

Kingston William Henry Giles

The Mines and its Wonders



William Kingston
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Chapter One.

The Miner's Dangers

A hum of human voices rose from a village in the centre of England, but they were those of women, girls, and children, the latter playing in the street, running, skipping, laughing, singing, and shouting in shrill tones, the former in their yards or in front of their dwellings, following such avocations as could be carried on out of doors on that warm summer evening. Not a man or lad, not even a boy above eight years old, was to be seen. On one side of the village far away could be distinguished green fields, picturesque hills, widespreading trees, and a sparkling stream flowing in their midst; on the other, nearer at hand, a dreary black region, the ground covered with calcined heaps, the roads composed of coal dust or ashes, and beyond, tall chimneys sending forth dense volumes of smoke, which, wreathing upwards, formed a dark canopy over the scene. Then there were large uncouth buildings, above which huge beams appeared, lifting alternately their ends with ceaseless motion, now up, now down, engaged evidently in some Titanic operation,

while all the time proceeding from that direction were heard groans, and shrieks, and whistlings, and wailings, and the sound of rushing water, and the rattling and rumbling of tram or railway waggons rushing at rapid speed across the country, some loaded with huge lumps of glittering coal, others returning to be refilled at the pit's mouth. Those high buildings contained the steam-engines which worked the machinery employed in the coal mine; the tall chimneys carried up the smoke from the furnaces and produced the current of air which kept them blazing. The deafening noises came from cranks, pulleys, gins, whimsays, and other contrivances for lifting the coal from the bottom of the mine, pumping out the water, loading the waggons, ventilating the shafts and galleries, and for performing duties innumerable of various descriptions. As the evening drew on, the women retired into their cottages to prepare supper for their husbands and sons, whose return home they were now expecting. Already the corves which took them down to their work in the early morning must be on their way up to the surface, and it is time to have the savoury messes ready for dishing up. Abundance is on the board, for the miner's wages are sufficient to supply him with what would be luxuries to an ordinary labourer above ground; but were they far higher, could they repay him for a life of constant danger, of hard incessant toil, and the deprivation for more than half the year of a sight of the blue sky, the warming rays of the sun, and the pure air of heaven, except on the one blessed day of the week when he enjoys them with the rest of God's creatures? For months

together he descends the shaft in the gloom of morning and does not return till darkness has again shrouded the earth.

Many of the good wives had looked at their clocks to judge when to take off the bubbling saucepans from the blazing fires, when, to their dismay, they felt the earth tremble beneath their feet, while a dull rumbling sound like the discharge of musketry struck their ears, coming from the direction of the works. Pale with terror, they rushed out-of-doors to see a vast black mass of dust and smoke rising into the air and forming an inverted cone, beneath which, for an instant, could be distinguished shattered beams and planks, corves and pieces of machinery, which quickly fell again to the earth. The next instant a darkness, like that of early twilight, pervaded the atmosphere, and fine ashes, such as are ejected from a volcano, fell in a thick shower to the ground, which it covered to such a depth that the feet of the terror-stricken women left their imprints on it as they ran towards the scene of the catastrophe – some shrieking and lamenting, but, in most cases, the intensity of their alarm preventing them from giving utterance to their feelings. Among them a young woman, superior to the rest in appearance, went hurrying on towards the pit's mouth, her hand held by a little boy, who had evidently grasped it, refusing to be left behind, when startled by the explosion, she had quitted her cottage. Her fair hair, escaping from beneath her cap, streamed in the wind; her countenance exhibited the most intense anxiety. Her boy, among the oldest of those who had remained that morning in the village, was well

able to comprehend what had occurred, yet he did not cry or shriek out, but did his utmost to keep pace with the woman's rapid steps.

“Perhaps father and Mat had come up before the blast happened, mother,” said the boy in a hopeful tone. “They would be stopping to see how things are going on, or maybe to help any poor fellows left in the pit.” The woman answered only by a gasp. “Don't give way, mother dear,” continued the boy. “We shall find them both well above ground, depend on't.” Still the woman made no reply; her heart told her that her worst anticipations would be realised. She and the rest of the women from the village arrived in a short time at the pit's mouth, where, among the ruined buildings, the broken machinery, and the heaps of rubbish, they rushed frantically here and there seeking for the bread-winners of their families, many uttering piteous wails when they sought in vain for their loved ones; while others, when they were discovered, bursting into shrieks of hysterical laughter, as they flung their arms round the men's necks, led them off to their homes. Some of the miners had, it appeared, come up just before the explosion; but what was the fate of the rest, far beyond a hundred in number, still below? Some, it was surmised, might have escaped death, and many brave volunteers came forward ready to descend to their rescue. All was quiet – the shaft appeared to be free – a fresh corve or teek was procured – a rope attached to the gin, to the shaft of which a party of men putting their shoulders worked it with the strength of horses. The

