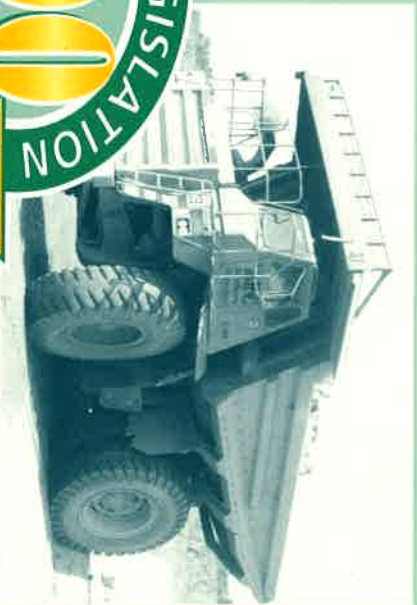


HEALTH AND SAFETY IN QUARRIES

A Hundred Years of Law



Foreword



This book leads us through a century of quarrying history. Its purpose is not only to commemorate the 100 years but to help its readers recognise the contribution which the laws of the land, the inspectorates, quarrying companies and the advance of technology have made on the long journey towards a productive, healthy and safe industry.

In the early days of quarrying there was little machinery to do the work and most of it was heavy and manual. Working in all weathers and paid only for what they produced quarrymen suffered terribly. Drilling blast holes in hard rock with hand tools (jumpers), blasting the rock with explosives

paid for out of meagre wages, slewing the rail track and loading the wagons by hand must have been body and soul destroying. Many workers fell victim to the diseases of the day such as tuberculosis. Those who survived ill health daily ran the gauntlet of rock falls from the quarry face and other workplace risks which would be unthinkable today. Whoever coined the phrase "the good old days" could not have been thinking of quarrying at the turn of the century.

So what are the messages? One at least is very clear, that if the lessons of the past are forgotten or ignored we run the risk of repeating them in the future.

Quarrying had its fat years in the boom times of the 1970s and 1980s. In the lean years which followed the industry learned that managing the health and safety of its workforce and economic survival and growth can be mutually consistent. The rewards of putting that lesson into practice are still to come.

A handwritten signature in dark ink, appearing to read "Eric Darlow". The signature is written in a cursive, flowing style.

Eric Darlow
Head of Quarries Inspectorate



CHAPTER 42.

An Act to provide for the better Regulation of Quarries. A.D. 1894.

[25th August 1894.]

BE it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. This Act shall apply to every place (not being a mine) in which persons work in getting slate, stone, coprolites, or other minerals, and any part of which is more than twenty feet deep, and every such place is in this Act referred to as a quarry under this Act.

2.—(1) The provisions of the Metalliferous Mines Regulation Act, 1872 and 1875, and the Metalliferous Mines (Isle of Man) Act, 1891, specified in the schedule to this Act, shall, subject to the modifications therein specified, apply in the case of every quarry under this Act in like manner as they apply in the case of a mine. (2) The inspectors under the Metalliferous Mines Regulation Act, 1872 and 1875, shall be inspectors of the quarries under this Act.

(3) In the appointment of such inspectors in Wales and Monmouthshire among candidates equally qualified persons having a knowledge of the Welsh language shall be preferred.

3. In the application of the Factory and Workshop Acts, 1878 Modifications to 1891, and of any future Act amending the same to quarries under this Act, the following modifications shall be made:—

(a.) In every such quarry the powers of the inspectors under those Acts shall be transferred to and exercised by the inspectors under the Metalliferous Mines Regulation Acts, 1872 and 1875:

(b.) Sections thirty-one and thirty-two of the Factory and Workshop Act, 1878, shall not apply to any such quarry;

(c.) Nothing in section fifty-eight of the Factory and Workshop Act, 1878, shall prevent the employment in any such quarry of young persons in three shifts for not more than eight hours each.

4. This Act shall come into operation on the first day of January, one thousand eight hundred and ninety-five.



George Naden was still working at the age of 74 when this picture was taken (1931).

HEALTH AND SAFETY IN QUARRIES

A Hundred Years of Law

Quarrying is one of the oldest occupations in the world. It started with early man digging for flints and laboriously chipping them into shapes and, since these provided the first crude weapons and implements, it could be said that rock helped to generate man's development as a species.

The word 'quarry' derives from the medieval Latin 'quareria' ultimately answering to the verb quadrare - to square (stones) and came into English usage, initially with variants of 'querry', about 1420.

Despite these early beginnings the quarrying industry was comparatively late in having it's own specific legislation. Factory law had gradually developed from the Health & Morals of Apprentices Bill of 1802 and mining law from the 1842 Mines Bill. By the 1890s these had

become more comprehensive and the principle of inspections by the government appointed officials, if not generally welcomed, was well established.

Quarries were first mentioned in the Factory and Workshop Act of 1878 and defined as: "Any place, not being a mine, in which persons work in getting slate, stone, coprolites* or other mineral" (*fossil dung).

