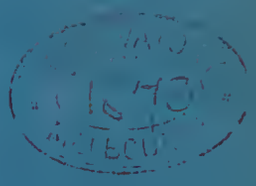
1885.

VICTORIA.



ANNUAL REPORT OF THE ACTING SECRETARY FOR MINES AND WATER SUPPLY,

TO

THE HONORABLE J. F. LEVIEN, M.P.,

MINISTER OF MINES FOR VICTORIA,

ON THE WORKING OF THE ACT 47 VICT. NO. 1 RELATING TO THE REGULATION AND INSPECTION OF STEAM AND MINING MACHINERY FOR THE YEAR 1884.

PRICE FIVE SHILLINGS.

By Authority:
JOHN FERRES, GOVERNMENT PRINTER, MELBOURNE.

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ON THE WORKING OF THE STATUTES RELATING TO THE REGULATION AND INSPECTION OF MINES AND MINING MACHINERY DURING THE YEAR 1884.

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INDEX.

LIST OF INSPECTORS OF MINES.

Name.	Address.	District.
H. B. Nicholas	Castlemaine	Castlemaine.
W. H. Grainger	Sandhurst	Sandhurst.
C. Stewart	Ballarat	Ballarat.
T. B. Trezise	Maryborough	Maryborough.
H. C. Bate	Stawell	Stawell.
W. G. Couchman ...	Dunolly	Dunolly.
A. B. Ainsworth	Alexandra	Alexandra.
A. Armstrong	Eltham	Eltham.
R. Arrowsmith	Chiltern	Chiltern.
H. Davidson	Beechworth	Beechworth.
O. P. Whitelaw	Rosedale	Walhalla.
D. W. Spreull	Rushworth	Rushworth.
R. Fennelly	Kilmore	Kilmore.
J. G. Peers	Bairnsdale	Bairnsdale.
A. W. Craven	Tallangatta	Tallangatta.
R. A. F. Murray... ...	Office of Mines	Colony.
E. R. Meekison	Melbourne	Travelling Inspector.

LIST OF MINING SURVEYORS.

Name.	Address.	District.
Thos. Cowan	Ballarat	Ballarat.
R. M. Harvey	Buninyong	Buninyong.
John Lynch	Smythesdale	Smythesdale.
H. Davidson	Beechworth	Beechworth.
R. Arrowsmith	Chiltern	Chiltern.
A. B. Ainsworth	Alexandra	Alexandra.
A. W. Craven	Tallangatta	Tallangatta.
A. F. Walker	Sandhurst	Sandhurst.
J. F. O'Dwyer	Eaglehawk	Eaglehawk.
R. Fennelly	Kilmore	Kilmore.
D. W. Spreull	Rushworth	Waranga North.
D. O'Leary	Maryborough	Maryborough.
Clarence Smith	Talbot	Talbot.
W. G. Couchman ...	Dunolly	Dunolly.
T. L. Brown	Castlemaine	Castlemaine.
M. Amos	Fryerstown	Fryerstown.
H. Archdall	Taradale	Taradale.
R. Nankivell	Maldon	Maldon.
A. Armstrong	Eltham	Eltham.
H. C. Bate	Stawell	Stawell.
J. Grimes Peers	Bairnsdale	Bairnsdale.
O. P. Whitelaw	Rosedale	Walhalla.
P. Simpson	Palermo-street, South Yarra ...	Heathcote and Waranga South.

LIST OF ILLUSTRATIONS.

REPORT.

To the Honorable J. F. Levien, M.P., Minister of Mines for Victoria, &c., &c., &c.

Sir,

Although this is the eleventh Annual Report on the operation of the Statutes relating to the regulation and inspection of mines and mining machinery, it is the first Report of the kind I have had the honour to submit. It will be observed that I have ventured—not, I confess, without much hesitation—to make a few alterations in the form of issuing it; and, in palliation of what may seem rashness on my part in making this departure from the beaten track of my predecessors, I may perhaps be permitted to state the considerations which actuated me in doing so. It appeared to me that the object in issuing these Annual Reports is not merely to afford the statistician or the average stater data for his theories, but to bring home to the every-day miner a knowledge of the dangers attending his calling, of the precautions which experience has proved necessary to be taken, the appliances invented to reduce the risks of accidents, and the means which science has provided to enable the precious metal—the object of all the miner's toil—to be more easily, economically, and effectually won from its natural hiding places, and subsequently separated from its ores.

Bearing this in mind, I have ventured to omit from their customary places in the Report the numerous tables giving averages and statistical information, and I have devoted more space to descriptions of new safety appliances and mining machinery, and to the reports of the Inspectors of Mines on the actual state of these latter on the gold-fields of the colony at the present time. The information hitherto contained in the tables referred to, and usually inserted in the body of the Report, will be found in separate tabulated statements at the end of this publication.

It affords me considerable pleasure to be able to state that the number of deaths which occurred last year through mining accidents is very much smaller than for several years past, as a glance at the comparative Statement No. 2 will show. Indeed, the number of fatalities is less than for any previous year since the Regulation and Inspection of Mines Statute came into operation, with one exception, namely, the year 1878, when the number of persons killed was 40, as compared with 41 last year. The list of persons injured (Statement No. 5) reveals also a great diminution, as compared with the two previous years. "This," writes the Senior Inspector of Mines, "is not a fortuitous occurrence, but is the outcome of a better observance of the regulations by all concerned, and that better observance has been fostered by the constant attention paid by the Department during last year to the administration of the Act."

Fatal accidents.

Dealing first with the fatal accidents of the year under review, it will be seen (*vide* Statement No. 1) that the two first victims owed their deaths to that most prolific source of danger to the miner—falls of earth. In the first case (that of a Chinese named Sun Gip), the victim and his mate (who escaped) were alone to blame, they having neglected the necessary precautions; but in the second case, that of an unmarried man named Thomas Worthington, the accident by which he lost his life was one of those against which human foresight can apparently make no provision. But while perfect immunity from accidents is not attainable, either in gold-mining or in any other pursuit, it is a lamentable fact, often commented upon, that the miner, whose occupation is one of the most hazardous, is, beyond all comparison, the least careful in plying his avocation. Every Annual Report of the Department has furnished melancholy proof of this, and the present one is no exception to the rule, no less than 49 of the accidents herein recorded being entirely attributable to recklessness or neglect on the part of the sufferers themselves.

Falls of earth.

Falls of earth and rock underground and on the surface were the immediate causes of 21 deaths, or 51·22 per cent. of the whole. At least seven of these fatalities were traceable to neglect. In one case (accident No. 21) the most ordinary precautions were omitted to be taken, and the verdict at the magisterial inquiry into the cause of the death of the victim was that "deceased met his death by gross carelessness whilst following his avocation as a miner." In another case (accident No. 104) two miners had worked in an old shaft for some time, but, finding no gold, they resolved to abandon it. One of them, however, was unwilling to allow the slabs which supported the sides of the shaft to remain, and he struck them several times with his pick with a view of removing them, when the bottom of the shaft caved in, completely smothering the unfortunate man, whose body was not recovered for two days.

Falls of men down shafts.

Six deaths occurred through falls of men down shafts, three of which were the result of carelessness. In one instance (accident No. 24) the victim was knowingly acting in direct opposition to a rule of the mine when he met his death. This rule required that the men should ascend the shaft by means of the ladders provided for the purpose; but instead of doing so, three miners (of whom the deceased was one) got on the edge of a bucket for the purpose of being raised to the surface. When about 20 feet from the bottom, it is supposed that the deceased fainted, lost his hold, and fell down the shaft. The two survivors were prosecuted and fined. In another case (accident No. 52) death resulted through the carelessness of some unknown person other than the deceased. This person, who, it is to be regretted, could not be identified, acted in direct contravention to rule 7, section 8 of the Act, in not replacing a bar which he had temporarily removed from the entrance to the shaft.

Falls of materials down shafts and winzes.

Only one death from a fall of material down a winze occurred last year. The accident referred to (number 83 on list) was the result of indiscretion on the part of the deceased, who incautiously ascended a winze without conveying any intimation to the trucker. The latter, unaware of the presence of any person in the winze, tipped a load of quartz into it, causing the instant death of the unfortunate victim.

Cage accidents.

Out of eleven cage accidents which occurred last year, only one resulted fatally. In 1883 ten deaths occurred through this cause, and six in 1882. The death which occurred last year—that of a miner named Thomas Roberts—was caused by a

non-compliance with the Act on the part of Simeon Roberts, the engine-driver, who was prosecuted for the offence, and fined by the magistrates, although it was shown that he was acting under the instructions of the manager of the mine in leaving his engine at the time he did. This accident is numbered 45 on the list.

Machinery in motion.

Two fatal accidents arose from machinery in motion. One of these was apparently of that class against which no ordinary human precautions can avail; but in the other (number 130 on list) rashness on the part of the victim himself was undoubtedly the cause. The unfortunate man, in endeavouring to reach the indicator affixed to the engine, put his head through the wheel, which (the brake not being properly on) revolved slightly, causing one of the spokes to descend on the neck of the deceased, killing him instantly.

Explosion of charges.

Through explosions of charges, four deaths occurred last year, viz., one from an explosion of gunpowder, and three from explosions of nitro-glycerine compounds. The former casualty illustrates forcibly the foolhardiness of those miners who persist in following the practice, so often condemned, of firing one of several holes charged, and then returning to fire the others. It appears that the deceased (John Hardy) and his mate had bored three holes in the face, which they charged, with the intention of firing them all before knocking off work. They fired the first, and after the explosion the deceased returned to fire another charge, but, when he had arrived within a few feet of the spot, the second charge exploded, killing the unfortunate man instantly. The second explosion was no doubt caused by a spark from the first. Hardy leaves a widow and seven children.

Of the three fatal accidents from explosions of charges of nitro-glycerine compounds, one (accident No. 18 on list) is supposed to have occurred through the drill coming into contact with some unexploded lithofracteur in a crevice of a hole previously fired. The second accident (No. 77 on list) was apparently unpreventable; but the third (No. 82 on list) had its origin in a reprehensible practice—namely, that of taking vessels used for thawing dynamite within close proximity to fire.

Stored explosives.

Only one death was recorded last year in connexion with stored explosives, and it could have been averted if ordinary precautions had not been wilfully neglected. Not only was the explosive stored by the mining manager at a place prohibited by the Statute, but the deceased actually smoked a pipe while handling it. The wonder is that, in view of such recklessness on the part of miners, the number of fatal accidents of all kinds is not even larger than it is.

Foul air.

On the 8th April last two men lost their lives through the presence of foul air in the mine of the New Tubal Cain Company, at Stringer's Creek. Full particulars of the melancholy occurrence are given in the annexed Statement No. 1 (see accident No. 48).

Truck accidents.

Of four truck accidents recorded last year, only one proved fatal, and this was entirely owing to the recklessness of the deceased, who jumped upon an empty truck in order to have a ride, thereby causing the fore-wheels to tip up, and the truck to leave the tram-line (see accident No. 13).

Flooding of mines.

Although I have not the unpleasant duty of recording any death or personal injury arising through this cause during 1884, there was a narrow escape from a

catastrophe of the kind at the Working Miners' United Company's mine, at Homebush, at the beginning of the year. Full particulars of the occurrence, and of the steps taken to prevent a repetition of it, will be found at page 44 of this publication.

Miscellaneous.

Although sixteen accidents of a miscellaneous character occurred during 1884, fortunately none of them ended fatally, whereas in 1883 no less than five accidents, classed under this head, so terminated.

Non-fatal accidents.

In dealing with those accidents in which bodily injuries were inflicted, without fatal results, I purpose describing only such as were apparently preventable by the exercise of ordinary care. The first in this category is accident No. 7, where the engine-driver allowed the cage to move, after stopping it, without receiving a signal to do so. Through this carelessness, a miner was jammed between the cage and the shaft, and sustained painful injuries. The engine-driver was prosecuted, and fined £5, with £2 17s. costs. Other acts of carelessness on the part of miners which occurred during last year, and through which injuries were inflicted, may be briefly alluded to as follows:—Jumping out of cage in motion; holding lighted candle close to charges; returning to "missed-fire" charges before the prescribed time; rushing to be first up the shaft; standing too near trucks under shoots; standing at other dangerous places after warning; neglect to properly timber drives; letting material fall down shafts; omission to give warning of blasting; falling down passes and winzes; violation of rules of mine; neglect of instructions; leaning over shafts in use, &c., &c.

Mining districts compared.

The Ballarat district had the largest number of fatal mining accidents during 1884, namely, 11; but Sandhurst follows close up with 10; Castlemaine, 7; Maryborough, 5; Ararat and Gippsland, 3 each; and Beechworth only 2; total, 41. The Ballarat district had 10 fatalities in connexion with alluvial, and only 1 in quartz mining; while Sandhurst, on the other hand, had only 1 in alluvial, but 9 in quartz mining. In the non-fatal accidents of last year, Sandhurst shows unpleasantly prominent, with a total of 51 men injured; whilst Ballarat has only 28; Maryborough, 12; Ararat, 6; Beechworth and Gippsland, 4 each; and Castlemaine only 1; total for the colony, 106.

Condition of persons killed and injured.

Of the 41 victims of the fatal mining accidents which occurred last year, 21 were married men, 19 were single, and 1 was a widower. Their names, and the date of each accident, will be found in Statement No. 4, and full particulars of each casualty in Statement No. 1. Of the 106 persons injured, 64 are married men, 36 single, and 6 widowers. The cause of each non-fatal accident is shown in Statement No. 6, and the names of the persons injured in Statement No. 7.

Averages.

The average number of persons killed by mining accidents in Victoria, during 1884, per 1,000 miners employed, was 1·404. In the coal mines of England, in 1883, the average death rate through mining accidents was, according to the "Reports of the Inspectors of Mines," 2·046 per 1,000 miners employed; whilst in the metalliferous mines it was 1·712 per 1,000. The average in the coal mines, New South Wales, in 1883, was 2·01, and in the coal mines of New Zealand 1·60 per 1,000 miners employed. In other words, 1 death occurred for every 712 miners employed in Victoria, 1 for every 497 employed in New South Wales, and 1 for every 625 employed in New Zealand. Statement No. 9 shows the average per thousand killed and injured in Victoria for every year during the period 1874 to 1884 inclusive, and Statement No. 10 shows the average in quartz and alluvial mining respectively during the same period.

There were 35 prosecutions for various offences under *The Regulation of Mines and Mining Machinery Act* during last year, and convictions were obtained in 30 cases. The names of the offenders, the nature of the offence, and the result of the prosecution in each case will be found in Statement No. 12. Prosecutions.

Particulars of the amounts paid by mining companies, during the year 1884, to persons injured and the relatives of persons killed through mining accidents, are given in Statement No. 13, and the like particulars of sums paid by the various branches of the Amalgamated Miners' Association to its members will be found in Statement No. 14. From the latter it appears that, on the 31st December last, the association had a total of 8,113 benefit members on its books; that 1,239 claims were made on its funds for death and accident allowances; and that a sum of £5,463 10s. 10d. was distributed amongst the injured members and the relatives of members killed. This association is doing good work, and deserves the cordial support of every person engaged in or connected with mining pursuits. Compensation.

During last year no less than 1,831 separate mines were visited by the inspectors of mines, and 2,319 inspections made, some of the mines having been visited several times during the year. Statement No. 15 shows the number of visits made by each inspector, the number of accidents, and the number of men killed and injured in the mines under their supervision. Mine inspections.

The appendices attached to this Report are:—A synopsis of *The Regulation of Mines and Mining Machinery Act;* regulations for the issue of certificates to engine-drivers; rules adopted at some of the principal mines in Victoria; report of the Board of Examiners for Engine-drivers; list of certificated engine-drivers; report of the Inspector of Explosives, Victoria; list of licensed manufacturers of explosives; suggestions for the prevention of accidents through the use of nitro-glycerine compounds; regulations relating to the importation of explosive substances; regulations relating to the manufacture of explosives; report of the Chief Inspector of Explosives, England; list of patents for improved mining appliances granted in Victoria during 1884; suggestions for the amendment of *The Regulation and Inspection of Mines Act.* Appendices.

For the eleven years during which a record of mining accidents has been kept by the Mining Department—namely, the years 1874 to 1884 inclusive—the total number of persons killed by such accidents was 673, or an average of 61 per annum. The number killed in the first-mentioned year was 90, and in the last-mentioned 41. Of these 673 fatalities, no less than 356, or nearly 53 per cent. of the whole, were from falls of earth or rock underground and on the surface. During the period mentioned 112 men lost their lives through falling down shafts and winzes; 43 through cage accidents; 40 through explosions of various blasting compounds; 38 through falls of material down shafts, &c.; 17 through machinery in motion; 6 through foul air; and 4 through truck accidents; whilst during the whole period of eleven years only one fatality occurred through fire-damp, and one through boiler explosion. etrospect.

Every effort has been made by this Department to administer the admirable provisions of *The Regulation and Inspection of Mines Act*, so as to secure, as far as legislation can secure, the safety and well-being of the men engaged in the hazardous occupation of mining; but, as has been frequently pointed out in previous annual Reports, the miner's safety is practically in his own keeping. If he disregards the Administration of the Statute.

warnings of experience, and wilfully neglects to observe the precautions dictated by it and brought prominently under his notice in every conceivable way, it is evident that no Act of Parliament, however perfect, and no amount of care in the administration of it, can have any perceptible effect in diminishing the number of mining accidents.

Mine owners, &c

I cannot conclude this brief summary without expressing my obligations to the mine owners, mining managers, and others who have favoured me with reports and drawings for this publication, and in other respects facilitated its compilation. To the officers of the Department stationed in country districts, as well as to those in the Head Office, and to the Travelling Inspector of Mining Machinery, I also owe my best thanks for the zealous attention they have given to the duties entrusted to them.

I have the honour to be, Sir,

Your most obedient servant,

C. W. LANGTREE,
Acting Secretary for Mines and Water Supply.

Department of Mines and Water Supply,
Melbourne, 30th April, 1885.

GENERAL REPORTS.

At my request, the Mining Inspectors of the principal gold-fields have each furnished a general report as to the working of *The Regulation and Inspection of Mines Act* during the year 1884. The Senior Inspector (Mr. H. Boyns Nicholas) writes as follows :—

At no period since the passing of the first *Regulation of Mines Statute*, in 1873, has so much useful work been done by the Mining Department as in the year just closed in stimulating managers of mines and their employés to a more strict attention to the requirements of the Act, and in supporting the inspectors in the performance of their duties.

Copies of the Regulations have been supplied to the mining inspectors for gratuitous distribution to managers and miners, so that the plea of ignorance of the law is now seldom made. Circulars have been issued to mining managers, instructing them in the use and storage of explosives. Placards* have been posted up at the mines cautioning miners against charging more holes in proximity to each other than are to be blasted at the same time. Circulars have been sent out enjoining upon engine-drivers the necessity for retaining control of their engines on starting to wind with "men on," and suggesting the adoption by mining managers of gates or bars at all entrances to shafts. Detailed descriptions of the whole of the machinery on the mines of Victoria have been collected from the managers, and registered by the inspectors. The information thus collated of the age and condition of boilers and engines is most important, and will be permanently valuable for reference. Copies of the annual report of the Inspector of Explosives—replete with notes of practical observation—were forwarded to all managers, mine-owners, and dealers in explosives. Every description of safety cage, with its appliances, has been practically tested by the inspectors, under your instructions, and the results of the trials recorded. Sittings of a board of examiners for engine-drivers have been held at all centrally situated gold-fields, and the vast majority, if not all, of our engine-drivers have thus been enabled to attend the required examinations, and to obtain their certificates of "service," or of "competency."

In addition to the above-mentioned measures, initiated during the past year to ensure greater safety to our miners, and protection to mining property, the staff of inspectors was increased by the appointment of an inspector who possesses special knowledge of mining machinery, and of an inspector to take charge of the Maryborough mining district.

I have had occasion to refer in my periodical reports to the regular decrease which has taken place in the annual accident rate, and it affords me great satisfaction to close this report by stating that the notable decrease in the number of serious accidents in the district under my charge during 1884 is not a fortuitous occurrence, but is the outcome of a better observance of the regulations by all concerned, and that better observance has been fostered by the constant attention paid by the department during last year to the administration of the Act.

Mr. Inspector Grainger (Sandhurst) writes:—

I may begin by stating it is very gratifying to see there is a considerable reduction in my district in the number of accidents, both fatal and non-fatal, compared with 1883. This, I have no hesitation in stating, has been greatly due to the steps taken by the Mining Department, to the practical supervision and inspections of the mines by the inspectors, and to the general compliance with the Act on the part of mining managers. The circulars issued by the department have aimed at attaining these results :—1st. The putting of gates or bars at all entrances to plats. 2nd. The prohibiting of charging a greater number of holes than is intended to be fired at the time. And, 3rd, The instruction of engine-drivers to keep hold of the handle of the engine while raising or lowering men. It is a noticeable and praiseworthy feature that, in all the accidents which occurred in my district, there was only one instance in which blame could be attributed, and in which I had to prosecute a mining manager for a contravention of the Act. He was not fined heavily, as the case was not at all of a serious or gross character.

I regret, however, that in several instances, I have had to prosecute miners and engine-drivers for carelessness, and in some cases for gross negligence, whereby men have been injured and property damaged. In all those cases fines (some of them heavy) have been inflicted, which it is hoped will have a deterring effect. Accidents, such as those referred to, are the more to be deplored, as they could all have been prevented if the men employed had only exercised the forethought and carefulness which the nature of their calling demands.

In dealing with the question of safety appliances, I desire to specially notice the good effects arising from the use of Middleton's safety hook. It has been the means of preventing injury to property in many instances, and is, in my opinion, the best one in use.

The cages have been better looked after than hitherto in the way of oiling and cleaning, which keeps them more effective. The ropes also have been tested periodically.

In concluding this report, I may add that it is very gratifying to observe, on the whole, the way in which mining operations have been carried on, especially with regard to the precautions taken for the safety of the miners, from whom very few complaints have been received by me.

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* For copy see Appendix G.

Mr. Inspector Charles Stewart (Ballarat) reports :—

The amended Act has now been in force twelve months, and, so far, it has been most beneficial. I am pleased to say that mining managers generally show a willingness to assist in carrying out its provisions, the greatest trouble being with co-operative parties of working miners, the men for whose especial benefit the Act was passed, but who are the least inclined to comply with its provisions. While the Mining Department is doing everything possible to make the miner's life less hazardous, many of the latter show a great indifference to their own safety, as is plainly shown by the number of preventible accidents which are continually occurring.

At the commencement of the year, having been supplied by the department with copies of the Amended Act, I distributed them gratuitously amongst mining companies throughout my district, more particularly amongst small parties of working men. I also marked and explained those rules which would most directly affect themselves. The value of this is clearly shewn by the small number of accidents occurring amongst this class of miners.

Safety Appliances.—During the past year safety cages have proved their usefulness by the saving of a large amount of valuable property, and my experience of their value convinces me that they should be retained in use and kept in good order. I am sorry to say, however, that there are a number of cages in use called "safety" cages, but which are perfectly useless, either to save life or property, and at present legislative power is wanting to condemn all such useless articles.

Self-acting Catches.—The usefulness of these appliances between the brace and poppet-heads has proved the wisdom of their compulsory adoption. I have known several cases of overwinding, when the detaching hook having acted, the cage was perfectly safe and no damage resulted. These catches are particularly valuable with some makes of cages, especially Pryor's. I would here suggest that all safety hooks attached to cages should be so constructed as to suspend the cage after slipping the rope, thus giving additional security in cases of overwinding. There are three such hooks at present working in my district, viz.:—Middleton's, Williams', and Humble and King's. The fallacy that ropes are neglected in consequence of the use of safety cages is not borne out by facts, for there has not been one case of rope breaking (*i.e.*, through actual wear) in my district during the past year.

Boilers.—The enforcement of the clause relating to the testing of boilers has been beneficial, as it has been the means of several old ones being condemned.

Ventilation.—Throughout the mines in this district the ventilation is generally good, but where the natural ventilation is not sufficient, Root's blowers are coming into general use, and proving a valuable addition to our mining appliances.

Flooding.—Early in the year, the water in the New Australasian Company's mine suddenly stopped running from the old ground in the No. 1 claim, causing very great uneasiness. The men were all withdrawn from the mine except a sufficient number to construct escape drives. It remained stopped for ten days, breaking away again at its old running place, and it has continued running steadily ever since. Nothing was left undone by the company to ensure the safety of the men, who have now escape drives, placing them beyond the reach of danger. The New Golden Belt Company's mine, at Springdallah, has been several times flooded, and, from the dangerous position of the men, it was considered advisable to direct the company to construct an escape drive, but, on their showing no inclination to do so, an Order in Council was passed in August last to enforce its construction. Even in the face of this, the company have, under various pretences, systematically evaded the order; but the Department of Mines has now finally and positively given them instructions to at once carry out the work.

Prosecutions.—I am pleased to say I have had but few occasions to resort to the police court to enforce compliance with the Act. Mining managers, as a rule, are now willing to carry out any reasonable suggestions I may make to them, and to co-operate generally with me in carrying out the duties of my office. It only requires the miners themselves to exercise a little more care in pursuing their arduous avocation to ensure the number of accidents being reduced to a minimum.

Blasting.—In connexion with blasting operations carried on in mines, a total disregard to the provisions of the Act is often shown by miners, especially in returning to holes supposed to have missed fire before the expiration of the time allowed by the Act, viz., one hour. Although numbers of miners have lost their lives, and many have been rendered totally blind or are otherwise maimed, it does not appear to have the effect of deterring others from continuing the practice, as witness four accidents from this cause during last year in this one district alone. The first of these was in April last, at the New North Clunes mine, the result being the almost total blindness of the sufferer. Three others occurred during the month of October; in one of these the eyes were also completely destroyed, besides other injuries, and in the other two cases the Mining Department prosecuted the sufferers, as their injuries were not severe. It is as well that the miners should understand that in all such cases prosecutions will take place, unless they are very seriously injured, and I have requested mining managers to report to me every case of neglect on the part of their employés.

Additional Inspector.—Through the appointment of an additional inspector, the department has relieved me to such an extent (by taking Blackwood and Ararat out of my district) that I shall be able to make at least one additional visit to every mine during the year.

Suspensions of Work.—Very few mines have stopped during the past twelve months; but several shafts previously abandoned have been taken possession of and mining operations carried on by co-operative companies. This shows the value of general rule 36 of section 8 of the Act, in not allowing any shafts to be destroyed without the consent of the Minister of Mines. Applications, which have been wisely refused, were made for permission to draw slabs from some of these shafts now being successfully and profitably worked.

In conclusion, I may say that nothing of any serious importance has occurred during the year calling for special attention. Everything in connexion with the mines in this district is in fair condition, and with careful attention, by all parties, to the proper and faithful carrying out of their respective duties, accidents should be few in future.

SAFETY CAGES.

This Department has several times been urged to offer a reward or premium for the best safety cage, but I have hitherto declined to recommend such a course, on the ground that, if a Board were appointed to adjudge such an award, its opinion would not convince mining managers of the superiority of the cage selected. Moreover, in the Report of the Board appointed in 1878 to investigate the merits of the different safety cages, it is specially recommended that "mine proprietors should be permitted to exercise their own discretion in the selection of cages."

The Department, however, has always been glad to afford the inventors of cages or of any other improved mining appliances every opportunity of having them practically tested in the presence of a mining inspector, and to furnish a copy of his report thereon. In the following pages I propose to give a short description of each safety cage which has been brought under the notice of the Department during the past year, taking them in alphabetical order of the name of the inventors. By this means, and by the aid of the mining inspectors' reports on safety cages in actual use (see page 25), it is hoped that mine owners and others will be enabled to select cages suitable to their requirements.

Allan's Patent Safety Cage.

Amongst the safety cages which have been in use for a considerable time, Allan's is spoken of by the Mining Inspectors in very favorable terms. So far back as 1879 Senior Inspector Nicholas reported that the trial which he made of the cage was "perfectly successful." Inspector Stewart, in the same year, stated that "the test of Allan's cage was perfect, its grip being instantaneous," whilst Inspector Grainger reported as follows:—"This cage, from all I saw, stood the severe tests to which it was subjected, and was, I consider, a great success, having, I believe, only fallen one inch or so on being suddenly detached from the rope."

Mr. Allan withholds his consent to the publication of a sketch of his cage, otherwise I should have pleasure in giving it a place in this Report with other similar contrivances. He has, however, kindly forwarded a model to the Department, and in doing so made the following remarks:—

> I believe you will find in the model which I have this day forwarded all that can be desired in a safety cage. Everything is provided for that can be provided for—ropes breaking, over-winding, the drum getting loose on the shaft, or the cage being accidentally lowered into water. In the first two cases the cage is self-acting, in the last two it can be stopped instantaneously by hand; and I venture to say that if my cages are attended to the same as any other part of the machinery on a mine, the companies using them may safely calculate on complete immunity from cage accidents. I here tender you my best thanks for the action you have taken in having all safety cages tested.

Speaking of the necessity of having cages periodically overhauled, he says:—

> In the majority of cases when cages are put into a shaft they are no more thought of as long as they will haul the stuff, and in many cases I have seen my own safety appliances, and those of other people, made fast so as to make it impossible for them to act, if required to do so.

Mr. Allan has issued some printed instructions to accompany his cage, and, as the contrivance is already in use in several mines, being preferred by some mining managers to other rival inventions, it will not be out of place to reproduce the instructions here. They are as follow:—

> *Instructions as to the Proper Keeping in Order and Working of Allan's Patent Safety Cages.*—It should be the duty of every boss of a shift, when landing at the plat, to see that the spring after raising the grippers to the skids has still a firm pressure upwards against the cross-bar of the cage; if it has, then it may be reckoned in working order, but if it leaves the cross-bar in the slightest degree, it is not reliable, and should be reported to the manager, and attended to at once. Every man working in any mine where these cages are used should make himself thoroughly acquainted with the working of them, and, when being raised or lowered, one should always have his hand on the knob ready for action. If accidentally lowered into water, or should the spider get loose on the shaft, or being lowered too quick, pull the handle, and the cage will be fixed on the skids in one second. In case of a rope breaking, the self-action of the appliance would have to be depended on, which is quite reliable if the spring is good; a slight wearing of the points of the gripper teeth that first touch the skid will necessarily take place, by being constantly brought against the skid every time the cage rests, particularly at the bottom, as the back weight of the

rope partially prevents it at the brace. This will not prevent the grippers from holding, neither will the hardness of the skids, not even if they were made of iron. In being over-wound, whenever you see that you are being taken too high, pull down the handles, and hang on to them till the cage stops; if it should go to the poppet-heads and be disconnected, you will not experience the slightest shock, but will remain firmly fixed on the skids till the rope is readjusted, and the strain taken. Some managers, I am aware, are afraid to educate the men as to the use of those handles, for fear they might stop the cage when not wanted, but this would be better than to have them ignorant of what they can do when required. It might be necessary, for the satisfaction of every one, to have a sham over-wind without detaching the rope; then no danger could be apprehended. Take the cage a few feet above the brace, and let the occupants act as if an over-wind were imminent, viz.—pull the handles, and hang on to them till the engine is reversed, when the rope will fall slack, and the cage will remain fast on the skids. I would suggest that cages should be tested at least once a month, reeve a small rope through the top and bottom links of the chain, and draw them to within a foot or so of each other, then raise the cage, say, a foot, from the flippers, and suddenly chop through the small rope, when the cage, if in good order, will drop only about an inch.

Brown's Patent Safety Cage Appliances.

Mr. H. B. Nicholas, the Senior Inspector of Mines, under date 19th July, 1884, reports as follows concerning the safety cage appliances invented by Mr. Wm. Brown, Postmaster, Talbot:—

The model is constructed about half the size of a working cage. Attached to each angle of the bottom of the cage there are two reversed wedges; the one with the butt end upwards is affixed to the cage; the second wedge, with the thin end upwards, moves on the face of the fixed wedge, and is controlled by a tongue and groove movement. On the face of the movable wedge, which is presented to the shaft timbers, there are three small projecting bosses. There is a false bottom to the cage, and between it and the permanent bottom are four spiral springs. The false bottom is connected by gearing with the butts or lower ends of the movable wedges. When the rope breaks, or is detached from the cage, the springs depress the false bottom. This action forces the movable wedges upwards; the fixed wedges descend with the cage, jam the movable wedges against the shaft timbers, and stop the falling cage. The several test trials which I made with the model were perfectly successful. The principle of the invention is good, but the method of adapting it can be improved. Mr. Brown is now reconstructing his model, so as to apply it to the skids of shafts. I inspected it in progress, on the 16th instant, and then proved that, in its application to the skids, the principle will be equally successful. This model will be complete in a week.

Writing on the 8th September, Inspector Nicholas reports further respecting this cage:—

In compliance with your instructions, I attended at the Southern Cross Company's mine, near Talbot, on Saturday, 6th instant, and inspected the trial tests of Mr. Wm. Brown's safety appliances, as affixed to a cage in use at that mine. I found some alterations had been made to the appliances since the model was tested at the Talbot Town Hall, last month, but they do not in any manner affect the principle of the wedge, as the means adopted for stopping the descent of a falling cage. There is an improved method of applying the springs to the movable wedges. The grippers on the face of these wedges are stronger, and, in lieu of fixed wedges, bars of angle-iron are strongly riveted to the sides of the cage, with diagonal faces parallel with the faces of the movable wedges. The weight of the cage and load used for the trial tests was about 15cwt.

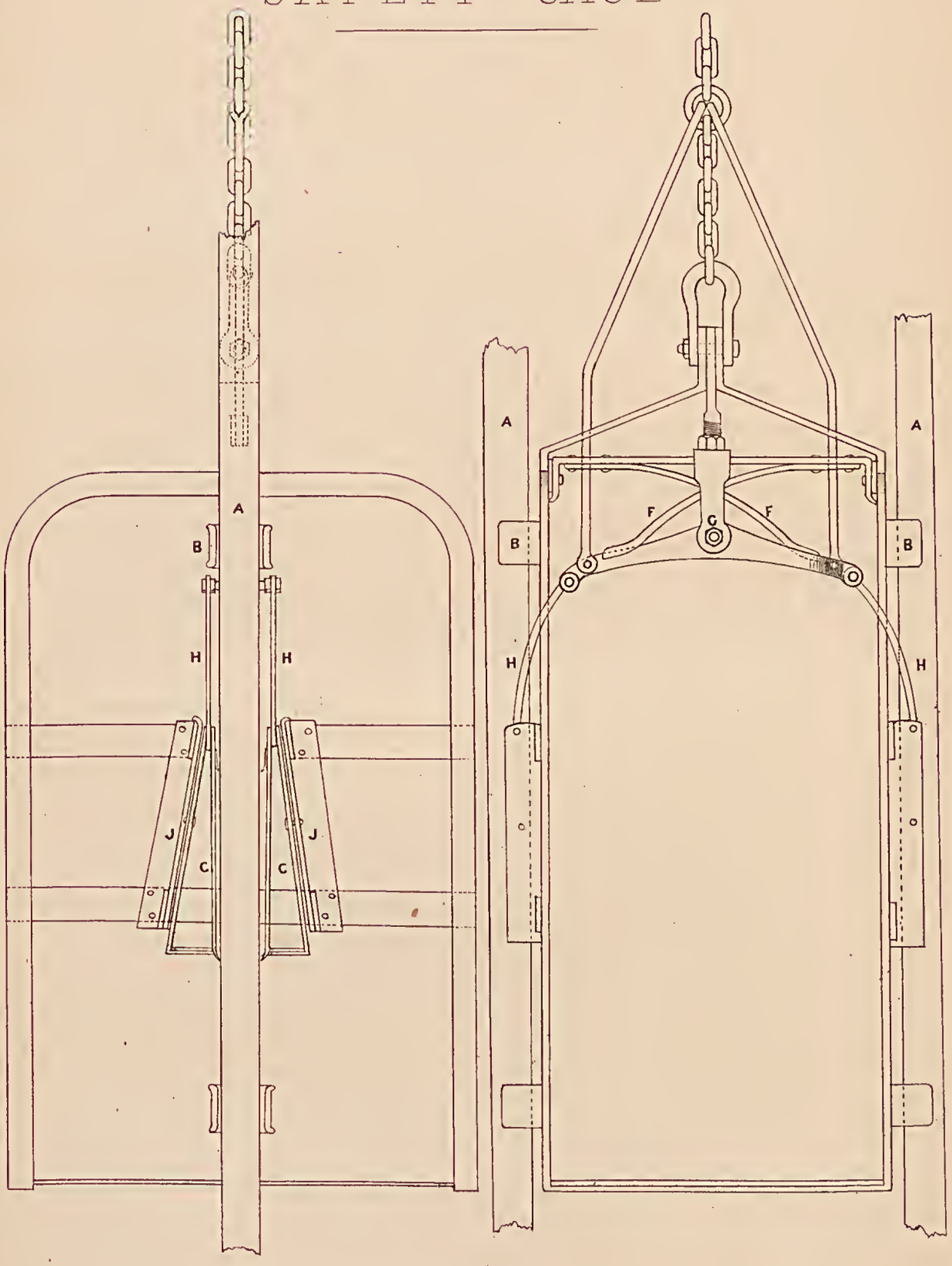
I tested the cage in the following manner with satisfactory results throughout:—At the first trial, the cage was suspended, with its load, between the landing brace and the surface. The rope was cut, and there was no perceptible fall of the cage. I found the indents into the skids, made by the grippers, were half-an-inch below my marks. At the second trial the gripper indents were directly on my marks; and at the third trial, the indents were 2⅜ inches below my marks. This important fact was apparent at each of the tests, that immediately the grippers touched the skids the descent of the cage was arrested. As I ascertained from the manager that it was his intention to adopt Mr. Brown's safety cage for the future working of the mine, I informed him that the tests of the safety appliances were satisfactory, and that I would furnish him with the certificate required by general rule 27 of section 8 of the Regulation of Mines and Machinery Act 1883. The cost of attaching Brown's safety appliances to ordinary cages is, I believe, about £8, inclusive of the royalty.

Reference to sketch of Brown's Patent Safety Cage.

A.A. Skids or guides.
B.B. Shoes of cage.
C.C. Movable wedges, with roughed (serrated) face next skids.
F.F. Springs.
G. Fulcrum.
H.H. Connecting rods.
I.I. Fixed plates of angle-iron parallel with face of wedges.

I am informed that it is claimed for Mr. Brown's invention that the wedges will act upon skids which may not be plumb—a condition under which some cages have failed to act. Moreover, the appliances are simple, and can be fitted to any cage.