corve descended with its adventurous crew down the shaft. The young woman with the little boy had been among those who had sought in vain for a husband and son. "Have any of you seen John Gilbert and his boy Mat?" she asked of those who had come out of the pit and of others standing by. No one could give her any information about her husband, though one had replied that he had seen young Gilbert leaving the trap at which he had been stationed.

Unlike the other women, on hearing this she uttered no cry, but stood speechless and trembling as near as she could venture to the pit's mouth, where she waited, with intense anxiety, the return of the corve to the surface. "Don't take on so, mother dear," said little Mark, who felt her hand trembling. "They say some may have escaped, and things may have been worse above than they were down at the bottom. Perhaps they threw themselves flat on their faces, and let the blast pass over them. I heard father say, only the other day, that was the best thing to do when fire-damp breaks out. He wouldn't have forgotten that, mother, would he?"

"I pray Heaven that he did not," she answered in a scarcely audible voice. Minute after minute went by, while the brave explorers who had gone below were searching for their comrades. How that poor mother's heart ached as she thought of what had too probably happened to those she loved. Night had come on, but torches and lanterns and a blazing fire not far off lighted up the scene, casting a lurid glare on the dark figures of the men, the lighter-coloured dresses and pale faces of the

women, and the surrounding ruins. At last the cry arose that the corve was ascending. The eager crowd pressing forward could with difficulty be restrained from impeding the men working at the gin. Then came the shout, "They're alive! they're alive!" and six dark figures stepped out on the ground. They were soon recognised by their wives or mothers, and hurriedly dragged off to their homes, while the rest of the women, bitterly disappointed, waited till the basket should again come to the surface. The same scene was again enacted, and the rescued now reported that there were more to follow, though how many they could not tell.

Little Mark and his mother waited with trembling hearts. Those they longed to see had not appeared, and to their anxious inquiries no satisfactory reply was given. Neither John Gilbert nor his son had been seen. At length, another party came up from the depths, but this time there were five boys borne in the arms of stronger men. Alas! two were motionless – the arms and heads of the others drooped helplessly down. The poor mothers pressed forward – Mark and Mrs Gilbert among them. "That's Mat – that's Mat!" cried the child, as one of the first was placed on the ground. The mother, kneeling by the side of the boy, gazed into his face. Too truly she recognised her son, but no responsive glance came from his once bright eyes. "Oh, speak to me – speak to me, Mat," she exclaimed. There was no reply. She took his hand, it was icy cold. Then she knew that her boy was dead. The doctor came. "I grieve for you, my poor woman;

he is past recovery," he said, and went on to attend to others. Little Mark sat by his dead brother's side, gazing at him with awe. No one disturbed him. Mrs Gilbert waited on, hope not yet abandoned. More men came up, some fearfully injured. They reported that the rest were in the workings far away – already the mine was on fire, the heat and smoke unbearable – that it was a miracle any had escaped, that all but themselves must have perished. Heartrending were the wailings and shrieks and moanings which arose at this announcement, confirmed by the viewer and overmen. Still many lingered on in the hopes that the corve might be again sent down, but the viewer forbade any to descend, as it must prove their destruction. At length some men came to carry young Gilbert's corpse to his mother's cottage. She and Mark followed with tottering steps. The sad truth had forced itself on her that she was a widow – the two bread-winners of her household gone. Still it was some poor consolation to have recovered the body of her son. Many had not that – they were destined never again to see those they loved. More explosions took place, and the report was spread that the whole mine was destroyed. This was, however, not the case. Science enabled the manager to triumph over the fiery element raging below. By completely closing the mouths of the shafts, the atmospheric air was excluded, and the flames extinguished. After nearly three months' labour, the mine was explored, and the bodies of the dead, scorched and dried to mummies, were recovered. None could be recognised, and they were buried in a common grave.