Under this Act quarries were classed as factories if power was used to aid the process of quarrying or as workshops if no power was used or was used solely for hauling and pumping. The vast majority of quarries fell into the workshop category and, particularly if no young persons were employed, were practically exempt from any legal controls. The number of quarries had been compiled from information generally received from local constables and the actual total was unknown.

The Quarries Act of 1894, which came into force on 1 January 1895, followed on the report of a Departmental Committee called the Open Quarries Committee. It was the first attempt to exercise any real control over the working of quarries as the Factory and Workshop Act was primarily designed to deal with entirely different industries.

The Quarries Act transferred inspection duties from the Factory Department of the Home Office to the Mining Branch. It only applied to quarries over 20 feet deep as it was considered that Mines Inspectors would be swamped with work if all quarries were included. There were endless arguments with some quarry owners who were perfectly content with a system where they rarely, if ever, saw an inspector. Some owners of chalk and sand and gravel quarries argued that the substances they excavated were not minerals as defined by the Act. This argument received short shrift although the owners probably felt that it was worth trying. In addition, so many differences of opinion arose as to how the 20 feet depth was measured in borderline cases that the Law Officers of the Crown had to be consulted for an opinion.

They produced a diagram (*Figure 1*) and ruled height of a face was DB and not BE or BF as by many quarry owners who doubtless based argument on the principle that the shortest between two points was a straight line.

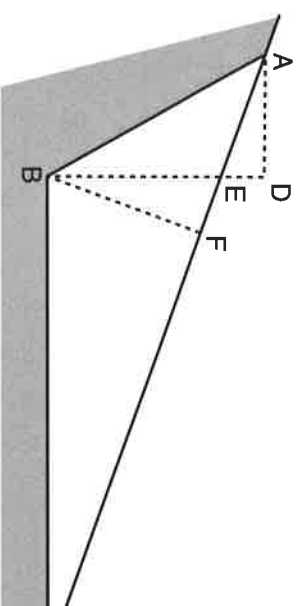


Figure 1

The Quarries Act did not apply beyond the margin excavation apart from any machinery used for working the quarry. The numerous people engaged in processing and preparing the mineral within an distance of one mile of the quarry still came under the Factory and Workshop Act and certain provisions still applied within the excavation itself. This was applied in total to quarries less than 20 feet in

The main requirement of the Quarries Act was that it gave the power to establish Special Rules for the purpose of reducing the dangers connected with the industry. A code of Special Rules had been drawn up by the Open Quarries Committee and later modified by the Mines Department. These Special Rules dealt with six matters:

1. The safety of the quarry
2. Blasting
3. Access to the quarry
4. Machinery and plant
5. Duties of officials and workmen.
6. Ambulance

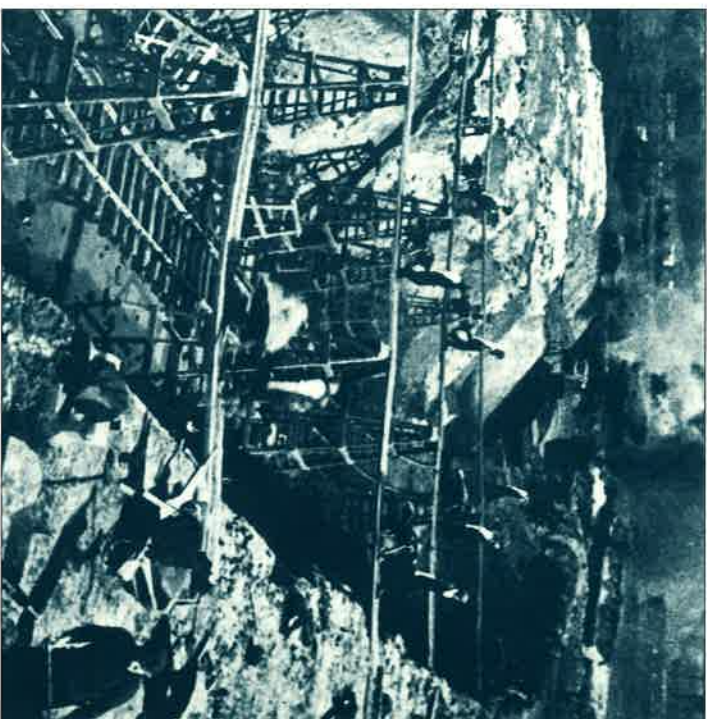
The Inspector in charge of each mining district tried to establish Special Rules at all principal or important quarries in his district. However, it is not clear how he decided which quarries met these criteria and there was certainly a marked lack of enthusiasm towards the Rules in some areas. One Inspector reported in 1896 that he had not been very successful in establishing Special Rules in his District as many owners considered them unnecessary and too stringent.