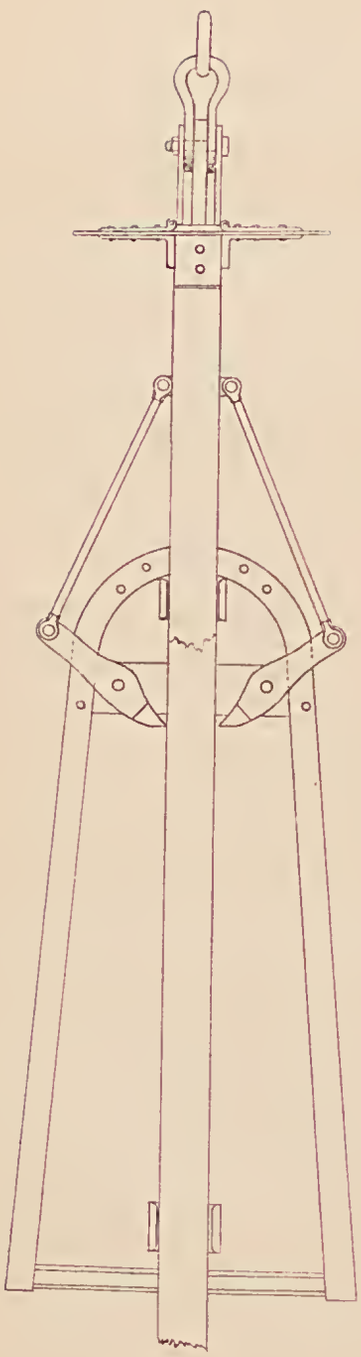
W. BROWNS
PATENT
SAFETY CAGE



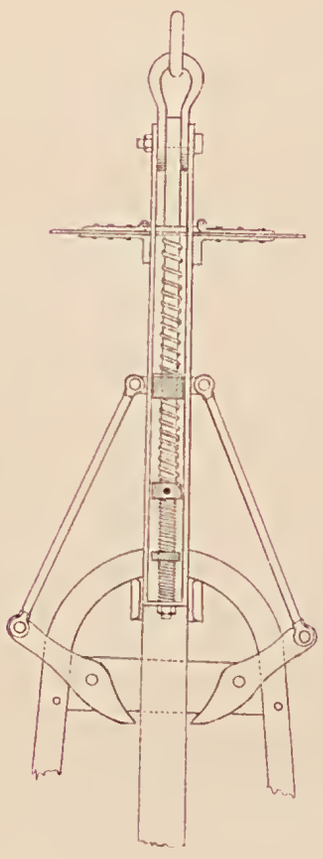
SIDE VIEW

FRONT VIEW

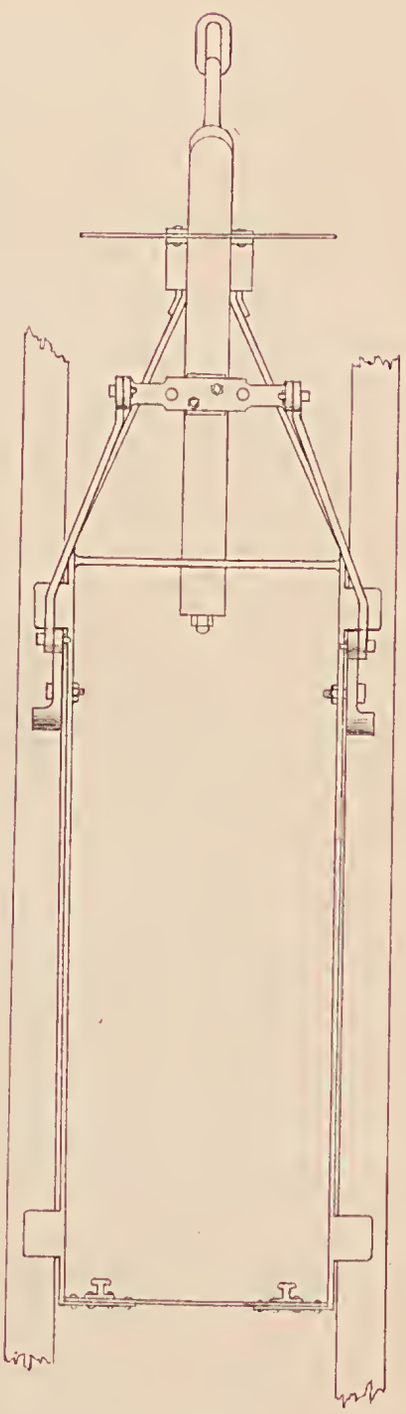
C CHESSEL'S
SAFETY CAGE



FRONT VIEW



SIDE VIEW
shewing Spiral Springs.



SIDE VIEW

Buttle's Safety Cage.

Mr. William Buttle, of Quarry Hill, Sandhurst, has added a safety cage to the long list of inventions which he has brought under the notice of this Department from time to time. Respecting this latest invention he writes as follows, under date 18th December, 1884 :—

Herewith is a sketch and description of a safety cage altogether different from any ever proposed by others. I beg you will be so good as to place the matter before the proper officials of the Department—it will be found deserving of foremost attention. *Description.*—Flexible ropes are secured at the bearings above the shaft, and also at the bottom of the shaft, one on each side of the cage. Each rope is coiled round one of the drums once or twice. The levers vibrate on the fulcrum. Under each lever is a claw, which drops into notches on the drum and prevents them from revolving when the arms of the levers descend, which descent takes place when the hauling rope (which is likewise attached to the ends of the levers) breaks. A platform, on which the men stand, is attached at the angles to the arms of the levers by ropes; and instantaneously on the breaking of the rope the platform descends. But please observe that the descent of the cage is retarded by the coils of the ropes round the drums, consequently the platform descends quicker than the cage, otherwise the platform and cage would descend at a like speed, and the object would not be attained, as the claws would not act. No springs are used, neither are any skids needed in the shaft.

The sketch and description were referred to Mr. Inspector Grainger, Sandhurst, who reports :—

The cage would not be at all adapted for working in our shafts here. As to the merits claimed for it by the inventor, it would be necessary to have a suitable shaft specially sunk, and a test of the cage given, before an opinion could be rightly formed. Mr. Buttle has considerable inventive genius, but, in my opinion, his present invention would not be a success.

Chessell's Safety Cage.

Mr. Geo. Chessell, of Kyneton, has forwarded to me, through Senior Inspector Nicholas, a description of a safety cage invented by him, which is as follows :—

1st. The cage is 7 feet in height from the floor to the crown, and is protected by substantial covers. The centre bar is firmly fastened by means of 1¼in. screw and nut to the underpart of the crown of the cage, and has a slot 5 inches long, at the top, in which the bar of the connecting shackle works; the weight of the cage is held by this bar.

2nd. Two feet below the crown of the cage is a strong cross-bar, holding the cage firmly together. Between this bar and the crown a spiral spring, 19 inches long, is fixed and kept in position by a screwed spill, which passes up through the centre of the spring; at the lower part the spring rests upon an adjusting nut, forged for this purpose.

3rd. About the centre of the loop, which extends from the crown to the cross-bar, and is made of 4in. x ⅜ths iron, two straight bars are fastened by nuts and screws, and these bars carry four connecting rods, to which the grippers are attached.

4th. The bar of the shackle works freely in the slot at the top of the centre bar. The ends of the loop are connected with the shackle bar. When the bar is at the top of the slot the grippers are open. The spill travels with the loop, and the spring is compressed when the grippers are open. When the rope breaks, the spring expands, brings down the loop, and the grippers catch the skids instantaneously, and stop the fall of the cage.

Mr. Nicholas states, in reference to this cage—

The appliances are simple and effective; they are easily kept in working order, and the first cost is less than that of the majority of safety cages.

Gherardin's Safety Appliance.

Mr. John Henry Gherardin, of Heathcote, forwarded to me a photograph of a model appliance to prevent over-winding, for which he claimed the following merits :—1st. That any cage reaching the poppet-heads will be detained there in an upright position until lowered in the proper way. 2nd. That when the contrivance is once set it will last for years, cannot get out of order, will require no looking after, and will not be in the way of anything. I obtained from Mr. Inspector Grainger a description of the contrivance, which is as follows :—

Within a short distance of the pulley wheels there are self-acting doors. Attached to the flooring of a small brace or landing, where the doors are fixed, there is an upright bar which works on a pivot. Connected to the upright bar, there is a horizontal one which rests on one of the self-acting doors. There are two lever hooks made fast to the bearers that carry the pulleys. These lever hooks are fixed in a horizontal position resting on a cross-bar a little bevelled. As soon as the bucket or cage is raised by over-winding up through the doors, the upright bar disconnects the lever hooks, when the hooks instantly

grip the bow of the bucket or cage, thus keeping them in position in case the rope breaks ; the doors also instantly close.

As regards the invention itself, there is considerable merit and ingenuity in it, and Mr. Gherardin is deserving of praise. Practically, however, I do not consider it would be a success. We have the self-acting doors in use already for years, and as for the hooks, they are not to be compared with Middleton's or many others that I have seen. The hooks will only act when the rope breaks from over-winding, whereas Middleton's will disconnect, and thus not only prevent the poppet-heads, but the engine also, from being forced out of position, and at the same time hold the cage and keep it from falling. On the whole, therefore, I cannot recommend it for use, as we have many appliances already which, for safety, are far preferable to it.

Although the Inspector's report is unfavorable to the use of the contrivance, I have given it a place here, believing that it is only by giving publicity to the failures as well as to the successes of inventors that an approach to perfectness in mining appliances will ultimately be attained.

Hart's Patent Safety Cage.

In introducing his cage to notice, Mr. Hart remarks :—

In constructing a safety cage that will prove master of the important work it has to perform in case of accident to the rope, or from over-winding, it is absolutely necessary to employ a superior gripping power, or resisting force, than would be given out by a falling cage; and this can only be done by bringing into immediate action a proportionate amount of holding power to the weight of a cage and its contents. Besides this superior power, it must be instantaneous in its action, as a falling weight not only gathers velocity, but increases in weight; and, and if allowed to pass through a space, cannot be easily arrested, if at all. Thus it will be seen that any invention which claims to be reliable, must possess four essential points, namely:— 1st, Immediate action ; 2nd, Certainty of action ; 3rd, A gripping power more than equal to the weight it has to sustain; and 4th, Simplicity of construction together with direct action. Without these features it is useless trying to secure satisfactory results, or to prevent the sad accidents which have of late been so frequent, and which have resulted in the loss of valuable lives, saying nothing about the loss of property.

My cage is made of boiler-plate, with a roof sufficiently strong to carry its own weight, together with its load. Through the roof passes a suspension bar, which is attached to the rope or chain at the upper end. This suspension bar is also attached to two levers, which act upon a joint or fulcrum ; the one lever going to the one side of the cage, and the other to the opposite side. Between the ends of these levers and the roof of the cage is fixed a strong spiral spring, which encircles the suspension bar. The other ends of the levers are connected to the gripping bars, which act upon radius arms working upon strong studs, secured at both ends; the one to side of cage, the other to a cover, which protects the radius bars. The gripping bars are in a 6-feet cage, 4 feet long by 3 inches wide, and work upon the principle of a parallel rule. These gripping bars are notched like a ratchet; and, upon the rope breaking, or from over-winding, they are instantaneously brought against the skids, presenting 288 square inches of gripping power. There will also be a handle attached to suspension bar, so that when men are coming up, or going down, they will have command of the grippers, in case of accident to the rope. It will thus be seen that I have entirely dispensed with the usual cam-shaped grippers, which have failed to present a sufficient force equal to the weight they have had to contend against. Hence the accidents. My invention can be attached to any cage that has solid sides at a cost of from £15 upwards. A new cage complete, at from £25 upwards, according to weight and size.

A trial of the above-mentioned cage was made recently at the mine of the Amherst United Quartz Mining Company, Amherst, and was witnessed by Mr. Inspector Trezise, who reports respecting it as follows :—

In the first test the double-weighted truck had about 8 cwt. on. Detaching the rope, the cage dropped half an inch only.

2nd test.—Tried the hook for over-winding with the same truck in cage as before. On slipping the rope, the grippers acted instantly.

3rd test.—After the above tests I went in the cage with the patentee, the manager of the mine, and one of the workmen (four of us) to descend from the brace to the surface. When within 2 feet of the surface, I pulled on the detaching lever and disconnected the rope from the cage ; the drop was not perceptible.

I consider the above tests highly satisfactory, and in a good vertical shaft the cage cannot fail in the object for which it is designed, the gripping power being greater than in other cages at present in use.

Section 8, clause 17, of the Regulation of Mines Act (see Synopsis, page 92), has been overlooked in the construction of the cage, as you will observe by a careful examination of the plans. This was pointed out to the patentee (Mr. Hart), who has taken steps, to comply with the above provision. When this is done I shall forward to the manager (Mr. Clark) a certificate that the cage has undergone the tests to my satisfaction.

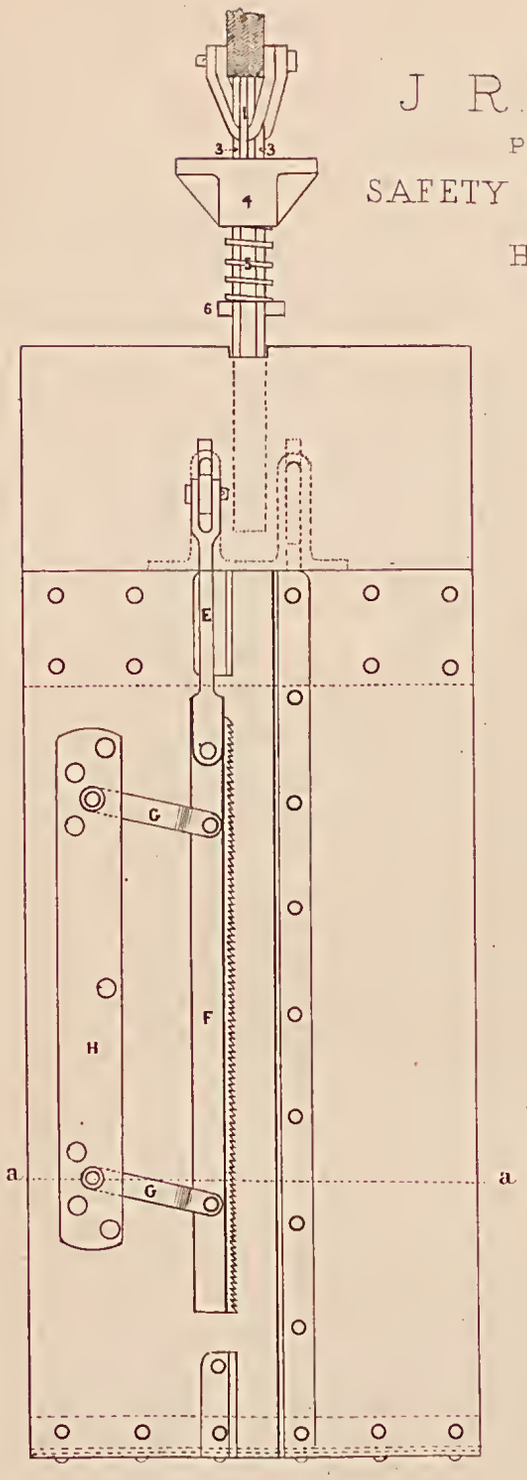
The model of the cage was also inspected by Mr. E. R. Meekison (Travelling Inspector of Mines and Machinery), who reported :—

The model acted on every trial, and caught at once, and I am of opinion that, if kept in good order, in the event of the rope breaking, it would suspend the cage in the shaft, as it has an unusually large serrated gripping surface. The hook is of the description that allows the cage to fall away. In my

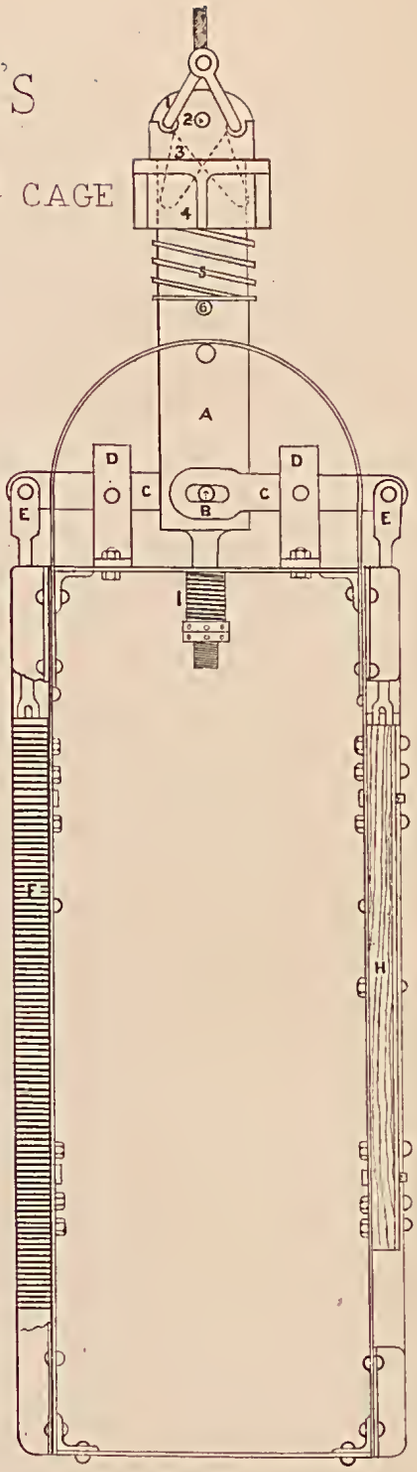
J R HART'S

PATENT

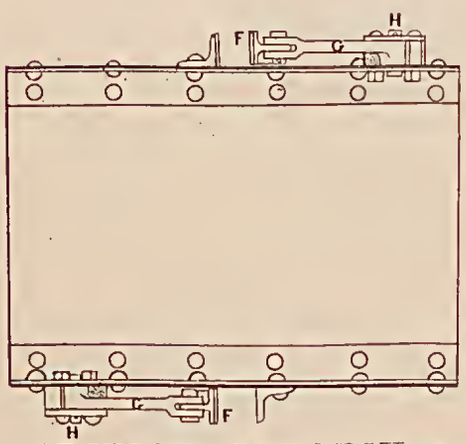
SAFETY WINDING CAGE AND HOOK



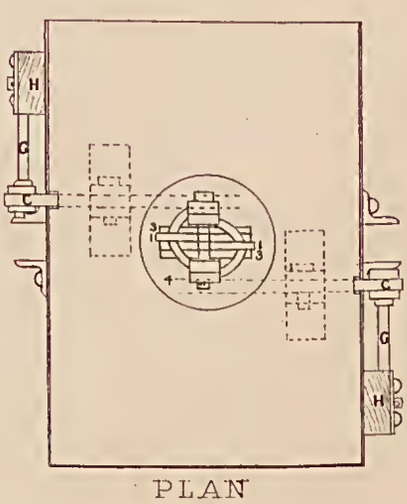
SIDE VIEW



FRONT VIEW



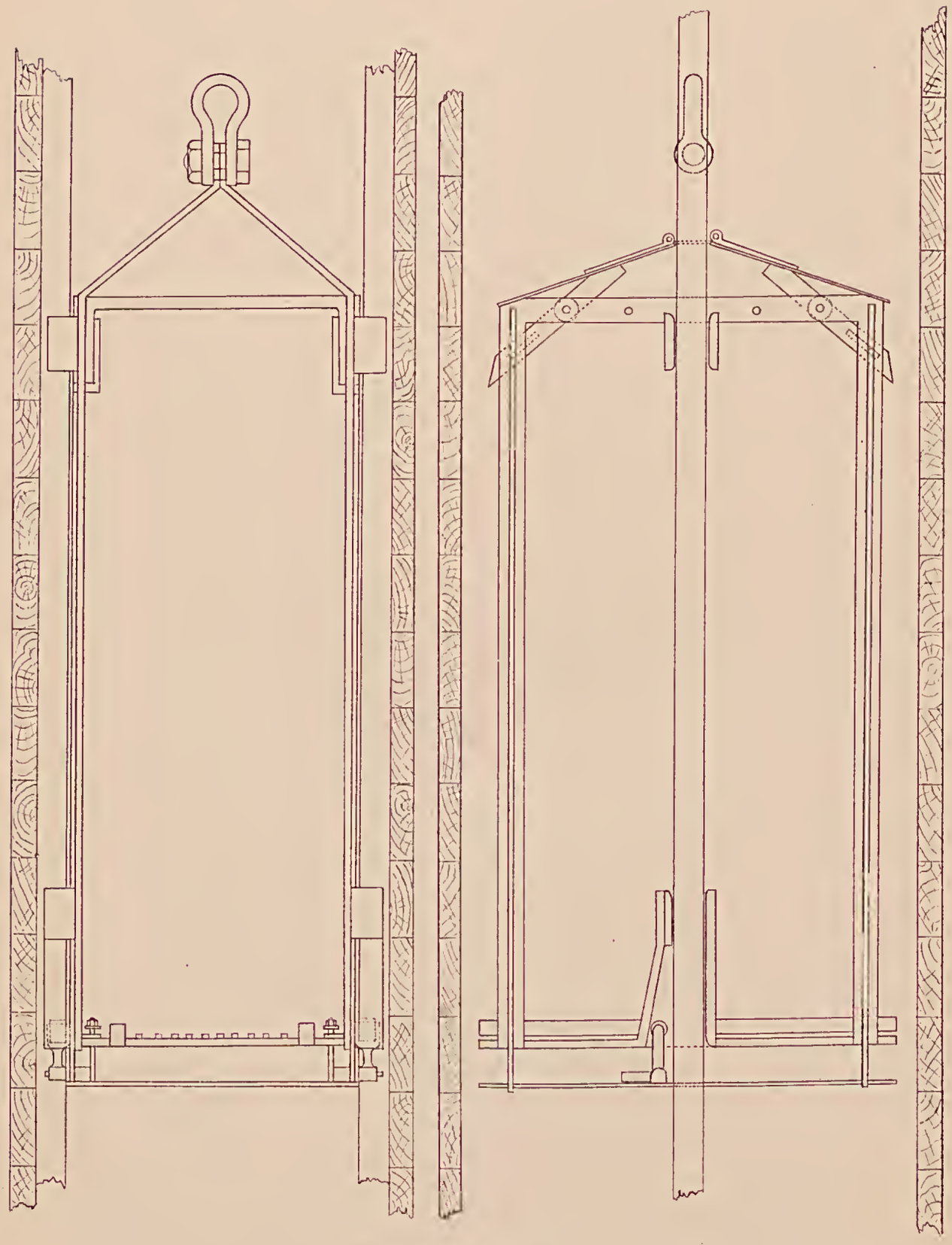
SECTION THROUGH a_a



PLAN

Scale. ¾ of an In. to 1 Ft

NAYLORS SAFETY CAGE

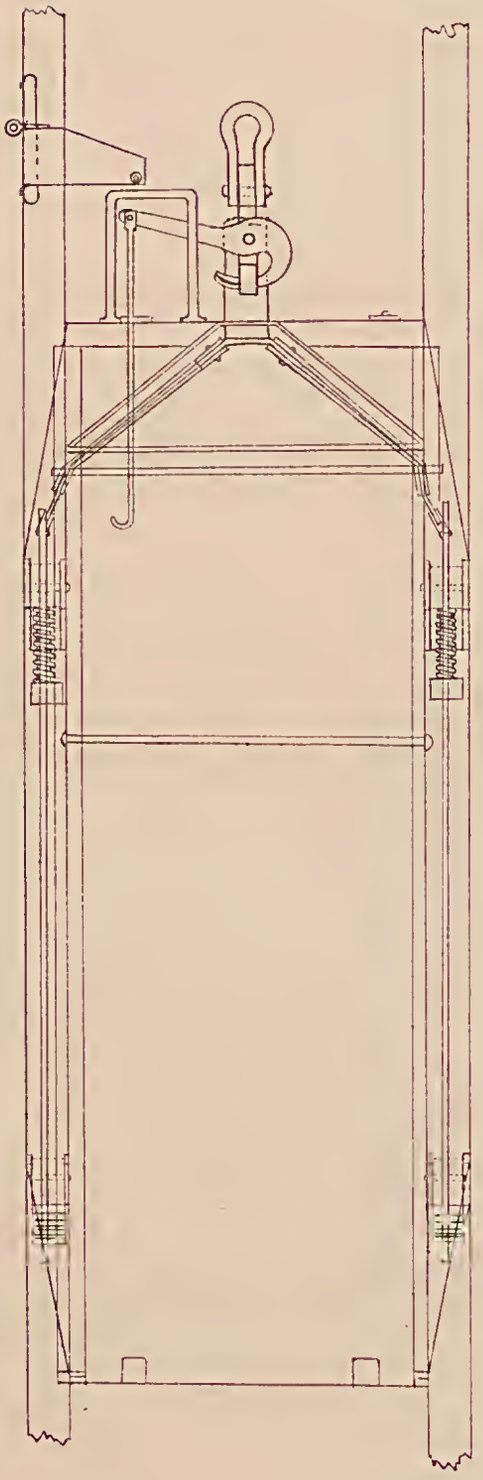


Scale . ¾ In to 1 Ft

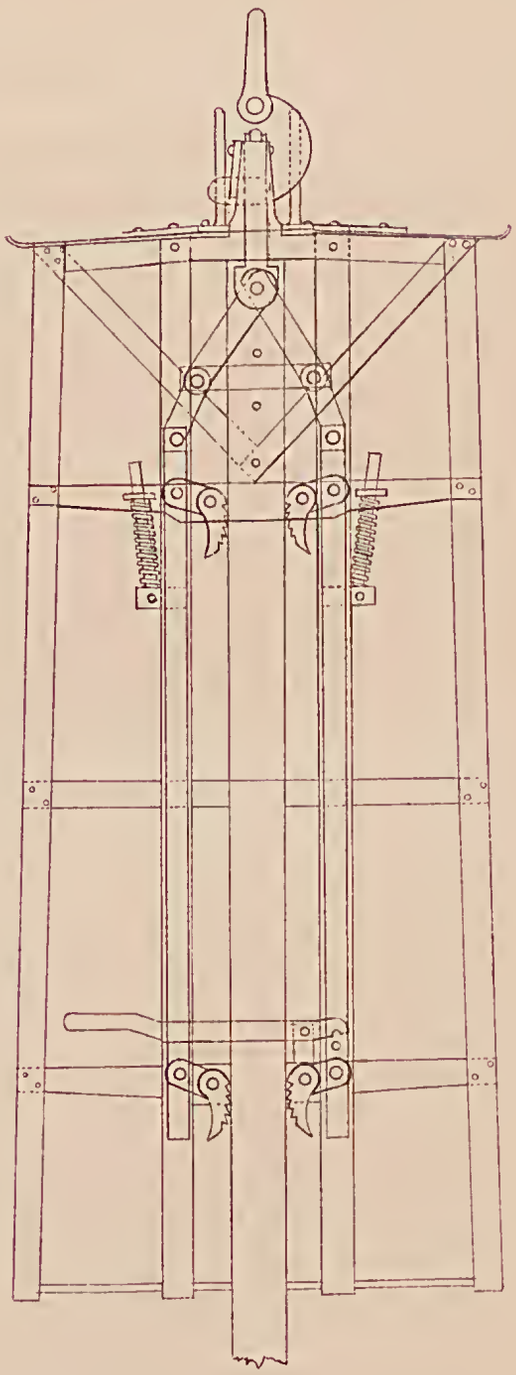
J J T NOLAND'S

IMPROVED SAFETY CONTRIVANCE

for Mining Cages



SIDE VIEW



FRONT VIEW

opinion, all safety hooks ought to hang the cage (not allow it to fall away), as then it would give two chances of catching instead of one. Safety cages ought to have appliances by which a man on the cage could stop it, in any part of the shaft, if desired.

Reference to sketch of Hart's Patent Safety Cage.

A, suspension bar, having formed on its lower end a stud or bolt which acts as a guide and to receive the spiral spring *I*, which is adjusted by means of nuts.

B, pin secured to suspension bar *A*, which gives motion from *A* to levers *CC*, which are pivoted on pins carried by brackets *DD* to the other end of the levers. *EE* are two connecting rods which are connected to the grippers *FF*, and held in position by radial arms *GG*, which are held by pins fixed in stationary bracket *H*.

In case of accident to the rope, the result would be as follows:—*A* would be at once forced down by means of spiral spring *I* and its own weight; thus *B*, the pin, conveys motion to the levers *CC*, by which the connecting rods *EE* and the grippers *FF*, to which they are attached, are lifted up. The grippers are thus pressed against the skids by means of the radial arms *GG*, which are set at a given angle, so as to give out a superior gripping power to maintain the weight of cage and its load.

Naylor's Safety Cage.

Mr. John Naylor, J.P., of Stawell, has kindly furnished me with the following description of a safety cage invented by him:—

The cage, I believe, is different in its construction to any other now in use, as it is designed to act upon the slabs in shaft by grippers at each corner of cage (as shown in sketch), which are balanced, and by that means are easily set in position to grip the slabs by four small rods attached to the lower plate of cage. Small rollers fixed in levers will also be observed attached to the lower plate. They rise inside tapered shoes, or guides, and, on any breakage of rope or shackles occurring, the cage carrying the load overtakes the lower plate in its descent, and throws the rollers up between the skids in the shaft and the tapered shoe, and throws out grippers to slabs in shaft simultaneously. A slight spring is fixed in each side of cage to make the action of grippers more sensitive.

My reasons for introducing the levers for gripping slabs in shaft are that, in my experience, the majority of accidents occurring in winding shafts are occasioned by the skids getting out of their places, through the rusting of nails or spikes, and very frequently through the settling of ground when mined underneath or around, and consequently any safety appliances adapted only to skids become inoperative.

I have a half-sized model of the cage, which proves very effective so far as yet tested. I may state that the invention is not patented. I merely designed the cage to act upon both skids and slabs in shafts as a double safeguard in cases of necessity, and so avoid, if possible, the sacrifice of human life and property. Some instances have come under my notice where safety cages acting upon the skids alone have failed to perform their duty. You are quite welcome to use the sketch in any way you may deem advisable.

(Signed) John Naylor.

Noland's Cage.

Respecting this cage, the invention of Mr. J. T. T. Noland, of Castlemaine, I have obtained from Mr. Nicholas, the Senior Inspector of Mines, the following report, dated 12th May, 1884:—

The model is constructed about one-third of the size of the intended working cage, and is placed in a strong frame, to which are affixed guides or skids.

The heavily loaded cage was wound up and detached similarly to a case of over-winding. At each trial the cage was instantly held by the grippers. The tests of the detaching hook and of the suspending power of the grippers were perfectly successful.

The safety appliances consist of twelve eccentric serrated discs, three pairs of discs on each side of the cage, and these are supplemented by two pairs of brake blocks. The discs are forced against the skids by the motive power of four spiral springs, and the brake blocks by the use of a double crank lever, which the men in the cage may put into operation when an emergency, or any necessity for suspending the cage, arises. The cage may be stopped by its occupants either in its ascent or descent; and there is a detaching lever for disconnecting the rope from the cage, which is also under the control of the occupants.

Mr. Noland has displayed a great amount of mechanical ingenuity in constructing his cage. Its defects are as follow:—

1st. Complication of parts in design.
2nd. Necessarily cumbrous form of cage.
3rd. Cost of manufacture.
4th. Liability of arms of detaching hook being caught by the coupling chains.

Writing subsequently, under date 17th December, 1884, Mr. Nicholas remarks in reference to this cage:—

I have, on several occasions since the date of my former report, tested these improved safety contrivances, and always found them to act perfectly.

Parker's Safety Cage.

The following is a description of the sketch of this cage, the invention of Mr. John D. Parker, of Scotchman's Lead, Buninyong:—

Hook *A* (Figs. 4 and 5) works on pin *B*, and is kept in position by disconnecting lever *D*. Pin *E* allows hook to turn just sufficient for shackle to let go, and keeps the hook at nearly right angles, so that it will catch on the disconnecting bars *F* (as shown in Fig. 4), which are fixed near the pulleys, and prevents the cage from falling should the grippers fail to act when the cage is over-wound. Lever *D* works on pin *G*, and is kept in position by pin *R* (Figs. 4 and 5). Spring *S* (Fig. 5) fetches lever back in position, when the hook lets go. Hook *A* and disconnecting lever *D* works between two bars *CC* (Figs. 4 and 5), which are riveted to suspension bar *M*. Bar *M* suspends the cage by bolt *T* and cross-bar *Q* (Figs. 1 and 3). When the cage is suspended bolt *T* is at the bottom of slot in suspension bar, and nut *U* is against cross-bar *Q*. Grippers *H* work on pins *I* (Figs. 1, 2, and 3), and are lifted to skid by rollers *J*. Rollers *J* are attached to cranks *K* (Figs. 1 and 3). Cranks *K* work on pins *L*, pins *L* being fixed to sides of cage. Spring *P* is attached to suspension bar *M* and cross-bar *Q*, and pulls down suspension bar when the rope breaks, causing the grippers to take skids. Cranks *K* (Figs. 1 and 3) oscillate with rise and fall of suspension bar. Grippers *H* fall when suspension bar rises, and rise when it falls. Handpiece *N* is attached to bars *O* (Figs. 1 and 3). Bars *O* are attached to cranks *K*. Handpiece is for men to pull and stop cage in case of necessity.

Taylor's Safety Cage.

From the list of patents granted last year I take the following particulars respecting a safety cage invented by Mr. S. R. Taylor, of Talbot:—

This invention works by means of iron ratchets fixed on the face of the skids, or against the sides or ends of the shaft and pawls. Steel rods, or pawls, are connected with springs, so that as long as the rope is taut the cage works up and down smoothly, but directly the rope slackens the action of the springs forces the rods out on to the ratchet, and the cage is instantaneously stopped. The above appliance also answers in cases of over-winding, as the skids, being fitted with ratchets from the poppet-heads to the bottom, no matter in what part of the shaft an accident should happen, the action of the invention causes the cage to stop instantly.

Mr. Taylor has also invented a small platform, made of wood or iron, to be used when changing shifts, &c. This platform is hung with ropes or chains from a shackle at the lower end of the suspension bar, and acts on the rope independent of the main cage. Upon this platform the men stand, and the whole of their weight is used to force out the steel arms, so as to more effectually stop the descent of the cage in case of accident. The weight of the men and the pressure of the springs combined will have a downward pressure of over half-a-ton, which will successfully draw the rope over the pulley and out of the engine house, should the rope part on the spider. The removable platform is suspended some 6 inches or so from the bottom of the cage, and is kept in position by guide-pins descending from its underside, and entering holes in the bottom of the cage.

Webster's Cage.

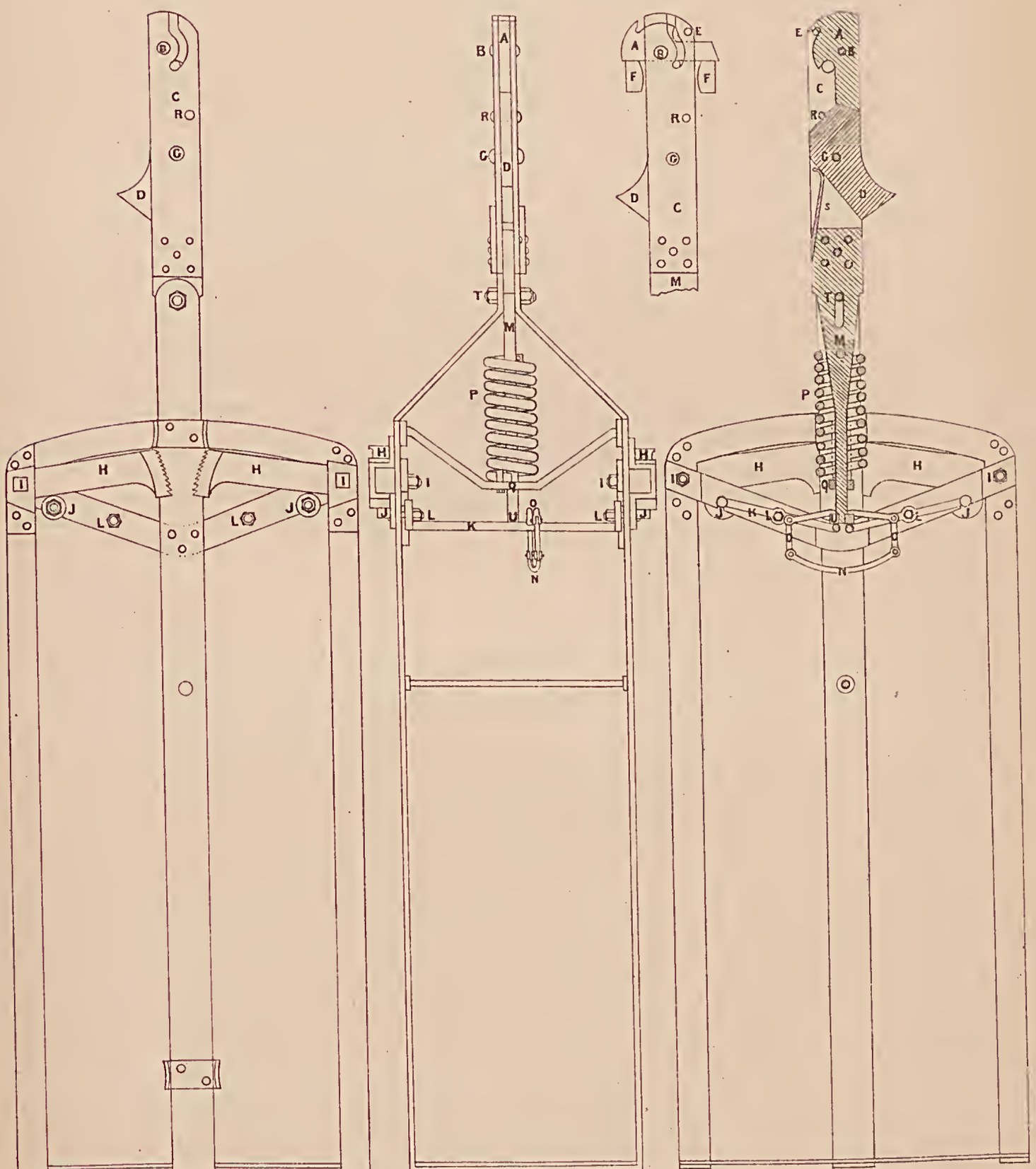
Mr. Francis Webster, of Ballarat, who states he has been connected with mining for the last 27 years, and is by trade a mining blacksmith, has brought under the notice of this Department a safety cage invented by him, a sketch of which is given at page 25. Mr. Webster says he has had opportunities of seeing all the safety cages now in use, and he has come to the conclusion that the principle on which they suspend has no sound foundation. "I do not," he writes, "find the principle of grippers applied to prop any suspended weight anywhere in these times. Surely it must be an out-of-date theory. It might be applied as a brake, but not to prop suddenly a suspended weight, because the grippers depend on spring power for suspension; not so with the ratchet principle, on which my cage is founded." And with an amount of enthusiasm, excusable perhaps in an inventor, he proceeds to insist that his cage is incomparably the best that has yet been brought under notice; in fact the only one in the use of which there is any real safety.

I instructed Mr. Inspector Stewart to examine the model exhibited by Mr. Webster, and to furnish me with a report, which I now subjoin. Mr. Stewart says:—

In accordance with the request contained in your memo. of the 31st December, I, in company with Mr. Inspector Meekison, met Mr. Webster and inspected his cage at the School of Mines, Ballarat. I may mention that Mr. Webster had previously waited upon me on several occasions, and he has been very demonstrative because no one will adopt his cage. He says if my report does not please him he will have another; I will therefore try and be as plain as possible. The cage is in principle somewhat similar to other cages at present working in the colony; the only new thing connected with it is the notched skid to act as a ratchet. These ratchet skids can be made wholly of iron, or of wood with iron ratchet face, or of wood with iron teeth let in. The cage itself, like others, must at first trust to springs, of which there are no less

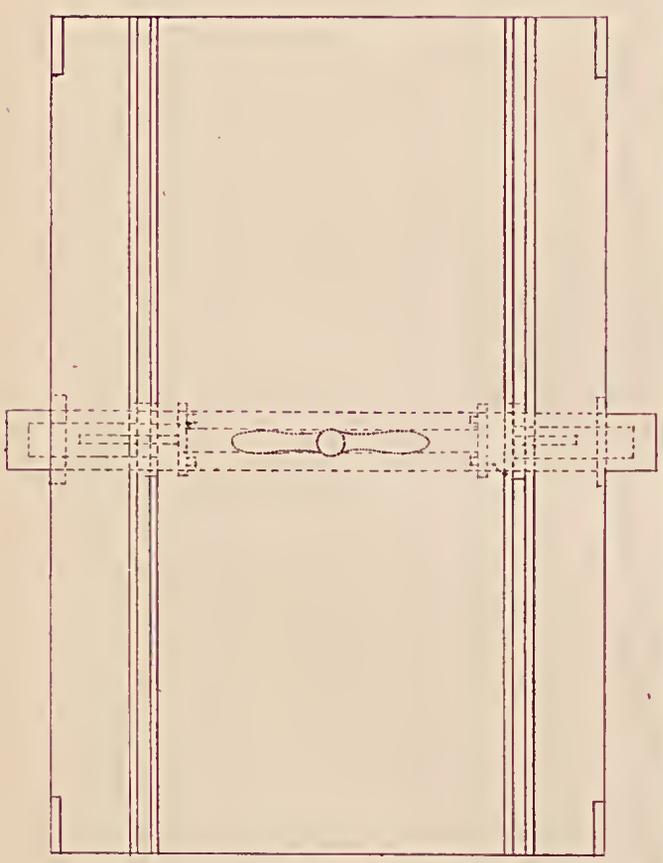
PARKER'S SAFETY CAGE.