Mrs Gilbert knew that her husband was among them. The pit was again opened. Fresh labourers arrived from other parts, and once more those dark galleries became the scene of active industry. The cottages were required by the fresh comers, and Mrs Gilbert, with her son and her little girl Mary, a year younger than Mark, would have been compelled to go forth houseless and penniless into the cold world, had not an uncle of her late husband, a hewer at a pit a few miles away, offered to receive her and her children into his house. She thankfully went, hoping to maintain herself and others by her needle.

Simon Hayes had been a miner from his boyhood. Though there were some soft places in his heart, he was rough and untutored, and he had many of the faults common among men of his class. He had a wife much like himself in several respects, but he had no children. Though receiving good wages, he had saved nothing, having spent them extravagantly in obtaining luxuries for himself and his wife, for which they cared but little. By refraining from these, he was well able to feed these additional mouths, and for some time his wife made no complaint at his doing so. Still there was nothing saved up for a rainy day. Simon Hayes took mightily to little Mary. There was nothing he thought too good for her; but he showed no affection for Mark. He was a boy doomed to labour as he had been, and the only labour he could think of for him was down in the mine, first as a trapper, then as a putter, and finally as a hewer. Mrs Gilbert shuddered when he alluded to the subject. She had hoped to bring him up to

some trade which he could follow above ground, though it would be several years before he would be old enough to be apprenticed. "But he is not very strong, and he is my only one, uncle, you know," she answered. "Let him go to school first. I have taught him what I could, but he will get on with his learning there faster than at home."

"What's the use of learning to a miner?" exclaimed Simon with a gruff laugh. "However, you must have your way, Mary, and I don't mind paying for his schooling, though, look ye, if times get bad, he'll have to earn his bread like the rest of us." Mrs Gilbert thanked her uncle, hoping that the evil day was put off for a long time. Little Mark went to school, and being fond of his books, made rapid progress in reading and writing. He thus soon possessed himself of the key of knowledge. Little Mary was also sent to a girls' school, and being bright and intelligent, soon became a favourite pupil of the mistress. At length Mrs Hayes fell ill, and her niece's time was so fully occupied in attending on her, that she could gain nothing by her work. Then there was the doctor to pay. Simon also was laid up for some weeks from a severe bruise by a fall of coal. "I can't stand this no longer, niece," he said one day. "The next time I go down the pit I must take Mark with me." Mrs Gilbert begged hard that her boy might remain above ground. She would take him from school and try to get employment for him on a farm. Simon was obdurate; if she would not agree to his wishes she might leave his house. Her fears were all nonsense, the boy would do well enough in the pit,

he would get tenpence a-day as a trapper – on a farm he couldn't get twopence. Without telling her what he was about to do, the first morning he returned to work he took Mark by the arm and led him along to the pit's mouth. He had brought a flannel suit. He made the boy put it on. "Now, Mark, we are going into the pit, and you'll do what I tell you when we get down," he said, as if it was a matter of course. "I've arranged with the manager to take you on from to-day as a trapper. Though you may not like it at first, you'll soon get accustomed to the work, and so let's have no nonsense. Here's the corve all ready to go down – come along."

Chapter Two.

Learning to Watch

Simon, taking Mark by the hand, stepped on to an iron framework or cage, suspended over the pit's mouth. "Take hold of this bar and don't move as you value your life, boy," he said.

Mark obeyed. Several other men and two boys stepped on to the cage, it began to descend. Though little Mark had been hearing of mines all his life, and felt no especial unwillingness, yet all seemed strange about him. It appeared to him by the dim light of the lamps which his uncle and the other men held in their hands, that the shafts were rushing upwards at a fearful rate, while the light of day, which he could still see above him, grew gradually less and less. A giddiness overtook him. He might have fallen, had not his uncle still held him by the shoulder. How long he had been descending he could not tell, when he found the cage come to a stand-still, and that he was down beneath the surface of the earth, a thousand feet or more.

The rumbling of the trains of laden waggons coming to the shafts, the faint voices of the men in the distance, were the only sounds heard, while the lights which flitted here and there only served to make the long vaulted galleries appear more gloomy and dark.

"Come along, Mark!" said his uncle, shouldering his pick and

spade, and holding his lantern before him.

