , the Act required that ventilation fans in all collieries be capable of reversing the air current underground ; this measure was to be implemented by 1 January 1913 .

In 1913 the colliery was producing 1 @, @ 800 long tons (2 @, @ 000 short tons) of coal a day , and Senghenydd 's population had grown to just under 6 @, @ 000 . No work was undertaken at Senghenydd to implement the requirement , and the Mines Inspectorate gave the management an extended deadline of September 1913 to complete the work , but this was missed .

= = 14 October 1913 = =

At 3 : 00 am on 14 October 1913 , the day firemen descended the pit to conduct the daily checks for gas ; they had three hours to complete their investigations . The firemen for the Mafeking return had to travel more than two miles from the shaft bottom to the workplace . It left insufficient time in which to make a thorough check of the workings ? which involved placing a naked flame into cavities to see if the flame lengthened ? although the historian Michael Lieven states that " the company considered any other form of inspection to be too time @-@ consuming " . Between 5 : 10 and 6 : 00 am 950 men descended the shaft for a shift that was due to last until 2 : 00 pm .

Just after 8 : 00 am an explosion occurred in the west side of the underground workings . It is possible there were two explosions as survivors stated a smaller explosion preceded the main one , although the official report referred only to one . The cause was probably a build @-@ up of firedamp that was ignited by an electric spark from equipment such as electric bell signalling gear . The initial explosion ignited airborne coal dust , and a shock wave ahead of the explosion raised yet more coal dust , which also combusted . Many victims who were not killed immediately by the explosion and fire died from the effects of afterdamp . The explosive wave travelled up the Lancaster shaft to the surface , destroying the headframe ; it killed the winder ? the man in charge ? and badly wounded his deputy .

Edward Shaw , the colliery manager , was on the surface and the remaining shift foremen were still underground and unable to give assistance . He took charge and descended the York shaft , accompanied by overman D R Thomas . The descent was slow , and they had to clear several girders and obstructions before they reached the bottom . They found that the men from the east side of the workings (approximately 450 workers) were unharmed , and their evacuation was ordered . Shaw and Thomas moved to the western side , where they found other men , alive but injured , and arranged for them to travel to the surface . Thomas later reported that the view into the western workings " was exactly like looking into a furnace " .

Shaw explored what he could of the western workings , before he and some of the survivors began tackling the fire . The water pipes from the surface in the Lancaster shaft were all fractured , and hand @-@ extinguishers were used . Shaw returned to the surface at 9 : 30 am to arrange for rescue and fire @-@ fighting teams from neighbouring collieries . From 11 : 00 am the specialist mines rescue teams began arriving at the colliery from the Rhymney and Rhondda Valleys , as did Red Cross workers and local ambulance services ; a police detachment was sent from Cardiff in a special train . Members of the Inspectorate of Mines were quickly on the scene , and an inspector descended to view the mine the same morning .

Lieven recounts how the rescue parties " in their desperation , ... were reckless with their lives " in their attempts to find survivors ; many were injured in small roof collapses , or suffered the effects of carbon monoxide poisoning . Their endeavours saved lives throughout the remainder of the day and into the night , including a group of 18 men found at around 1 : 00 am . They were the last survivors found . A total of 432 miners had died that day ? although some bodies were not found until later ? and 7 others died later in hospital or at home . A journalist from The Times wrote : " The numbers are truly awful . We talk in awed terms of the decimation of a regiment in a bloody battle , but here a great community engaged in the pursuit of a peaceful vocation is threatened with the loss of at least a quarter of its able bodied manhood " . On the surface the townsfolk waited for news ; a reporter for The Dundee Courier thought : " the scene at Senghenydd last night was depressing in the extreme . The streets were full of silent throngs of people who moved aimlessly about or stood stolidly at the street corners . "

= = Rescue , fire @-@ fighting and recovery : 15 October to 30 November = =

Work continued throughout the night of 15 October and into the following day . It focused on finding survivors and fighting the fire that blocked the entry into some workings of the western returns . The fire caused the roof supports to become unstable , and falls triggered outbursts of methane . Several rescuers were injured by the falls , one fatally . Before descending the mine many of the firefighters wrote what they thought might be their last letters home , and some made their wills . As the water pipe in the shaft was out of operation , fire @-@ fighting continued with hand extinguishers and work

was only possible in 20 @-@ minute shifts . Despite wearing respirators , several rescuers were overcome by the effects of firedamp . During the course of the day , 56 bodies were raised to the surface and , that evening , a new water supply , connected by three @-@ quarters of a mile (1 @.@ 2 km) of pipes to a nearby reservoir , was installed in the Lancaster shaft .