Fig. 2. Fig. 1 Fig. 4. Fig. 3.

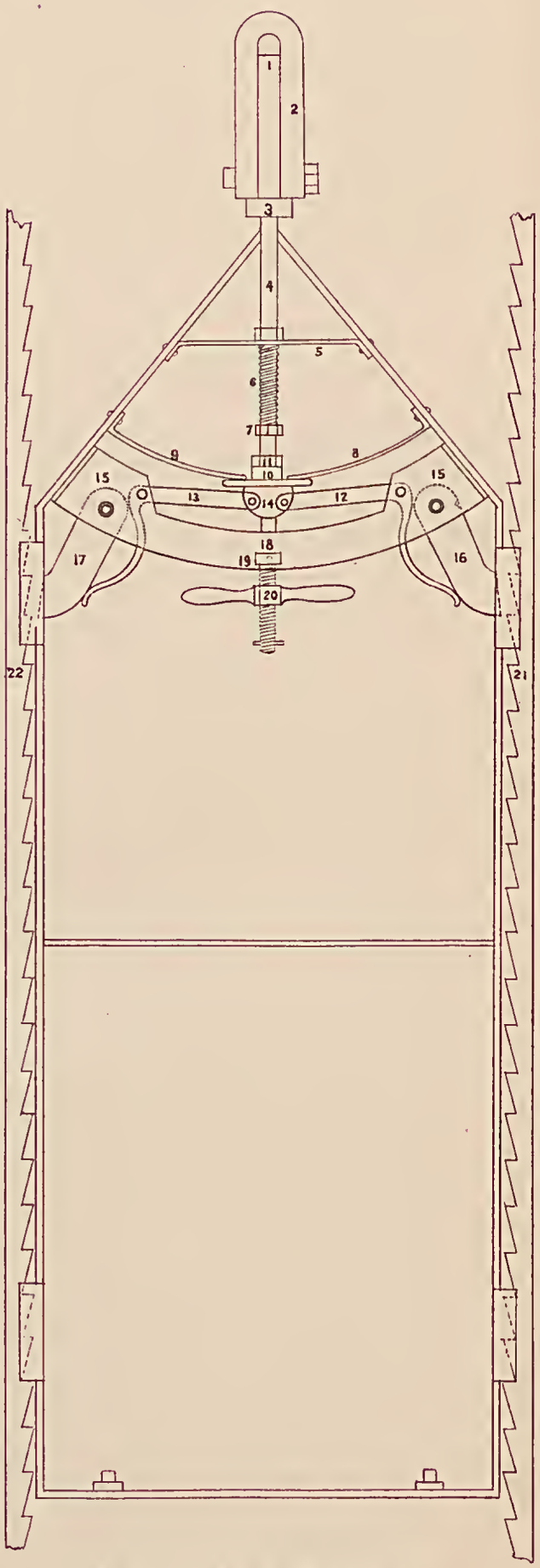


Scale ¾ of an Inch to 1 Foot.

WEBSTER'S SAFETY CAGE



PLAN



ELEVATION

than five (which in itself is an objection, for all springs working in mines are liable to lose their power through the action of the water, and also—in my opinion—through the action of the air; consequently, a complication of springs is not desirable). I cannot myself see in what the superiority of this cage over some others at present working consists. All models look and act well, but the cage has not yet been practically tested. No doubt, if the principle of notched skids could be got to work, it would be an additional assistance to cages, which, like this one, are to work on the face of the skids. The spread of the dogs on cage would have to be limited to (say) 2 inches each side, and, to prevent these dogs, or arms, from having any outward pressure on the skids, the notch would have to be fully 2 inches deep. Now, seeing that nearly all skids at present in use are of timber 4 inches by 3 inches, and flat on to the shaft, you will at once see *that the skids would be completely destroyed* unless larger timber were used. To do this (seeing that many shafts are the same size), the cages would have to be smaller; this would not matter if for cages only, but then all trucks would have to be smaller as well. I therefore cannot see that the Department can adopt any unusual course with this cage; but if, as Mr. Webster says, everybody approves of it, he should have no difficulty in getting it brought into use and thus prove its value. I am informed that a similar cage is now, and has been for the last fourteen years, working at the Comet Co., Sandhurst, but I cannot see anything about it to induce me to say it is the best and must be used. The description I forward herewith is written by Mr. Webster himself, also the estimate of cost, which I consider too low.

Description of Patent Safety Cage designed by Francis Webster, Tress-street, Ballarat East.

1. Top of centre straps with slot holes; when placed together form a socket.
2. Connecting shackle with pin running through the socket and lifting bar.
3. Iron band tying centre straps together.
4. Lifting bar, which compresses the springs when the cage is suspending by the rope.
5. Stay for lifting bar fastened to centre straps.
6. Spiral spring.
7. Screw nut on to lifting bar compressing the spiral spring.

8 and 9. Flat springs fastened to centre straps.

10 and 11. Cross-head and jam nut on to lifting bar to compress the flat springs.

12 and 13. Two lever springs pinned on to main stay which move the dogs.

14. Link bolt tying lever springs.

15. Hollow stay fastened on to centre straps.

16 and 17. Dogs pinned on to hollow stay. The bottom parts of dogs protrude through the centre straps, so that when the springs are compressed the arms, or dogs, fall back in the cage; or, if any sudden slackening takes place, the dogs move to the skids.

18 and 19. Spiral spring and gland fastened with set screws. Spiral spring is on to link bolt and inside the hollow stay to act as a counter balance.

20. Stop handle screwed on to the link bolt. Can be used to stop the cage in any part of the shaft apart from the self-acting gear in the *descent*, and to act as a ratchet in the *ascent*.

21. Skids which are notched in the centre of face, which have the appearance of an inlet ratchet tooth, so that the dogs when moved to the skids get imbedded.

22. Iron skid, which is plain in the sides and notched in the face.

I do not intend to introduce the iron skidding in my cage. The wooden skids could be made for about 25s. per 100 feet, and a cage constructed for about £20 to £25.

(Signed) F. Webster.

Safety Cages in Actual Use.

In the following pages will be found the reports of the Mining Inspectors on the safety cages actually in use at the present time on the several gold-fields; but it will be advisable, before submitting them, to enumerate the cages described in previous Annual Reports of this Department, many of which are still in use and highly approved of. With this view, I subjoin an alphabetical list of previously mentioned cages, together with the date of the Annual Report in which each is described, viz.:—

Aytoun's (English)	1874	Nancarrow's ...	1877
Buttle and Jackson's	1877	Osborne and Mitchell's	1879
Dobson's... ...	1882	O'Malley's	1877
Jackson's ...	1877	Owen's	1880
Kennedy's ...	1877	Pryor's	1878-9
Macaw's	1879	Seymour's	1877-9
Middleton's ...	1879	Thomson's	1876
McKay's... ...	1879	Wayman and Kay's ...	1879
McLeish's ...	1877	William's	1876-9
Nance's	1879		

The Senior Inspector of Mines (Mr. H. B. Nicholas, Castlemaine) writes:—

Since the receipt of your instructions to practically test each description of safety cage, in use in my district, I have made fifty-eight trials of eight different styles of appliances adopted by mining managers for preventing cages falling down shafts, and now beg to report the results.

The majority of my trials were made by cutting the rope with which the cages were suspended, but in a few cases I tested by over-winding. Generally the tests were made with the full working load in the cages. This load would be heavier than four men, which is the maximum number permitted to ride in ordinary cages.

With Seymour's cages I made fifteen trials. The fall of the cages ranged from 2 to 15 inches. In three cases the catches failed to stop the falling cages, and in another instance a skid was broken. The failures, and the breaking of the skid, were caused by the skids yielding to the outward thrust of the catches on the face of the skids.

In fourteen tests of Allan's cages, the fall ranged from 1 inch to 2 inches. Seymour's and Allan's cages are also fitted with hand levers, for bringing the appliances into action when the occupants desire to stop the descent of a cage. I tested the hand levers, and found all were efficient for that purpose.

William's cages were submitted to eleven tests, and all were failures.

In seven tests of Brown's cages the fall ranged from $\frac{1}{2}$ an inch to $2\frac{3}{8}$ inches.

In four tests of McKay's cages the fall ranged from $5\frac{1}{2}$ to $14\frac{3}{8}$ inches.

In four tests of Chessell's cages the fall ranged from $\frac{1}{2}$ an inch to $\frac{3}{4}$ of an inch.

In two trials of Noland's cage the falls were $\frac{3}{8}$ of an inch to $1\frac{1}{4}$ inch; and one trial of Wayman's appliances proved unsuccessful, because of the springs being out of order.

The cages fitted with Allan's and McKay's appliances were tested in the full swing of ordinary work, whilst Brown's, Chessell's, and Noland's, and two of Seymour's, were new cages tested for certificates.

Mr. Inspector Stewart (Ballarat) reports :—

I have practically tested 42 safety cages, working in the several divisions of the Ballarat district, and have now the honour to report as follows :—

Ballarat.

Allan's Patent.—I tested five of these cages, and their action may be considered perfect, the greatest fall being only $2\frac{1}{4}$ inches.

McKay's.—Tested two of these cages; each dropped only 3 inches.

Macaw and Son's.—Tested two of these, neither of which acted at all.

Pryor's.—Tested two of these; neither attempted to act.

Williams'.—Tested three which act on the face of the skids, also three which act on the side of the skids. All completely failed except one of the latter kind, a new one, which fell 5 inches.

Meekison's.—I tested two cages known as Meekison's, but both failed.

Referring to Williams' cages, those that are supposed to act on the face of the skids, I would direct your attention to my opinion of the cages, as contained in my report for the week ending 4th November, 1882, and also the correspondence between Mr. Curthoys, the manager of the Band of Hope Quartz Co., and the Department, in October, 1883, *in re* the same cages. I am still of the same opinion, *i.e.*, that they are not safety cages at all.

Before proceeding to describe the tests made in other divisions, I feel it my duty to call especial attention to the care bestowed upon the cages by the managers of the Band of Hope and Albion Consols and Band and Barton companies, Ballarat, especially the latter, who by his diary shows that his cages are regularly tested every fortnight by himself and engineer. The result of this care is shown by the satisfactory tests.

Creswick.

Macaw and Son.—Tested seven of these cages, six single and one double. The double failed to act, but the whole of the others caught, the drop being from 4 to 14 inches. The manager of the New Australasian Company, in this division, has his cages looked at every day by the blacksmith, and cleaned and oiled by the braceman. Hence the successful tests at this mine.

McSporrin.—Tested four double cages by this maker, only one of which acted at all.

Egerton.

Macaw and Sons.—Tested two of these cages, both of which completely failed.

Pryor's.—Tested two of these. Both completely failed.

Allan's.—Tested two of these. One failed; the other caught after dropping 3 feet. I consider this more the fault of the skids than the cage.

Gordon.

Allan's.—Tested one, which acted well, only falling 3 inches. Tested another made on the mine; it also only fell 3 inches.

Haddon.

Allan's.—Tested two cages. One caught after falling 3 feet; the other did not catch at all.

Buninyong.

Williams'.—(Side-grip cages.) Tested two. One fell 5 feet; the other fell 1 foot.

Remarks.

Allan's cage has serrated grippers acting on the sides of the skids, and brought into action by an elliptic spring. This spring is always visible, so that a defect is easily seen.

McKay's cage has serrated grippers, brought into action by two spiral springs; but the springs, being encased in an iron tube, cannot be seen, and require to be often taken out to ensure their usefulness.

Macaw and Son's cage is an eccentric, brought into action by a spring fixed on the side of the cage and working on the disc to force it to the skid.

Pryor's has four arms to catch on the slabs of the shaft, and is supposed to fall by its own weight, having no spring to assist it.

William's cages are of two kinds, one with serrated grippers to catch on the side of the skids, and brought into action by indiarubber springs. The other has simply two chisel-pointed arms coming out through the top of the cage, and supposed to enter the face of the skids, but has nothing to bring it into action.

It must by this time be apparent to every one that no cage, however good its principle, can be of any use unless it is well looked after and kept in good order. This is clearly shown by the results of my tests, for even cages of the best makers have completely failed where they have been neglected. But I am pleased to observe that many managers are taking more interest in safety appliances than formerly, although some are still opposed to them, and only take just sufficient trouble to comply with the law, and thus save themselves.

I feel confident we have in use in the Ballarat district good safety cages, if properly looked after; and I am also confident there are many working that are utterly useless, and will never assist in saving either life or property. These latter have only been obtained on account of their cheapness, and to comply with the letter of the law.

As showing the value of safety cages, if kept in good condition, Mr. Stewart, in a report dated 10th December, mentions:—

At about 3 p.m. on the 8th December, at the No. 7 shaft of the Band of Hope and Albion Consols Company's mine, while the engine was at full speed, the rope broke, and the cage (Allan's patent) immediately caught, thus preventing any further damage. The cage contained a truck of mullock, about 6 cwt., and the rope (an improved steel one, an inch in diameter) broke, leaving 95 feet of rope attached to the cage. *No doubt the cause was the platman not properly putting the catches on the truck.*

The great importance to be attached to this accident is the fact that men were in the bottom of the shaft sinking, and although there are good pent-houses over their heads, the fact of the cage falling a distance of 600 feet (had not the grippers acted) would most likely have had a disastrous effect, at least destroying the bottom of the shaft, and smashing the cage to pieces, and (if a weak place happened to be in the pent-house) killing the men in the bottom of the shaft.

The cage at the time was at an enlarged part of the shaft, allowing two wheels of the truck to get off the cage, thus causing a tremendous strain upon the rope, the wires of which were drawn out quite thin.

This is not the first time that the cages at this mine have acted to the benefit of the company, and I am certain that both the legal and mining managers will acknowledge the value of a good safety cage, if kept in order.

The distance the cage dropped in this instance was about 3 inches.

Mr. Inspector Meekison reports:—

The conditions under which the tests were made by me were that the cages were landed on a prop on the surface, and the chains connecting them with the ropes were slacked down until a fall of from 4 to 6 feet was obtained, according to the length of the chains; then the shackles on the cage and the rope were connected together with a small rope, and the cage lifted off the bearing. The small rope was then cut, and if the cage fell until the chains took the weight, I classed it as having failed. Those classed in the list hereunder as having acted fell from 1 inch, the smallest drop, to 14 inches, the longest one, before they caught. The cages most in use in this district are Allan's and Macaw's.

Allan's Cage.—Tested eleven. Six acted, five failed.
McKay's Cage.—Tested two. Both acted.
Macaw's Cage.—Tested eleven. Six acted, five failed.
McSporrin's Cage.—Tested five. One acted, four failed.
Williams' Cage.—Tested eight. Two acted, six failed.
Pryor's Cage.—Tested four. None acted.

In addition to the above, I tested one safety cage, not patented, which acted. The name of the inventor is unknown to me.

I consider Allan's safety cage is the best of the different makers' tested. The two handles fixed inside this cage, by which any one in them can apply the grippers and stop them in any part of the shaft, is, in my opinion, a necessary appliance to any safety cage. At the Llanberries Co. I was informed that when an influx of water occurred in the mine on a Sunday lately, unknown to any one, the men, on being lowered down the shaft on Monday morning, would have been drowned if the Allan's cage in use had not been provided with this appliance, by means of which they stopped the cage as soon as it struck the water.

Only two of McKay's cages were available for trial, and both acted. I would place these cages second.

Macaw's cages had the same number of trials as Allan's, and the same number acted, but they fell further before they caught, and they have no appliances by which any one in them could stop them in any part of the shaft if required. I would place these cages third.

These three makers' cages will act satisfactorily if kept in good order, but if allowed to get out of repair, or if dirt and rust are allowed to accumulate around the working parts, neither of them can be expected to act as safety cages, and it greatly depends on the care bestowed on them when in use whether companies have really safety cages at all, or only shams. All the cages that acted were in better order and better attended to than those that failed.

I consider the best kind of safety hook to be those that, if the cage go to the poppet-heads, and the rope is disconnected, hang the cage by the hook, as they give an extra chance and additional safety as compared with those that allow the cage to drop away and depend solely on the grippers. In my opinion the best safety hooks are Middleton's, Humble and King's, and Williams', but to keep them efficient they require to be kept in order. A good plan to keep the parts from rusting together is to put a thin sheet of brass between the plates.

Mr. Inspector Grainger (Sandhurst) reports the results of his tests as follows :—

I tested altogether nine different cages :—

1. *Webb's.*—Tested this cage with a full truck in, and without any load. The tests were very satisfactory, the cage not dropping more than 1 inch. It has been in use about four years.

2. *Osborne and Mitchell's.*—Tested empty cage, and also with full truck in. Test good, cage not dropping more than half inch. In use five years.

3. *Turnbull's.*—Stood test well, with load in and without, not dropping more than 2 inches, just sufficient to let eccentrics act. In use four years.

4. *Jackson and Middleton's.*—Test good, with empty and full truck in, only dropped half inch. Cage in use five years.

5. *Bowman's.*—Gave this cage a severe test, but it stood it well, with full truck in and without. Could not discern how little it dropped. In use about five years.

6. *Hocking's.*—This cage would not stand the test. I was disappointed in it, as I considered it one of the best in use. Mr. Hocking explained that it was not properly made. It was not made by him.

7. *Kay's.*—This cage stood test well, with and without full truck in, only dropping about half inch. Working about three years.

8. *Seymour's.*—I gave this cage severe tests with a full truck on and without it, and I could not discern how little it dropped. The tests were most satisfactory. In use about four years.

9. *Kennedy's.*—This cage also stood a good test, with a full truck on and without it. The grippers acted at once. In use about two years.

I may add, all the cages, with the exception of Hocking's, stood the tests well, and were highly satisfactory. If I were asked which one of all I have tested I prefer, I would select Seymour's from my general knowledge of all of them, and from the fact that its principle is the least complicated.

Mr. Inspector W. G. Couchman (Dunolly) reports as follows :—

I have practically tested the working of the various safety cages in use in my district, with the following results :—

Maddock's Patent.—The safety appliances attached to this cage consist of strong iron grippers (worked with a spring), which catch the sides of the skids fixed in the shaft. When sufficient weight is off to allow the spring to act they hold very well, but should the rope break near the drum, or the drum revolve on the shaft of the winding gear, leaving sufficient strain to keep the spring expanded, the grippers cannot act, and the cage would descend to the bottom of the shaft.

The Queen's Birthday Company, Dunolly, have these cages working, but they have an additional safety appliance of the manager's invention attached, consisting of a wedge which is applied with a lever, so that when men are in the cage it is the duty of one of them to keep his hand on the levers and, in case of accident, apply it to stop the downward progress of the cage, when the grippers act immediately.

Allan's Patent.—The safety appliances on this cage also consist of strong iron grippers worked with a spring. They take hold of the sides of the skids which are fixed in the shaft ; a lever is also attached to the cage, by which means, when men are in it, they can stop its descent at any time, and it works very well ; but this, as with the others I have seen, will not work if there should be no person to apply the lever when there is sufficient weight behind the pulleys to keep the spring expanded.

Seymour's Patent.—The safety appliances to this cage consist of two strong iron arms (worked with a spring), which press the skids outward against the sides of the shaft. It also has a lever that can be applied when men are in the cage, and works very well; but there is the same objection to this as the others, namely, the grippers will not act if there is sufficient weight, in the shape of a tail rope behind the pulleys to keep the spring expanded.

Penniment's Cage.—The cage now in use by the Mercantile Company, Carp Diggings, was manufactured by Mr. J. Penniment, of Chiltern. The safety appliances consist of strong chisel-pointed grippers, which catch the sides of the skids in the shaft. These grippers are worked with a spring, and act very well, stopping the descent of the cage immediately, when they take hold; but the same objection applies as to the others.

Mr. Inspector Fennelly (Kilmore) reports :—

There are four safety cages in my district, being one at each of the following mines, viz.:—The Langridge, Empress of India, Doyle's, and Crown.

On the 30th December I visited the aforesaid mines, but could not examine the cages, as work was suspended for the holidays.

On the 15th instant I made another visit, with the following results :—

The Empress was idle, but the manager stated he would resume work in a few days, and he would communicate with me, so that I could arrange to test his cage.

The safety cage at the Langridge is not used.

The trials of the cages at the Doyle's and Crown mines were disappointing. The first-named company use Seymour's cage, and that used by the latter is, I believe, Macaw's. Both are fitted with Middleton's hooks.

I caused each cage to be dropped *five* times, and each caught only once, thereby showing that, in their present condition, the safety appliances of these companies are useless.

I am confident that some time ago both cages gripped satisfactorily, and I attribute their present failure to the shrinkage of the timber in the shafts, which has evidently got out of the neat gauge required for the gripping appliances, and I have therefore directed the managers to make such adjustments as will ensure their safe working in future. I intend to make another inspection at an early date. It is self-evident, owing to the rough wear and tear to which cages are subjected during work, that the efficiency of the best

constructed contrivances will, in a short space of time, become seriously impaired unless a constant and thorough system of maintenance is kept up; and consequently I would beg to suggest that mining managers be compelled to test their cages at least once a week, and to make a record of the results, with a view of rectifying any defects that may be present in the appliances. I would also suggest that the following particulars be legibly stamped on each cage, viz.:—Name of maker, date of construction of cage, weight of cage, number of cage.

Mr. Inspector Bate (Stawell) states :—

Since the date of your instructions, I have, at various times so as to suit the convenience of the mining managers, made tests of the working of all the safety cages now in use within my district, and have the honour to report thereon as follows :—

Safety cages are at present in use at the following mines, viz.:—Magdala Co., Pleasant Creek Cross Reef Co., Oriental Co., Extended Cross Reef Co., and Scotchman's United Co.

It must be understood that, in each of the trials or tests made by me, the cages were, in the cases of the Magdala and Extended Cross Reef companies, immediately below the surface sill of the shaft; and in all the other cases they were a few feet above the surface, these being the only positions possible in an ordinary test, and in the absence of the favorable conditions under which the tests were made in 1878 by the board of inquiry on safety cages.

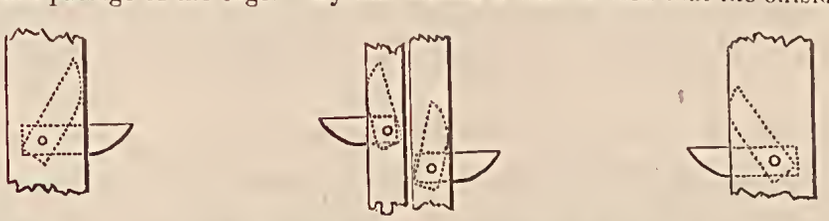
Magdala Co.—At the Magdala Co.'s shaft there are strong, automatic safety catches of iron plate at the main brace, and similar ones at the upper, or safety brace. These would prevent the fall of the cage down the shaft in the event of over-winding, White's safety detaching hook being used. The safety appliance on the cages itself is Pryor's (described at page 5 of "Report of the Board of Inquiry on Safety Mining Cages, 1878-9").

The trial of this appliance resulted in a complete failure, the sharp blade-points, which should have become imbedded in the slabbing, having failed to even touch the wood, and not a scratch was discernible on the side of the shaft in the vertical line of descent of the blades.

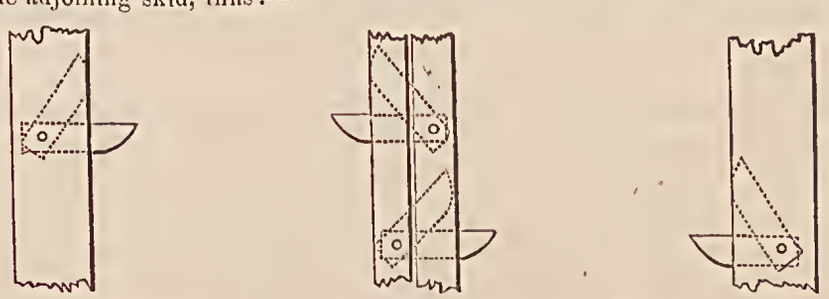
At the Pleasant Creek Cross Reef Company's No. 1 shaft the cages are fitted with White's detaching hook, and there are automatic safety cages at the main and false braces which would effectually prevent the fall of a cage down the shaft in the event of it being inadvertently carried to the poppet-heads. The safety appliance is an adaptation of Wayman and Kay's, the alteration consisting in the gripping wheel, or roller, being indented or made to assume a ratchet form. This alteration was made at my suggestion, in consequence of the rollers having failed to grip the skids when the latter were greased, at my request, at a test made by me on 6th November, 1884. On the occasion of the present test the cage only dropped about 8 inches, whether the skids were or were not greased. I considered the trial satisfactory.

As no men go up or down No. 2 shaft, I did not consider it necessary to test the safety appliances there.

At the Oriental Company's shaft the safety and detaching appliances are, in all respects, similar to those used by the Pleasant Creek Cross Reef Company. The test was satisfactory, the cages falling only from 5 to 6 inches on the rope being cut. At the Extended Cross Reef Company's shaft, Middleton's patent safety hook is used, and there are "tumblers" on the skids between the main brace and poppet-head, besides automatic iron-plate safety catches at the brace itself. I discovered a defect in the tumblers, and pointed it out to Mr. Naylor, the legal manager, who promised to have it remedied. The defect consisted in the inside tumblers not being long enough (and consequently not having weight enough) to fall, after the upward passage of the cage. By this sketch it will be seen that the outside skids are much



wider than the inside ones. The inner tumblers cannot, therefore, be so long if the bolt be (as is the case here) in the skid of the compartment of the shaft to which it belongs. My suggestion was to place the bolt in each case, in the adjoining skid, thus :—



The safety cage is Naylor's improved, which, in its main principle, is similar to Pryor's, inasmuch as the mode of arresting the accidental descent of the cage is by sharp blade-points being thrust into the slabbing. In testing these cages, one of them fell 18 inches, the other 10 inches, after the rope by which they were suspended was cut.

At the Scotchman's United Company's shaft the detaching hook is Middleton's patent. There are automatic iron-plate safety catches at the brace, and tumblers above—all in good working order. The safety cage is similar in all respects to those now in use at the Pleasant Creek Cross Reef and Oriental companies' mines, and, when tested, the cage only fell about 6 inches on the rope being cut, whether the skids were greased or dry. I would point out that the failure of the safety appliance attached to the cage of the Magdala Company was, in my opinion, due to the fact that, immediately below the surface, where the

test was made, the shaft is much too large for the blade-points to reach the sides, and not to any defect in the appliance itself. In connexion with this, I would also remark that the success or otherwise of any safety appliance must, in a great measure, depend upon the condition of the shaft in which it is used. In the case of Pryor's or Naylor's, for instance, to ensure success, the shaft should be of an uniform width; and for Wayman and Kay's, or any other in which the principle is the gripping of the skids, these latter should be of the same thickness from top to bottom of the shaft.

Mr. Inspector Alfred Armstrong (St. Andrew's Division) reports, under date 13th December, as follows:—

There are four safety cages in mines in this division, namely, at the Antimony mine, Ringwood, the Pigtail Co., Warrandyte, Creighton's Freehold Co., Gembrook, and Diamond Creek Gold Mining Company Limited, Nillumbik. The three first-named mines are not at present being worked.

I tested the Diamond Creek Company's cage, and found it most efficient. After the rope was cut the grippers instantly held the loaded cage. The makers' names are Wayman and Kay, of Stawell, who, I believe, are also the inventors. The grippers are rollers, which act from tubes by steel spiral springs fixed on each side of the cage, which compress firmly on the guides of the shaft upon the rope being severed.

The safety hook used is known as "Middleton's."

Mr. Inspector Davidson (Beechworth), under date 31st December, reports:—

At present there are no safety cages in use within my district.

The safety cage at the "New Wallace" Deep Lead Co.'s mine, Morse's Creek, Bright, is idle, and, with the rest of the machinery, about to be removed to site of the new shaft, higher up Morse's Creek.

The Try Again Co., El Dorado, are fitting their cage with William's Safety Appliances, but the thimbles are not yet fixed. As soon as this has been effected, I will practically test, and report.

Mr. Inspector A. B. Ainsworth (Alexandra) writes:—

The only cage working in my district, namely, that at the Toombon mine, Aberfeldy, was tested by me on the 1st of December. The result was as satisfactory as such tests can in their nature be, both safety hook and grippers acting perfectly. The hook is Middleton's and the grippers Wayman's.

Mr. Inspector Sprenll (Rushworth), under date 19th December, reports:—

I have inspected the safety cage at Menzies Tribute Company, Balaclava Hill, Whroo, and found that it worked satisfactorily, as far as I could judge under the circumstances of my visit. The company were hauling quartz to complete crushings for Christmas, and tests that I otherwise would have carried out could not be done without very great inconvenience, as, should any damage be done to the cage while testing it, repairs could not have been executed in time to allow of crushings being completed.

In view of the circumstance that the cage is only used for hauling for about two days in the month, I deferred completing the testing until the new year, when certain other matters requiring the attention of the manager have also to be carried out.

The safety cage at the above-named mine, which is the only one in use in this division, is never used for raising or lowering men unless when hauling operations are being carried on. The name of the maker of the cage is unknown to me, but it is fitted with Allan's hook and appliances for catching on skids.

Mr. Inspector Arrowsmith, Chiltern, reports:—

There are no safety cages worked in this division other than those in use at the claim of the Chiltern Valley Gold Mining Co., viz., Duncan's.

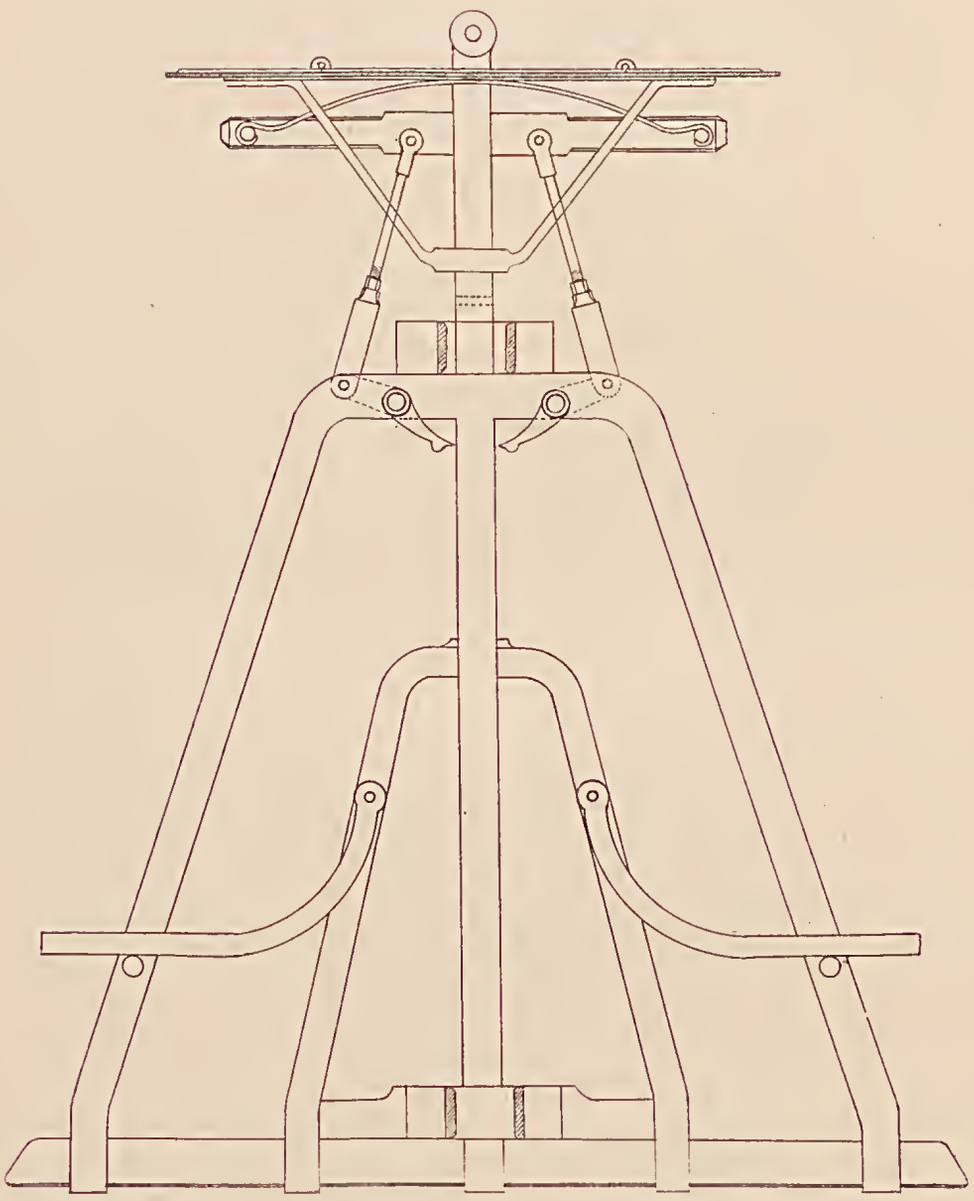
I called at the mine prior to the 6th December for the purpose of making arrangements for testing these, but the manager (Mr. Cock) was absent at the date of my visit. He, however, at my subsequent request, furnished the enclosed sketch-plan and description for the information of the Department. I may say I believe the cages are at least equal to any in use elsewhere. A couple made by a Chiltern blacksmith on this plan were sent a few months ago to Tarnagulla, and they were very highly spoken of in the local papers.

"*Description.*—The winding cages in use in the Chiltern Valley Company's mine are each adapted for hauling two trucks at a time; weight, when loaded, about 30 cwt. The safety principle is an improvement invented by Mr. Thos. Duncan, about thirteen years ago, when he was engineer to the Doma Mungi Mining Company. In that company's mine the invention had several severe tests, and it is authentically reported that there it never failed to act. Some two or three years ago, however, while one of these cages was at work in this mine, the rope broke, and although on that occasion the descent of the cage was not suddenly arrested, yet the safety gear acted so as to prevent its attaining a dangerous momentum, and the cage reached the bottom uninjured. This accident was reported to the Department shortly after the occurrence, and it was explained that the circumstances were most unfavorable to the safety appliance acting effectively. Mr. John Small was at that time engineer here. It may be mentioned that Mr. Duncan is now the engineer of this company, under whose supervision the whole of our machinery is placed, and I have no hesitation in pronouncing our safety cages to be entitled to rank amongst the best of similar appliances in the colony, nearly all of which have come under my notice.

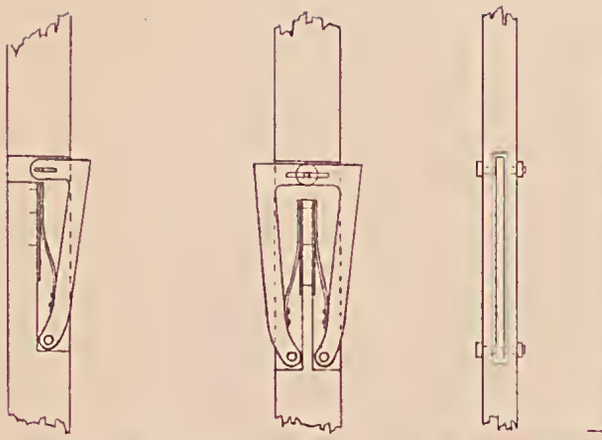
"I enclose a rough sketch of the cage, which will be better understood than any verbal description I could give. I may add that we use Middleton's safety hooks, and have found them to answer admirably.

(Signed) "John Cock, Mining Manager,
"Chiltern Valley Gold Mining Company Limited."

THOS DUNCANS
SAFETY CAGE

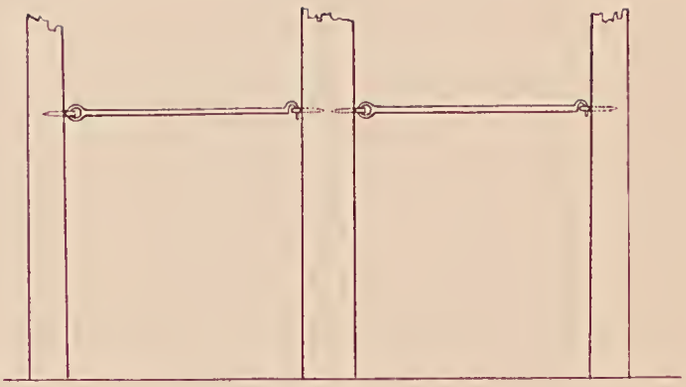


Scale ¾ of an In. to 1 Ft

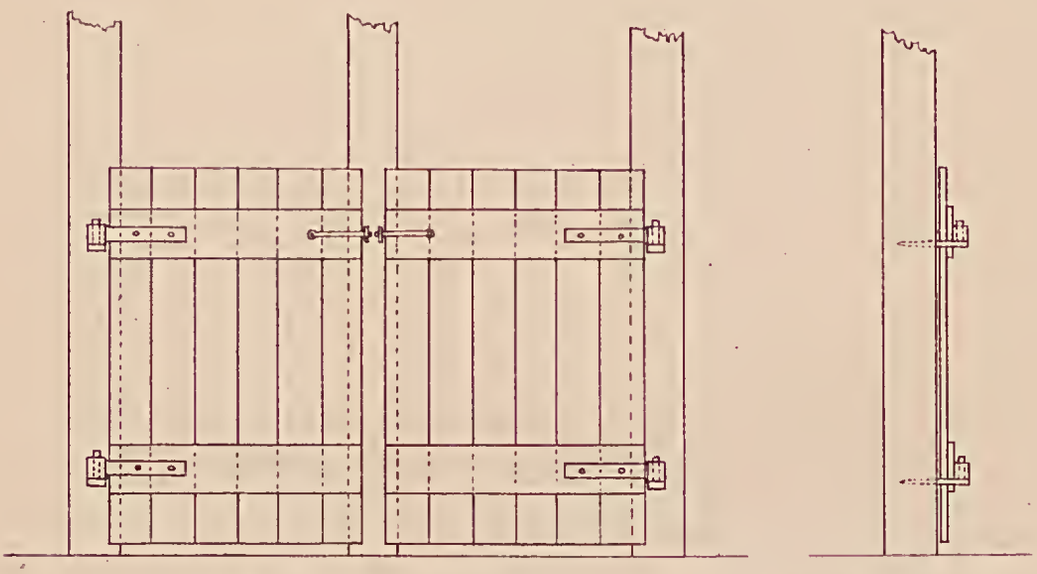


Side Elevation Front Elevation

SPRING SAFETY CATCHES
in runners above landing Brace
VICTORY & PANDORA COMPY

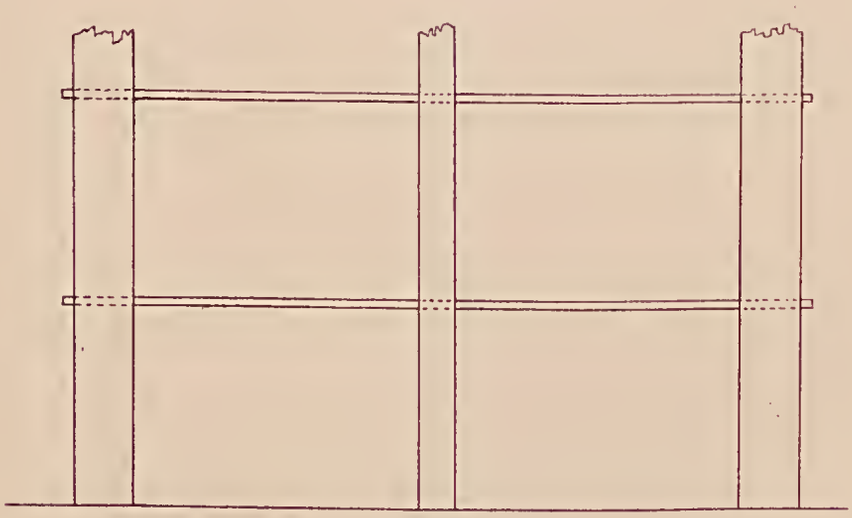


Bars at surface
GARDEN GULLY UNITED COY



Front Elevation End Elevation

GATES IN PLATS CATHERINE UNITED COY



Bars

LANSELL'S N°180 SHAFT (Surface)
Gates or Doors, 7ft high hung outside
Scale, 2Ft to 1 In.