As they stepped out of the cage, they found themselves in a gloomy vault, on one side of which a huge furnace was unceasingly roaring, while at the other were the stables in which a number of horses, mules, and donkeys were kept. Before them was the main gallery, about eight feet high and the same wide, arched over with bricks four thick, and extending three miles away from the mouth of the pit. Out of it for its whole length opened shorter galleries or side galleries where the coals were now being won. In all of them rails were laid down for the waggons to run on, and on each side were seams of coal, in some places narrow near the top, in others close to the ground, and in some there was coal from the top to the bottom. At the entrance of these side galleries were doors which had generally to be kept shut, and were only opened when the waggons, loaded with coal or returning empty, had to pass through. After Simon and Mark had proceeded a couple of miles along the main gallery, they stopped at one of these doors. "This is to be your post, Mark," said Simon.

"When you hear the waggon coming, you are to open the door, and as soon as it is passed to shut it. Mind you don't go to sleep. You'll be in the dark, but that won't hurt you, and if you feel anything running by, you'll know it's only a rat. It won't touch you while you are awake. I began my life in this way, so must you. There, go and sit down in that hole cut out for you. When you hear the rolley coming, pull that rope, which will open the

door. There, now, you know what to do. Take care that you do it," and Simon, leaving his nephew, proceeded on to the farther end of the working. He then commenced operations on a new cutting which the under-viewer had marked out for him in the side of the gallery. It was about three yards square, and was to be about four feet six inches back under the bed of coal, he began by hewing away about two feet six inches from the ground and working upwards, cutting out the coal with his pick, shovelling it into a large corve or basket which stood at hand ready for the reception of the lumps. At first the work was tolerably easy, as he could stand upright and swing his pick with all his force. As he got deeper and deeper into the bed, he had to fix a strut or post with a cross beam to support the weight of the roof, and he had to get the coal out by stooping down low or resting on his knees. Finally he had to work lying down on one elbow, swinging his pick over his head with the other arm in a way a miner alone could have used it.

Occasionally the boy called the putter came by, shoving a rolley or little band-waggon before him. On to this the full corve was lifted and the empty one left in its place. Sometimes he proceeded by cutting a space on each side of the square bed of coal, from the roof to the floor. He then bored a hole in the middle of the block, into which he rammed a charge of gunpowder, and having lighted it by a slow match, retired to a distance. The powder exploding, shattered the whole mass, and it came tumbling down to the ground in fragments. This could

only have been done where no foul air was present, otherwise the moment the lamp was opened there would have been a fearful explosion, and he, with many others, would perhaps have been killed. He laboured on incessantly until dinner time, when he and all the men in the working, including the putters, came out, and taking Mark with them, repaired to a central spot where there were casks of water, and seats, the only accommodation required by the rough miners. Here their dinners, which had been sent down during the morning, were eaten.

“Well, how do you get on?” asked his uncle of Mark.

“I kept awake, opened the door when the rolleys came by, and shut it again after they had passed!” answered Mark.

“That’s what I had to do!” said Simon.

“I only wish that I had a candle, and had brought a book down to read. I should not have minded it much then, although it was a hard matter to keep awake!”

“You were not afraid, then?” asked another man.

“What was there to be afraid of?” asked Mark. “I heard noises, but I knew what they were, so I did not mind them!”

“You’ll do!” said his uncle in an approving tone. Mark ate his dinner, and then went back to his trap. He there sat all alone in the dark, anxiously waiting for “kenner” time. It came at last, and Mark heard the words “kenner, kenner,” which had been shouted down the pit’s mouth, passed along the galleries. It was the signal for the miners to knock off work, and return to the upper world.

Mark, however, could not venture to move until his uncle

came for him. He was very thankful when he saw the glimmer of a light along the gallery. Slowly it approached. It was carried by his uncle, who having closed the door, led him along through the main tunnel towards the shaft. Together they ascended, and returned home. Mrs Gilbart had been dreadfully alarmed at her son's absence, until told by a neighbour that she had seen him going along with his uncle towards the pit's mouth.

A mother's eye alone could have recognised him, so greatly changed was he by the coal dust. She soon, however, got that washed off, and dressed him again in his clean clothes. He did not complain or ask his mother to keep him out of the mine, so, although still with an unwilling heart, she allowed his uncle to take him. The next Saturday he received five shillings, which was as much as she could make by stitching all day, and sometimes late into the night, by her needle. Simon was well pleased with Mark, and reported, after he had been some weeks at work, that no fault had ever been found with him. He was always awake, and ready to open and close his trap at the proper time. When a little bigger, he would become a "putter," and have the employment of rolling the waggons along the tramways.