The Quarries Act required that certain provisions of the Metalliferous Mines Regulations of 1875 applied to quarries. These included the notification of accidents and annual returns of persons employed and minerals produced. From the first year of the Quarries Act coming into force quite detailed statistics were produced in the annual reports of the Inspectorate. Those for 1895 record that there were about 105,000 persons employed at 8,000 quarries over 20 feet deep. These produced approximately 30 million tons of mineral with a net value of some £5 million. These figures are doubtless on the low side owing to the reluctance of some quarry owners to submit returns although this was gradually overcome by the Inspectorate's readiness to prosecute the laggards.

Present day companies and managers may bemoan the use of enforcement notices and the occasional prosecution but their early predecessors had far more cause for complaint in this respect. The Chief Inspector's report for 1895 records that as the Quarries Act had just come into force much leniency was displayed towards owners and agents. However, this leniency did not prevent three successful prosecutions being taken against owners that year with fines totalling £4,16.0.

One of the cases was for not sending in a statutory notice and two for the apparently heinous crime of not posting up an abstract of the Act. The following year Inspectors, warning to their task, took 20 prosecutions against owners for various infringements of the Act. A further 13 were taken against workmen for breaches of the Special Rules regarding explosives. Thereafter, enforcement of the Act was applied with great gusto. In the first 10 years of it coming into force almost 500 prosecutions were taken against owners and 100 against workmen. The average fine for the latter was 15 shillings which probably represented the greater part of a man's wages for a whole week.

Quarrying was a dangerous occupation and, in the 10 years following the coming into force of the Act, 1,150 persons were killed and over 12,000 seriously injured. Apart from the fact that quarries less than 20 feet deep were not included, the figures are probably low due to the under-reporting of accidents. During this ten year period the death rate per 1,000 employed in quarries was almost consistently higher than that for underground workers in coal mines.



Stripping overburden by the plank and barrow method. This method was in use as recently as 1936.

The vast majority of quarries were hand worked and excavations were deep as this reduced the need for costly and unproductive removal of overburden which was often

left to the edge of the face. When absolutely necessary it was removed by wheelbarrow along narrow planks supported on timber trestles sometimes up to 40 feet or more in height and it was claimed that speed in wheeling the barrows could be increased by bouncing the planks. To economise in the use of explosives it was often the practice to undercut the face to induce falls. Large numbers of men worked close to the face and over 40% of fatalities in the first ten years were due to falls of ground.

The use of explosives was also a major cause of accidents and 112 fatalities were reported in the same ten year period. In many cases workmen had to buy their own explosives and, although prohibited in the Special Rules, there was wide recourse to such economies as using straw fuses and other home made devices. There was little control in many instances and explosives were used by almost all and sundry in the quarry. Primary blasting was usually either by springing shots or tunnel blasts sometimes referred to as monster or mine blasts. In springing, repeated charges were fired at the bottom of a single hole with the object of forming a chamber which was finally filled with explosive and fired.

The results were unpredictable and the method was the cause of numerous fatalities, sometimes two or three in the same incident, usually caused by premature explosions from remnants of smouldering fuse. Tunnel blasts entailed driving small tunnels into the foot of the face and forming chambers which were packed with explosive. It was often the practice to make a public spectacle of these blasts with visitors invited along to watch the event. In 1886 many people, who had entered a quarry to see the results of a tunnel blast, were overcome with fumes and seven died. Gunpowder was the most predominant explosive and formed 80% of the 2,200 tons of explosive used in quarries in 1909. Gelatine explosive was required to be softened in the winter months but the use of warning pans, stipulated in Special Rules and in notices sent to every quarry for display in 1902, was often ignored. Explosive cartridges were frequently heated over open fires with the inevitable result. There were often accidents from projected rock, trying to un-plug misfires and ramming with steel bars. The Special Rules relating to explosives were repeatedly flouted despite numerous prosecutions of both owners and workmen.

Access to the quarries was another frequent cause of accidents. It was often by ladders or in some cases by inclined haulage, aerial ropeway or cages sometimes operated by water balance where two water tanks alternately filled and emptied. Stipulations made under the Special Rules were often disregarded especially in quarries several hundred feet deep. In these cases, riding in a skip at the end of a working day was much preferable to climbing endless ladders which could, as one report sympathetically stated, "put considerable strain on the heart". On the other hand, aerial ropeways were a source of danger even when used for the normal purpose of extracting mineral, as a report for 1897 records: "When one pictures a wagon full of slate or stone dangling from a wire rope and swaying in its ascent, what is more natural to expect than that from time to time a piece will drop off and endanger the persons working on the floor of the quarry below".

Fatal accidents also regularly occurred to members of the public. These were usually as a result of falling into the excavations at night often whilst engaged in poaching or other nocturnal activities although it was reported that the four killed in 1898 were intoxicated.



Means of access to benches at a monumental quarry.

The Quarry Fencing Act of 1887 required that any quarry dangerous to the public in open land within 50 yards of a highway or place of public resort should be adequately fenced. Local authorities, usually sanitary inspectors, had the duty of enforcing this Act but, like other legislation, it was often disregarded.