GATES AND CROSS-BARS TO SHAFTS.

There is considerable diversity of opinion amongst practical miners as to whether gates or bars form the better or more convenient protection against accidents through falling down shafts. In alluvial mines in the Ballarat district bars are, the mining inspector states, preferred, on account of the large number of trucks caged, and the great quantity of timber at times in the plat at the bottom of the shafts. Gates, under such circumstances, would not always be in a condition to be used, while bars are never in the way, as they hang down by the props when not required for actual use. In quartz mines, however, gates seem preferable to bars, owing to there being so many entrances to the shafts, and there being no platman constantly at each entrance as in alluvial mines. Furthermore, the ground is much harder and dryer in quartz mines, and consequently gates are easily kept in order.

In the Sandhurst mines, about an equal number of gates and bars are used. The inspector for the district considers gates to be more convenient, and less liable to be left open than bars are to be kept up.

In the Castlemaine district, the senior inspector reports that gates are generally adopted for protecting the surface entrance to shafts and bars at the entrances to the different levels, more especially in quartz mines. He considers bars to be inferior to gates in many respects, as bars may be taken out and dropped without being replaced in the staples or catches. Moreover, men have fallen into shafts *under* the bars, and timber, drills, stones, and even trucks are liable to roll in from the surface or from the levels in the same way. With self-closing gates, however, the senior inspector considers similar accidents could not happen.

The inspector for the Maryborough district states that gates are generally used in the mines under his supervision, and he considers them preferable to bars, as they make the entrance to a shaft more secure. "When a gate is closed," says the inspector, "it is impossible for any person to fall into the shaft, whilst a bar placed across an opening gives but little protection. A trucker coming in the plat, or a platman working therein, or any person stepping out of a cage, might slip and fall under a bar. Moreover, a bar might be displaced, because of its movable nature, or, in case of emergency, it might be used temporarily for some other purpose, and when required for its legitimate use would not be available."

Experience has, however, shown that these objections of the inspector against the use of bars can be overcome—the first, by using two bars instead of one for each opening into a shaft, as in Lansell's 180 mine; and the second, by having one end of each bar fixed so as to hang down by the props, as at the Garden Gully United Company's mine (see sketches).

At the Long Tunnel Extended Company's mine, Walhalla, instead of bars or gates, an iron door is used (see sketch).

The side-bars of these doors or gates are 2½in. by ⅞in., the centre bars 2½in. by ½in., and the bottom, or hinge bar, 1in. round iron. They are thus strong enough to support a loaded cage, and light enough to be lifted up by one hand. They completely cover the winding compartments, thus rendering an accidental fall down the shaft an impossibility. They are fixed in the winding compartment at each level. While winding is going on from any given level they are used as landing stages at that level, and at all other levels, being raised on their ends, they act as gates. When the cage is temporarily stopped at a level it hangs near the top of the gate, which is then used as a short ladder by any one getting in or out of the cage. (Fig. A shows the gate, and Fig. B the hook for lowering the gate across the shaft.)

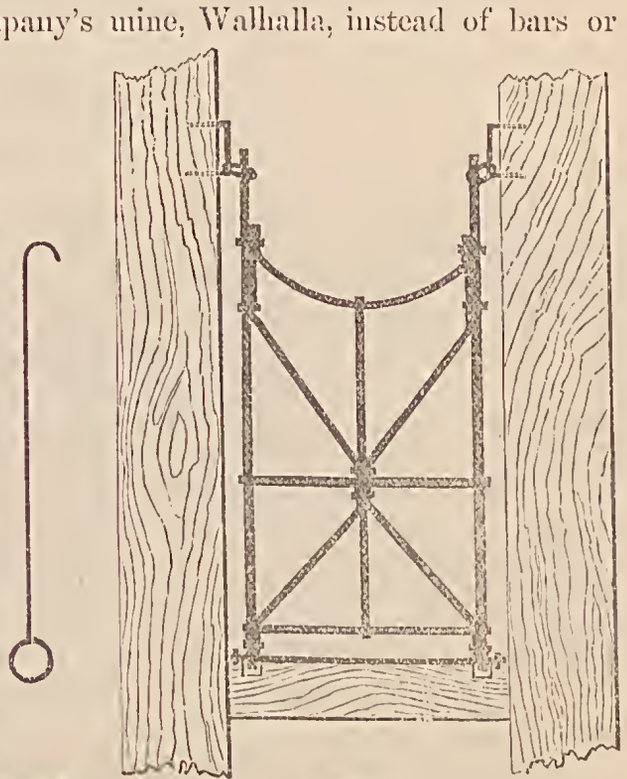


Fig. A.

Fig. B.

Referring to this gate, the local Mining Registrar remarks:—"It is the most perfect contrivance I have seen to prevent falling down a shaft from any underground level, and I know of at least one fatal accident which could not have taken place had these gates been in use."

No doubt the contrivance is an admirable one, but either bars or gates will also afford adequate protection against accidents of this kind if properly attended to. When bars are used there should be two instead of one at each entrance to the shaft, the first at a height of 2 feet, and the second at a height of 4 feet, and they should be fastened to the props at one end, as shown in the sketch of bars used in the Garden Gully United Company's mine. There, however, only one bar is used, which is a mistake. Two feet is recommended as the proper height from the floor for the first bar for the reason that when the plat is not in use a bar so placed, below the second bar, is an absolute protection against a man falling down a shaft, while, by removing it when the plat is in use for hauling, &c., the trucks can pass under the second bar, which latter will not only afford considerable protection against falling down the shaft, but will also serve the platman to lay hold of when pulling out the trucks.

When gates are used there is a great difference of opinion as to whether they should be self-closing or not. The weight of evidence seems to be against the self-closing principle on the grounds that an accidental or untimely swing might push a man back into the shaft, also that if the gate were kept closed it would be extremely inconvenient for hauling trucks, bringing up timber, &c. On the other hand, a jury recently empanelled in connexion with the fatal accident at the United Ajax mine, Campbell's Creek, added a rider to their verdict of accidental death to the effect that all gates or doors to the entrances to shafts should be self-acting, and that this should be made compulsory by law. As in the case of rival safety-cages, however, I think that the time has not yet arrived when a final decision as to the respective merits of the various contrivances can with safety be made. Doubtless, when the different modes of providing safeguards against accidents adopted in the several mining districts are made known by means of this and similar publications, mining managers will select that appliance which seems most suitable to their requirements. In the meantime, if they could be induced to insist on having such appliances as are already in use properly attended to, a corresponding decrease in the number of accidents would be a sure result.

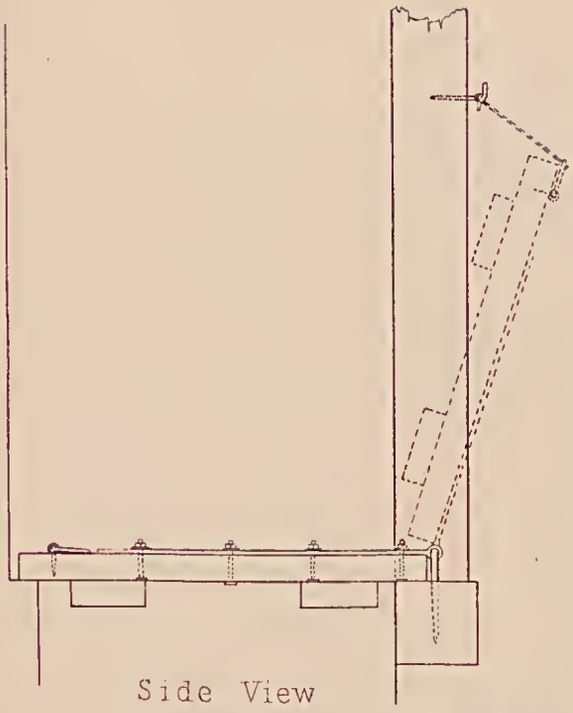
At my request, Mr. Caleb Thomas, Mining Surveyor, Sandhurst, has forwarded sketches (re-produced here) of different styles of arrangement of gates, bars, and safety-catches, used in some of the mines at Sandhurst. Mr. Thomas states that he can find no instances of self-acting gates in use underground in the Sandhurst mines.

VENTILATION.

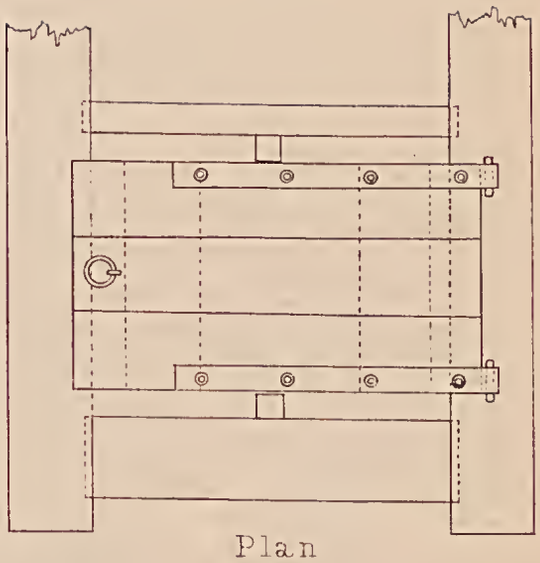
The subject of properly ventilating mines received a good deal of attention during the year, and, in connexion with it, the equally important subject of dispersing the fumes arising from the use of nitro-glycerine compounds in blasting. From the reports of the Inspectors, it appears that the mines throughout the colony generally, with very few exceptions, are well provided for in the matter of ventilation. Where the usual means of securing a supply of fresh air, namely, by sinking winzes, or putting up rises to connect the different levels, are not sufficient, Root's Patent Blowers are, in many cases, used with excellent effect.

In the Castlemaine district the Senior Inspector of Mines reports that the modes adopted for ventilating mines are—(1) Root's Blower, (2) ducts, (3) air-courses, and (4) water falling in pipes down the shafts. The Root's Blower is, the Inspector considers, superior to any other ventilator. There are four sizes (Nos. 1, 2, 3, and 4), and a corresponding horse-power of 1, 2, 3, or 4 h.p. is sufficient for driving the respective sizes. The largest sizes are equal to the requirements of the most extensive mine. The supply of air can be regulated by the speed of the fans being increased or decreased.

In the Sandhurst district the Inspector (Mr. Grainger) reports that there is no machinery used for ventilating the mines. The modes adopted are—Sinking winzes,

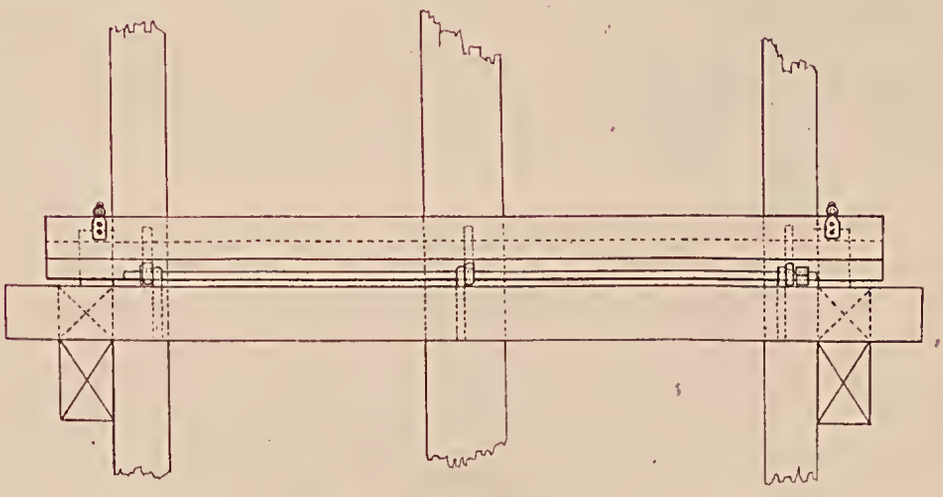


Side View

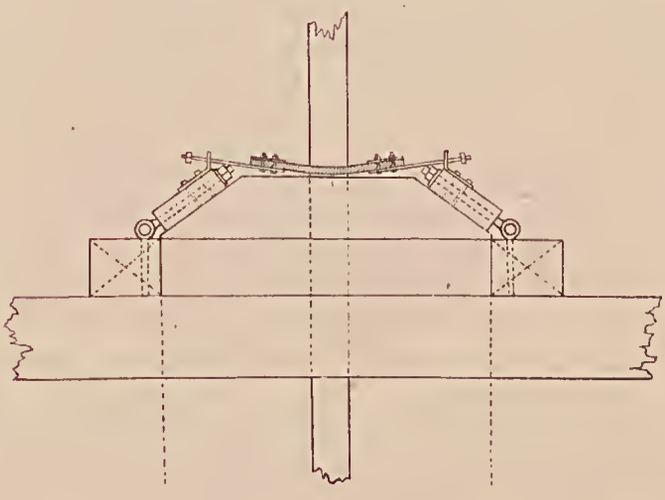


Plan

DOOR USED IN PLATS LANSELL'S N°180.



End Elevation



Side Elevation

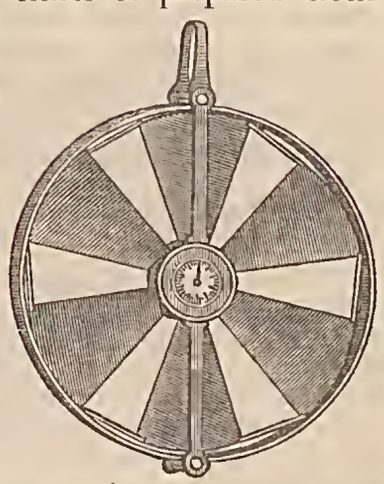
SELF ACTING SAFETY CATCHES, J B. WATSON'S KENTISH CLAIM

Scale. 2 Ft to 1 In.

&c., to connect the several levels, and thus creating currents of air. In some few cases ordinary fans have been used temporarily. Mr. Grainger suggests that, in certain circumstances, the owners of adjoining mines should be compelled to connect their workings by means of drives. If this were done, he considers that perfect ventilation would be secured in many cases where it is now none of the best.

The methods adopted for securing ventilation in the Maryborough district are, in shallow mines—Windsails, fans, and waterfalls. In deep and extensive mines Root's Blowers are used, and, in some cases, an air shaft is connected with the main shaft by means of drives. The local Inspector considers that a system which would combine the two last-mentioned methods would be the most perfect.

In the collieries of England it was until recently the usual practice, according to Mr. Hunt, the author of *British Mining*, "to fix a furnace at the bottom of one shaft so as to rarefy the air, by which it was made to ascend. This is called the 'upcast' shaft. Consequently the colder external air, which is of greater weight, then descends another shaft, which is called the 'downcast shaft,' and by well devised arrangements the current of air is circulated through all the devious windings of a colliery. The furnace system of ventilation is, however," continues Mr. Hunt, "rapidly passing out of use, mechanical ventilation having been proved to be much more economical and effective. Where the colliery has not two shafts—a state of things which is being discontinued—it has been the custom to obtain the same result by dividing the single shaft by a 'brattice,' which may be either of prepared cloth or a division of thin boarding. In either case it is not difficult to produce an upward flow of air from the depth of the pit, and consequently to establish a downward current of fresh atmospheric air."



A sketch of the "Anemometer," an instrument for determining the rate at which air travels through the workings of a mine, is here given. "It consists essentially," says the author of *British Mining*, "of six vanes made of thin sheet brass; these are delicately mounted on a centre moving freely within a brass ring. It is carried by the handle, and indicates the most gentle current, the rate at which the vanes revolve being noted by the index shown in the centre of the figure."

On the subject of ventilation, Mr. William Buttle, the prolific inventor, of Sandhurst, writes—

As ventilation in mines is occupying the attention of the miners, I very much wish to mention that I have deposited, at the office of the Miners' Association, a case or tube in which a spiral screw is caused to revolve with very great rapidity. The blades being somewhat similar to the screw propeller of a steam-ship, the plan needs very little further description than to say that the screw is not continuous, but only at intervals on the spindle, therefore the design is not expensive. I have volunteered to attend at any meeting and fully explain the principle of the proposed ventilator, which cannot fail, if properly applied in the manner I will be glad to direct.

Mr. Inspector Grainger, having been requested to report on this contrivance, writes—"The suggested mode of ventilation would not be at all practicable. I have examined the model and cannot recommend the apparatus, as I am satisfied it would not answer. The inventor himself can only say that he considers 'it should be good, judging from the principle of its construction.'"

The following extract from *Iron* describes an improved fan for mine ventilation—

At a meeting of the Manchester Geological Society, in January last, Mr. Cockson read a paper descriptive of the construction of a new fan he has designed. He has termed it the "Silent Guibal," for which he claims that whilst it has the great advantages of the Guibal type, it is at the same time a silent non-vibratory fan like the Schiele, and can be constructed of considerably less dimensions than would be required for an ordinary Guibal.

The special advantages which Mr. Cockson claims for the fan, he sums up as follows:—(1.) That fans of this type, of from 12 to 20 feet in diameter, are able to do, at the same blade-tip speed, just as much work as any Guibal fan of the usual size, of say from 30 to 50 feet in diameter. (2.) That, on account of their less size and weight, they are not so liable to break-down and injurious straining, and, for the same reason, are much more economical than the larger Guibal or any other type of fan. (3.) They are less costly to erect, on account of the less size of the fan-gearing, and the requisite foundation, excavation, &c., than a Guibal would be, to do the same work. (4.) They can be made as small and light as the Schiele, and will give equal water-ganges and quantities of air, at an average of two-thirds of the speed that would be required by the Schiele to do the same work.

NOXIOUS FUMES.

With regard to the fumes arising from the combustion of dynamite and lithofracteur, several suggestions have, from time to time, been made. One of these was by the Explosive Board in 1882, which recommended the use of sulphate of iron spray. Mr. J. Cosmo Newbery, the analyst to this Department, has had a kind of syringe manufactured for the purpose, and he is now engaged in experiments to test its value, the result of which will shortly be published. A practical miner has suggested that, instead of employing a syringe after the explosion, some plan might be adopted by which the sulphate of iron might be mixed with the charge, but Mr. Newbery states that the sulphate of iron must not come into contact with the dynamite, otherwise the charge would not go off. He considers, however, that the desired effect might be produced by placing a wad of paper or good clay over the charge, and then tamping the whole with water charged with the sulphate of iron. Another suggestion is that of scattering powdered lime in the mines where nitro-glycerine explosives are used. In reference to this, Mr. Newbery states that as miners often suffer from the effects of dynamite fumes when they are moving mullock which has been blown down by dynamite, the powder of *air-slaked* lime, used as tamping, would probably have a beneficial effect. He has made, at his laboratory, some experiments of this kind with fairly successful results, but he considers that it would be necessary to make further trials in a mine to see whether the lime dust would settle, as, if it did not, it might be as great a nuisance as the dynamite fumes. *Fresh* quicklime should not, he considers, be tried as tamping in any case, as the heat generated by any mixture might cause the charge to explode.

Nobel, the inventor of dynamite, remarks, on the fumes arising from its combustion, as follows:—

> The frequent occurrence of bad fumes in mines only proves that dynamite is injudiciously used. The general mistake consists in not securing carefully the detonation cap to the fuse, and especially the fuse to the cartridge. In charging, the miner, under such circumstances, easily draws fuse and cap out of the cartridge, leaving them separated, so that the cap cannot possibly exercise its detonating effect. What then takes place is this: part of the dynamite burns, emitting hyponitric fumes, and part generally explodes under the influence of accumulating heat and pressure. Thus the charge goes off, but with a far inferior effect as compared to that of a proper detonation and with the omission of a great quantity of red fumes of hyponitric acids.

With a view of ascertaining the opinions of the miners in the Sandhurst district respecting the effects resulting from the use of lithofracteur, powder, compressed air, &c., the committee of the local branch of the Amalgamated Miners' Association of Victoria issued, in November last, a circular, of which the following is a copy:—

> Bendigo branch, No. 1, of the Amalgamated Miners' Association of Victoria. Dear Sir,—The committee are desirous of getting the result of the experience of the miners, regarding the use of lithofracteur, dynamite, and powder in mines. And the effects of inhaling exhausted compressed air, also the general state of ventilation. The committee hope every miner will answer the questions to the best of his ability. All names will be kept strictly private. The information is required by the A.M.A. to lay before the Government. Will you kindly fill up and return them to me through your steward or otherwise, on or before Saturday, the 13th December, 1884.—I am, sir, yours obediently, P. Phillips, secretary. Questions: 1. Are you of the opinion that nitro-glycerine compounds should be used in mines? 2. If you think it should, would you use it in all places or only in wet ground? 3. Are you in favour of a penal clause being inserted in the Mines Inspection Bill, forbidding the use of these explosives in dry ground? 4. Do you consider the fumes of these explosives injurious to the miner's health? 5. What sensation do you experience after inhaling the fumes of nitro-glycerine compounds? 6. Are you in favour of entirely prohibiting the use of these explosives in mines? 7. Do you think powder could be generally used in place of nitro-glycerine compounds? 8. Which of the two do you personally prefer using? 9. What is the general state of ventilation in your mine? 10. If bad, what would you suggest as a remedy? 11. How many places are there in your mine badly ventilated? 12. Do you consider the exhausted compressed air injurious to the system? 13. Have you lost any wages through bogus companies being floated?

To this circular the committee received 842 answers, an analysis of which is as follows:—

> 376 were in favour of confining glycerine operations strictly to wet ground; 252 were in favour of total prohibition, and 13 for non-prohibition; 640 were in favour of a penal clause prohibiting its use in dry ground, whilst 60 opposed the penal clause idea; 732 considered the fumes injurious, and 4 did not; 648 thought powder could be generally used, 36 were opposed to that idea; 704 miners were in favour of using powder, and 14 in favour of lithofracteur; 430 miners condemned compressed air as injurious, and 68 did not think so. From the answers the committee considered there was an overwhelming expression of opinion in favour of powder as against lithofracteur.

In answer to the question—"What sensation do you experience after inhaling the fumes of nitro-glycerine compounds?" the answers, of course, varied, according to the constitution of the men; but the general opinion was that the fumes produced headache, with vomiting, giddiness, loss of appetite, lassitude, palpitation of the heart, and pains all over the body. Some said that every nerve in the body was affected, and others declared they had to leave their work, as they could not stand the fumes in any shape.

At a meeting of the Maldon branch of the Association, the alleged injurious effects arising from the use of dynamite, even in wet ground, were very forcibly dwelt upon. One member (Mr. P. J. Williams) said he "spoke from experience, and asserted that dynamite injured men in wet shafts as well as in dry, and even more so. They all knew that it was the nitro-glycerine that injured them, and in wet shafts this nitro-glycerine could be seen floating on the top of the water. This saturated men's clothes, and got on to their hands, and into their systems. He knew one man, who did not complain when working, but who died, and according to the statement of the doctor who examined the body, it was saturated with lithofracteur. He knew another who died from the effects of using it, and he was assured by those who visited the man on his death-bed, that they could smell the fumes of lithofracteur the moment they entered the room—the man's system was so charged with it that it escaped from his body. He (Mr. Williams) had used it in both wet and dry places, and frequently, after coming from below, he had laid down on the ground for half-an-hour before being able to walk home."

Mr. Spence, another member, said "his own experience corresponded with that of the last speaker. He had used the compounds in both wet and dry places, and always felt seriously injured, by not only the fumes, but the substance found among the débris. He knew of similar cases in Creswick. One fine young man, who was working on a contract sinking a shaft, had to leave it by order of the doctor, as the compound was fast killing him; yet it was being used only in a very wet shaft. Another man, working in the same party, did not feel it at the time, but since had been obliged to give up underground work owing to weakness in the head caused by its use. Eleven years ago, at the first conference at Sandhurst, the city coroner, Dr. Pounds, had given evidence as to the deadly effects of such compounds. Evidence from all sides proves that it is fatal in its effects."

In view of this accumulated evidence, it is clear that, unless some effectual means are discovered for dispersing these noxious fumes or neutralizing their undoubted injurious effects on the health of the miners, it will become a question for consideration whether the use of nitro-glycerine compounds should not be altogether prohibited by law, or at any rate confined to wet ground where the results are but little if at all harmful. The health of the miners is not only a matter of supreme importance to themselves and their families, but it is a subject in which their employers are also interested, for, apart from natural feelings of humanity, it is essential that bodily health must be maintained to enable the miner to render a fair day's work.

Compressed Air.

It is alleged, by some miners, that exhausted compressed air has an injurious effect on them; in fact, several have stated that, in close places, it is as bad as lithofracteur. In view of this, I sought the opinion of Mr. J. Cosmo Newbery on the subject, which is as follows:—"Air cannot be in any way vitiated by passing through the compressor. The only alteration that can take place is loss of heat and moisture." Whether or not, however, this loss of heat and moisture is the cause of the unpleasant sensations experienced by some when inhaling compressed air, it is certain that there are many miners to whom it is more injurious than others. This is shown by the replies received to the circular on the subject issued by the Bendigo Miners' Association (see page 34). Mr. Phillips, the Secretary of the Association, himself a practical miner, speaks thus on the subject of compressed air—"I am impressed very much with the fact that it is not wholesome, and should not be depended on altogether for men to work in. The difference between inhaling it and the air from a waterfall is on a par with the atmosphere on the surface; when the wind is from the north we feel a great lassitude, scarcely able to move about, immediately it changes to the south we feel, in a very short time, as though we could almost run. The comparison is as near as I can put it for those unacquainted with the case."

EXPLOSIVES.

Concerning the effectiveness of the various kinds of explosives and their relative safety and economy in use, there appears to be a considerable difference of opinion between the miners, mining managers, &c., in Victoria, and their *confrères* in the mother country. In this colony the miners are almost unanimous in condemning the use of dynamite, on the ground that, although it enables the work to be done cheaper, the fumes arising from its use are most injurious to the health of the men. In England, on the contrary, mine owners and others assert that powder is more economical, but that the workmen prefer dynamite. For instance, Capt. Abraham James, of the South Frances mine (quoted in *British Mining*), says—"In this mine we use nothing but dynamite, not because we think it more economical than powder, but simply for want of good ventilation. The mine will be thoroughly ventilated in a few days; we shall then insist on the men using powder in many places where dynamite is used now. We consider we pay equally as much now for drivage as when no other explosive was used than powder. The workmen prefer dynamite because, in the first place, it is a little stronger; it requires no tamping, and makes less smoke. It is a boon to the workman, but little or no profit to the adventurer. In my opinion, powder for ordinary ground is by far the cheapest explosive."

Again, Sir Geo. M. Denys, Bart., of Richmond, Yorkshire, states—"We have, of course, tried various kinds of gun-cotton, powder, and tonite, but prefer No. 2 dynamite to anything else, and use it almost entirely. In wet ground it is invaluable; it requires no tamping. It is safer than powder or cotton."

Mr. Hort Huxham, M.I.C.E., writes—"For penetrating the very hard silicious sandstone and other hard rocks, especially when heavily watered, the greatest economy and efficiency is arrived at when using a quick powerful explosive, such as dynamite, *with bore-holes of small diameter*. For shales and other soft ground the slower-acting explosives, gunpowder—used with bore-holes of larger diameter—are much superior to dynamite in effectiveness and economy; and for even the hardest coal the latter explosive is useless."

Mr. A. L. Stephenson, of Durham, says—"My opinion is that gunpowder when used with safety-fuse, and supplied to the men in small cases or in cartridges, is the safest, but if carelessly used, or carried loose, or in bags (as was frequently the case some years ago), I think it more liable to accident than dynamite. If gunpowder be used in the form of a cartridge, with safety-fuse attached, and carefully rammed with a copper rammer, with dry clay or other like material, free from grit, there is, I believe, no safer explosive in the market. Dynamite, on the contrary, should be used without tamping of any description, other than water or fine sand, poured in loosely, so as to avoid the danger of concussion from tamping with a rammer. . . . . When dynamite is properly exploded, the amount of noxious gases given off is small, and by waiting a very short time the slight fumes are carried off by the ventilating current. If, however, dynamite is *not thoroughly* exploded and partly or wholly *burnt* away, the resulting nitrous gases are considerable in volume, and highly dangerous for the men to breathe. Fatal results have, from time to time, arisen from this cause, by the men returning before the fumes have cleared. In any unventilated pit or drift, or other confined working place, I should consider it dangerous for the men to return after an explosion of dynamite, without allowing a considerable time to elapse." (See "Noxious Fumes," page 34.) "These," says Mr. Hunt, "the results obtained by practical miners from the actual use of the various explosives named, are exceedingly valuable."

Towards the close of last year I requested several of the Inspectors of Mines, by circular, to state what explosives were in most general use on the gold-fields, and I invited them to express their own opinions as to their respective merits. From the replies received, it appears that, in the Ballarat district, powder and dynamite are both in use, but chiefly powder; dynamite being only used in sinking hard wet shafts, or putting in wet drives. The local inspector is of opinion that there is very little advantage in using dynamite excepting that it saves the time and labour of making cartridges for wet holes, and is a little cheaper. The disadvantage connected with its use is, he considers, the injurious effect on the miners' health. In the Sandhurst

district, dynamite, lithofracteur, Hall's blasting powder, Curtis and Harvey's, and colonial safety powder are used. The local inspector considers that dynamite and lithofracteur possess great advantages over powder in wet ground, but that the fumes from them are hurtful to the miners, especially when used in dry ground.

Mr. Inspector Trezise (Maryborough) states that the explosives used in his district are (1) Hall's blasting powder, (2) Stawell giant powder, (3) Nobel's dynamite, and (4) colonial lithofracteur. He considers that dynamite and lithofracteur should be used only in wet shafts or where there is a good current of air; the general consensus of opinion among miners being that they are injurious to health; while in very many places powder could be used with equal advantage, except that there is a saving of labour in boring with dynamite, as a lesser hole is required. Mr. Trezise states that the manager of the New Bendigo Co., St. Arnaud (Mr. Rew), has been using the Stawell (colonial) giant powder since January, and he states the cost is less by one-third than the imported powder or dynamite. The advantages of this explosive are—1st. That there is no danger from ignition, as it will not explode until it is tamped and the air excluded. 2nd. That it can be compressed by tamping without any danger of exploding. 3rd. That compression increases the explosive power, making it equal to dynamite. 4th. The miners who are using it prefer it to Hall's powder and to nitro-glycerine compounds. The Stawell explosive, however, is only adapted for dry ground.

The Senior Inspector of Mines, who has the supervision of the Castlemaine district, states that gunpowder and the nitro-glycerine compounds (lithofracteur, dynamite, and gelatine) are commonly used in his district. For driving, stoping, or sinking through the ordinary dry blasting ground, and without the assistance of rock-boring machinery, gunpowder is the general explosive; and for hard and wet ground the nitro-glycerine explosives are used, and are incomparably superior to gunpowder, for the following reasons:—1st. Because of the lesser size of the steel drill required (whether machine or manual labour is employed in drilling); 2nd. Because of the short time occupied in charging a hole with lithofracteur or dynamite, as compared with gunpowder; and 3rd. Because the strength of nitro-glycerine compounds is scarcely affected by water, while the absorption of moisture by gunpowder rapidly destroys its usefulness as an explosive. On the score of the disadvantages connected with the use of explosives in badly ventilated parts of mines, there is not much choice between the fumes from dynamite and the black smoke from gunpowder. Certainly the means for "dispersing" the former are more easily obtained than the current of air necessary for removing the latter.

The well-known fact, alluded to by Mr. Nicholas, that the absorption of moisture by gunpowder destroys its usefulness, has led to an attempt being made by Mr. Cock, a mine manager of Sandhurst, to produce a waterproof covering for powder made with nitrate of soda. No public experiments have yet been made with this compound, but the manager of the New Chum Railway Company states that he fired a few charges of it, that it did its work well, and, in his opinion, will be found particularly useful in wet mines. A gentleman who has carefully examined the explosive has favoured me (through the Mining Registrar at Sandhurst) with the result of his examination, which is as follows:—

> The compound appears to have the property of resisting deterioration by damp without materially differing from ordinary powder in its component parts. Sulphur, which in the general article in use is diffused through the body of the material, is, in this instance, partly employed as a glaze to protect the more susceptible ingredients from the effects of moisture. It is an undoubted fact that pellets formed in this manner can be employed successfully in exploding mines under water, no effect being perceptible in the condition of the powder after immersion for days, thus overcoming the oft experienced difficulty of maintaining powder in an efficient state, even for military purposes, in damp climates. As to the proportion which the sulphur bears to the other ingredient, viz., nitre and carbon, I have been unable to obtain any information, and therefore refrain from hazarding any opinion as to the relative strength of the one as compared with the other. In no case, however, would it be possible that the fumes given off could be more deleterious than those emitted by the combustion of powder prepared in the ordinary form. There might possibly be an excess of sulphurous acid gas, and a perceptible diminution of force and slowness of action, compared, weight for weight, with ordinary powder. Experiments can, however, alone determine this.

A sample of the compound has been submitted to Mr. J. Cosmo Newbery, who reports that he is doubtful of the advantages of the waterproof coating, inasmuch as he thinks the constant changes of temperature will crack the covering and allow moisture to enter. He will not, however, be able to report fully to the Department until the end of the summer.

Should it be found that the preparation is, or can be made, impervious to moisture, and that (as alleged by the inventor) the fumes are innocuous, a boon of the greatest value will be conferred on the mining community, especially as it is asserted the new explosive will not be more costly than the much-dreaded dynamite.

Concerning this latter explosive, I make the following extracts from *British Mining*:—

Dynamite was patented by Nobel, in May, 1867. It is divided by the Rhenish Dynamite Company into three classes—No. Ia., containing 75 to 77 per cent. of nitro-glycerine, and 25 to 23 per cent. of an infusorial earth known as *kieselguhr*. No. I., containing 70 to 71 per cent. of nitro-glycerine, and 30 to 29 per cent. kieselguhr. No. II., containing 60 to 61 per cent. nitro-glycerine, and 40 to 39 per cent. kieselguhr.

No. Ia. is applicable to the hardest and most resisting rocks, such as quartz, porphyry, and basalt, as also to the removal of ground in small headings.

No. I. may be used for similar classes of rock when less resistant, and in levels of large sections; also in blasting limestone, gneiss, and granite.

No. II. is adapted for all sorts of soft rocks, and is well suited for assisting No. Ia. quality dynamite, by placing the latter at the bottom, and the former upon it in very deep holes, or for the removal of "side-cuts" after the "centre-cut" is blown out.

The safety of dynamite is alleged to lie in its soft mealy consistency, constituting, as it were, a cushion, a physical condition of great importance in lessening the chance of its exploding when somewhat roughly handled.

At a temperature of 46° Fahr. dynamite hardens into a mottled whitish substance. When frozen it cannot be readily fired. In a pulverulent condition it can be more easily exploded, although with diminished violence than when fired in a pasty state. The firing point of dynamite is 356° Fahr. If ignited it burns slowly, evolving fumes of a deleterious character. When instant and complete combustion is affected by detonation the gases evolved are innocuous; but if the dynamite should be only partially detonated, hypo-nitric fumes will be given off, offensive to the miner and deleterious to his health.

In reference to dynamite, Drinker observes—"It is unquestionably a safer material to transport, handle, use, or store, than black powder. To explode it, heat and strong percussion are necessary;" while Nobel in effect states—"There are no accidents on record due to its spontaneous combustion in mines. Local accidents are almost exclusively to be attributed to injudicious thawing of nitro-glycerine preparations, to reckless removing of the tamping in bore-holes after a mis-fire, and to the careless handling of detonators. That comparative immunity from accidents is due to safety from fire where small quantities are dealt with, and to the absence of danger in loading bore-holes, since it is useless to ram the tamping."

Accidents frequently occur through improperly thawing dynamite. In 1883 nineteen accidents of this description occurred in England. "Each of these cases," says *Iron*, "is said to have been preventable by the commonest prudence, or rather to have been due to the deliberate disregard of the most ordinary and obvious precautions." Accident No. 82, in the attached Statement, page 77, is a further illustration of this lamentable want of caution, and it cannot be too strongly or too frequently impressed upon miners and others using dynamite that it should not, under any circumstances, be thawed over fires, whether in the open air or otherwise. If kept below in a mine dynamite will not freeze; and if frozen when purchased, it will thaw after the lapse of a day or so if taken below.

The relative power of various explosive substances, when compared, bulk for bulk, is given by Nobel, as follows:—

Nitro-glycerine	100
Dynamite (No. 1)	74
Lithofracteur	53
Gun-cotton	45
Curtis and Harvey's blasting powder, fired by detonators	17·5

Amongst the Appendices will be found the Report of the Inspector of Explosives for Victoria (Appendix F), and a Report by Col. Vivian Majendie, Her Majesty's Chief Inspector of Explosives, on the circumstances attending an explosion of dynamite at Dunfermline (Appendix J).

CHARGING AND BLASTING.

Inspector Stewart (Ballarat) reports that all charging of holes in the Ballarat district is done by hand. He is not aware of any mine in which an apparatus is used. The Senior Inspector at Castlemaine states that no charging apparatus is required with the nitro-glycerine explosives. The first cartridge of dynamite is, by gentle pressure, placed at the bottom of the hole, and each additional length of the charge is brought into contact with that preceding it, also by gentle pressure. The fuse, armed with a

detonating cap, is then lowered down the hole until it touches the charge. Generally, the hole is then filled with water, and fired by a lighted candle "snuff" being placed under the fuse which projects from the hole. If the hole has been drilled in an upper or horizontal direction, clay or sand is used for keeping the charge and fuse in their proper positions. For blasting with gunpowder, the charge, whether loose or in cartridge form, is placed in the hole with the fuse and firmly packed; then the process of tamping pounded clay slate, free from grit, with a copper bar and hammer, is carried on until the hole above the charge is strongly tamped up; the fuse is then fired similarly to other blasts. With this method of charging, there is increased danger to the miner, in addition to the loss of time.