Reginald McKenna , the Home Secretary , visited the colliery on 15 October representing King George V , who was attending the marriage of Prince Arthur of Connaught and Princess Alexandra , 2nd Duchess of Fife . The king sent a £ 500 donation to a disaster relief fund , while the royal couple displayed their wedding presents at St James 's Palace and charged a shilling for entrance , raising £ 1 @,@ 200 for the fund . The fund was started by the Lord Mayor of Cardiff , while another collection , the Mansion House Fund set up by the Lord Mayor of London , raised more than £ 3 @,@ 000 on its first day .

William Brace , the local MP speaking on behalf of the South Wales Miners ' Federation , announced on 16 October that the priority would be given to putting out the fire and that no more search parties would be looking for survivors . Brace observed that the fire was blocking the western workings and consuming the oxygen in the air , making it unlikely that anyone was left alive . Progress in tackling the fire over the previous days had been slow , and it had only been extinguished in the first 30 yards of the roadway ? still two miles (3 @.@ 2 km) from the coal face . Two coroner 's inquests were opened : one in Senghenydd for the men who died in the colliery , and one in Cardiff for those who had died in hospital ; both were adjourned the same day . The first funerals took place the following day , Friday 17 October . An estimated 150 @,@ 000 mourners gathered for the 11 men buried on the Saturday and 8 on the Sunday .

The firefighters built bashings , walls of sandbags , turf and sand , approximately 18 feet (5 @.@ 5 metres) deep and 17 feet (5 @.@ 2 metres) up to the tunnel 's roof to prevent smoke filling the rest of the workings and allow men to explore areas previously cut off . Within two days the temperatures dropped and the volume of smoke was reduced . Although the fire was contained , miners still faced several obstacles , including roof collapses and large pockets of trapped firedamp . The first collapse consisted of more than 100 tons of debris , while another fall was more than 300 feet (91 @.@ 5 metres) long and 30 to 40 feet (10 ? 12 metres) high . Clearing the falls and finding bodies was slow , and it took until 8 November for the first of the 4 working districts to be explored and cleared of bodies . Many victims were unidentifiable ? either the explosion , fire or subsequent decomposition had taken its toll ? and many had to be identified by their personal effects , although some bodies remained unidentified .

By 17 November the Mafeking and Pretoria districts had been fully explored , with more than 200 bodies raised to the surface in the preceding two days . On 20 November an official announcement reported that 439 miners had died , of whom 33 were still unaccounted for . Toward the end of the month , the men voted to return to work , even though the western workings were still out of action and 11 bodies were still missing .

A photographer , W Benton , took a series of photographs as the disaster unfolded , and later published them as a set of postcards . Their publication is described by the National Library of Wales as " an excellent example of early photo @-@ journalism " . The photographs came with a caption , shown below :

= = Aftermath = =

The Senghenydd explosion remains the worst mining disaster in Britain . The deaths of 440 men on a small community had a devastating effect ; 60 victims were younger than 20 , of whom 8 were 14 years old ; 542 children had lost their fathers and 205 women were widowed . The impact on individual households was great : 12 homes lost both a father and son , 10 homes lost two sons each , while the death of one father and son left an 18 @-@ year @-@ old daughter to raise her 6 siblings alone ; another woman lost her husband , 2 sons , a brother and her lodger .