The accident rate in quarries was therefore, as in other industries, a cause of widespread concern and, in order to provide more detail of the overall situation, the Notice of Accidents Act was introduced in 1906. This extended the requirement to report non-fatal accidents to include those disabling for more than seven days. The Act also required certain categories of dangerous occurrences to be reported.

Over the years, accidents and incidents in quarries had also been marked by acts of bravery and in 1907 King Edward VII issued a warrant for the institution of the Edward medal for acts of gallantry in mines & quarries. One of the first to be awarded in the quarrying industry was to William Roberts, quarryman at Dorothea Slate Quarry, North Wales for gallantry in rescuing a fellow worker.

In 1910 a Royal Commission on Metalliferous Mines & Quarries was appointed to inquire and report into, among other things, what steps could be taken for the health and safety and for the better prevention of accidents for those employed in quarries. Urfah Lovett, Secretary of the National Union of Quarrymen, was one of 9 members of the Commission which inspected many quarries and interviewed owners, managers and workmen during the course of the inquiries.

The Commission's report, published in 1914, recommended that quarry managers should not be less than 25 years of age, possess a qualifying certificate and limited as to the number of quarries they were allowed to manage at any one time. The manager was required to be made responsible for the control, direction and management of the quarry. He was also to exercise daily personal supervision and to be liable, together with the owner, for the observance of the Act and Regulations. Representatives of the workmen who were interviewed were almost wholly in favour of certificates for managers. They expressed the view that, in many cases, management was in the hands of persons who were better acquainted with the commercial rather than the working

The workforce at Croft Quarry 1900. Taken when C. Robotham was made manager.



side of quarries so that safety did not receive its proper share of attention. On the other hand, owners and managers were much divided in their opinions and the report records the emphatic statement of one owner that: "Certificates would never do in the Highlands although they might be a good thing for the younger generation".

The report also included the following recommendations:

1. The 20 feet deep rule be abolished, the Factory Act cease to apply to quarry processes and all quarrying operations to come under a revised Quarries Act. Notification to be given to the Inspectorate of the opening and abandonment of all quarries so that adequate records could be maintained.

2. Some quarries, especially slate, had for years been classed as metalliferous mines and this was a particular bone of contention with the owners. The commission considered that the only logical division would be to class those excavations open to the sky as quarries and those underground as mines.

3. A daily examination to be carried out of the quarry face and overburden and a report of the examination made and signed.

4. All new galleries (benches) should not be more than 60 feet high and existing galleries, more than 100 feet high, reduced to 60 feet where practicable and the use of ropes, for men working on the face, to be made compulsory.

The report contained stringent recommendations regarding the use of explosives and suggested that the requirements be combined in a single, comprehensive set of regulations. The Commission felt that explosives, fuses and detonators should be subject to Government tests and that explosives be supplied solely by the quarry owners together with suitable places for storage. Other recommendations covered the procedure for dealing with misfires, springing shots, heading blasts, warnings and the provision of shelters.



Dressing down a face from ropes.

The Report also recommended that provision be made for messrooms with facilities for heating food and boiling water and also that accommodation be provided for drying clothes. Attention was drawn to the fact that where any accommodation was provided at quarries it was, in many cases, very rough. Some owners were inclined to think they were unnecessary because, even if provided, they would not be used.

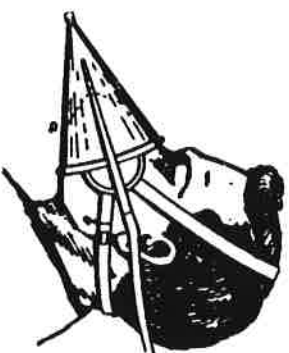


Figure 2

The Commission also examined the use of safety goggles and the harmful effects of silica dust on the lungs particularly in the slate and dressed granite sectors which formed a major and powerful part of the quarrying industry. The Chairman of the Commission had even designed a respirator (*Figure 2*) fed with air which issued from the pointed nozzle and blew away dust in the front of the wearer.

Many of these proposals were quite radical at the time but, with the start of the first world war, were not progressed and some of the recommendations were not contained in legislation until 40 years later. In fact the stipulation of an age limit for managers, at quarries where explosives are used, was not introduced until 1988.

By the end of the war, with many men swept into the armed forces, the number of employees had dropped by almost half to around 43,000, the number of quarries to 4,300 from approximately 7,000 and annual production down by one third to 32 million tons. The position gradually improved during the inter-war years and by 1938 annual production was up to 104 million tons from 6,500 quarries with a workforce of 76,000.