Mr. Inspector Grainger (Sandhurst) writes—"For charging powder the ordinary scraper and spoon are used. A few of Veale and Thomas' 'chargers' are employed, but they do not seem to come into general use, although I consider they are by far the best. They can be made to any size to suit. I witnessed several trials of them and was well satisfied. I have no hesitation in stating that they are a great improvement on previous modes of charging, and especially as regards their safety."

I give here a sketch of the apparatus, the invention of Messrs. Veale and Thomas, California Gully, Sandhurst, and a description of which is as follows:—"It consists of a copper tube, to fit into the hole to be bored, and inside this tube is fitted a copper piston, or 'ramrod,' if it might be so called. The powder is placed in one end, which is then inserted in the hole, and the powder forced out of the tube into the hole. In a downward hole the tube can be put into the bottom, and the powder poured down. In the first place, there is a great saving of time as compared with the use of the 'spoon' and 'scraper,' and, secondly, the liability to accident is much less. There is no fear of ignition from friction in the use of copper, and the tube going right to the end of the hole, the bar does not touch the sides of the hole, and therefore a frequent cause of accident is removed. At a trial of the 'charger' made at Sandhurst, the idea was regarded as an excellent one, and the miners agreed that it would save time and make the work much safer. There was some doubt whether an 'upper' hole could be charged, but the patentees, who were present, gave an assurance that this could be easily and effectively done. The cost of the chargers is said to be only 30s. each."

On the subject of charging and blasting, I make the following extracts from *British Mining*:—

Holes bored by machine drills cannot be placed in accordance with the line of least resistance. To compensate in some degree for this defect, incident to machine work, the strength of the charges should be varied according to the resistance which they will be required to overcome. The holes for unkeying the face will require the heaviest charge of explosive material, since the conditions for getting out the cut or wedge are usually most unfavorable for the power of the explosive. The quantity of explosive for each hole must vary greatly, since it will be dependent on the nature of the rock and the resistance offered to the blast. The proper charge can only be ascertained by experience. If holes are fired singly, more dynamite will be required than if fired simultaneously. For taking out the wedge or centre-cut, the strongest dynamite should be used. For enlarging the face round the wedge or centre-cut, No. 2 or 70 per cent. nitro-glycerine dynamite will often prove strong enough. In schist and sandstone rocks of a bedded character good results have been obtained by the use of cartridges of compressed powder being ignited at the bottom. At Rouchamp, in France, dynamite and powder exploded together gave excellent results. It was held that powder prolonged, as it were, the time of the explosion, and exerted its force on the rock weakened by the quicker-rending strength of the dynamite. . . . . At St. Gothard, very deep holes were tried; but in many instances it was found that "sockets" were left after the holes were blasted. By giving the holes a greater diameter, this drawback was materially abated. As, however, the consumption of dynamite was found to be large, it was afterwards used surrounding a cylinder of clay. In this way the weight of the explosive was said to be sensibly lessened without decreasing to a proportionate extent the measure of the result. To obtain a maximum effect from the detonation of dynamite, it should be placed at the bottom of the shot-hole and confined by water, or otherwise gently tamped with about three inches of soft clay. Many miners assert that tamping is unnecessary. The fact is it is not so essential a matter with quick-rending explosives as with black powder. In the one case the liberation of the expansive gases is instantaneous, in the other it is gradual; but with any explosive the complete confinement of gases must increase the effect. The filling up of any space round the charge is also important. . . . . If water be employed for tamping purposes, the detonators attached to the fuse should be protected, so that no water can enter between the fuse and the detonator to interrupt the igniting operation. Even if the fulminate should become damp, this circumstance alone will materially lessen the power of the fulminate, and, perchance, cause the dynamite to burn, losing thereby its money value, as well as its disrupting effect. The order of firing the shot-holes should be determined at the time of charging and tamping them. Naturally such holes should be selected as will rupture and unkey the rock to the desired depth, and which will also secure the most

effective results on firing the second set of shot-holes. When successive series of holes are to be fired by means of safety-fuse, the length of the fuses may be regulated, if necessary, so as to effect the charge of certain holes earlier than that of other holes. If, also, the ends of fuses be brought together, their ignition may be accomplished at one and the same time. This may be effected by enclosing the ends in a small powder-cartridge, and firing the latter by a short piece of safety-fuse.

DETONATORS.

According to the reports of the mining inspectors there is no particular preference for any one description of detonator on any of the gold-fields. Senior Inspector Nicholas states that the eagle brand, manufactured by George Egestorff, of Linden, near Hanover, is pretty generally used in his district, and he adds—"No complaints of failure of these caps to explode have been brought under my attention during the past year. This may be due to the fact that when a 'missed fire' occurs, the cause is seldom inquired into. Whether it arises from a defect in the fuse, or from the coating of grease or tar not properly closing the junction of the cap and fuse, and thus admitting water into the cap and wetting the powder of the fuse, at any rate the 'missed fire' follows, and is not troubled further about, because there is no danger attendant on the 'missed fire' of a dynamite charge. Another fuse with a detonator is simply placed in the hole and fired, after the required lapse of time. The fulminate in the detonator cap is waterproof."

On the subject of detonators, the author of *British Mining* remarks:—

To the researches of Roux and Sarran is chiefly due the light thrown on the possibility of producing two kinds of explosion in the same substance—one by the application of heat and percussion, the other by flame-heat. Heat and percussion are produced in an explosive by the ignition of fulminate of mercury, which in itself possesses a detonating quality.

Detonation may be defined as the instantaneous decomposition of an explosive. When gunpowder is fired in the usual manner, combustion takes place, each grain burning from the surface inwards; but, when nitro-glycerine compounds are ignited by means of fulminate of mercury, the mass explodes simultaneously or nearly so. In one case the rupturing force may be said to be gradually developed, in the other instantaneously produced. The following table, by Roux and Sarran, give the relative strength of three well-known explosive compounds when simply fired and detonated:—

	Simple explosion.	Detonation.	Relative weight of gases.
Gunpowder ...	... 1·00	4·34	0·414
Gun-cotton ...	... 3·00	6·46	0·850
Nitro-glycerine ...	... 4·86	10·13	0·800

From the foregoing figures it will appear that an enormous instantaneous force is gained by detonation over the simple explosion of either of the compounds enumerated; while a brief consideration of the general facts already adverted to will suffice to show that if high speed in levels or shafts are to be obtained by means of boring-machines, the strongest explosives must be employed and detonated, so as to dislodge the rock under all the conditions in which the bore-holes may be placed, and that it will be desirable to shatter the rock into fragments for effecting their immediate removal.

Detonators are now so well known as to render any description of them unnecessary. Dynamite may be completely detonated by means of a treble detonator, if uniformly plastic. On the other hand, if hard, or if it should present a mottled appearance, a quintuple detonator may fail to effect the object of complete detonation.

BORING SHOT HOLES.

On this subject Mr. Hunt, in his valuable work already quoted from, has the following observations:—

Two distinct systems for arranging the holes for blasting purposes are in use, viz.:—1. The "Circular Cut," which includes centre or rupturing holes, surrounded by shot-holes more or less concentric with the rupturing holes, and angled, so as to allow the explosive to remove, first, a centre core; second, the rock encircling this core.

2. The "Square Cut," in which the shot-holes are mostly parallel to the sides of a level or shaft, the holes being angled, so as to remove, first, the wedge; second, the rock on each side of this wedge. The circular cut system (devised in driving the Mount Cenis tunnel) is observed mostly on the Continent, and particularly in the Seraing collieries, Belgium.

The form and character of rock-boring machines, together with the method resorted to for mounting them, render it necessary that the circular, the square-cut, or a combination of these two systems should be

employed for the purpose of effecting the removal of the ground, both in levels and shafts. A clever miner will take advantage (it may be a limited one) of faces, joints, and lie of the ground, so as to minimize the number of the shot-holes and weight of explosive necessary. He will bore the shot-holes as deep as possible, or, in other words, as deep as the explosive is likely to produce a satisfactory result, so as to quicken speed and lessen the dead cost. He will seek to get out his cut or wedge in a part of the face where resistance is least, and acquaint himself fully with the mechanical conditions of the machines, and the stands to which they may be attached.

The general tendency of recent practice is to bring into use larger machines for boring; to increase the diameter of a part, if not of the whole of the shot-holes; to lessen the number of holes in a given area of rock, and to employ a greater proportion of dynamite per hole.

ELECTRIC FIRING, ELECTRIC LIGHTING, ETC.

From reports made to the Department by some of the Inspectors of Mines on these subjects, I make the following extracts:—

Mr. Nicholas, the senior inspector (Castlemaine district), states that "Electric firing of blasts was, some time ago, adopted at the Eaglehawk Union mine, Maldon. The manager, Mr. F. C. White, regarded it with favour, and he states that the only drawback to its general adoption was the necessity for educating the miners how to use the wires. When I inspected the method of electric lighting of the Ellenborough Company's mine, at Eaglehawk, I noted that, on the question of comparative cost, the electric light is cheaper than candles. I also noticed that the electric light possesses the special advantages of giving a pure, unvarying, strong light under the worst conceivable circumstances, such as on the surface in storms of wind or rain, underground in strong draughts, or in a sudden rush of air from an explosion, or other causes, in the wettest of wet mines, or in the impure atmosphere in which a candle will not keep alight. These are advantages of no common order, and, after consideration, I decided to recommend the introduction of electric lighting in all extensive mines, more especially in alluvial mines."

Mr. Grainger (Sandhurst) reports:—"Electric firing is used at the Shamrock Company, the Empire Amalgamated Company, Lansell's No. 222 and No. 180 mines (Sandhurst), and at the Butter's and Alabama Company's mine, Heathcote. It answers well, and I consider it is one of the safest modes of firing. Electric lighting is used in the Ellenborough and St. Mungo mines, Eaglehawk, and gives satisfaction."

In June last, Mr. G. W. Davis, of Eaglehawk, brought under notice a light for use in mines which consists in the substitution of kerosene oil for candles. For this purpose he has made brass tubes of the size and shape of a candle, which, when filled with oil and the wick in, are claimed to be air-tight, so that there is no danger of spilling, and the new lamps can be stuck up with a piece of clay in the same way as ordinary candles. The lamps hold a supply of oil sufficient for four hours and a half, and larger lamps will hold a shift's supply. It is asserted that the oil used only costs a penny per shift, whereas candles cost fourpence per light per shift. The greatest advantage claimed for the new light is its resistance of water. Ordinary water drippings falling directly on the flame will not, it is said, put it out. Mr. Mining Inspector Grainger examined the light, but he does not report favorably of it. Although it is very much cheaper than candles, it is not so convenient to use, and miners have an objection to it on that account. It is, however, used in the engine-houses of a few of the mines.

Mr. Stewart (Ballarat) states that he is not aware of any instance in which electricity has been used for firing in his district. Electric lighting was tried for some time at the Band of Hope and Albion Consols Company's mine, but was discontinued on account, it is said, of the expense.

Respecting the economic results of electric firing, as compared with safety-fuse, Mr. Hunt, the author of *British Mining*, quotes the opinion of a practical miner (Mr. Joseph Ball), who states:—"With safety-fuse the men have often to fire the centre-cut holes two or three times over, with electric fuse only once. The harder the ground the greater is the saving, consequent on the use of electric fuses. With safety-fuse, the whole number of holes can only be fired in three operations; with electric fuses, two operations are sufficient."

According to Mr. Hunt, others who have had a lengthy experience in electric blasting, enumerate its advantages over ordinary fuse-blasting thus:—

1. It economizes capital, time, and explosive material; 2. It is more certain; 3. It is more effective; obstacles are overcome which cannot be removed by the ordinary system of blasting; and 4. It is safer, inasmuch as absolute protection to life is secured. The essential points (adds Mr. Hunt) to be observed in electric blasting operations are to have a reliable fuse, a machine capable of giving a strong electric spark, good conducting cables, and insulated connecting wires, so as to ensure the passage of the spark to the fuses included within the electric circuit. . . . . A series of shot holes charged with dynamite may be simultaneously fired by means of "high" or "low" tension electricity. High tension electricity is obtained by a frictional or dynamo-electric machine; low tension electricity by a galvanic battery or low tension exploder. In employing high tension electricity, it is necessary that the leading or positive wire should be well insulated, otherwise a serious leakage of the electric charge is apt to occur, especially if the wire should happen to be in contact with the earth, or with any conducting material. For the conveyance of low tension electricity, the insulation of the leading or positive wire need not be perfect; but the copper forming this wire should be of comparatively large section. In the use of high-tension electricity, the line resistance upon the current is but small; consequently, with a well-insulated wire, most of the electricity produced may be conveyed to fuses placed at considerable distance from the firing machine. On the other hand, the line resistance to low-tension electricity is so great as to render it desirable to make the distance between the firing machines and the fuses as short as possible.

On the subject of shot-firing in mines, a circular has been issued from the Home Secretary's Office to all colliery proprietors in the United Kingdom, in which it is stated to be the intention of the Government to make it compulsory that a specified time shall be set apart daily for firing shots, and that only such persons as are actually engaged in firing shall be allowed in the collieries during that time. It would be well if a similar rule were adopted in all the mines of this colony.

BOILERS.

On this subject, Mr. E. R. Meekison, the Travelling Inspector of Mines and Machinery, has forwarded to me the following report:—

The boilers used in mining are mostly of the Cornish flue type, with the fire in the tube, and the pressure used in the great majority of cases is 40 lbs. per square inch.

One of the great items of expense in mining is firewood, and a great saving in the consumption of fuel could be effected (where the feed water is good) by adopting the multitubular boiler, and working the steam expansively, with a much greater pressure on the boiler than is now used. The engines that have not expansive gear could have it put on at a moderate expense, and the saving could still further be increased by using compound engines, the difference in cost of the machinery being soon made up by the saving effected in firewood.

The majority of boilers at present in use are not adapted for a much higher pressure than 40 lbs. per square inch, as mining companies, when purchasing boilers by tender, very often take the lowest offer, irrespective of the class of iron or workmanship, but they would find it true economy to pay a good price for the best material and workmanship, and so avoid much of the loss caused by stoppages for repairs.

All the boilers used for mining (without any exception known to me) have been tested by hydraulic pressure to not less than 50 per cent. over the working pressure within the last twelve months. In cases where mining managers had not allowed this margin of safety, I have asked them to re-test the boilers, and they have always complied by doing so on as early a date as possible. In cases where I considered the mountings defective, or any necessary appliances wanting, on drawing attention to them, the defects have been acknowledged and remedied, and in all my inspections I have not met with a refusal to comply with my requests.

I would suggest it be made compulsory to test boilers to not less than one and a half the working pressure. I would also suggest that, from as early a date as possible, it should be made compulsory that all boilers, either new or secondhand, should be inspected inside and outside, and tested to not less than one and a half, the proposed working pressure, before being erected and built in position, and that a certificate be given, classing the boilers as 1st, 2nd, or 3rd class, and stating to what pressure tested, and also the allowed working pressure taken from the test; any boiler users working with a higher pressure than certified to be prosecuted.

I have, within the last six years, inspected for companies several boilers that I did not consider fit to be worked again, and have reported so, but I have known such boilers to be sold afterwards at a low rate to other companies. Machinery merchants often tender to supply and erect plants on a purchasing lease, mining companies paying a deposit of about £50 and a weekly rental, such rental going towards the purchase-money. Inferior boilers which are never examined by any engineer, and which no company would take if they had to pay cash for them, are often supplied on these conditions, but by making the examination and testing compulsory, it would prevent unfit boilers being erected in the future. If this suggestion is adopted, I think it should be part of my duty to examine and test all boilers and complete plants before they are started to work.

I would further suggest that boilermakers or importers, when selling new boilers, should be required to give a certificate, stating date of sale, what brand of iron, thickness of material, and all particulars of construction of such boiler. If the boiler were re-sold after having been used, the certificate

should be handed over to the purchaser with an endorsement showing how long it was in use at each mine. By these means the age of each boiler could be known; but at present, owing to the frequent removals of boilers, there are no means of knowing how long they have been in use, or what sort of water has been used in feeding them.

Mr. Meekison's suggestions cannot, of course, be adopted under the present *Regulation of Mines and Machinery Act*, but they will no doubt be taken into consideration in connexion with any proposed amendment of it. In the meantime, each of the Inspectors of Mines has been instructed that if any boiler has not, in his opinion, been tested up to sufficient pressure he should make a record to that effect, and call the attention of the manager of the mine to the fact, informing him at the same time that should any accident occur by reason of the defective character of the boiler he will render himself liable to prosecution under section 19 of the Act. The Inspectors have also been instructed to bring under notice every case where the erection of a new plant is being proceeded with, in order that an examination of it may, if necessary, be made by the travelling inspector of machinery before the plant starts to work.

There is some difference of opinion as to whether glass gauge mountings on boilers are sufficient without try-cocks, but experience goes to show that no boiler can be considered complete without try-cocks. Mr. Inspector Meekison, in reference to this matter, states:—

In addition to glass gauges, I am of opinion that try-cocks are necessary to the safety of the boiler, for the following reasons:—

1. It is a common occurrence for the bottom cock of the glass gauge to get choked when working with muddy water, and in some kinds of mountings (especially wheel valves) there is great difficulty in clearing them when steam is up, and in that case all you can depend on for your water level is the try-cocks. In my own experience I have known this often happen.

2. In most cases the gauge-glass mountings are fixed to the boiler, so that when the water is at the bottom of the glass it is at a safe height over tube, but as the cock is fixed to the boiler, at least two inches below the level of the bottom of glass, in the event of the glass being broken, the bottom cock may show water when it is dangerously low in the boiler.

In most of the boilers I have alluded to as having only one try-cock, there has originally been two, but from some cause (probably one cock becoming useless, and not having another to replace it) the hole is filled with either a bolt or rivet. In every such case, when I drew the manager's attention to there being only one cock, he admitted the necessity of two, and always agreed at once to put another one in. Where engineers were employed, there were always two try-cocks or two gauge-glasses in each boiler. All authorities agree on the necessity of at least two cocks, while some recommend three.

Most boilers have two try-cocks attached to them, but it is a well-known fact that in many cases the persons in charge never use them, a circumstance which is specially commented on by the Board of Examiners for Engine-drivers. (See page 98.)

Quite recently a boiler explosion took place at the Comet mine, Sandhurst, in reference to which Mr. Inspector Grainger has furnished me with the following report:—

The boiler of Lansell and Mueller's Comet mine exploded at about a quarter to eight a.m. on the 24th January. An engine-driver named William Bonson was in charge at the time, having commenced work at 7 a.m. He states everything was all right as far as he knew, and plenty of water in the glass. This statement is corroborated by the mining manager, James Hall, who, on arriving on the mine at 7 a.m., also went around the works, and took particular notice of the glass (this being his regular custom), and saw the water up in it all right. Fortunately no injury was done to any one, and the damage was confined to the boiler and a small portion of the engine-house. The boiler, which was first used about 20 years ago, was 30 feet in length by 6ft. 6in. diameter, with ⅞-in. plates. The fire of it was torn from end to end. It was tested last August up to 60 lbs. to the square inch cold water, which is considered equal to 80 lbs. steam pressure. The manager's record book, showing the test, was made on my inspection of it. The working pressure was 40 to 45 lbs., and the safety-valve blew off at 50 lbs. On making my inspection I saw evident marks that the water was up in the glass. The cause of the explosion cannot be accounted for in any other way than that the boiler was defective although it stood the tests. I may add, I cannot impute blame to any one.

From the above report it appears that the working pressure (the limit of the safety-valve) was 50 lbs. According to the requirements of the English Board of Trade, marine steam boilers have to be tested by hydraulic pressure up to one and a half times the limit of the safety-valve; but the practice of the most reputable mechanical engineers, in turning out new boilers, is, I believe, to have them tested by hydraulic pressure up to twice the guaranteed maximum of the safety-valve.

In this case the boiler, an old one, should certainly have been tested up to one and a half times the maximum possible steam pressure, namely 75 lbs., and the flue and all visible portions of the boiler carefully examined for deflection whilst under the test.

Mr. Grainger is quite right in assuming that the tensile strength of iron is greater when hot than when cold, and that therefore the hydraulic test is a more severe strain than an equivalent pressure of steam would be; but I think the ratio of increase is not so great as he supposes.

It should not be forgotten in the applying of tests of this kind that, whereas the test strain is applied for a moment only, so to speak, the working strain is continuous, and that the strain the boiler might easily withstand for the short period of testing might rupture it if continued for a protracted period.

FLOODING IN MINES.

One of those fearful accidents in connexion with mining, against which human foresight cannot always provide, occurred at the Working Miners' United Claim, Homebush, at the beginning of last year, but, unlike the lamentable disaster at the Australasian Mine in 1882, it was fortunately unattended with any fatal consequences. Only a few hours before the accident Mr. Nicholas, the Senior Inspector of Mines, visited Homebush, and found the mine in question in efficient working order, and the workings apparently free from all risk of danger.

The accident, which occurred on the 19th January, was entirely owing to the treacherous nature of the ground. It appears that the drift, which was of the consistency of quicksilver, broke through the pug overhanging the washdirt, and swept everything before it up to the spot where the miners were at work. A glimmer of light fortunately revealed an opening in the barricade formed by the débris, and by means of this opening the miners, thirteen in number, after wading a distance of about 600 feet, up to their armpits, through drift and water, escaped, and were hauled to the surface in safety.

Senior Inspector Nicholas, writing on the subject of this accident, on the 23rd January, states:—

I have the honour to forward an interim report on my inquiry into the circumstances connected with the inburst of drift and water into the mine of the Working Miners' United Company, Lower Homebush.

I found a fresh subsidence from the surface, at a short distance northwards from the subsidence which occurred in May last. It extends over a small area. The heavy rainfall since the 20th inst. has filled up and covered with water the immediate locality of the subsidence, and prevents a more exact description of its extent. Below, I found the main level clear; and work at the faces of the main and eastern levels going on as usual. In the branch drive leading towards the No. 6 block from the main level there is still a large quantity of drift, which will occupy the men about two days to clear. None of the timbers of the main level or the branch drive were displaced by the inburst. At the engine and pumps there is considerable reserve power to deal with any increased influx of water.

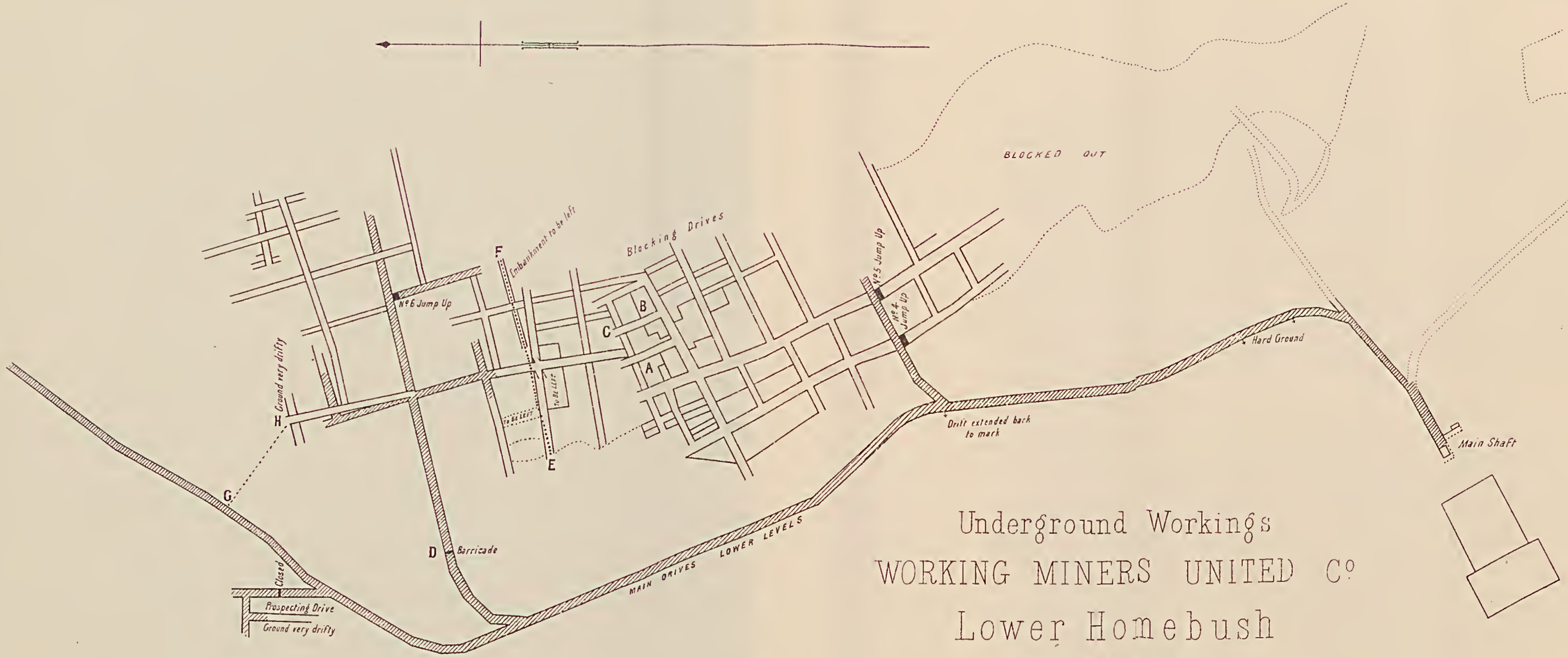
I held a consultation with the manager (Mr. Andw. Robertson) on future inbursts, and providing for the safety of the men. He will bring the subject before the directors at their meeting to-day. I will complete my inspection on Friday, and report more fully immediately afterwards.

Writing on the 29th January, Mr. Nicholas reports:—

I completed my inspection of the Working Miners' United Company's mine at Lower Homebush on the 25th inst.; and now have the honour to send you my report on the flooding of the No. 6 section of that mine; and my suggestions for preventing accidents by future similar floodings.

On the surface, about 1,000 feet from the main shaft, I found the fresh subsidence extended from the edge of the depression caused by former subsidences over an area of 40 feet in diameter, which is filled with water and "slum." There is no perceptible drainage of this surface water into the mine. The mark of the line of floating débris and water shows a fall of two inches only since the rains ceased.

Underground, I got access in the usual manner, by the main and branch levels, and the No. 6 jump-up, into the No. 6 section of the works. I found the part of the block where the men had been working was standing intact. The sets, centres, and laths were in the same condition as when I saw them on Saturday, the 19th inst., a few hours previous to the inburst. Part of the water and sand from the inburst had passed through this blocked-out ground; but the place of the inburst was about 100 feet southwards. It was at first supposed that the ground had fallen in where the men had been blocking, but I found the timbers there were as erect as when I saw them on the Saturday. The men finished their blocking soon after I left, and had started to "horse-up" (close) the entrance to it as a precautionary measure against inbursts of the same kind.



Underground Workings
WORKING MINERS UNITED Co
Lower Homebush

Scale 120ft to an Inch.

The rush of water and sand swept the trucks and timbers before it down the No. 6 branch level to the point marked *D* on the plan, and there they formed a barricade, and checked the further flow of the sand into the main level, in the direction of the shaft.

The inburst continued at its full flow for about ten minutes only. The men were shut in by the barricade. The air-pipes were uninjured, so the ventilation was good. There was a large extent of drives in a safe condition leading from the jump-up into the block. The men were cool and collected. Where it was necessary they finished the timbering of the faces, and commenced to "horse-up" a drive which they thought might be dangerous.

The alarm signal is made on the air-pipes, no other signal is permitted on the pipes. This signal is rapid, distinct, and definite. It was used on this occasion, but the escape by the branch level was closed almost immediately on the discovery of the danger.

Two instances of self-sacrifice of the highest kind are worthy of mention. Angus McDougal and Michael McLean were the first aware of the inburst. They were apart, but, actuated by the same motive, turned their backs on the safe means of escape which were open to them, and performed the duty of warning their fellow-workmen at the peril of their lives. In doing so they also were shut in.

The cause of this short but dangerous inundation is clearly traceable to the surcharged water of a drift bed forcing its way through a layer of "pug" clay, and suddenly emptying the water and sand into the mine. I cannot attribute it to the overflow from an accumulation of water in the No. 1 mine.

The collapse at the point *C* on the plan is identical with the fresh subsidence on the surface. The inbursts which took place at *A* and *B* were in each case followed by subsidence on the surface, and those inbursts happened when the engine was pumping at the No. 1 shaft.

The late suspension of pumping at the No. 1 shaft will lead to a dangerous accumulation of water in the old workings of the southern part of the mine; and, as the best safeguard against this accumulation becoming dangerous, I must recommend the resumption of pumping at the No. 1 shaft.

I do not anticipate any objection will be raised by the company to the adoption of this recommendation. If it is opposed, I would suggest that the power conferred by general rule 38 be resorted to, and an order from the Governor in Council obtained to enforce the carrying out of this necessary work.

To prevent accidents to the men from the inbursts of water and sand from the drift beds, which will occur so long as this mine is working, it is advisable that all points of communication with the blocked-out parts of No. 6 section should be cut off, and securely "horsed-up" across the lead on the line from *E* to *F* shown on the plan. It will be seen that a large portion of the ground on this line consists of unworked strips, and these strips will greatly help to form a thoroughly effectual barrier against future inbursts.

The main level is being driven northwards through a partly decomposed granite which is impervious to water. The blocks to be next opened out on the lead will be northwards from No. 6. The barrier across from *E* to *F*, and the pumping at the No. 1 shaft, will protect the men from danger in the rear. They will then have to contend with it in front, in the faces, and thus reduce the risks to those of the ordinary working of the mine.

The Working Miners' United is one of the most strongly timbered mines in Victoria. The system of timbering hitherto carried out attests the amplitude of the supply provided by the company, as well as the ability of the manager and men to make good use of it. It has been suggested that an escape drive should be constructed from *G* to *H*, but the very drifty nature of the ground at *H* has compelled the manager to horse it up in the face. Escape drives which must be driven through beds of drift gravel and sand would, because of the water contained in and always flowing into those beds, become a source of danger rather than of safety. It would be the case at this mine, where the whole of the 160 feet from the surface to the bed rock consists of alluvium deposits in the form of beds of drift gravel, sand, and clay. The beds of drift above the clay are reservoirs of water.

With regard to the further necessary provision for safety in working the lead when it comes down to and passes below the main level, and is worked by an incline, I recommend the extension of the main level. It would be a reef drive and an escape drive, and should be connected with the incline workings by short cross-cuts and jump-ups.

I have consulted with Mr. Robertson, the manager, on the provisions recommended for the safe working of his mine. He is possessed with the full knowledge of his position and its surroundings, and I am persuaded that his intelligent experience and forethought will provide all necessary means for carrying on the works of the mine with the least possible risk to his men's lives.

Writing on the 4th April, Mr. Nicholas remarks—

I was at the Working Miners' United Company's mine on the 2nd instant, and now have the honour to report, in reply to your inquiries, that the requirements recommended for the prevention of flooding of the mine have been duly attended to, in so far as they apply to the working of the mine up to the present date.

1st. Pumping was resumed at the No. 1 shaft. It was found that there was only sufficient water to supply the pump working slowly for about three hours daily. There has been a considerable increase of water flowing into the No. 2 shaft, and it would appear from that circumstance that the water from the upper part of the lead has found a course to the No. 2 shaft. To prove that this is the case, and also to ascertain whether there is any increased accumulation of water at No. 1 shaft, I will, with the manager, make measurements periodically of the depth of the water in that shaft.

2nd. Cutting off communication with the old blocks by "horsing up" the drives, and leaving unworked the strips indicated on the plan by the line *E* to *F*, has been observed.

3rd. It will be a considerable period yet before compliance with this requirement will be necessary. The wash drift is still between 5 and 6 feet above the floor of the main level, and that means an extension from the present face of from 500 to 600 feet on the course of the lead before any loss of levels will commence, and several months before providing for the special means of escape required where mining is carried on below levels will be necessary.

The Inspectors of Mines have instructions to bring under the notice of this department any instance of neglect on the part of mine owners to take proper

precautions to secure the safety of the miners in case of floodings. In accordance with these instructions, Mr. Inspector Stewart, under date 28th April, 1884, reported a case where, in his opinion, after making a thorough inspection of the mine, the necessary means and appliances to facilitate escape were not provided. His letter is as follows :—

I have the honour to direct your attention to the working of the New Golden Belt Company's mine at Springdallah. On the 26th of May, 1883, in my report for the week I called attention to the position of this shaft and the old Trunk Company's shaft, and the liability of this company's (Golden Belt) shaft to floodings. At that time the latter company had struck gold, but in consequence of the mine being several times flooded since, and the drives and jump-ups being lost, they have not yet been able to work in the golden ground; and in my opinion never will be with their present appliances.

But what I wish to specially point out is that the men working in this mine are continually in danger of their lives, for there is no escape from below except by the cage, and, should the water come in suddenly and the cage be away from the bottom, or should the engine-driver not be at his post, the men must be drowned; and I am most certainly of opinion that this mine is liable to be flooded at any time. At present, with the ordinary water, the pumps only just manage it. When below with the manager on the evening of the 22nd inst., I called his attention to this matter, and suggested to him to at once take some action to enable the men to escape, and first to put ladders in the pump shaft. Ladders, I may mention, are at present fixed from the surface down to the plunger pump, and only want continuing on to the bottom. He said there was not sufficient room to put ladders in, but I find the shaft is 4ft. x 5ft. 8in., and the largest part of a pump (door piece) is only 3ft., consequently there is room for a straight ladder which would enable men to escape from the bottom of the shaft. The manager promised he would at once put the ladders in. I also desire to direct attention to the fact that in this mine they have a drive open 90 feet from the bottom, and running almost directly over their bottom drive. If these two levels were connected by a jump-up, with ladders, there would always be an escape. This is acknowledged by the manager, but he says the company has been long struggling on, paying calls, and the ground between the two levels is so hard that he is afraid to incur the expense. I should think the jump-up could be constructed for about £2 per foot; or, ladders and all complete, for £200. At present only two men are employed below in each shift, so that the ladders in pump shaft may do, but if more men are put on, I should most certainly suggest that the company be compelled to connect the two levels, and I think the manager should be so informed.

The manager was duly informed of the Inspector's recommendations, and requested to give immediate effect to them. He disregarded the request, and proceedings were instituted against him, but the case was dismissed on a technical point.

The Senior Inspector of Mines has brought another case under notice, that of the Grand Junction Company, Yandoit. Writing on the 18th October, he states:—

I inspected the underground workings of this mine, and examined the plans, also the surface area. Having regard to the relative positions of the old and the new mines, I found that the nearest face southwards, working towards the nearest northerly point of the old mine, was still 580 feet distant, or about twelve months blocking at a monthly average of 50 feet. I arranged with the manager that in about a month, when the drives will be under the tunnel across the lead, between the Jim Crow and the Yandoit creeks, that a proper means of ascent into the tunnel should be made, so that it may become an escape drive. I also arranged for the manager to put permanent ladders into the air shaft at the north part of the mine. These provisions for escape will prevent accidents in case of flooding of the mine.

MINERS' SAFETY LAMPS.

Of the safety-lamps hitherto in general use, namely, Davy's, Clanay's, Stephenson's, Williamson's, Mueseler's, Purdy's, and Marsaut's, a writer in a recent number of *Iron* asserts that they are "fairly safe so long as the explosive gas is at rest," but that they become unsafe when exposed to a current of explosive atmosphere the velocity of which is over 14 feet per second. A new lamp to provide against the danger of such currents has been invented, and is known as Morgan's Patent, the principle of which is stated to be that of "obstructing the inward passage of air or gas to the flame in such a manner that the force of a current, however powerful, becomes so entirely broken up that when within the lamp it is reduced to little more than the ordinary draught, while the outlets are constructed and proportioned to carry off the results of ordinary combustion only, so that should those results be materially increased by the presence of carburetted hydrogen in the lamp, extinction must follow."

On the subject of safety-lamps, the *Mining Journal* of 26th July, 1884, has the following remarks :—" The adjudicators for the prize of £500 offered by Mr. Ellis Lever

in 1883 for a new safety-lamp had to examine 108 lamps. Of these, four were electric lamps, and 104 oil lamps, of which a few were designed to burn mineral oils. The conditions of the prize were:—The lamp to be a perfectly self-contained electric lamp, or other lamp, which the working miners can conveniently carry from place to place in the mine, which will continue to give a useful amount of light for not less than twelve hours, and which will not cause an explosion of gas under any circumstances at all likely to represent conditions which may occur in actual practice. The prize not to be awarded to any lamp in use. The last condition was:—"If a lamp meeting the requirements herein stated has not been invented, the £500 to revert back to Mr. Ellis Lever." Of the above 108 lamps, no one lamp fulfilled the whole of the conditions, consequently the adjudicators were unable to make the award to any one of the lamps submitted. Among the best there were two which the adjudicators regarded as deserving of special mention—the Marsaut lamp, with three gauzes, which most nearly fulfilled the conditions, and a lamp by Mr. William Morgan, South Wales, which presented several good features of marked originality."

At a recent meeting of the North Staffordshire Mining Institute (a report of which appears in *Iron*), Mr. A. R. Sawyer, Assistant Government Inspector of Mines, read a paper on the Marsaut safety-lamp. The lecturer stated that he had made a number of experiments with it and the Mueseler lamp, and he found that gas was more readily detected in the latter than in the former. On several occasions gas burnt within the inner gauze of the Marsaut for several seconds after the lamp flame had gone out. He gave particulars of the danger of the Davy and other lamps which were not self-extinguishing, and said that two of the eleven fatal explosions which had occurred in the district within the last five years were caused by ignition of gas at a Davy lamp.

"At the meeting of the Manchester Geological Society, held on February 5th, 1883" (reports *Iron*), "Dr. C. Le Neve Foster, F.G.S., read a paper on a safety-lamp invented by Herr Pieler, a German mining engineer, specially constructed for indicating fire-damp when it existed in quantities so small that it would be impossible to detect its presence with an ordinary lamp. The construction of this lamp was described as follows:—It was a suitably altered Davy lamp to burn spirit in the place of oil, and in order to produce a clean and regular flame it was necessary to prevent any vapour of the spirit from acting upon it. The wick was, therefore, carried closely in a long neck, and all the joints were made to fit tightly. The flame was regulated by means of a screw which passed through a simple stuffing-box at the bottom of the spirit-holder. It was advisable to make the latter rather larger than the oil lamp, so as to be able to carry a sufficient amount of spirit for a journey through the workings. The wire gauze must be made somewhat higher than usual, in order to admit of the full development of the cap. A small converging chimney was fixed above the burner, and hid the flame for a height of $1\frac{1}{2}$ inch, and furnished a fixed starting point for estimating the height of the cap. The best spirit to use was alcohol. The method of testing with the lamp was practically the same as with the ordinary Davy, and except in degree it produced similar results. Tests which had been made with the Pieler lamp showed that it would indicate the presence of fire-damp when it existed in as small a quantity as $\frac{1}{4}$ per cent."

"A safety-lamp, with an improved attachment or extinguisher, lately patented by Mr. J. L. Williams, at Shenandoah, is now being made by Messrs. James W. Queen and Co., of Philadelphia. The improvement consists of a tube or sleeve sliding upon the wick tube, and attached to a wire which passes through the body of the lamp to the bottom, where a recess is formed for the admission of the finger or thumb. A single movement of the finger presses the wire upwards, carrying the sleeve over the wick, and instantly extinguishing the light. If it is desired to reduce the flame for the purpose of testing for gas, the extinguisher may be partly raised, and the flame reduced to any required extent, thus obviating the necessity of the tedious and dangerous operation of pulling down the wick by means of a picker. The advantages of this device, in enabling the most inexperienced or excited person, in danger from a rush of gas, to instantly extinguish the flame of his lamp, is obvious, as few in these circumstances are likely to have the calmness to stop and pull down the wick by means of a picker. The new safety-lamp is said to have been tested by some of the most experienced and practical men of the Pennsylvania coal-fields, who all agree that it is the best improvement on the Davy lamp ever offered."—(*Iron.*)

MINING MACHINERY.