Coal mines, it should be understood, are worked in various ways, some in squares, or what is called the panel system. The main roads are like the frame of a window, the passages like the wood-work dividing the panes of glass, and the masses of coal which at first remain, may be represented by the panes themselves. After the various passages have been cut out, the

masses are again cut into, pillars only remaining, each of which is about twelve feet by twenty-four feet in thickness. At length these pillars are removed, and props of wood placed instead, and thus the whole mine is worked out. There are miles and miles of passages in which tramways are laid down, leading to the shaft, up which the coal is raised. As the air in the mine has a tendency to get foul and close, it is necessary to send currents of wind into the passages to blow it away. The chief object is to make the wind come down one shaft, and then to bring it along through the passages, and so up by another shaft. If the wind which came down were allowed to wander about, it would produce no good effect. The traps or doors, such as the one at which Mark was stationed, are used to stop it from going through some passages and make it move along others until the bad air is blown out of them. To create a powerful current, a large furnace is placed at the bottom of one of the shafts, which is called the up-cast shaft, and the foul air is cast up it. Often, notwithstanding this, the heat below is very great, and the hewer working away with his heavy pick is bathed in perspiration. Where no bad gas is generated, open lights may be used, but this cannot often be done with safety, as fire-damp may at any moment rush out of a hole, and if set alight it would go off like gunpowder or gas from coal, killing everybody within its influence, and bringing down the tops and sides of the passages.

In some mines where it is important to have ventilation, there are four shafts, two up and two down-cast. The latter, where the

coals are drawn up to the surface, are in the lowest part of the mine, and all the passages are on a gentle ascent towards the furnace, so that the air down the shafts is drawn that way. The furnace consists of a number of iron bars placed horizontally across the end of a large brick arch, and the roof and sides are built of the best fired bricks. On the iron bars nearly a ton of coals is kept constantly burning and throws out a great heat, relays of men being employed in replenishing it. At the back of the furnace is a shaft to carry off the smoke. Thus the cool air circulates all over the mine. When a large supply of air is required in any particular part of the mine, the doors are closed at the entrance to the other parts, thus directing the current where it is most wanted. This current is so strong that on opening one of these doors, care is necessary in shutting it, as it would slam with a force sufficient to knock a man down.

These and other arrangements, and the vast amount of machinery now employed, had not, however, been introduced when Mark Gilbert began life as a "trapper." The most dangerous operation is the opening of a new passage, from which foul air may suddenly escape and poison the miners inhaling it, or a stream of water may rush forth, rilling up the gallery, and drowning all within its reach. Numberless, indeed, are the dangers to which miners are exposed. Their condition is now improved, but they formerly worked eleven or twelve hours a day, and occasionally even from thirteen to sixteen, far down in the depths of the earth, in a heavy and noxious atmosphere, in

a half naked state and in unnatural positions, kneeling, stooping, lying upon their sides and backs, at any moment liable to the loss of life. The miner has not only to undergo bodily labour, but must exercise skill, patience, presence of mind, coolness, and thoughtfulness. Countless, also, are the dangers to which they are exposed. To accidents as they come down or go up the shafts by the breaking of ropes, or the giving way of machinery, from the falling in of the roof or walls, as also from accidents in blasting, from spontaneous combustion, from explosion of fire-damp, suffocation from choke-damp, and eruptions of water, and even quicksands. Sometimes floods or heavy rains find their way down unknown crevices into the pit, where the miner is working, and forming a rapid torrent, suddenly inundates the mine and sweeps all before it.

Such was the life young Mark Gilbert was apparently doomed to lead.

Chapter Three.

Learning to Work

We must proceed more rapidly than heretofore with Mark Gilbert's history. He did his duty as a trapper, never falling asleep, and always opening and shutting the trap at the proper moment. The rolley boys never complained of him, and as he was invariably in good humour, and stood their chaffing, he became a favourite.

Often he had to go into the pit before daylight, and remain until ten o'clock at night with one candle to light him on his way to his trap, and another with which to return.