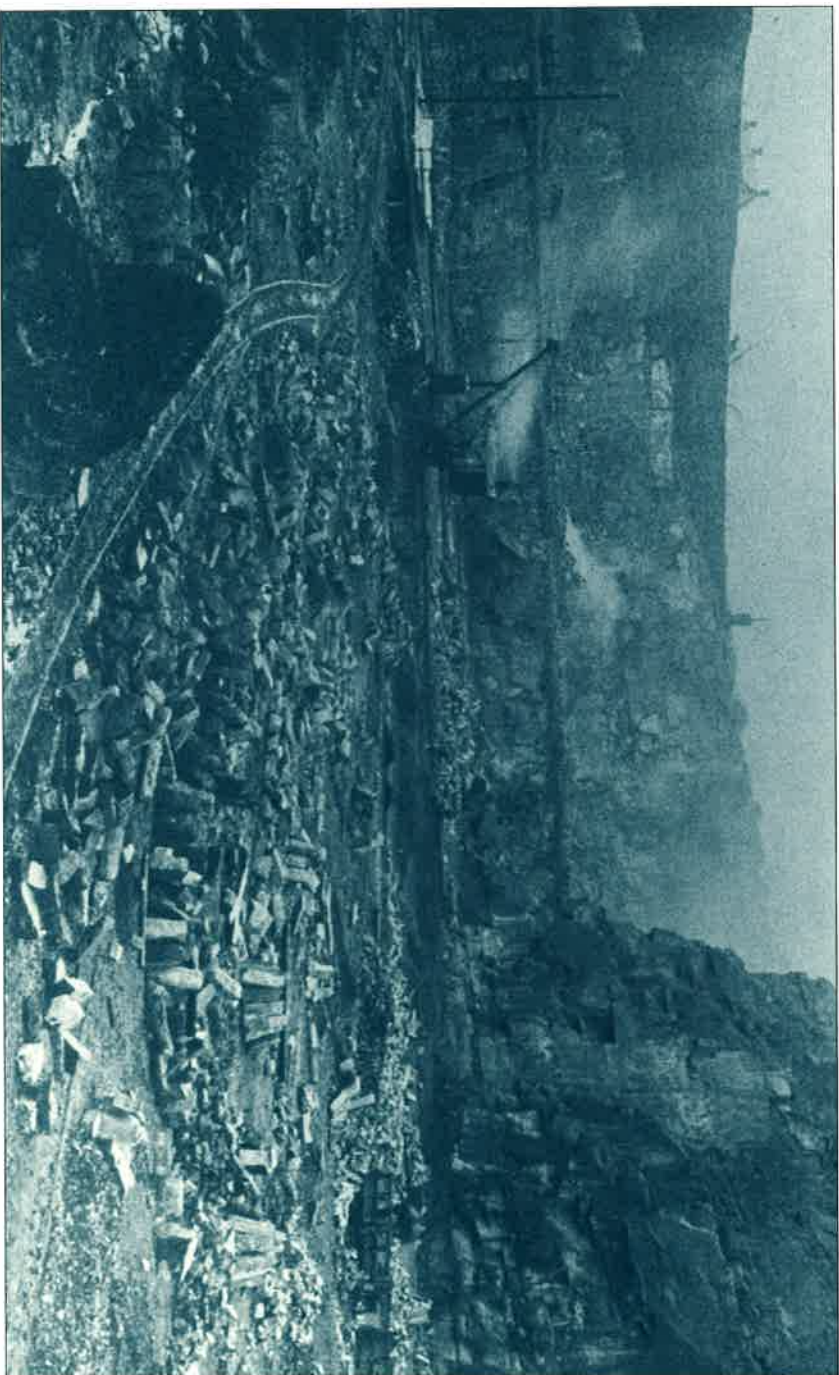
Many of the quarries were small and a large number were owned by local authorities and worked infrequently when there was demand in a particular area. One of the first excavators had been introduced in 1895 and their use gradually extended but not without opposition, in some instances, from the quarrymen who saw it as a threat to their jobs. However, at the vast majority of quarries the



Hand loading at the quarry face - 1930s.

mineral was still hand broken and loaded into narrow gauge rail trucks. Crushing and screening plants were becoming more commonplace at the large roadstone quarries but, at many, crushed material was still produced by hand knapping with hammers, usually to pass through a 2 inch size mesh. This was either done at the quarry or at the roadside and the men paid by assessment of the size of the heap.

Quarry excavation activities 1903.



This could be judiciously increased by either burying large stones or an upturned wheelbarrow and/or cutting a

One man recalls hand knapping in this producing an average of 4 tons per day at 2

The high level of accidents continued and, in the 20 year period 1919 to 1938, there were 1,249 fatalities. 500 of these were due to falls of material from the face and 118 by men falling from ledges whilst barring down or drilling. A further 118 deaths were caused by the use of explosives although there were developments which would result in improved safety in this field. In 1925 some primary blasts were fired using cordeau detonant (the forerunner of detonating fuse), a lead tube filled with TNT. A report stated that this would seem to definitely prevent the misfire of any part of the charge. This statement, however well intended, was premature as failure of the fuse ten years later was considered the cause of a misfire in a tunnel blast. Subsequent remedial action killed two men and seriously injured three more. Low freezing explosive, dispensing with the need for cartridges to be softened by heating, came onto the market in 1925 and, three years later, represented about 20% of the 2,800 tons of explosives used in quarries.