Mr. E. R. Meekison, the Travelling Inspector of Mines and Machinery, has furnished me with the following report on the condition of the machinery in use in the several mining districts of the colony:—

Ballarat District.

The machinery in this district is extensively applied both to alluvial and quartz mining. The plants, as a rule, are well adapted for their work, are substantially erected, and what is absolutely necessary for doing the work is provided, but very little is spent on fine finishing or ornament.

As regards machinery, the most important part of the district is the Allandale gold-field. The machinery there is wholly used for alluvial mining, and is the best of the kind procurable. The winding engines are nearly all single cylinders, with loose eccentries, and winding on the first motion, the spiders for the flat ropes being on the crank shaft, and two trucks are brought up the shaft at a time in the cage.

The cylinders of these engines are from 20-inch to 26-inch diameter, and the slide valves have to be worked by hand, both when starting and stopping the engines. This makes it much harder work for the engine-driver than if they were double-cylinder engines, with link motion. I consider the double engines would be a better kind for this work.

The driving power for the puddling machines is supplied by engines fixed on a level with the top of the machines, and worked by steam supplied through pipes from the same boilers that work the winding and pumping engines.

The mines are ventilated by Root's blowers, and they perform their work very satisfactorily, giving the best supply of air of any machine employed for this purpose.

Most of the winding engines at work there have been made in the colony, and will compare favorably, both in economy of working and finish, and suitability for their work, with the best imported engines of their class.

The pumping engine at the Berry No. 1 Company (see sketch) was made by the Union Foundry, Ballarat, and is the only one of this type made in the colony up to the present, but another of the same size is being made for the Hepburn Estate Company.

There is nothing in the crushing plants in this district to call for special mention. The quartz gold, as a rule, is coarse, and does not require so fine crushing, nor so many appliances to catch it, as where it is finer. The pyrites treated give a low average, but the cost of collecting and treating them is so reduced that 1oz. of gold per ton will leave a profit.

Sandhurst District.

The machinery in this district is mostly used in connexion with the treating of quartz, and the mine-owners have spared no expense to get as complete appliances as possible.

The batteries are the most complete in the colony, and in the latest ones erected the arrangement of the machinery for efficiency and economy leave little to be desired. They are erected in a substantial manner, both machinery and housing being finished in a first-class style, and they are afterwards kept models of cleanliness.

There are several companies that only treat pyrites. They either buy them or charge by the ton for treating them, and they can either do them by the burning and grinding process, or by the chlorine gas. A large amount of money has been expended on the plants, and no better results are obtained anywhere in the colony.

The winding engines lately erected* have all double cylinders and link motion, and the winding drums for the round steel ropes used are on the crank shaft. They are provided with strong clutches, to allow the ropes to be changed to the different levels, and also with powerful brakes attached to each drum, and also fly-wheel.

The ropes, cages, and safety appliances are well attended to, and are never allowed to get out of working order. The best batteries, winding engines, and gear have all been made in Sandhurst, and are superior to any others in the colony for the class of work they have to do. The owners of the mines are willing to pay the increased price required for these plants, and any new invention designed to increase the efficiency of their appliances (if it shows a reasonable hope of success) is given a trial.

Some of the plants have, however, this fault—that the brake handles are not conveniently placed, as in many cases the engine-driver would have to leave the starting handle of engine to put the brake on. The Johnson Reef No. 2 Company have the best-arranged brake I have seen in Sandhurst. It is fixed so that the engine handle and brake handle are placed about 20 inches apart, and the engine-driver can take one in each hand and have full control of both engine and brake at once. (See sketch.)

Castlemaine District.

In this district the mining is partly alluvial and partly quartz, and the machinery is generally of the plain and substantial order.

At Chinaman's Flat, there are two large imported pumping engines erected. They are kept in first-class order, and are very suitable for the work they have to do. There is also a similar engine at work at Avoca. At Homebush is situated the iron shafts sunk by Messrs. Thompson and Richards.† I went down the shafts, and examined them. They are a good piece of work, answer the purpose well, and must add to the safety in working the mine.

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* For description of winding engine erected at Lansell's 222 Claim, Sandhurst, see page 49.

† For plan and description of Thompson and Richards' apparatus, see page 50.

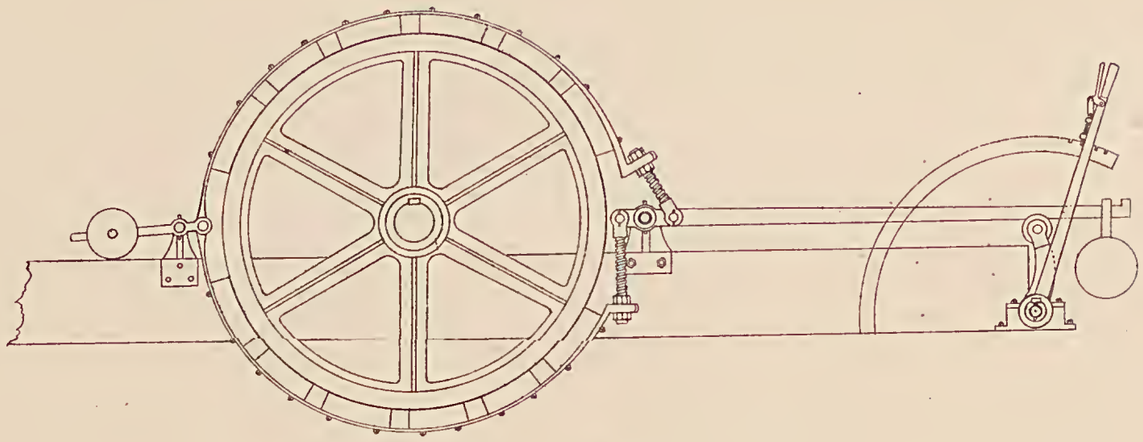
PLAN

OF

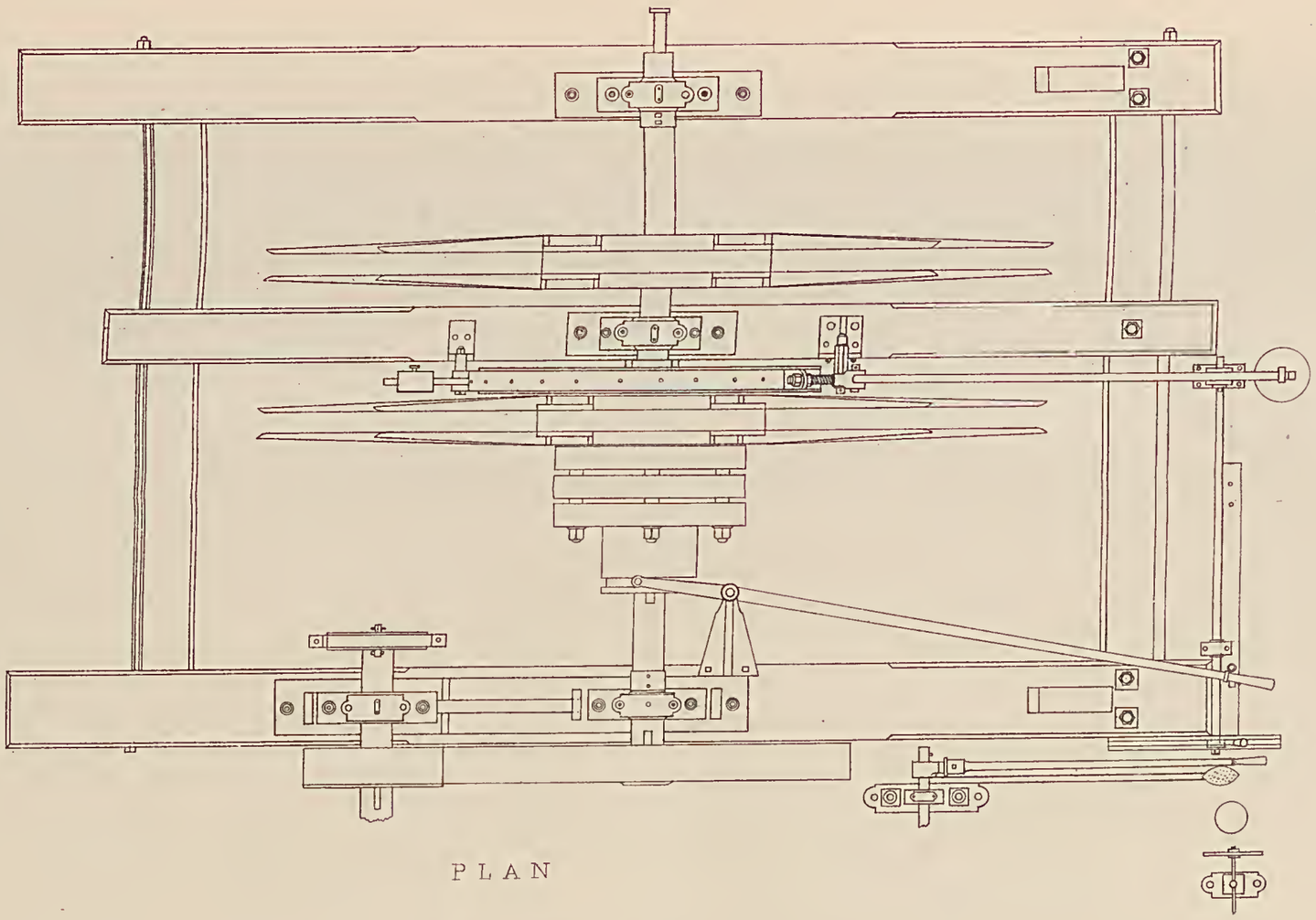
WINDING GEAR & BREAK

JOHNSON'S Nº 2 MINE

SANDHURST



SIDE · ELEVATION



PLAN

Scale 1½ Inches to 1 Foot

PLAN

OF

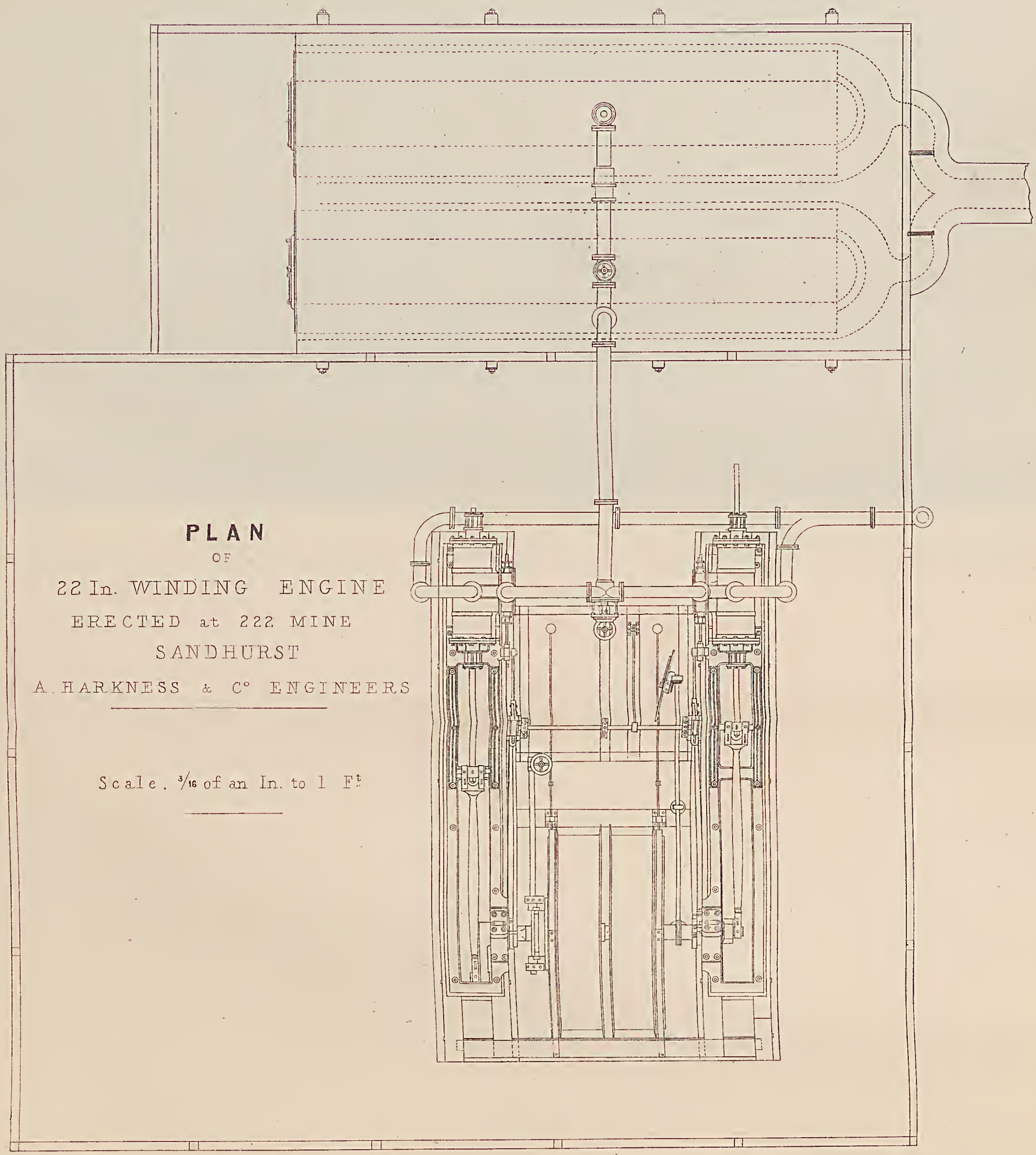
22 In. WINDING ENGINE

ERECTED at 222 MINE

SANDHURST

A. HARKNESS & C° ENGINEERS

Scale, 3/16 of an In. to 1 Ft



ELEVATION

OF

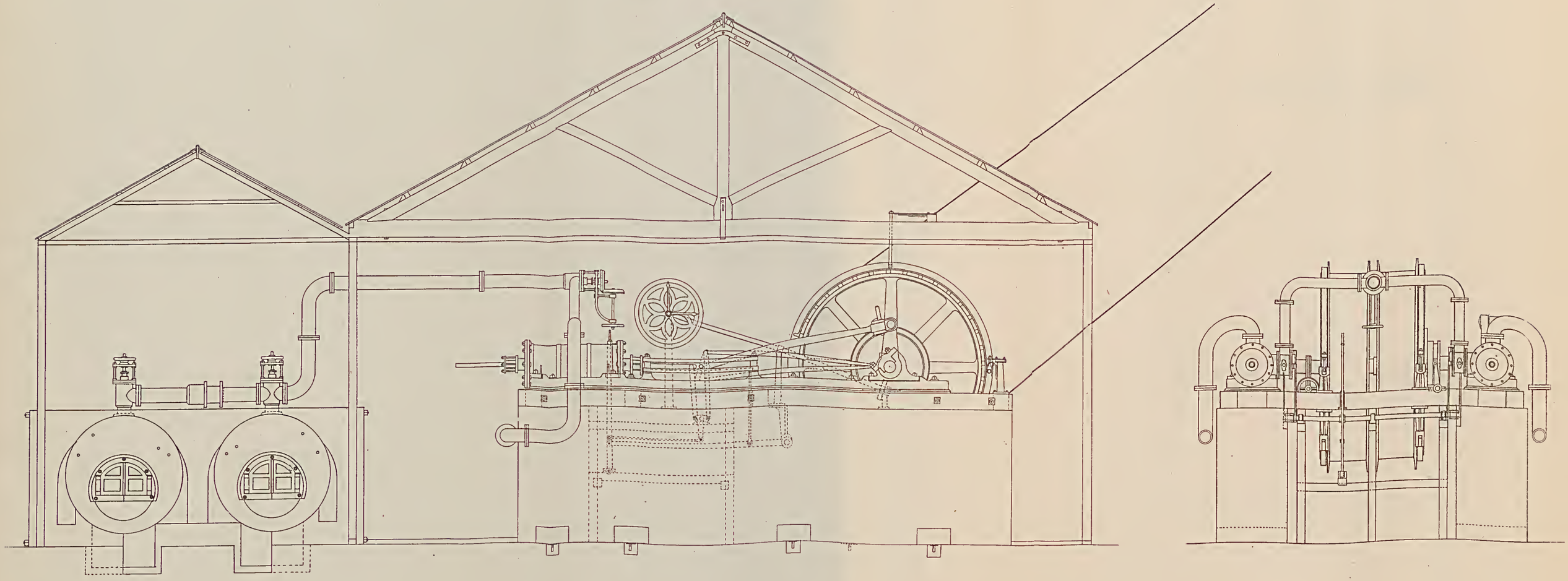
22 In. WINDING ENGINE

ERECTED at 222 MINE

SANDHURST

A. HARKNESS & C° ENGINEERS

Scale 3/16 of an In to 1 Ft



Gippsland District.

The class of mining in this district is principally quartz, and the batteries and winding plants at work are of a superior description, both in make and erection.

The batteries of the Long Tunnel and the late Walhalla Companies are driven by belts instead of wheels, the driving wheels having been taken off about six years ago, and belts substituted. The same ones are in use still, and have never broken or given any trouble.

The main driving belt that drives the counter shaft is 14 inches wide, and the belts from counter shaft to wyper shaft are 12 inches wide. All the belts are made of sewed canvas, painted with red lead between each ply.

The Long Tunnel battery consists of 40 heads of 8 cwt. each, giving 80 to 85 blows per minute, with 7 inches drop.

The manager considers the belts an improvement on the wheels, as there is less vibration, and less cost in repairs.

In the other mining districts of the colony the bulk of the machinery is in fair working order, though I have found a good many plants working in a very unsafe condition, often through the ignorance of those in charge, who, however, on showing them the danger they were incurring, have taken steps to put them in a more satisfactory and safe condition.

In the following pages will be found descriptions of some of the most recent plants and mining appliances that have been brought under the notice of the Department:—

Winding Engine at Lansell's 222 Mine, New Chum Reef, Sandhurst.—The cylinders are 22 inches diameter, with a 5-foot stroke. The cylinder covers have glands both ends, and the piston rod works through both. The back end of the rod is protected with a polished wrought-iron shield. The cylinder covers, glands, and flanges are turned, planed, and polished bright. The piston rods are made of hammered scrap iron. The connecting rods are made of hammered scrap iron, and 11 feet long from centre to centre of brasses. The engine cranks and crank pins are forged from scrap iron, and are turned, planed, and polished bright. The shaft is 10 inches diameter, with square forged on for clutch of the loose drum. The eccentric blocks for the valves are wrought iron, made in two halves. The eccentric straps are brass. The eccentric rods, valve rods, and links are all made of hammered scrap iron, and all the working parts case-hardened. The winding drums are 12 feet in diameter, and made in two halves. Each drum has a brake 12 feet in diameter fixed to it, and all the levers come within reach of the engine-driver when at the starting-bar of the engines. The clutch for the loose drum is 4ft. 6in. in diameter, and the teeth are so arranged as to take up or lengthen the rope 2 feet. This is also made in two halves, as all the work on the engine shaft is, so that in the event of any breakage any part could be removed and replaced without removing the engine shaft. The connecting rods and engine cranks are balanced with weights firmly bolted inside of the fast drum. The indicator for showing the position of the cage in the shaft is a dial 4 feet in diameter, with two arms pointing to the different levels marked on the dial, which is stationary. The arms are worked with a worm wheel from the winding or engine shaft. The pit-head pulleys are 12 feet in diameter, cast-iron rim and centre, wrought-iron spindle and arms. The engine-beds are brick, with top frame of Oregon timber, to which the bed plates of the engines are fitted and bolted through beds with 1¼-inch bolts. The engines are supplied with steam from two Cornish flue boilers fitted with Galloway tubes, and are each 30 feet long by 7 feet diameter. They are connected so that one or either or both can be worked at the same time. The boilers are supplied with water by a special boiler feed pump from a cylindrical hot water tank into which the engines exhaust the waste steam, which heats the water before being pumped into the boilers. The boilers are set in brickwork with stone foundations.

The house is lofty and roomy, the foundations being stone and brickwork to the floor level. The walls are studs and weatherboards and iron roof.

The whole of the work was designed, made, and erected by Messrs. A. Harkness and Co. at their works, Victoria Foundry, High-street, Sandhurst.

Single-acting Pumping Engine.—The accompanying plate represents a single-acting pumping engine made at the Union Foundry, Ballarat, by Mr. John Hickman, and is a type of engine found to be the most economical in the consumption of fuel, the economy depending on high steam pressure adopted, and the facility of cutting off the steam at any part of the stroke to suit the load on the engine. This engine is erected at the Berry Number One Company's mine at Smeaton, and a similar one has been manufactured for the Hepburn Estate Leasehold Company. Both of these mines expect to have to deal with a heavy body of water at about 600 feet in depth.

The great beams are of cast iron in two main sections over 32 feet long by 6ft. 3in. deep, the two sections weighing 25 tons. The main gudgeon is of hammered wrought iron, and weighs nearly 4 tons. The bed-plate stools and pedestals for carrying main gudgeon are of massive proportions; all pin-holes are bored, and gudgeons made a driving fit. The parallel motion work is all finished bright with gun-metal bearings, the parallel motion being fitted with an adjustable anchorage block. The out-end pins are of hammered iron, finished bright, which oscillate on gun-metal bearings fixed in each end of the two sections of the beam. The main links are of wrought iron, finished bright, with gun-metal bearings and turned distance pillars. The in-door end of beam is provided with strong catch-bar and eyes. The cross-head is finished bored and turned to permit the piston rod to rise up through it without damage, in case the engine should come suddenly in-doors from rods breaking or bucket tripping. The cylinder bottom is also furnished with a lead ring for piston to drop on in case of a similar accident, thus deadening the shock. The crosshead is made of steel and cast iron.

The cylinder is 70 inches diameter, and of a sufficient length for a 9ft. 4in. stroke; its weight is 10 tons, bored, faced, and drilled, fitted with turned bolts to a cylinder bottom casting, all joints faced. Bottom casting weighs 5 tons.

The cylinder cover and false cover are all finished bright, and furnished with four gun-metal lubricators and glands, brass bushed; also a lantern brass for admission of steam to piston rod at neck of stuffing box. Cylinder cover weighs about 4 tons.

The stroke at out-door end of beam for pump is 8 feet, and will work a 22-inch lift for 500 feet in depth. The air pump is 36 inches diameter, and is fitted with a marine bucket, having vulcanized indiarubber disc valves on gun-metal seating. The condenser is fitted with intermittent injection gear and jet.

The feed pump is worked from the main beam, and takes its water from the hot well.

The valve gear is carried on two weigh-posts, and is worked by tappets carried on two plug rods attached to the main beam. All the arbors, horns, and spanners, as well as the plug rods, are of Bessemer steel. The weigh-posts, and every part of the gear, being finished bright. The engine being controlled by two sets of cataract gear—one working the steam and exhaust catches, and the other the equilibrium. The equilibrium and exhaust arbors are fitted with inside quadrants to keep the equilibrium valve shut.

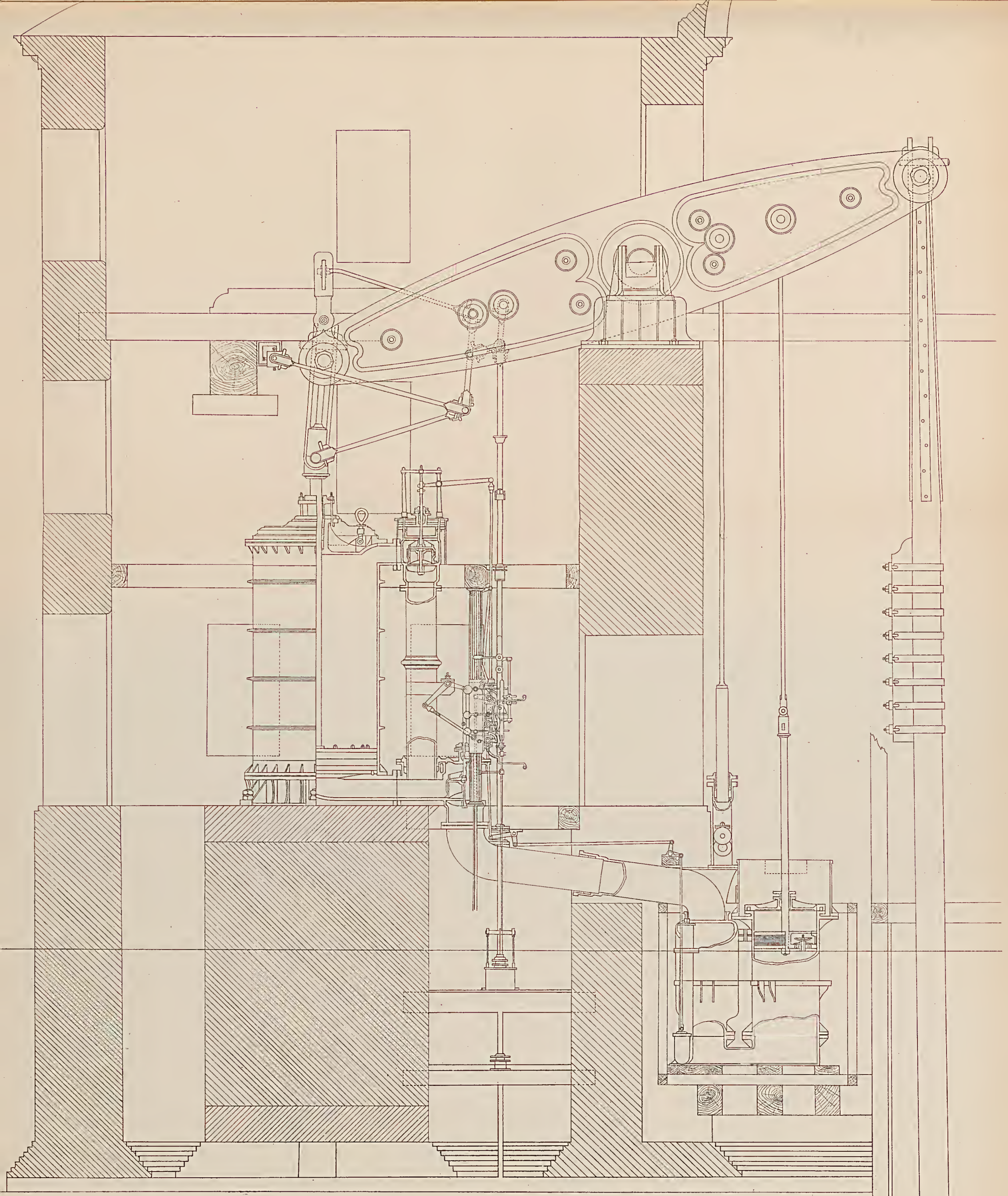
When the exhaust valve is open, the top quadrant abuts on the lower one, and keeps the equilibrium valve shut until it is released, when the tappet for the bottom shuts off the exhaust, and allows the quadrant to pass, the equilibrium quadrant thus releasing it, and the valve is instantly opened by the weigh-arm. All the arbors are fitted with weight-arms for the purpose of lifting the steam. Equilibrium and exhaust valves, all of which are of the equilibrium type, are made of gun metal.

The exhaust valve is contained in the bottom nozzle at the foot of the vertical equilibrium pipe, which is attached at the top end to the top nozzle piece. This pipe is finished bright throughout. The top nozzle contains the steam and equilibrium valves and a governor valve, and is boxed in under a polished iron chest of handsome design, the top of which carries the weigh-shaft on handsome polished columns of steel, and the several lever and rod attachments to spanners or arbors.

The engine may be set to make from one to ten strokes per minute, and the cut-off regulated to suit the load. At ten strokes per minute the in-door stroke takes two seconds, an interval of one second occurs, and the out-door stroke occupies three seconds.

Thompson and Richards' Hydro-Pneumatic Apparatus for Shaft-sinking.—The past year has witnessed a new departure in shaft-sinking, namely, the substitution of iron for wood in shafts where heavy drifts have to be contended against. This experiment has been successfully tried by the New North Homebush Company, who employed the above-mentioned apparatus, a description of which, supplied by the patentees, is as follows :—

The invention is to provide a method of sinking shafts through loose sand or drift, or the like strata, by forcing iron tubes in lengths or sections through such strata. Cylindrical tubes of any length, thickness, and diameter are to be made of cast or wrought iron; if made of cast iron, the cylinders will have internal flanges and ribs extending vertically from flange to flange, and special long brackets, the recesses to be cast in cylinders to receive wrought-iron tongues or dowels, and the cylinders to be costered together as shown on plan, so as to leave cylinders free from any projections inside or out. The lowermost cylinder to be made



SINGLE ACTING PUMPING ENGINE

Manufactured at

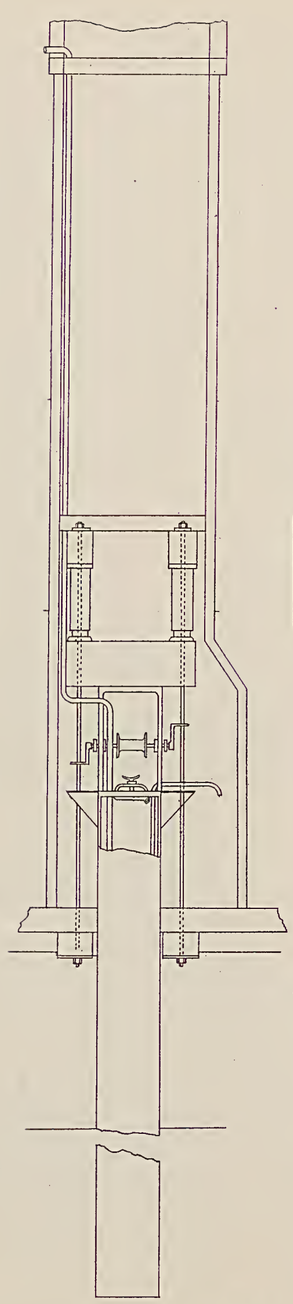
THE UNION FOUNDRY BALLAARAT

Scale 1 In. to 1 Ft

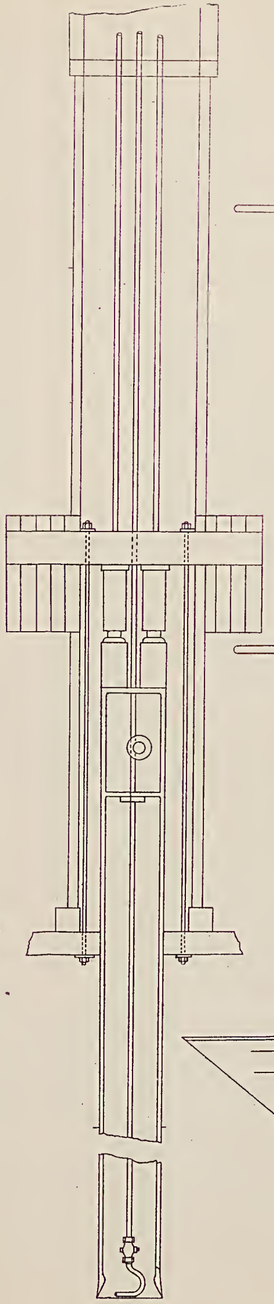
THOMPSON AND RICHARDS HYDRO-PNEUMATIC APPARATUS

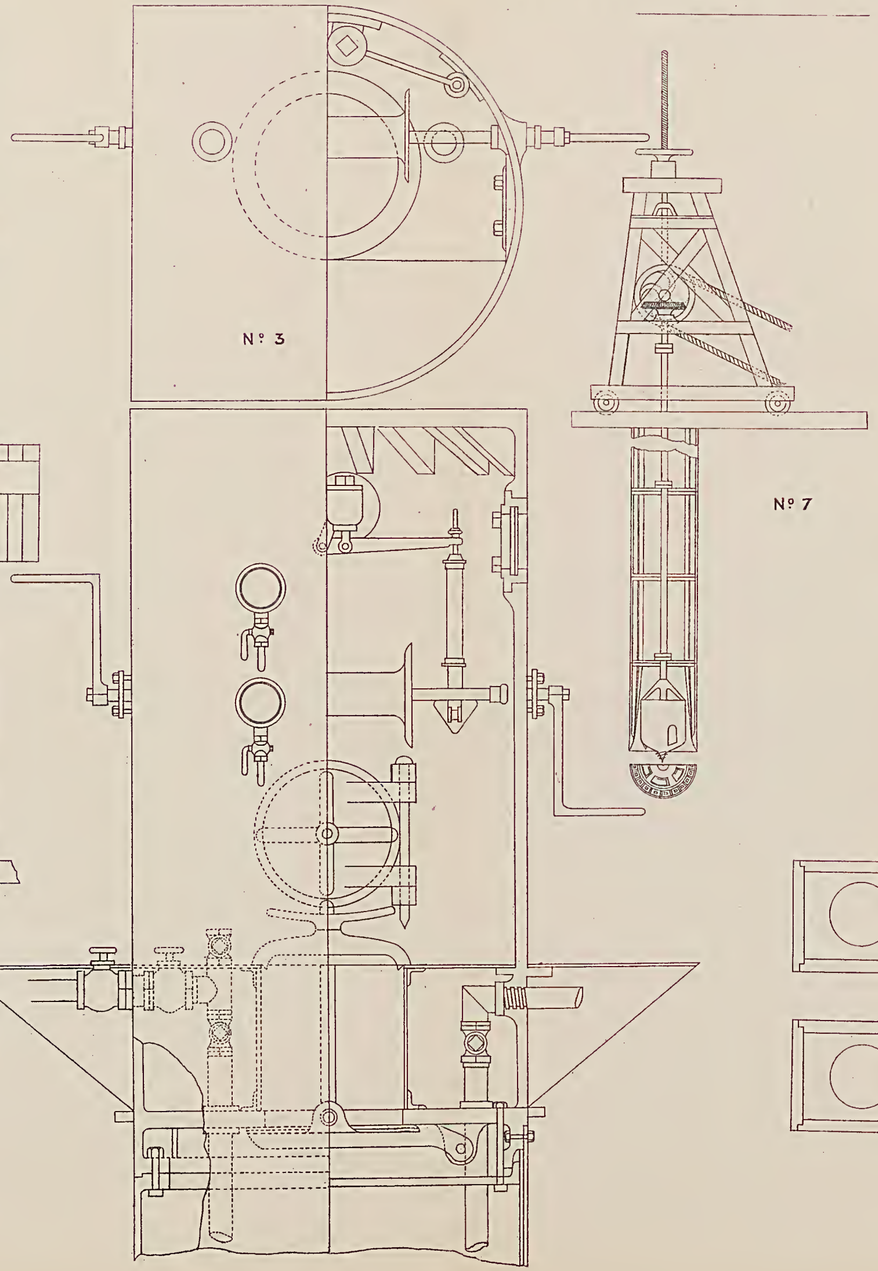
FOR SHAFT SINKING

applicable to Mining purposes



Nº 1





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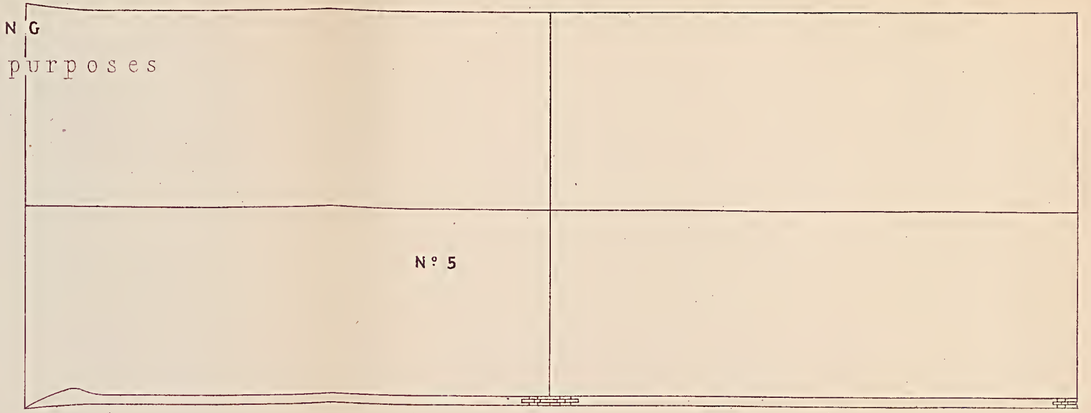

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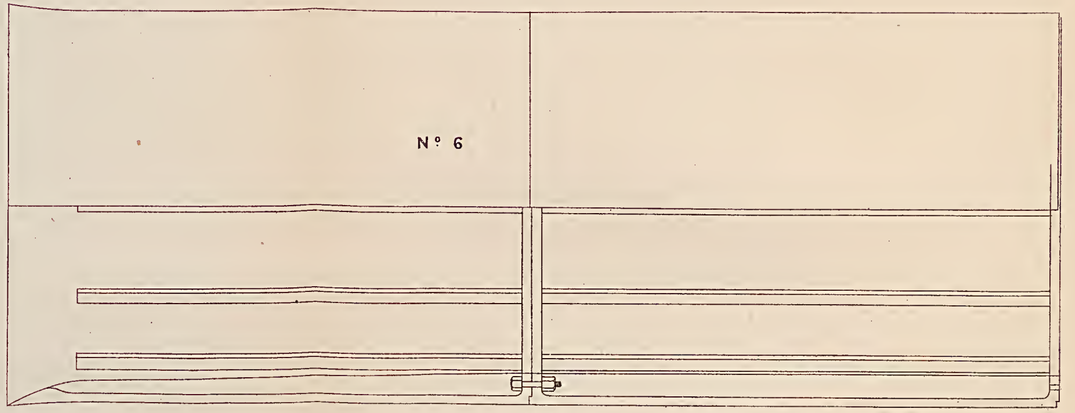

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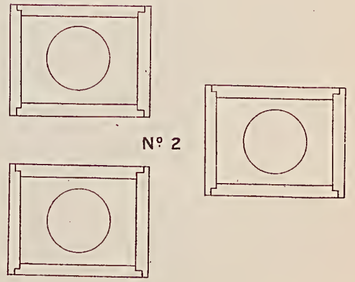
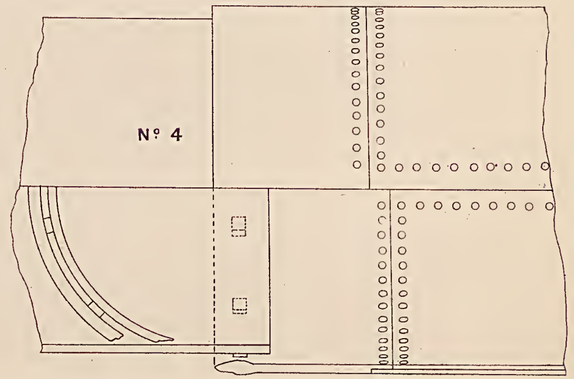


Nº 2



Nº 4

of east iron, or solid wrought iron, steel pointed at bottom edge, so as to give clearance for upper sections of tube. If made of wrought iron, the cylinders will be constructed with one or two thicknesses of wrought iron plates. Where one thickness is used the plates may be joined together inside with fish-plates, allowing the cylinders to be perfectly plain and free from projections outside. Where two thicknesses are used, each thickness to overlap the other about three inches, forming spigot and lancet points for coupling tubes together. All the rivets countersunk inside and out. The inner and outer thicknesses are quite parallel, and free from inequalities, the lowermost cylinder to be of solid wrought iron, steel pointed at bottom edge, so as to give clearance for upper sections of tube. When required, the tubes will be cast or fitted with internal segment flanges, leaving a rectangular opening and way or skids for the working up and down of cages or other rectangular means of conveyance (method shown on plan No. 6). All the cylinders to be lined (when the condition of the surrounding strata requires it) with brickwork, laid in cement, so as to form a substantial shaft. At the top or head of the tubing is an entrance and equalizing chamber (hereinafter called the entrance chamber), the bottom of which rests on the top of the uppermost cylinder. The entrance chamber is to be made of cast or wrought iron. It is to be provided with a stuffing box or flanged joint fitted inside of the tubing, so as to make the joint between the tube and entrance chamber perfectly air-tight. The entrance chamber is also to be provided with air-tight entrance door on the side, and communication door on the bottom between the entrance chamber and tube, also with windlass working through stuffing boxes as shown on plan, mullock tip holding about ten cubic feet for tubes of four feet in diameter, deadlight fitted on the sides of entrance chamber; spring-balance, safety-valve pressure gauges, one for the tube and one for the entrance chamber. Also two air pipes, one for the chamber, and the other for the tube, each pipe to be provided with two high-pressure steam valves inside entrance chamber, for the purpose of filling the tube and entrance chamber with compressed air, and releasing compressed air from the tube and entrance chamber. The entrance chamber will also be fitted with a water-pipe leading to the bottom of the tube for the purpose of blowing out any water or soft material that may accumulate in the tube when the workmen are below. The pipes to be provided with steam-tight valves. The entrance chamber will also be provided with telephones for communication between persons inside it and those outside. The head of the entrance chamber is acted upon by hydraulic rams placed immediately above. The entrance chamber is movable, and can be shifted from over the excavation beneath it, so as to allow of the sections of the tube being inserted from time to time as required. When a section of tubing is in its proper position, and the entrance chamber in its place above the tubing, the hydraulic rams force the entrance chamber and all the tubing below it downwards. When the tubing has been forced down far enough to permit of another section of tubing being introduced, the entrance chamber is drawn up again, moved to one side, another section of tubing introduced, the entrance chamber placed in position, and the operation of forcing the tubing downwards is by these means repeated from time to time. In the event of any obstruction to forcing the tubing down, workmen are admitted to the entrance chamber through the air-tight door. Compressed air is then admitted into the chamber and tube as by an outside attendant required until the pressure of the atmosphere within the tube exceeds the resistance of the water therein, and forces it to the bottom of the tube, and out under the bottom edge of the tube.