The inquiry into the disaster opened on 2 January 1914 with R A S Redmayne , the Chief Inspector of Mines , as the commissioner ; he was assisted by two assessors , Evan Williams , the chairman of the South Wales and Monmouthshire Coal Owners Association , and Robert Smillie , the

president of the Miners ' Federation of Great Britain . The inquiry ran for three days before being adjourned to allow for the coroner 's inquest to run at Senghenydd . It reopened on 27 January and ran until 21 February . Over the 13 days it heard evidence , 21 @,@ 837 questions were put to 50 witnesses . The coroner 's inquest chaired by David Rees lasted for 5 days from 5 January 1914 . A total of 9 @,@ 000 questions were put to 50 witnesses , and the jury returned verdicts of accidental death .

The inquiry report failed to identify a definite cause , although it was considered that the most likely cause was a spark from the signalling gear . It would have ignited the firedamp , exacerbated and fuelled by coal dust in the air . The report was critical of many aspects of the management 's practices , and considered it had breached the mining regulations in respect of measuring and maintaining the air quality in the workings , and in the removal of coal dust from the tracks and walkways . The report pointed out that because the management had not implemented the changes needed to the ventilation fans as demanded by the Coal Mines Act 1911 , the fans were unable to reverse the direction of the airflow , which would have blown the smoke out through the Lancaster shaft , although Redmayne and his colleagues held differing opinions on the advisability of reversing or stopping the airflow . The historian John H Brown , in his examination of the disaster , states that had the airflow been reversed , firedamp or afterdamp could have been extracted from some sectors into the blaze , causing another explosion .

Further criticism was directed toward the emergency procedures . The lack of respirators at the mine was deemed to have cost lives . The lack of an adequate water supply for fire fighting was criticised , and Redmayne wrote : " I should have thought , in view of the fact that the colliery was such a gassy one , and it had already been devastated by an explosion , that the management would have made arrangements for a supply of water adequate to meet an emergency of the kind that actually occurred . "

Shaw 's actions were described by Lieven as those that " gained him a degree of respect from the local mining community which remained over the years ; they probably also cost the lives of scores of miners . " The Duckhams describe Shaw 's inaction in fixing the ventilation fan before the explosion , as well as his delay in sending for assistance from rescue teams until he exited the mine an hour and a half after the explosion . The official report considered there had been a " disquieting laxity in the management of the mine " , although Shaw was described by the Duckhams as " undoubtedly a highly capable manager " . The report led to Shaw being charged with 17 breaches of the Mines Act 1911 , and four charges were made against the company . Shaw was found guilty of failing to keep adequate environmental records and failing to replace a broken lamp locker ; he was fined £ 24 . The company was convicted of failing to provide a ventilation system that could reverse the airflow and was fined £ 10 with £ 5 5 shillings costs . One newspaper , Pioneer , calculated " Miners ' Lives at 1 / 11 ? 4 each " (1 shilling 11 ? 4d or 51 ? 2p each) .

After it reopened the colliery never reached the same levels of employment as before the explosion . William Lewis died in August 1914 ; Shaw continued as manager of the mine until November 1928 , when it closed .

A stage play based on the disaster , by the journalist and broadcaster Margaret Coles , was first performed at the Sherman Cymru , Cardiff in 1991 . The disaster at Senghenydd has provided the backdrop to two printed works of historical fiction : Alexander Cordell 's *This Sweet and Bitter Earth* (1977) and *Cwmwl dros y Cwm* (2013) by Gareth F Williams .

In 1981 a memorial to those lost in the disaster was unveiled by the National Coal Board . Based outside Nant @-@ y @-@ parc Primary School , which is built on the site of the former colliery , the monument is a 20 feet (6 m) high replica of the colliery 's winding gear . A second monument was unveiled in 2006 to the dead from both the 1901 and 1913 explosions .

On 14 October 2013 , the centenary of the disaster , a Welsh national memorial to all mining disasters was unveiled at the former pithead . Funded by the Aber Valley Heritage Group and their patron Roy Noble , with matched funding from the Welsh Government , a bronze statue by Les Johnson depicting a rescue worker coming to the aid of one of the survivors of the explosion , was unveiled by Carwyn Jones , the First Minister of Wales . Jones said : " Mining is central to the story of Wales . It has shaped our history and communities and its social and physical legacy is still with

us to this day It is only right that we have a permanent memorial . "