Steam formed the principal motive power and accidents due to boiler explosions were frequent. Investigations into the failures were carried out by inspectors of the

Board of Trade and, apart from any legal proceedings that might be taken, the owners were frequently charged for the cost of the investigation. Electricity was gradually being introduced and, for some years, annual reports recorded the total electrical horse power used and this had risen to 170,000 h.p. by 1937. Large electrically driven excavators were coming into use and in 1935 a memorandum was issued by the Inspectorate giving a specification for such matters as trailing cables, earthing and the design of sockets for these machines. The electrical installation at many quarries was often rough and ready and the Quarries General Regulations (Electricity) came into effect in 1938. These laid down requirements for electrical cables and equipment although some of these were relaxed due to shortages caused by the war and did not come into effect until 1954. The Regulations also stipulated voltage restrictions for portable tools and for tests of the circuits and equipment to be carried out at six monthly periods.

In 1924 a new code of Special Rules was drawn up to include some of the recommendations of the 1914 Royal Commission. Specific versions of the rules were also

introduced, after consultation with owners and managers, to reflect the different working conditions in some sections of the industry such as iron ore, slate and granite. Special Rules were also drawn up for the protection of persons employed at quarries where the mineral had a high silica content and these required the use of water sprays and exhaust ventilation but progressing these matters was disappointing. In 1932 the Department of Science and Industrial Research started work on the design of a suitable respirator and after extensive trials a Mark IV, stated to be comfortable and efficient, was available in 1938. At some quarries the men had their own preference and, at one producing ground lime, a long linen hood tucked into the waistcoat was used (*Figure 3*). At another quarry the use of a woman's silk stocking, drawn over the head and again tucked into the waistcoat, found particular favour with men. Reports do not state whether demand exceeded supply.

The Factories Act 1937 came into effect on July 1938 and, as the general provisions of this Act did not apply to quarries, it resulted in several important



Figure 3

changes. All quarries, regardless of depth, were now brought under the Quarries Act together with any processes for the preparation for sale of the minerals. However, any manufacturing processes on quarry premises were still subject to the Factory Act and, where these processes formed part of the main plant, the whole plant would be included and only the excavation would come under the Quarries Act.

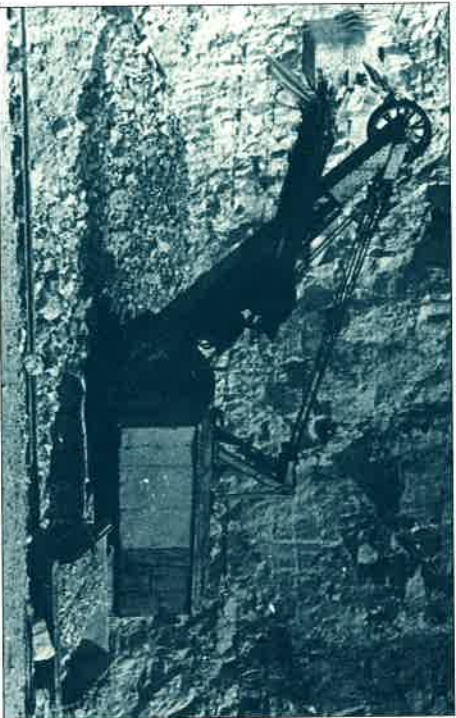


Processing plant circa 1940.

In the light of these changes the Quarries General Regulations 1938 came into force and these introduced general rules for the safe working of small quarries. The Regulations also brought in requirements for all quarries regarding fencing of machinery, the equipment and inspection of steam boilers and lifting machines, health and welfare and the provision of first aid equipment.

Special Rules established at most quarries over 20 feet deep, still remained in force and although it was the intention to revise the overlap between these Rules and the General Regulations this was postponed indefinitely with the outbreak of the Second World War.

Production, which again had fallen during the war years, increased to 137 million tons in 1950. There was a severe labour shortage and men were understandably reluctant to work in quarries when better pay and working conditions were widely available elsewhere. Mechanisation, already well established in many quarries, started to replace the labour intensive hand working. Purpose built dump trucks, usually strengthened lorries, were available together with small machines of about 5 tons capacity, which had to be charged against a stop block to tip. Many quarries utilised ex-service vehicles or lorries considered to have finished a useful life on the road and were to be seen, often minus doors and windscreen, and with brakes and steering which could, at best, be described as dodgy. The first loading shovels, basic farm tractors with a 1/2 ton capacity rope operated bucket, also started to appear on the scene.



Old excavator in action at the quarry face.



Early quarry dumper.

The opencast coal industry had been exempt from quarry law by the Quarries (Opencast Coal Workings) Order 1942 but this exemption was withdrawn on 1 June 1950 known, for some reason, as Vesting Day. During this 8 year period these quarries had become highly mechanised and produced over 75 million tons of coal.

The Mines & Quarries Act 1954 came into force on 1 January 1957. It repealed the Quarries Act of 1894 and simplified quarry legislation which had become confused and overlapping through the years. This Act brought in the statutory appointment of individuals and the requirement that no quarry should be worked unless a manager had been appointed to exercise close and effective supervision over all operations. The Act covered, amongst other matters, safety health and welfare, notification of accidents, employment of women and young persons and powers of inspectors. It placed wide responsibilities on owners and managers and was a major advance in quarries legislation.