The current of water passing outward under the bottom edge of the tube will force minor obstructions from it and allow it to descend rapidly. If there should be any large obstructions in the way, workmen descend the tube by means of ladders and remove them. If the descent of the tube should be obstructed by any permanent obstruction not removable by the means aforesaid, an inner tube to be inserted at the locality of the obstruction, leaving an annular space of about two inches between such inner tube and the outer one. The space to be filled with cement and caulking, and fibrous material which will find its way under the bottom of the outer tube, making a water-tight joint between the drift and the permanent obstruction or hard country. Where the use of hydraulic rams is unnecessary, the sand drift or other strata within the tube would be removed by means of a dredger. The dredger to be cylindrical and of any required diameter and length or depth, constructed of wrought or cast iron or steel, fitted with inlet scoops or scrapers and valves, and is to be worked by the application of wrought-iron hanging rods made in suitable lengths, and coupled together and driven by bevel or mitre gearing, either by manual labour or steam power. As the tube descends into the sand, drift, or other like strata, the tube will be filled with water (by means of pumping) to a level equal to that of the water outside the tube. The water in the tube will prevent the sand or drift from rising up in the tube from external pressure, and the dredge will work at the bottom of the tube under the water.

The plans accompanying the specification are as follow :—

No. 1 plan shows sections of shaft and strata, with hydraulic rams, entrance chamber, and wrought or cast-iron tube in position.

No. 2 plan is general plan showing triangular systems of tube sinking, with poppet-heads and gearing.

No. 3 plan shows half section and elevation of entrance chamber and details.

No. 4 plan shows half section and elevations of tubing and stuffing box.

No. 5 and 6 plan shows half section and elevation of cast-iron tube.

No. 7 plan shows dredging apparatus.

The inventors make a special claim for novelty in the design and construction of entrance chamber and tubes, and for the method of the application of hydraulic power in forcing the tubes through the loose sand, drift, and the like strata without the necessity of pumping the water out of the shaft, and in the design and construction and application of dredging apparatus, and in the application of telephonic communication between interior and exterior of entrance chamber.

Respecting the difficulties of sinking through drift in the Smeaton district, Mr. Mining Surveyor Stevenson has, at my request, furnished the department with the following report, dated 17th July, 1884 :—

The Berry Consols is the only company that has failed in sinking its shaft. The shaft was sunk to a depth of 315 feet 6 inches when the drift commenced to boil, rising 39 feet in the pump shaft and 8 feet in the winding shaft. The shaft was then cleared out and sunk to a total depth of 317 feet, when a drift

box was put in, and the shaft sunk to a further depth of 11 feet. It was then decided to sink with an iron shaft, a description of which I forward to the department, on the 22nd July, 1883. Sinking was resumed and the iron shaft pushed through the drift 21½ feet; then they commenced to clean and pump the water out, also timber and centre at the same time, but at a distance of 6 feet from the bottom a boil took place, and filled the shaft 13 feet up. The sinking was discontinued for a time, and a 2ft. 10in. tube pressed down in the eastern end of the shaft, with a hydraulic ram, to a depth of 33 feet 8 inches below the iron shaft. Owing to the drift boiling from the bottom, with 12 feet of sand in and 30 feet of water, it refused to travel with a pressure of 80 tons. A bore was then put down 6 feet below the tube without any change. The total depth of drift proved was 64 feet 8 inches. They then put six hydraulic rams on the iron shaft, and pressed it down 2 feet 6 inches, when it refused to travel. The company then decided to call for sinking of the shaft. A party of contractors undertook to sink it to the bed-rock in four months. They commenced operations on the 17th of March last, by boring out an opening (6 feet x 3 feet) in the west end of the shaft and 16 feet from the bottom of same, then put in a water drive a distance of 7 feet. Then they decided to sink the west end of the shaft with an iron box, ⅜in. thick, 6 feet by 4 feet in the clear, and 3 feet deep, and at the same time placed a pine tank (capable of holding 600 gals.) in the east end of the shaft to pump the water from. While two of the men were forcing down the iron box with the screwjacks, and when the iron box was about 5 feet 6 inches from the bottom of the iron shaft, the drift commenced to boil, and rose between 7 and 8 feet, or 2 feet above the top of the small shaft, which had been sunk 6 feet 6 inches. Work then stopped, and they reported to the directors of the company that they had decided to abandon their contract. The company then decided to abandon the shaft, after having expended £30,487 in sinking and erection of machinery, &c. The company then decided on boring with the diamond drill. The first bore was put down 375 feet 6 inches, which proved 42 feet drift not bottomed. The second bore bottomed at a depth of 411 feet 9 inches without drift. A site for a new shaft was then selected, and operations commenced, and it is now down 120 feet.

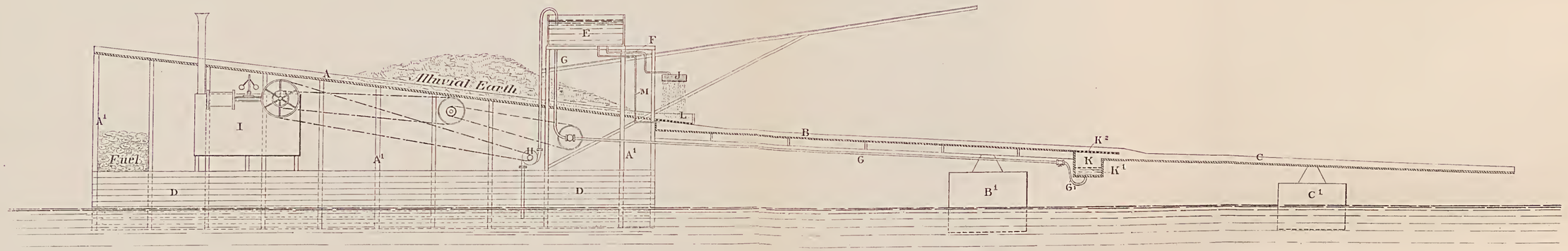
Hydraulic Ram at the Mine of the Madame Berry Company, No. 2.—Mr. Inspector Meekison has furnished me with the following report, dated 15th November, 1884, respecting operations at the Madame Berry No. 2 mine :—

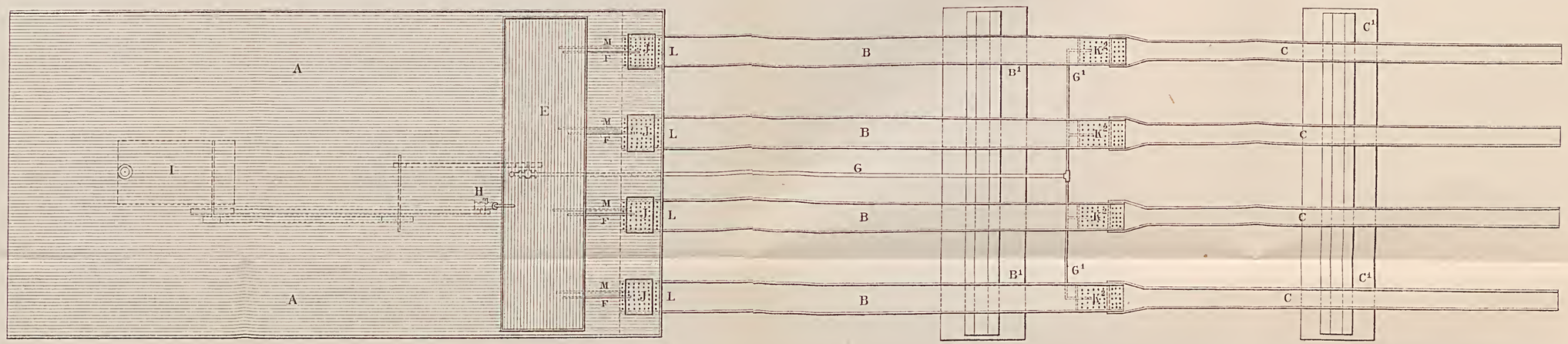
The sinking of the shaft was stopped when the company struck the drift, and it is to be continued through the drift with cast-iron tubes. I went down the shaft to see the preparations they are making for forcing the tubes down with a hydraulic ram. The size of the shaft from surface is 14 feet 6 inches long by 4 feet 6 inches wide, down to where the ram is to be applied, where it is widened out to 19 feet 6 inches long, by 9 feet wide, by five sets of timber 12 inches by 10 inches all bolted together. There are two malleable iron riveted girders, 19 feet long, fixed under the bottom set of 12-inch by 10-inch timber ; they are 3 feet 6 inches in depth, and 1 foot 6 inches wide, and weigh 6 tons 15 cwt. each. Under them are fixed two cross girders, also malleable iron riveted, 8 feet 10 inches long, 2 feet 4 inches in depth, and 1 foot 6 inches wide, weighing 2 tons 10 cwt. each. These are fixed in the east end of the shaft for the first tube. There will be three tubes put down, two for winding with, and one for pumping. The ram will be bolted under the cross girders and will be stationary, the case of the ram travelling down when the pressure is applied, a sufficient distance to allow the 6 feet long tube to be put under the case, when it is run up after pressing down one length of tubing. The ram is fixed 40 feet above the drift, and down above top of drift is fixed a wooden frame the size of the tubes, to guide them down plumb, and the top of tube being bolted to the ram, will keep that part in its proper position. The girders are to stand a pressure of 300 tons each, and the tubes are made in four segments, with planed joints and flanges inside, and bolted together, and the joints are to be filled with cement. The horizontal joints have turned inside flanges with bolts ; all the materials and workmanship are strongly and substantially done, and no expense has been spared to make the sinking of the shafts a success.

Hicks and Harris' Improved Caisson for Sinking in Alluvial Drifts.—This box or caisson (invented by John Hicks and Thomas Henry Harris of Ballarat) has been designed for the purpose of facilitating the sinking and timbering of shafts through alluvial drifts. It is constructed of iron and wood, and consists of a rectangular box, the sides of which are made up of a number of wrought-iron piles and whose interior measurement is large enough to admit of the shaft slabs or timber, and whose depth is sufficient to allow of men working conveniently therein (say about eleven or twelve feet). It has no top, and its bottom is formed of a series of wooden boards of the same width as the vertical piles, and which boards are seated on ledges and fitted on the piles and held down by suitable pins or keys. The two vertical piles at each of the four corners are riveted to an angle iron, and in these corner piles holes are provided to receive eye-bolts to which is secured the ends of the adjustable cross tie rods which prevent the vertical piles from opening out or spreading apart from one another. Three strong wooden frames are placed inside of the caisson, made smaller than the interior measurement of the box, so as to allow of wedges being driven to keep the piles forming the sides out to their proper position, and also to allow of the frames being easily lowered when the wedges are taken out. The two lower frames are suspended on the vertical rods, which are supported at their upper end in temporary sets fixed in a suitable position in the shaft above. This rod also passes through the uppermost frame, but the frame is seated on the ledges provided for said purpose on the vertical piles. Another series of ledges is placed at a convenient distance below those last referred to, against which second series the screw-

G. B. B. Elliott's Patent for

"An improved Portable Floating Apparatus for Sluicing alluvial earths."





jack when worked exerts its power so as to force down the pile which is at such time being operated upon.

The mode of sinking the above box is as follows :—Supposing it to have been partially sunk through the drift or other earth, and the shaft to have been slabbed down as far as is convenient with its timber, which are over the vertical piles, then one of the floor or facing boards is lifted up and the piles on which it was supported are forced down, one at a time, into the drift a distance of about eight inches by a screw-jack, which obtains its purchase from the upper wedged frame, and exerts its force on the ledge provided on the piles. The space between these piles is then cleared out of the drift, sand, or earth therein, so as to allow of the floor boards being again fastened down in position by the keys. This operation is repeated until each pair of piles and its floor-board has been sunk to the same level, when another set of shaft slabs are inserted, and the frames released of their wedges and lowered again to their position on the piles. Should any difficulty arise in lowering the frames, a false frame can be put in so as to wedge the piles out and so free the other frames.

Elliott's Sluicing Apparatus.—A trial of a new sluicing apparatus, the invention of Mr. G. B. B. Elliott, took place recently at the Melbourne Exchange, and was witnessed by an officer of this department, who reports thus concerning it:—

The apparatus is intended to be worked in connexion with Priestman's Patent Dredger. Both Mr. Elliott's machine and the dredger are floated on punts, each 40 x 20 feet, and 6 feet high, on the river intended to be worked. The dredger raises the washdirt at the rate of about 60 tons per hour, and deposits it on a sloping platform from which it gravitates to a riddle upon which falls a constant shower of water, raised from the river by a small engine. The water washes the minerals, sand, and small gravel through the riddle into sluice-boxes fitted with ripples, blankets, &c., in the ordinary way. The riddle is on hinges, and can be tipped up by means of a lever whenever it is desired to throw back into the river the large stones, &c., which cannot pass through. At the end of the first row of sluice boxes there is a box with a false bottom of finely perforated metal. A pipe, leading from an elevated tank, conveys water into this box. The pipe is fitted with a tap, which is turned off and on alternately by a pulley driven by a belt. This causes the water to flow spasmodically into the box and up through the perforated plate, imparting, at the same time, a lifting or pulsating motion to the wash. As the lightest portion of the wash comes to the surface first it is carried away, while the fine mineral particles, if any have escaped from the sluice boxes, fall to the bottom.

The cost, landed in Melbourne, of the entire apparatus, including the dredger, the sluicing machine, the two punts, engines, pump, sluice boxes, and all other necessary appliances, is £2,000.

For gold mining, it takes 15 hands to work the apparatus; for tin mining, 18. This includes two men for procuring firewood. The dredger itself can be worked by one man. All the men can live in the punts, which are constructed to float, if necessary, in eighteen inches of water; but, if required, the dredge will bring up stuff from a depth of 45 feet.

Some of the rivers in Victoria which Mr. Elliott considers would yield handsome profits by the use of his invention are the Thomson, Mitchell, Tanjil, La Trobe (for tin), Upper Yarra, Goulburn, Big River, Dark River, Loddon, &c.

It is expected that the apparatus will shortly be employed in tin mining on the rivers of Tasmania, and the results will no doubt be looked for with interest.

Reference to Drawing.—*A* is the inclined platform, *B* the sluice boxes, and *C* the tail races. A^1 is the framing for the platform supported on punt *D*, *E* is the elevated water tank, and *F*, *G*, and *M* the series of supply pipes therefrom. *H* is the centrifugal pump, and *I* the engine. The pipes *F* lead to perforated trays *J*, and the pipe *G* with its branches G^1 lead to the wells or troughs *K*, each of which has a perforated false bottom K^1, while the pipes *M* lead to the heads of the respective sluices, over each of which is a perforated plate *L*. B^1 and C^1 are the buoys or punts for the sluice-box and tail race respectively. K^2 are hinged perforated plates for preventing large stones from falling into the wells or troughs *K*.

The mode of operation is as follows:—The alluvial earth to be treated is lifted and deposited on the platform *A* by any suitable means, but preferably I employ what are well known as Priestman's dredgers. This earth is then conveyed to the perforated plates *L* either by shovelling or by means of a water jet playing upon it, and as it falls on to said plates it is subjected to the action of a shower of water from the upper trays *J* which washes all the finer particles through the perforations in said plates *L* into the sluice boxes *B*, which are of ordinary construction, the large stones remaining on said plates being then thrown out from time to time as required. The tailings from the sluice boxes are subjected to a water pulsation or jigging in wells or troughs *K*, and the waste passes away through the tail races *C*, which are made sufficiently long to prevent the tailings from returning back into the excavation being made by the dredger. When all the valuable alluvial earth has been excavated in one spot, the anchors or moorings are loosened, and the whole apparatus floated further up the stream and again moored, when operations are commenced afresh. By this means the operator is enabled to work river and creek beds, and to make artificial canals into alluvial flats on the banks of such rivers or creeks where otherwise it would be impracticable by reason of the difficulty of getting rid of the tailings at a sufficiently rapid rate.

Mr. Elliott states, in reference to his apparatus—

I do not claim any novelty in any of the contrivances herein described and explained, when taken separately and apart from each other, but what I believe to be new and therefore claim as of my invention is the construction of apparatus for sluicing alluvial earths on floating supports, in the manner and for the purpose herein described and explained.

Lisle's Apparatus to Prevent Overwinding.—A trial of this apparatus, the invention of Mr. Roger Lisle, of Sandhurst, was made at the mine of the Red White and Blue Company in June last, in the presence of several mining managers and other gentlemen interested in mining, who were unanimous in the opinion that it was the most simple and effective they had yet witnessed. I regret that, in consequence of the incompleteness of the drawings sent to the department, I cannot reproduce here a sketch of the contrivance, but the following description of it has been forwarded to me by Mr. Inspector Grainger:—

Fixed to the skid there is a projecting lever about ten feet above the landing brace. A wire is attached to this which passes over a bell crank fixed to the skid about ten feet above the lever. This wire is conducted to the slide valve over a bell crank under the floor of the engine-house, and to the levers to which weights are attached, being held in position by a pin passing through an eye. From the main wire from skid there is another one attached which connects by a pin which enters a slot and holds a thin flat bar of iron, also held by a pin with a weight attached to the brake. As soon as the cage overwinds and comes in contact with the projecting lever in the skid the wire becomes taut and instantly shuts off the steam and applies the brake. The steam is not entirely shut off, only $\frac{3}{8}$ of the port being open, thus preventing the cage again descending even if the brake should fail, a sufficient amount of back steam being there to prevent the engine going over her centre. The appliance is very similar to the one at the Ajax mine at Castlemaine; in fact, the principle is quite the same. I saw a few trials of it, the cage being raised at the ordinary speed, and in every instance it acted well. The appliance at present is only connected to the brake on the drum, but it is the intention of the manager to apply it to the brake on the fly-wheel also.

Phillips' Apparatus to prevent Over-winding.—Mr. P. E. Phillips, of Campbell's Creek, who states that he has been connected with mines and mining machinery from his youth, in England and in this colony, has forwarded to me a model of an appliance invented by him to prevent over-winding, a sketch of which is here given. The machine is simple in its operation. There are two vertical slides working in guides. These are fixed above the brace. The first slide is connected to the throttle-valve by a wire. Should the cage be carried above the landing brace through accident or the neglect of the engine-driver, the cage would at once carry the slide in an upward direction, and the steam would be at once cut off. Should the engine continue to work after this, the cage would come in contact with the second slide, which is connected by a wire to a wheel or travelling crank. This applies the brake gradually to the fly-wheel of the engine, and the whole machinery is brought to a standstill. The brake is held to the wheel by a foot ratchet, and here it remains until it is thrown off by the engine-driver, or some one else. This can be done with the foot. Mr. Phillips considers that any contrivance which provides for cutting off the steam and stopping the engine simultaneously would not be safe when the engine is driven at full winding power. His invention provides for cutting off the steam first and allowing the cage to travel 20 or 30 feet (if the fly-wheel will carry it so far) before applying the brake. The distance which the cage will travel after steam is cut off can be ascertained in every case, and the second slide fixed accordingly.

Safety Hooks.—Writing under date 7th January, 1884, Mr. Inspector Stewart (Ballarat) reported:—

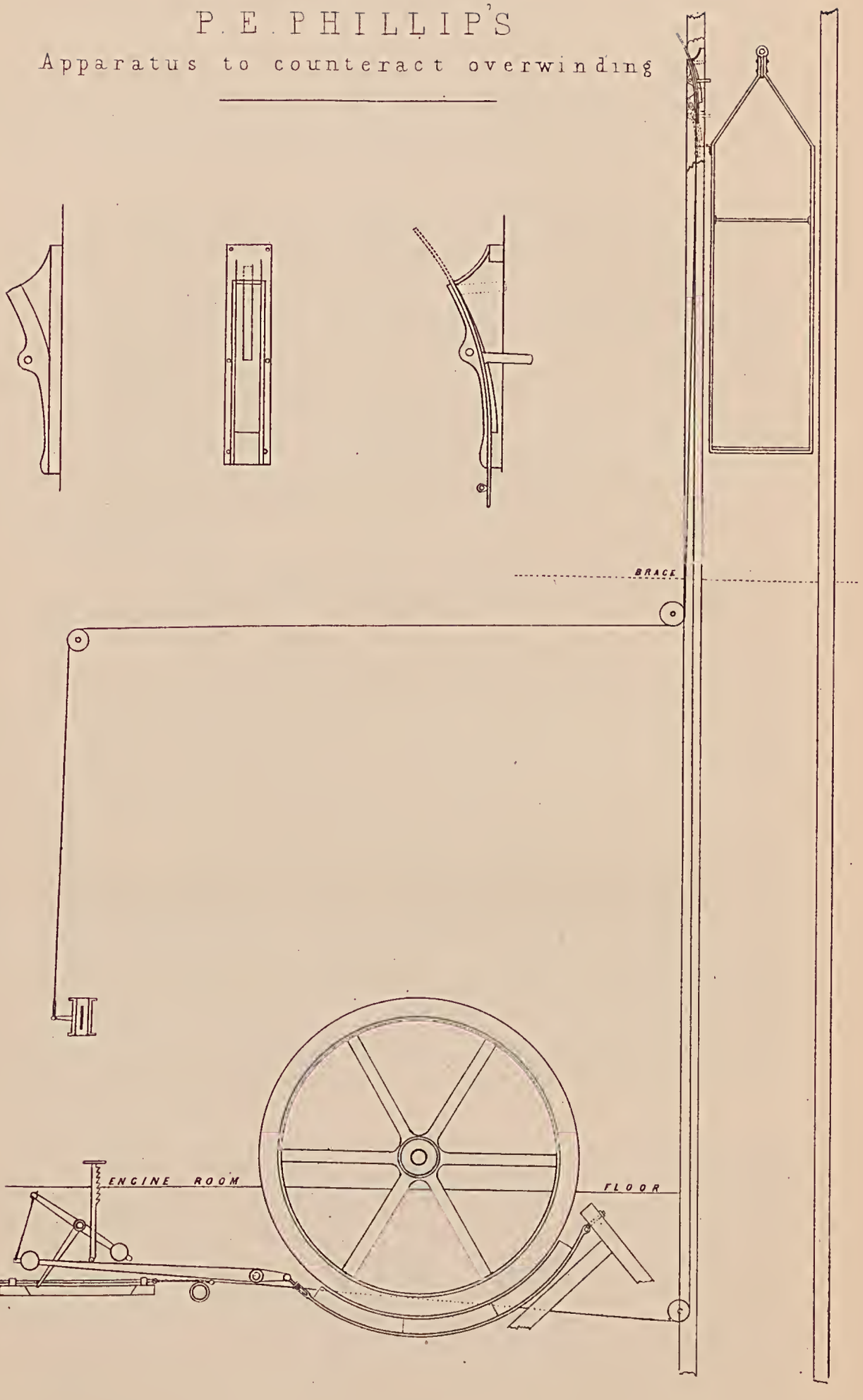
Some time since I got made a model in wood of Humble and King's safety hook (taken from the report of the Mines Department for 1880). Since then I have exhibited it at various places, and left it at the offices of the Ballarat and Creswick Miners' Associations. I also sent it to Sandhurst to the annual conference of the miners. Many of our mining blacksmiths have taken drawings of it, and, in every instance, it is pronounced superior to any other hook.

In consequence of the miners working in the Lone Hand Company's mine petitioning their manager not to use safety hooks, I lent the latter my model, and on Saturday I saw a model of a hook at the Phœnix Foundry from a design by the blacksmith at the Lone Hand mine. The company are going to make six of them for their large double cages. The first will be ready next Saturday. I will then see it, after which I will forward you drawings. It appears to me to combine simplicity and strength, and, with good catches above the brace, it will no doubt answer, but it does not (like Humble and King's) suspend the cage without the catches. A great advantage in Humble and King's hook is that there is nothing projecting, around which the chain or any other thing can catch. All its working parts are hid until it is brought into action, and it is the only hook that I know of that is free from these projections.

I am sorry to say there is a feeling growing amongst some classes of the mining community against safety cages, and an agitation is getting up in favour of doing away with them, but I am still of opinion that Allan's and McKay's cages, if kept in good order in their working parts, and the springs particularly looked after, are fairly reliable. But if plain steel is put in for springs without being tempered (as it appears was done in the Duke Company's cage), then of course they cannot be expected to act, for steel so put in would flatten out straight, but would have no spring in it.

P. E. PHILLIP'S

Apparatus to counteract overwinding



At Sandhurst, on the other hand, Mr. E. R. Meekison, Travelling Inspector of Mines and Machinery, reports that the general opinion is in favour of the provisions of the Act being enforced :—

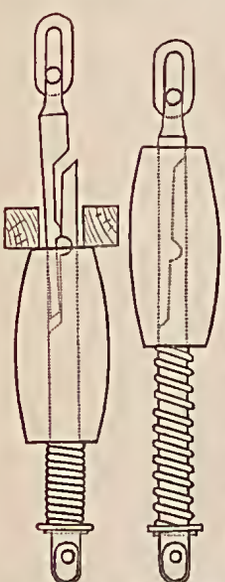
"I have asked," writes Mr. Meekison (under date 26th May), "the opinion of many mining managers, engine-drivers, and miners on the working of the Act, especially as relating to machinery, and, with very few exceptions, it has been in favour of the provisions being carried out strictly. Several managers asked me would I like to see their cages tested, and on my answering 'Yes,' the cages have been taken just as they were working and connected to the chain with a rope, then the rope was cut, when the cages caught at once. Their hooks and cages at Sandhurst are well attended to, and I was told several instances in which they had saved life."

An accident, which occurred at the mine of the New North Clunes Company, on the 2nd June, further illustrates the desirability of having all cages fitted with safety appliances. Mr. Inspector Stewart thus describes the occurrence :—

The driver, John Selkeld, has been driving engines for about 30 years. For the past 13 years he has been driving the same engine he is now at for the above-named company, and he has always been an exceedingly careful driver. On the 2nd June, at 2.45 p.m., Mr. Thomas, the pitman, came up in the cage and got off at the surface. The cage then knocked up to the brace, when the driver let it go a little too high, and the hook was slipped.

The engine is a powerful one and the spider large, the last few revolutions taking 45 feet of rope each revolution, and when I say there is only 7 feet 6 inches between the hook on the top of the cage and the poppet-heads, you will at once see how slight a mistake would cause the cage to reach the latter. The wonder to me is that it is not done oftener. This is another illustration of the value of safety appliances on cages, and of the necessity for self-acting catches between the brace and the poppet-heads. In this instance the safety hook at once acted, the cage quietly set on the catches, and in half-an-hour the cage was again working as though nothing had happened. Had the cage been shackled on to the rope, there is no knowing the amount of damage that might have been done.

The cages used in this mine are Pryor's Patent, fitted with Middleton's Hooks, and they are always well looked after by the manager.



Brown's Safety Hook.—In reference to this hook, which is intended to be worked with Brown's safety cage (see page 20), the inventor observes :—

I have endeavoured to overcome anything in the shape of an abrupt angle, and have also tried to prevent the mineral water entering the inside of the hook and thus create rust. The objection to angles is, a slack rope will sometimes foul, lift the cage a distance up the shaft, and then right itself—the cage suddenly dropping and taking up the slack, at the risk (if the safety appliances be not good) of snapping the rope. There can, I think, be no objection to my wooden model on that score. By taking out the little wooden peg at the bottom of the washer the hook will all come to pieces, and its principles can be examined. I have several ways of supporting the ball, but I think the indiarubber washer the most secure and best.

Hart's Patent Safety Hook.—This hook is intended to work in conjunction with Hart's patent safety cage (see page 22), but it can be fixed to any other. The difference between Hart's Hook and other patents is that it has no copper rivet to cut ; consequently no extra strain is added to the rope or poppet-head. It is composed of two half-hooks acting upon a centre pin, and kept in gear by a sleeve or socket. Under this socket is placed a spiral spring, sufficiently strong to hold same in position. Upon the socket coming in contact with the obstruction placed near the poppet-head pulleys, the hook is drawn through, and, upon being drawn a sufficient distance, the ends of the hook are set at liberty, and immediately release the shackle attached to the rope or chain, thus preventing accidents from overwinding.

New Safety Catch for Colliery Winding Cages.—"At the meeting of the Manchester Geological Society, held on 1st April," remarks *Iron*, "Messrs. Tonge and Kensley, of Hulton, near Manchester, exhibited a model of a new patent safety cage designed to remove risk of accident in the case of the breakage of ropes, &c. The cage is one of ordinary construction, with a pair of wheels, slightly eccentric, on each side of the conductor or rod. In winding, the wheels are held by the chains with their longest radius away from the rods. As soon as the chains holding the weight of the cage go slack, the wheels are brought together by means of an elastic band or spring, or by making the longest radius heavier, so that it falls of its own weight. The conductor being between, is firmly gripped by the wheels, and the greater the weight, or stronger the spring, the more tightly are the conductors held. This arrangement, which has already been tested satisfactorily by

experiments in a mine shaft, is readily adapted to any cage, and it possesses one advantage, that it is always in action, and there is no complicated machinery to get out of order."

Fleuss and Duff's Diving Apparatus.—Some time ago this department, at the instance of the Hon. Col. Sargood, imported four sets of the abovementioned apparatus, designed to enable explorations to be made in flooded mines or places filled with smoke or noxious gases. Two sets were sent to Maryborough, and two to Creswick, and placed in charge of the local fire brigade at each place. The following description of the apparatus is taken from a paper read before the South Staffordshire and East Worcestershire Institute of Mining Engineers on the 8th June last:—

The many difficulties to be met with in mining emergencies and submarine operations are well known to those who have to contend with them, and inventors of various appliances by which artificial respiration is maintained have made many improvements from time to time, and attempts have been made to enable the explorer or diver to carry on operations without the necessity of having the air pumped down through flexible tubes, but nothing practical had been done in this way until Mr. Fleuss invented his apparatus for filtering the breath and admixing oxygen, thereby giving a regular supply of pure air. Many severe tests were successfully applied to the apparatus, but more recently extraordinary practical work has been accomplished by means of the apparatus, and thus it has been put outside the category of theoretical inventions, and is to-day recognised as the most practical and valuable invention for submarine work, and for exploring the most intricate turnings of a mine in which there may be most deadly gases. The importance in mining emergencies of compact, portable, and self-contained apparatus, by means of which accumulations of noxious gases incidental to deranged conditions of ventilation or fire in coal mines may with safety and facility be penetrated, needs only to be mentioned to bring to mind at once occasions for application. The advantages of such means are obvious, particularly for purposes of observation, rescue of life and property, and opportunity to do, remove, place, or construct whatever the case may require. Fleuss' Patent Noxious Gas Apparatus, for breathing in irrespirable gases, is self-contained and wholly independent of the surrounding atmosphere, and will supply breathing air for four hours at a time, thus enabling the wearer to breathe with safety in the most deadly gases. The principle of the apparatus is that the wearer breathes his own breath over and over again; the carbonic acid being taken from it at each respiration and the requisite amount of oxygen restored, the revivified breath is fit to be again inhaled in the form of pure air. The apparatus, which is carried upon the back of the explorer in the form of a knapsack, consists of a strong sheet copper cylinder 12in. by 6¼in., with domed ends, and capable of holding 4 cubic feet of oxygen gas at a pressure of 16 atmospheres. Above the cylinder, and attached to the side of it, is a square metal box 12 by 12 by 4 inches, to contain the filter, which is a box of vulcanite, divided into four compartments by vertical diaphragms, and with a wooden lid made air-tight by an indiarubber washer, and having an inlet and outlet pipe with valves attached. This box is filled with hempen tow and stick caustic soda. The exhaled breath passes twice up and down through the tow and soda, and is thoroughly freed of carbonic acid, the excess of moisture collecting under a perforated false bottom arranged for that purpose. A flat bag of vulcanized indiarubber, 15in. by 12in., is fastened in front of the wearer, and is connected by an indiarubber pipe passing over the shoulder to the outlet pipe of the filter; the bag is also in communication with the oxygen chamber, and the supply of oxygen can be regulated by a jamb screw valve under the control of the wearer. An indiarubber mask is made to fit air-tight to the face, and is held in place by straps buckled up at the back of the head. The mask is fitted with a pair of flexible pipes, the one for exhaling being in communication with the inlet pipe of the filter, and the other for inhaling being in communication with the air bag. The exhaled breath having passed through the filter, enters the bag in a purified state, and there meeting with its complement of oxygen, is fit to be again inhaled. The bag being perfectly flexible readily expands or contracts as the breath passes in or out of it, so that no effort is required in respiration. Foster and Fleuss' safety mining lamp is a modification of the lime light, methylated spirits of wine being used instead of hydrogen gas, and consists of a strong copper sphere 7in. diameter, and capable of being charged with oxygen at a pressure of from sixteen to twenty atmospheres. To the top of the sphere is attached a small spirit lamp with two wicks, between which, through a small jet, a minute stream of oxygen regulated by an injusting valve on the sphere, is allowed to pass, carrying the flame against a cylinder of lime, held on a stud placed to receive it. The light is covered in, and rendered perfectly safe from inflammable gases, by a double dome-shaped metal casing, having an annular space left between its inner and outer surfaces, which is filled with water, discs of plain glass are inserted opposite each other in the inner and outer casings, and a small outlet valve is fixed in the inner case near its lower parts for the escape of the products of combustion from the inside of the casing into the annular space filled with water between the two cases, through which the gases bubble and escape through another outlet valve fixed on the top of the outer case. The cover is attached to the lower part by means of a screw, an air-tight joint being made by a leather washer seating. The lamp will burn for four hours under water, in carbolic acid, or in fire damp, and it cannot get hotter than boiling water. The essence of these inventions is that all means of communication with the surface or pure atmosphere is now dispensed with, and the wearer of Fleuss' dress is enabled to carry with him, not merely compressed air, but more compactly, and therefore lasting for a longer period, the ingredients for producing and reproducing breathable air. The lamp also is isolated and self-contained, giving light that is inaccessible to the gases or water by which it may be surrounded without imparting or sustaining injury and without any connexion with tubing or electric wires. The novelty of the apparatus and the principles upon which it depends might lead some to suppose that there would arise some difficulty in its ready use by uneducated or unskilled hands. It is to shew that these fears are groundless that I now detail to you the exact proceedings that took place at Seaham. The first thing to be done was to instruct the men in the use of the apparatus, and to give them the necessary confidence in its employment which the inventor, who was the instructor, already had. The oxygen gas required is usually procured direct from London in wrought-iron bottles compressed to 40 atmospheres, but, as on this occasion an unusually large quantity of gas was

required, it was decided to make it upon the premises; the gas in the iron bottles already procured being kept in reserve in case of need. I may mention here that the gas in these bottles is guaranteed to last intact for years. A disused smithy served as a gas house, and the gas was evolved from potassic chlorate and manganese in the well-known way. The gas was received into bags, from which it was pumped by hand into the breather and lamp as required. The men were then sent into a room filled with the fumes of burning brimstone, and were able to judge for themselves how easily the apparatus would enable them to defy a stifling or deadly atmosphere. The shaft, which is 580 yards deep, was free of foul air, so that the explorers had no need to use the apparatus until after quitting the cage, which carried them to the bottom, but each had his knapsack on his back and mask ready for instant use should occasion require. The lamps had been lit before they left the bank. The explorers were three in number, including Mr. Fleuss himself, who, though totally unused to life underground, unhesitatingly led the way in this difficult and dangerous enterprise, and that he was willing to risk his life in the dilapidated working of a mine filled with explosive gas is a valuable testimony to the efficiency of both the breather and the lamp, and that such efficiency is real may be judged from the work accomplished as detailed in Mr. Corbett's letter, and removes these life-saving appliances from the category of ingenious contrivances, and recommends them as efficient and practical appliances of immense importance to the mining interest. There are also other fields where the noxious gas apparatus might be beneficially employed, viz., the salvage corps, it enabling the firemen to traverse the densest smoke and save property and life. On board ship, where fire may have broken out in the hold, and often where a bucket of water would quench the incipient flame, if the smoke would allow its seat to be discovered, the breather would be of immense service; also in saving the life of any unfortunate who may have been overcome by carbon dioxide in sewers, gasometers, ship-holds, tunnels, &c. The apparatus, which can remain charged and ready for instant use, for any period without deterioration, will fulfil all these and many other purposes.

The Melbourne Harbour Trust have also imported one of these diving dresses, and, through the courtesy of the Secretary of the Trust (Mr. Mouritz), I am enabled to give the opinion of the diver (Mr. C. Erickson) who tried the apparatus. It is to the effect that he has been down with the Fleuss apparatus three times, twice in Hobson's Bay, and once in the River Yarra. He considers the apparatus is suitable for exploring purposes for short distances, if no work has to be done; but if the diver gets jammed, or if any heavy obstacle presents itself which he has to remove, the air in the vessel with him is not sufficient for him to rely on, as any extra exertion involves a much larger consumption of air than when merely walking about. Therefore, he (Diver Erickson) has not the same confidence he would have with the pump and pipe of the ordinary diving apparatus, by means of which the supply of air can be regulated by signal. He considers the apparatus is not suitable for Harbour Trust work *where heavy lifts have to be made*, as the same freedom of movement cannot be obtained as with the ordinary dress, the straps binding on the knapsack apparatus confining the muscles of the arms and chest, and preventing their full play.