As he always told his mother that he was happy, and he appeared to be in tolerable health, she became reconciled to his being thus employed, though she little dreamed of what he had really to go through. When he had shorter hours of work, he employed his time at home in reading and improving himself in writing. He had also a fancy for making models. He began by making one of the parts of the pit in which he worked. Then he tried his hand at making some of the simpler machinery of the pit. His uncle acknowledged that the rolleys, corves, picks, and spades were wonderfully exact, – indeed, was so well pleased that he allowed him a lantern and a supply of candles, so that instead of sitting in the dark, he could pass his time in reading and cutting

out his models, the materials for which he carried down with him. So perfect were his models that they were readily purchased by visitors to the pit. His mother, on one occasion, taking some of them into a neighbouring town, sold specimens to tradesmen, who offered to buy as many as she could bring them of the same description. At length Mark became big enough to be a “putter,” or rolley boy. He could no longer read or make models down in the pit, but he got better wages, shorter hours of work, and his health improved with the exercise. Being always wide-awake, he escaped the accidents from which so many of his companions suffered, which they called “laming.” The injuries they received were from various causes, but generally from falling, when the rolley passed over their arms or legs, and broken limbs were the consequence. Some had lost one or more fingers or toes, others had received gashes in their faces, or arms, or legs, but they had seldom long been laid up, and had willingly again returned to their work. The term “putter,” it should be understood, includes the specific distinction of the “headsman,” “half-marrow,” and “foal.” The “headsman,” taking the part of conductor, pushes behind. The “half-marrows” drag at the sides with ropes; while a “foal” precedes the train, also dragging by a rope. Mark, however, was not very long employed in this laborious task, for the overseer, hearing of his talent, appointed him to the duty of “crane-hoister.” The term explains itself. He had to hook on the “corves,” and keep an account by chalking on a board the number hoisted up. In this occupation he was able to gain a pound a week.

Some part of this he laid by, and with the other he enabled his little sister to attend a respectable school in the neighbourhood, where she made great progress, and showed a considerable talent for music. Mark had by this time gained the esteem not only of his companions but of the under-viewers, and was favourably known to the viewer. On several occasions when his services had been required, he had accompanied one of the under-viewers on his visits through the mines. He thus traversed the main gallery, the side walks, and the old, or abandoned works. In the latter the roof was propped up by perpendicular posts and horizontal beams. In many places the beams were so bent by the weight of the superincumbent earth, that it appeared they must before long give way. In many places they had to creep on hands and knees to pass through the old workings, which opened into others farther on.

As they made their way along, the under-viewer showed him a fault in the coal seam, and explained what it was. Coal seams generally run in a parallel position with the various other strata for a considerable distance, when, all at once, they abruptly terminate. This is marked as plainly as if a wall had been built up at the end of the seam. Thus, while on one side of the wall there is a thick seam of coal, on the other there is a mass of rock. This break or fault was caused at some remote period of the world's history by an internal convulsion. It is known, however, that the seam will again be found, either at a higher or lower level than the one first worked. To reach the seam a tunnel is driven right

through the rock, when sooner or later the seam is discovered. In the present fault, a tunnel had been run through the solid rock for fifty feet in length; and they might afterwards have to follow up the seam, extending perhaps half-a-mile, or even a mile, for the whole of which length a gallery would have to be cut, from which, side workings would extend on either side. So accurately did Mark note all he saw, that on his return home he was able to draw out a plan of the mine, with which the under-viewer was so pleased, that he took it to the manager.

“This boy deserves encouragement. We must see what can be done for him!” was the remark. Shortly after this, great improvements were introduced into the mine. Fresh shafts were sunk, for affording better ventilation, and for more rapidly getting the coal to the surface. Near them, engines of great power were placed to perform the various operations required. An endless wire rope was made to run from the shafts to the extreme end of the gallery, kept revolving by a steam-engine down in the mine. The man walking ahead of the leading waggon, to which is secured a pair of iron tongs, grips hold by them of this endless rope, which thus drags on his waggons without any labour on his part, towards the shaft, up which the coals are to be carried to the surface. The chief gallery was divided by a wall down the centre, with openings at intervals of twenty yards or so, to enable persons to pass through. There were also niches on either side, where he could stand while a train was passing. On one side of the gallery the full trains ran along on rails from the workings to

the shaft; on the other side the empty waggons returned to the workings to be filled. For the purpose of better ventilating the mine, an enormous fan, forty feet in diameter, formed like the paddle-wheels of a steam-ship, and kept constantly revolving by steam-power, was placed over a shaft sunk for that sole object. The suction caused by the enormous paddles drew up all the foul air and noxious vapours from the whole of the mine, and at the same time drew in from another shaft, more than a mile distant, a current of fresh air, amounting from 70,000 to 80,000 feet per minute, thus doing the work of a furnace far more effectually, and at much less cost.

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