A number of regulations came into force in the latter half of the 1950s:

1956 - Updated versions of the 1938 Electricity and General Regulations.

1958 - Ropeways and Vehicle Regulations which covered man-riding in conveyances on ropeways and vehicles running on rails.

1958 - Gravel and Sand Overhanging Exemption Regulations with requirements where gravel was normally dug from under water.

The last two regulations introduced, for the first time, a requirement for the quarry manager to draw up written rules to cover the safety aspects of an operation and to issue copies to the employees concerned.

By 1960 annual production had risen to around 200 million tons with a workforce of 50,000 but the number of accidents in the previous ten years remained

high with 437 men killed. The pattern however was changing and, although there were 110 fatalities from falls of ground, the proportion of the total was much reduced. Improved drilling equipment, lower bench heights and mechanisation was gradually reducing the need for large numbers of men to work on or near the quarry face.

Bottom hole drilling 1951.



The proportion of accidents due to the use of explosives was also falling although 27 men were killed from this cause during the ten year period. This reduction was due to improvements in explosives and initiation systems and the reduced number of men handling explosives. The Quarries (Explosives) Regulations 1959 placed stringent requirements on the use of explosives and replaced the old Special Rules.

A competent person had to be appointed by the manager who was required to draw up shoftfiring and mis-fire rules. The regulations, amongst other matters, limited the number of fuse lighting points for one man in secondary blasting, to not more than six. At many quarries it was the practice for a large number of men to have to light several hundred fuses. Failure to reach shelter before the first shots started to detonate, which often required an Olympic turn of speed, was the cause of numerous accidents. The subsequent gradual introduction of drop balls and hydraulic breakers practically eliminated this hazard.

With mechanisation, the major cause of accidents was now due to haulage and transport and accounted for

260, almost 60% of the total fatalities for this ten year period. Concern at this new development led to the Quarries Vehicles Regulations 1970. Under these, drivers of quarry vehicles had to be authorised by the manager who was required to draw up vehicle rules for issue to drivers and everyone concerned with the operation of vehicles at the quarry.

October 1966 saw the tragic disaster at Aberfan when a colliery tip slid down a mountainside and engulfed a village school and adjacent property. One hundred and sixteen young children and 28 adults died. The Mines & Quarries (Tips) Act 1969 and the Tips Regulations 1971 followed and these laid down stringent requirements covering the stability and safety of tips of refuse from a mine or quarry and applied whether the refuse was in a solid state or in solution.

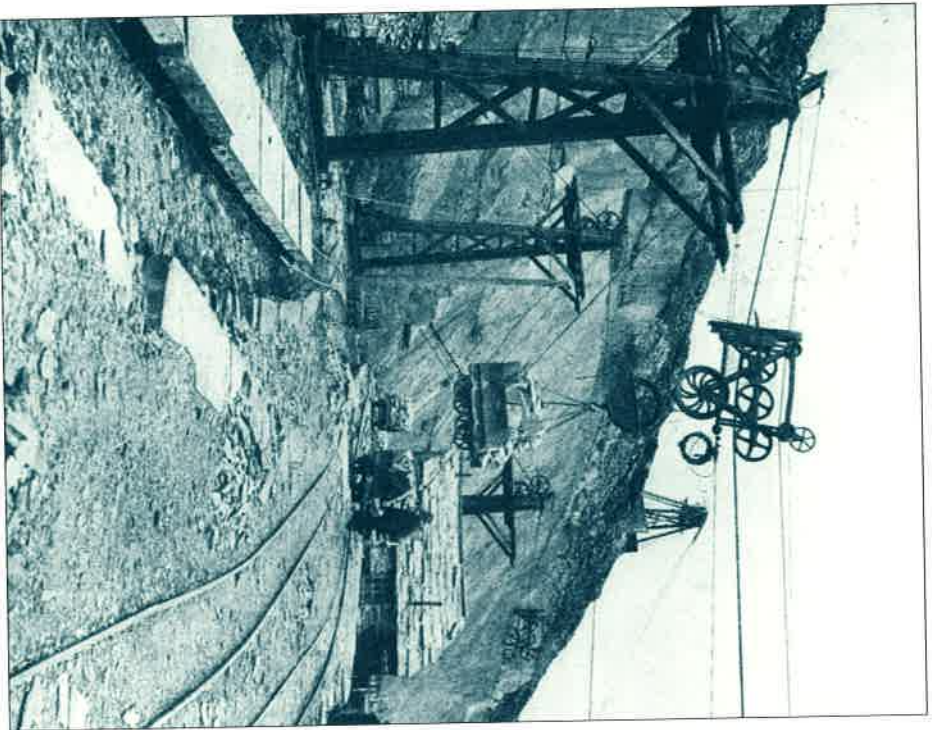
In 1970 a Committee was appointed, under the chairmanship of Lord Robens, to review the provisions made for the health and safety of persons in the course of their employment and to consider whether changes were needed. It was the most intensive investigation into

health and safety ever carried out in the UK and the report, published in 1972, led to the Health & Safety at Work etc Act 1974. The Health & Safety Commission was formed and the majority of the Inspectorates brought together into the Health & Safety Executive. The Act brought an entirely different concept to legislation. It introduced regulations supplemented by approved codes of practice and guidance notes with, in addition, informative publications giving information in a readable format instead of previous stilted wording. The Robens Report contained the statement: "The primary responsibility for doing something about the present level of accidents lies with those who create the risks and those who work with them". The requirement for an employer to make an assessment and consult the employees, which is contained in most regulations under the Health & Safety at Work Act, reflects this philosophy.

Through the 1970s and 80s mechanisation at quarries continued with vehicles and processing plant increasing in size and capacity. Many of the small quarries and family firms disappeared as they were closed down or



Early slate splitting.



'Blondini' crane, load being received.

amalgamated into large groups and the concept of the mammoth or super quarry, producing in excess of 5 million tonnes per day, started to emerge. Accidents due to the use of vehicles now predominated and accounted for over 50% of the 248 fatalities in the 20 year period from 1971 to 1990. A particular cause for concern was that the increased size of vehicles created a hazard by restricting visibility from the driving position.

Accidents from the use of explosives gave a much more encouraging picture and, although there were five fatalities, these all occurred in the first half of the 20 year period with none in the last 10 years. A cause for concern however was the number of incidents of projected material outside the boundaries of quarries as a result of shotfiring operations. These became reportable as a dangerous occurrence in 1981 and an average of 20 incidents a year were recorded. Over half of these were for projected distances of over 250 metres up to a maximum of 900 metres, with rock projected onto housing, factories, roads, schools and sports facilities. The Quarries Explosives Regulations 1988 came into effect on 1 January 1990 and were the

first regulations to be made under the Health & Safety at Work Act which applied only to the quarrying industry.

The Regulations required a specification to be drawn up giving full details of each blast including a profile of the quarry face in front of each shothole. They also stipulated the qualifications required for managers and shotfitters including evidence that they had successfully completed an accredited course of training. Since the Regulations came into full effect the number of reported incidents of projected rock have dropped from an average of 20 to 8 per year.

New sets of regulations, usually applicable to industry in general, followed the coming into force of the Health & Safety at Work Act with many based on EC Directives. The regulations included first aid, reporting of accidents, diseases and dangerous occurrences, pressure systems, noise and COSHH. These have repealed and revoked whole sections of the Mines & Quarries Act and regulations made under that Act. The 'Six Pack' of regulations, as they are generally termed, started to come into effect in 1992 with all but the Workplace

Regulations applicable to quarries. The next stage will be the implementation of the Extractive Industries Directive and finally a review of the 1954 Mines & Quarries Act and the remaining regulations still in force under that Act.

The Quarries Act of 1894 had transferred control of the inspection of quarries to the Mining Branch and initially these were carried out by Metalliferous Mines Inspectors. The first two Quarries Inspectors were appointed in 1911, a further six the following year and the number gradually increased over a period of time. Maurice Cheshire became the first Senior, later Principal Inspector of Quarries in 1950 and is still enjoying retirement in 1995 at 90 years of age. In 1989 the link with the Mines Inspectorate was broken and the Quarries Inspectorate became part of the Field Operations Division of HSE. A Quarries National Interest Group was also formed with two Senior Inspectors reporting to the Head of the Quarries Inspectorate.

The past 100 years have seen enormous advances in quarrying both in technology and in the field of safety,

health and welfare. Legislation has also seen great changes and become far more comprehensive in an effort to reduce injuries, combat hazards and safeguard health which should be unaffected by the environment in which persons have to work. Sadly these years have cost dearly in loss of life and injuries. Records are incomplete as, for a long period, many quarries less than 20 feet deep were excluded but, at a very minimum, there have been 5,200 fatalities and 40,000 accidents involving serious injury. The true figures would be far greater.

There are now about 3,000 quarries with 43,000 employees producing approximately 300 million tonnes per annum.

However, the accident rate continues to be high in comparison with other industries with 81 fatalities in the ten years to 1993 and this highlights quarrying as one of the most hazardous of occupations. The annual report of the Inspectorate in 1901 stated: "It would be utopian to suppose that quarrying will ever be carried on without persons being killed by falls of stone". With 39 fatalities that year from falls of ground no one could possibly have doubted those words. Inconceivable as it may have seemed then, there have been years in recent times when there have been no fatalities from this cause. With extra effort by all involved the time could come when this Utopia is achieved in total with no fatalities at all in the quarrying industry.

Footnote

Trevor King, a former senior inspector, has been and remains a keen observer of quarrying life and his place as the industry's Boswell has been reconfirmed by his valuable contribution to this book.



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Quarry

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