Recently the Creswick Fire Brigade tested the apparatus supplied to them, with very satisfactory results. The lamp, which is a part of the outfit, was left under water for over half-an-hour, and was found to burn brilliantly all the time.

The following directions for making oxygen gas for the apparatus are supplied by the patentees:—

Unscrew the curved pipe of the retort, and put into it about one pint and a half of chlorate of potash, mixed with about one-tenth its weight of black oxide of manganese, then screw on the curved pipe and connect the retort to the wash tanks by the indiarubber tubes, having previously filled the wash tanks with water to the level of the water-cocks; a piece of caustic soda about the size of a walnut put into each tank will help to purify the gas. The small indiarubber tube is to be slipped over the outlet pipe of the wash tank, and the gas bag placed in readiness to connect up the other end of the small pipe.

The retort should now be put on the fire, and when the gas begins to come over (which will be shown by the bubbling in the wash tanks) the bag should be connected to receive it. A small quantity of gas should always be allowed to pass over before connecting the bag, so as to drive the air out of the apparatus and get the gas as pure as possible. None of the indiarubber tubes should be tied, for, if the fire be too fierce, the gas will come too fast, and the tubes would slip off before anything could burst.

The retort must be taken off the fire, and the tubes disconnected, as soon as all the gas is over; the residue must be washed out of the retort with water, and the retort thoroughly dried on the fire before putting in a fresh charge; the water in the wash tanks should be changed about once a week. The oxygen should not be kept in the bags longer than one week before using.

To fill the knapsack.—Fit the pump up in a convenient place, and connect the pipe and pressure gauge to the outlet valve; the knapsack should be placed so that the pipe can be bent and shaped (which is easily done by the hand) until it can be screwed to the centre pipe of the knapsack. The bag of oxygen must be connected to the inlet valve of the pump, and the pump should be worked a stroke or two to drive out the air before connecting the knapsack. The valve on the end of the knapsack cylinder is to be opened by unscrewing it a couple of turns, and the pump can then be worked until the pressure gauge shows a pressure of 240 lbs. per square inch, when the machine will be fully charged, and the knapsack valve must be screwed up before disconnecting.

The pump must be kept well oiled, and plenty of water allowed to run through the jacket to keep it cool.

Attention should be given to the following:—Before using the apparatus it should be always thoroughly cleaned out and recharged with tow and soda.

Before going under water a diver should accustom himself to the apparatus by breathing through it for some little time. Great care should be taken that the filter is thoroughly clean before repacking. The diver should be most careful not to *waste* his oxygen, at the same time *never* to shut it off entirely. Be careful to screw up the oxygen valve after using.

Baird's Coal-cutting Machine.—On the opposite page is given a sketch of one of these machines—the only one in the colony—which was recently imported by the Western Port Coal Mining Company. It is a machine patented by Messrs. Baird, of Gartsherrie, Scotland, and said to have been used by that firm with every success for a number of years, to work the thin seams of coal in their collieries.

The machine is mounted on a strong cast-iron plate or frame (*A*), 6 feet in length, supported on four plain wheels, running on steel rails (about three feet long), resting on cast steel sleepers and secured thereto by parallel slips as shown. The machine is worked by compressed air, at a pressure of 35 to 40 lbs. per square inch, the cylinder (*B*) being $8\frac{1}{4}$ inches diameter, and 8-inch stroke, running 280 to 300 revolutions per minute, and constructed to run either way. The crank shaft carries a bevel pinion (*C*) gearing with a large wheel (*D*), attached to this wheel is a spur pinion (*E*) gearing into a wheel (*F*); the wheels *D* and *E* are cast together and run on a steel stud fixed to the frame. The spindle on which the wheel *F* is fixed carries on its lower end, under the frame, a gipsey wheel (*G*) having five projections for driving the cast-steel pitch chain (*V*) to which the cutters are attached. The cast-steel jib (*H*) projects from underneath the frame, and at its outer end is a similar gipsy wheel (*I*) for carrying the pitch chain and cutters; the inner end of this jib is bored to fit a projection cast on the under side of the frame, and has a worm wheel (*J*) cast on it, gearing into the worm (*K*) forged on the spindle (*L*) which can be turned round by a ratchet handle at either end of the machine, the object of this arrangement being for the purpose of enabling the machine to cut its own way into the coal, thus obviating the necessity of having a loose end at each end of the stall. Previous to starting the machine, the jib is turned round in line with the machine and parallel with the rails (one of the wheels carrying the frame being taken off for that purpose); the machine is then started, and the jib gradually brought round by the worm until it is square with the machine, and has entered the coal to the full depth of the cut (three feet). A T-headed bolt is then inserted in the slot (*M*), securing the jib to the frame; the traverse motion is then thrown into gear and the machine travels on the rails laid down, being kept on the same by the four guides (*U*) fixed to work inside the rails. The traverse gear is worked by a worm (*N*) (secured on the shaft for driving the pitch chain), gearing with the friction wheel (*O*), the friction being regulated by the hand wheel (*P*); on the same spindle is keyed a pinion (*Q*), gearing with another wheel (*R*), the same spindle carrying the capstan wheel (*S*), round which a chain is put twice, the ends of chain being secured to a prop fixed in the stall each end of the machine. The fly-wheel (*T*) is carried on an extra shaft, running at a greater velocity than the engine, which, being a single cylinder, requires a greater velocity of fly-wheel to carry it over the centre; it also reduces the height of the machine by lowering the centre of the fly-wheel. The whole of the machine, with the exception of the frame and cylinder, is manufactured of steel, being the only metal capable of resisting the strain. The height of the machine, including rails and sleepers, is $22\frac{1}{2}$ inches, and it will cut in a seam of 23 to 24 inches thick.

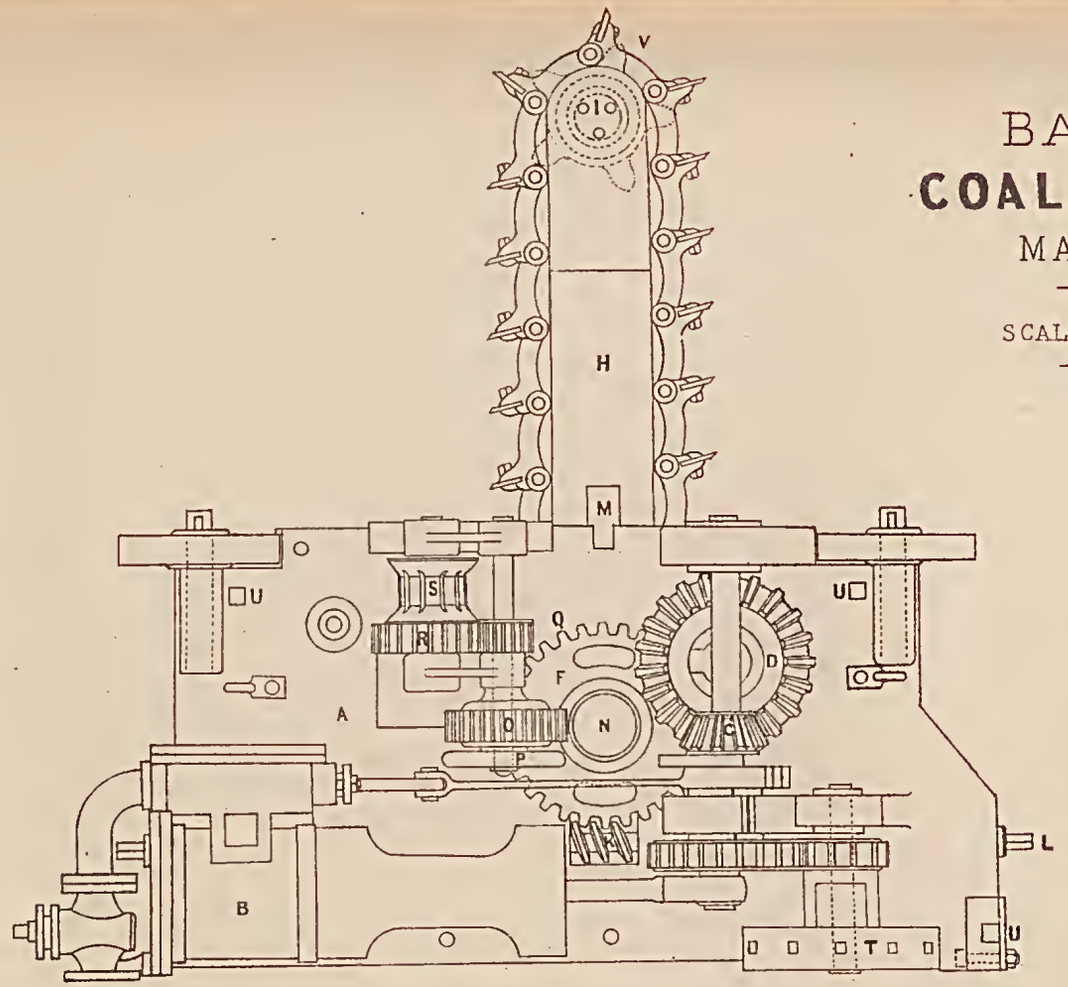
One of these machines has been tried at the Western Port Coal Mining Company's Collieries, at Kilcunda, the result of its working being as follows:—The machine will hole or undercut the coal (in the seam) three feet in from the face equally as well to the rise or dip, at the rate of one foot per minute when constantly working, or allowing for stoppages ordinarily incurred; the machine will cut 3 feet in depth in the coal, and 130 yards in length in eight hours, requiring for its attendance one skilled man and two ordinary labourers. The machine was tried in the fire clay bottom, which it cut very well, nearly equal to the coal, the bottom being however free from grit and not extra hard.

Estimating a fair day's work for a good collier in holing coal, in a 21 to 22 inch seam, at five yards per day of eight hours, it will be seen that the machine will do the work of 25 colliers, requiring the attendance of three men below and an engine-driver on the surface. It is considered that the machine at the above colliery will reduce the price of coal-cutting nearly 3s. per ton.

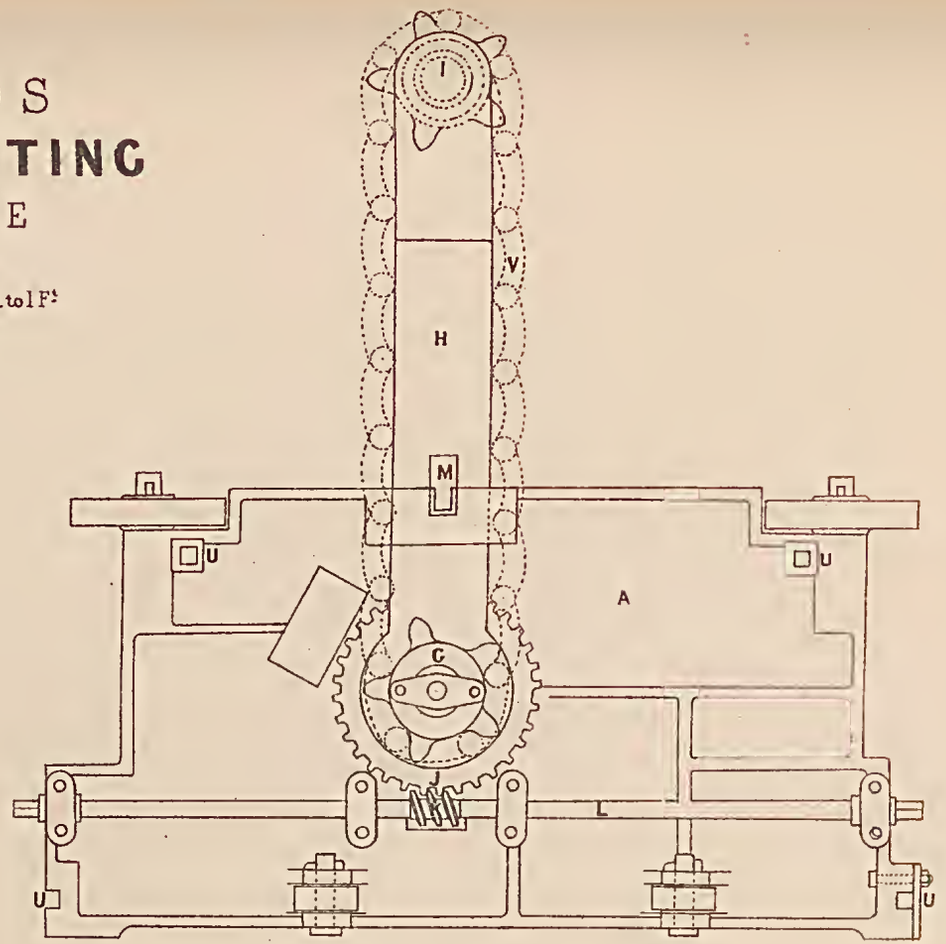
Crushing Plant of St. Mungo Company, Eaglehawk, Sandhurst.—This plant, erected by Messrs. Middleton and Delbridge, engineers, of Sandhurst, consists of a

BAIRDS
COAL CUTTING
MACHINE

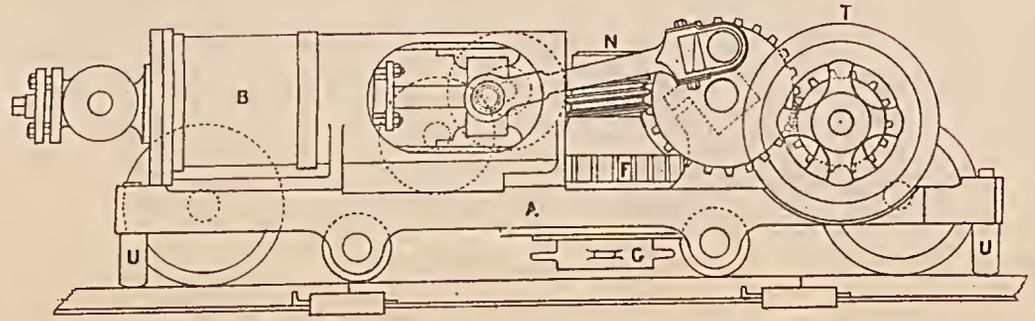
SCALE ¾ of an In. to 1 Ft.



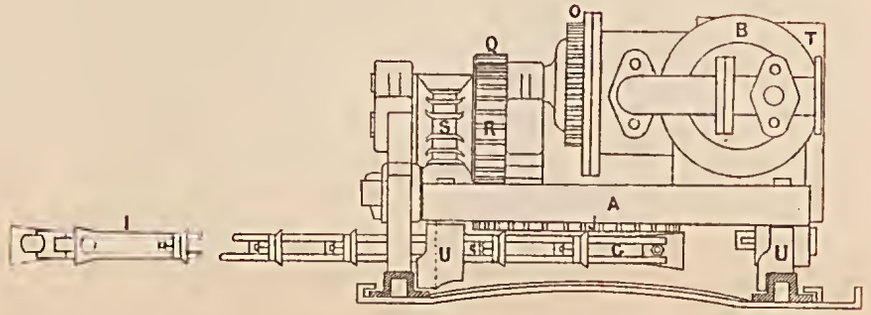
PLAN



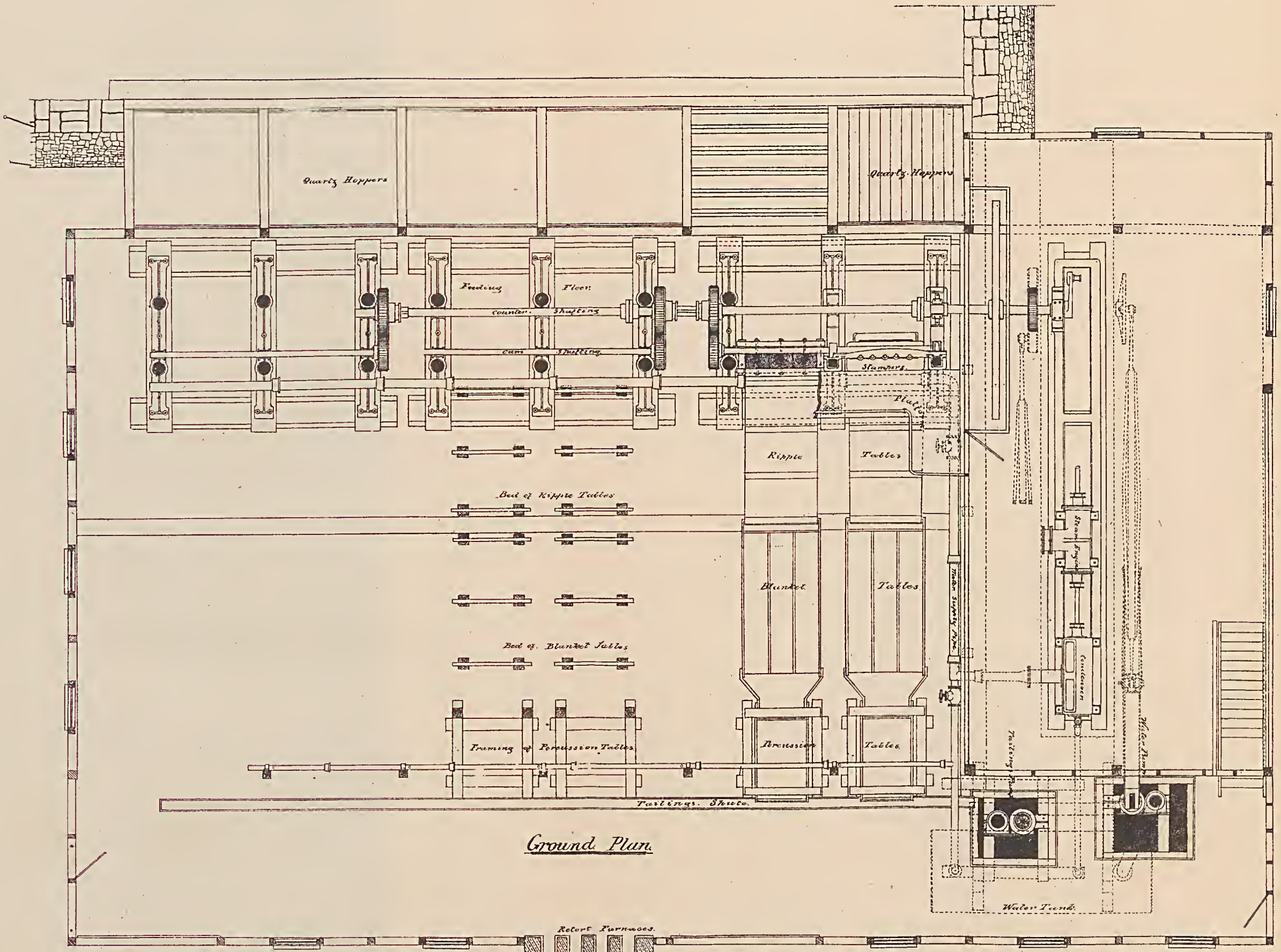
PLAN underneath MACHINE



ELEVATION



END VIEW



Ground Plan.

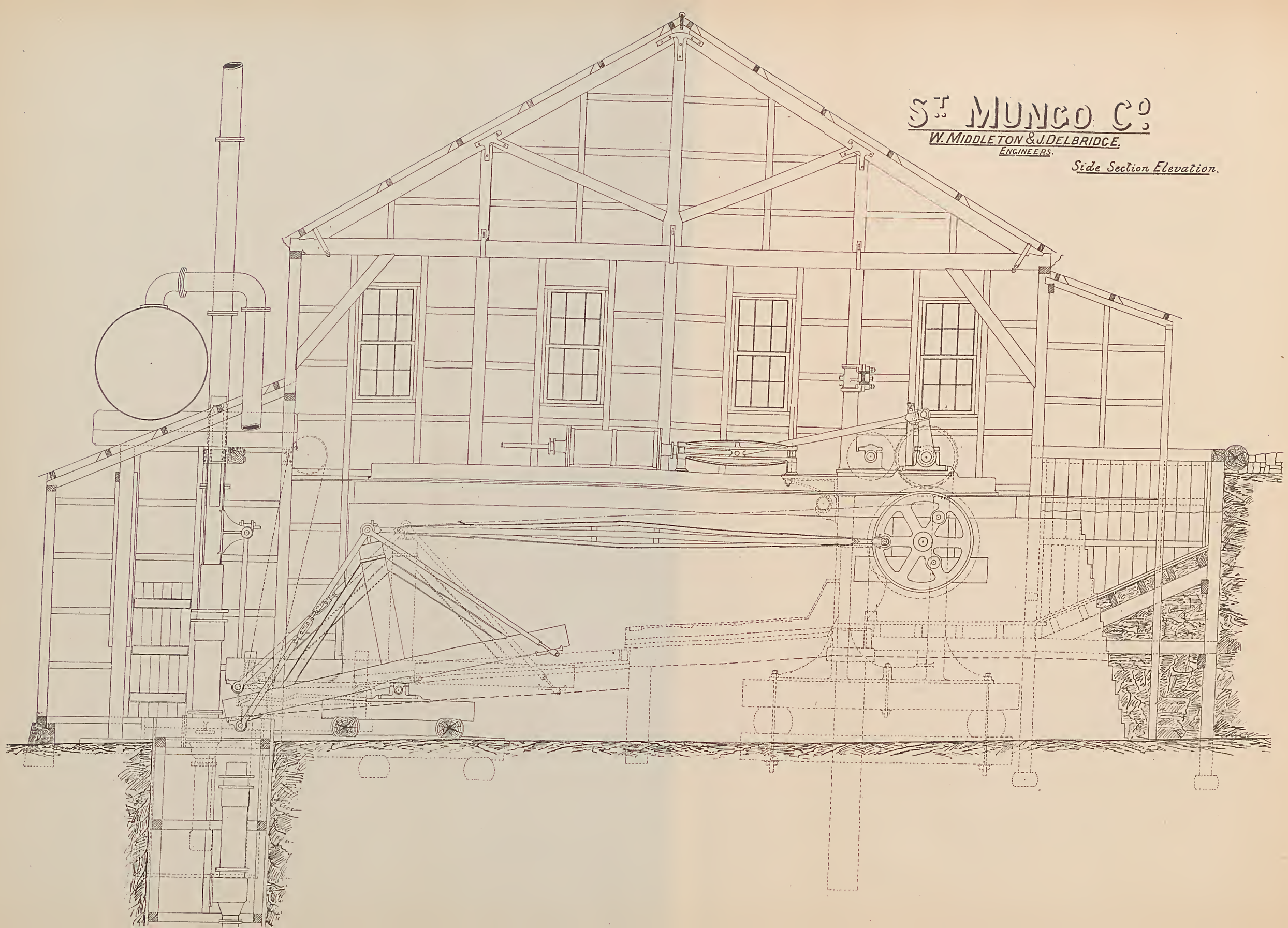
St Mungo Co

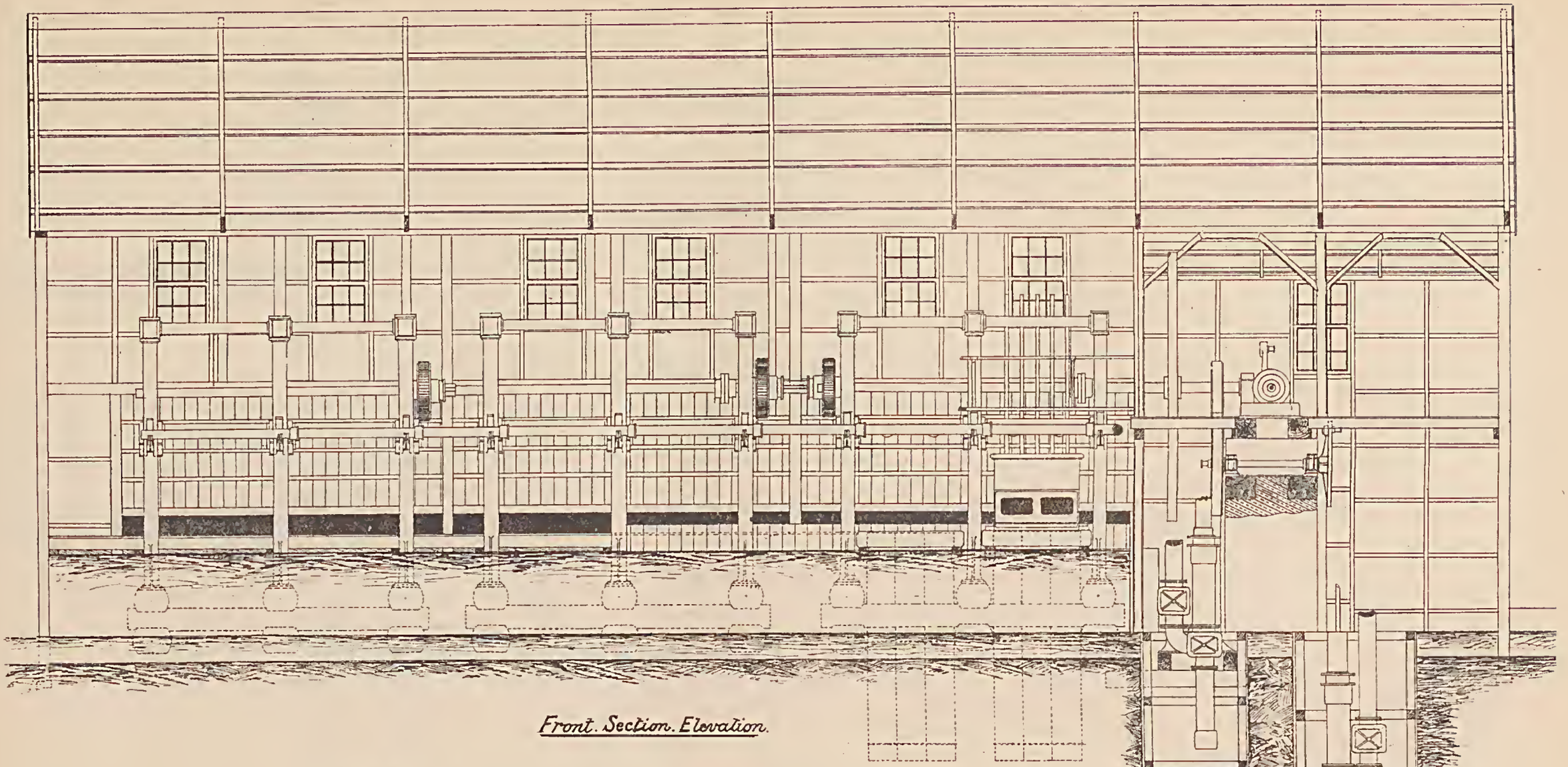
W. MIDDLETON. & J. DELBRIDGE.
ENGINEERS.

St. Mungo Co.

W. Middleton & J. Delbridge.
Engineers.

Side Section Elevation.





Front. Section. Elevation.

St. Mungo Co.

W. Middleton & J. Delbridge.
Engineers.

battery of thirty revolving stampers, five heads in each box. The whole of the machinery, including the water and tailings pumps, is driven by a horizontal steam engine, having a cylinder 22 in. diameter, with a stroke of 4 ft. 6 in. The engine is fitted up with variable expansion gear, and Tangye's patent governor. A double-acting horizontal air-pump is used, the piston rod being coupled direct on to the outer end of piston rod of the steam engine. The engine is calculated for, and erected so, that it is capable of driving, when required, an additional battery of thirty heads. Steam is supplied from two boilers, 28 feet long, having each a diameter of 6 feet, constructed with Gallaway's patent tubes and water bridge in the firing tubes. The boilers are fed with water by one of Tangye's patent steam pumps, which is a very great improvement on the old method of feeding by a pump attached to the steam engine; by using the steam pump, the water in boilers may be maintained at the correct level, no matter whether the engine be working or not.

The cast-iron frames or horses of the battery are of an improved design, and very massive. One great advantage in their construction is that they do not project before the fronts of the stamper boxes, thereby leaving a clear working room at the boxes and the head of ripple tables. The plummer blocks for the cam shafts are cast on the girder portion of the frames, and are fitted with strong brasses, caps, and bolts. On the girders are also fixed the plummer blocks for counter shafting.

The guides of stamper shanks are very strong ones, and well secured to the frames. The cam shafts are arranged to work ten heads each, driven by spur wheels and clutch gearing, so that any ten or the whole thirty (30) heads can be worked as desired. The counter shafting at the driving end next to the engine is $7\frac{1}{4}$ inches diameter, the lengths of shafting being secured together with strong cast-iron turned flange couplings. At front of frames or horses are fixed cast-iron brackets for carrying the water pipes, and a very substantial footboard or platform; a strong hand railing of wrought-iron gas piping is fixed to the outer edge of the footboard. The stamper boxes are of the latest improved design, being fitted with double splash doors of wrought iron, wood covers and inside splash boards. On tops of covers are fixed gun-metal pipes, &c., for conveying feed water into boxes. The stamper boxes are provided with false bottoms of the best scrap hammered iron. The shanks are $3\frac{1}{4}$ in. diameter, screwed to receive discs $9\frac{1}{2}$ in. in diameter. The cams are strong wrought iron, Seymour's patent. The ripple and blanket tables are very substantial ones, fitted with cast-iron wells for mercury, the principal timber used in the tables being Californian red pine. At the lower ends of blanket tables are fixed Halley's patent percussion table; after the tailings have left these tables, they are raised by a tailings pump, and conducted by shutes to be further treated by cradling, &c.

The water for supplying the battery and injection for condenser is raised by a plunger pump; the water is raised into a large wrought-iron tank placed about 3 feet above the centre of the engine.

Both tailings and water pump are worked by separate bell cranks and sweep rod; this allows the pumps to work at any length of stroke found necessary. The steam engine is erected upon a substantial bed of brick and stone work, the engine platform is elevated so high from the flooring of house that it enables the engineer in charge to overlook the whole of the machinery at work.

The buildings over battery engine and boilers are enclosed and covered in with galvanized corrugated iron. The whole of the flooring of main building of battery is laid with asphalte.

PYRITES.—GOLD-SAVING APPLIANCES.

Treatment of Pyrites.—"There is, no doubt," observes Mr. Cosmo Newbery, in his Laboratory Report for 1883, "a great deal of gold remaining in our tailing heaps, but each ounce is divided into very minute grains, and each is locked up in very small grains of quartz, distributed through some four or five tons of tailings. I do not think that more than 4dwt. or 5dwt. of gold will be found in any quartz tailings where modern machinery is in use, and where the quartz has been free from pyritous

minerals; and at the more complete plants the amount is less—probably from 2dwt. to 3dwt. per ton. Still, when an attempt is made to estimate the gold value of the tailings of such a district as Sandhurst, the figures become very large. Since 1860, some five or six millions of tons of quartz have been crushed, and if 4dwt. or 5dwt. per ton have been left in the quartz this would give a value of £5,000,000 worth of gold on or about the surface of Sandhurst, which, with our present appliances, cannot be profitably extracted. Where gold is locked up in mineral matter heavier than quartz there is a good field for those who are introducing scientific ore-dressing machinery, and they will at the same time collect any free gold and the quartz grains which contain sufficient gold to materially affect their weight. It is more than twenty years since my late colleague, Professor Ulrich, now of the University of Otago, tried to introduce into Victoria scientific ore-dressing machinery. Since that time hardly a year has passed without some one following his example. Yet, strange as it may seem, up to the present time a good ore-dressing plant does not exist in Victoria. I do not mean to say that there are not good plants, doing all that is required of them; but where refractory or complex ores occur there is a great waste of very rich material, and plenty of room for the introduction of true ore-dressing machinery, and it should pay handsome profits."

On this subject, the following letter and enclosure have been received by the Department from Mr. R. Murray Smith, the Agent-General for this colony in London, viz.:—

8 Victoria Chambers, Victoria-street, Westminster, S.W., 13th June, 1884.

Sir,

I have the honour to enclose for your information copy of a letter which I have received from Mr. Herbert Robson, B. Sc., on the subject of the extraction of gold from pyrites in the colony of Victoria by the process of levigation.

I have the honour to be, Sir,

Your most obedient servant,

(Signed) ROBT. MURRAY SMITH.

The Honorable the Minister of Mines, Melbourne.

[*Enclosure.*]

312 Rice lane, Walton, Liverpool, 7th June, 1884.

Sir,

I venture to trouble you with a few lines, having seen a statement in the *Times* about the extraction of gold from pyrites in Victoria.

The gold in pyrites being free could, I think, be profitably extracted by levigating the pyrites, previously very finely ground.

There is no reason why pig-iron and sulphuric acid should not be made from the pyrites afterwards.

The grinding and levigating of the pyrites, being purely mechanical processes, requiring neither chemicals nor skilled labour, could, I venture to express a belief, be done very remuneratively.

With many apologies for trespassing on your valuable time,

I beg to remain, &c.,

(Signed) HERBERT ROBSON, B. Sc. Lond. (Honors).

R. Murray Smith, Esq., Agent-General for Victoria.

The letter and enclosure were referred to Mr. Newbery, who reported as follows:—

The gold enclosed in the pyrites is in extremely minute grains. The cost of grinding is great when carried far enough to liberate the gold, and in the operation the gold is flattened and still further divided, so that it is easily carried away with the pyrites slime.

At Walhalla, Mr. Henry Rosales ground the pyrites to an impalpable slime, and it then required treatment in the most perfect amalgamators to extract the gold. The slowness of the process has prevented its adoption.

At the Yarraville pyrites works the ground ore was silk dressed, but the loss, owing to gold "floating," was very great.

Very little of our pyrites is of any value for the manufacture of sulphuric acid, as, for the most part, it is arsenical.

Amongst the many appliances designed to extract gold from its ores, which have from time to time been before the mining public, a recent invention by Mr. Rowland Jordan deserves special mention. Writing of this invention, *Iron* (November 7th) says, "It accomplishes the extraction of the gold from the most refractory mineral combination without the application of fire or water, and it effects its object at a very moderate working expenditure per ton of ore. The ingenious process embodies four novel principles or conditions of treatment. In the first place, the ore is reduced and

the gold amalgamated while in a perfectly dry condition. In the second, the ore is reduced entirely by impact, and not by abrasion, so that the particles are not rubbed or pounded together. Complete separation and individuality of the various constituent particles is thus maintained, the ore being divided into a powder of extreme fineness. In the third place, in this finely-divided, clean, and dry condition the ore is subjected to the action of mercury under considerable pressure, and under the constant action of mechanism, which continually separates the particles. The ore is thus retained under the mercury a sufficiently long time for each particle of the gold-bearing powder to be effectually acted upon by the mercury. Fourthly, the whole process is perfectly automatic from first to last, air currents being employed for the separation, conveyance, and delivery of the ore powder instead of sieves, water, and labour." *Iron* adds, that "the process is an exceedingly simple one, and that the principles embodied in the system of treatment meet the difficulties which have hitherto prevented successful operation on pyritic and arsenical auriferous ores, which form such a large proportion of the gold-bearing minerals."

Otto's Electric Gold-saving Apparatus.—In August last, the Senior Inspector of Mines (Mr. Nicholas) furnished me with the following report respecting this invention:—

In compliance with your instructions, I have inquired into the experimental tests of the merits of Mr. Otto's gold-saving electric apparatus, made at the Welshman's Reef, Sandy Creek, and at Messrs. Rowe Brothers' mine, Fryer's Creek.

The manager of the Welshman's Reef mine (Mr. John Opie) informed me that the particulars of the trials reported in the *Mount Alexander Mail*, of the 30th May last, were perfectly correct. He overlooked the crushing of the ton of refuse left by the last miners who worked the claim, also of a ton of quartz from the Mia Mia, and of half-a-ton of tailings from the old battery. He also attended to the retorting of the quicksilver, and saw a very satisfactory yield of gold as the result of each test. I examined the refuse heap still lying beside the shaft, also the tailings from the old battery, and noted that they were free from pyrites or any other sulphurets.

Mr. E. W. H. Rowe, the senior partner of Messrs. Rowe Bros.' firm, was present at the trials of Otto's gold-saving electric apparatus, at the battery of their Duke of Cornwall mine, Fryer's Creek. He stated that the report which appeared in the *Argus* of the 14th June was furnished by themselves, and was a plain statement of the facts.

The trials at this mine were with the ordinary quartz, with raw and roasted pyrites, and with tailings from the old battery. The experiments on the pyrites, whether raw or roasted, do not appear to have been attended with any markedly favorable results; but those made on the ordinary quartz, after passing through and over the usual gold-saving appliances, and on the tailings from the old battery, must be regarded with interest by all mine-owners. The first indicates an increased yield of gold from ordinary quartz amounting to 20 per cent., and the second that the immense accumulations of quartz tailings on the gold-fields may again be worked over with profit. In concluding my report on this new gold-saving process, I must record a not unimportant point noted by me, viz., that the experiments were made with an electric apparatus of insufficient capacity.

The following are the reports referred to by Mr. Nicholas, which appeared in the *Mount Alexander Mail* and the Melbourne *Argus:—Mount Alexander Mail*, 30th May, 1884.—"Mr. C. M. Otto, a mechanical electrician, employed at the Melbourne Observatory, is the inventor and patentee of this instrument or apparatus. A practical model has been made, about equal in capacity to the crushing-power of three stampers working at half speed, so that an apparatus large enough to pass through the whole of the crushed quartz from a five-head battery would have to be three times as large as the model, which is less than a foot in width and two feet in length. It is made of iron, and is simplicity itself. There is nothing to get out of order or break under all ordinary circumstances, and the whole mystery, if there is any, is the creation and application of the electric current by which all free gold is to be extracted out of quartz tailings and other gold-bearing material. The zinc-connexion from the electric battery is in direct connexion with the mercury, and insulated from the carbon poles, which are fixed opposite each other, right across the mercury, and a little above it. These sheets or slabs of carbon can be adjusted at pleasure to regulate the strength of the electric current, and are connected with the carbon from the electric battery. These carbon poles placed above the mercury produce the following effects:—Water being a good conductor of electricity, as it comes out of the stamp boxes and passes through the instrument and over the mercury, completes the electric circuit, and makes the whole surface and body of the mercury galvanic. As a consequence, the mercury is always bright, and attracts the gold, taking it out of the crushed material, much the same as a magnet would iron-filings, as it passes between the mercury surface and the carbon poles.

"The operations carried on were under the supervision of Mr. Otto, the mining manager of the Welshman's Company, and the chairman of the Board. A number of miners and gentlemen were there to watch the experiment, which was open to anybody in every stage of its progress. The first stuff dealt with was a ton of mullock from which the colour of gold could be obtained by dish washing; the second was quartz and bed-rock from a reef in the neighbourhood, quantity about a ton; and the third, half-a-ton of tailings that have been on the ground for many years. In every respect the experiments were completely successful, saving flour gold, and leaving not a trace of gold or silver in the material passed through.

"Some of the advantages claimed for this machine are that it does away with every necessity or excuse for using mercury in the stamp boxes or in the ripples, and thus causes a saving of mercury. It is affirmed that, without doubt, it takes or captures all the free gold. It is also asserted that the electric current dissolves the gold and that it will act upon auriferous pyrites without sickening the mercury, and take the gold out of that most difficult and costly material to deal with; but of this we at present have no

surety. But if it does we may congratulate the inventor, and assure him of a rapid fortune, and the mine owners of a large addition to their profits; and that by a process so easy and simple that any engineer or mine-manager can master the whole business in a day. The experiments are carried on with an ordinary electric battery of 15 elements, which is said to cost about £1 per week; but when the apparatus is in permanent use, the battery engine can be utilized to drive a dynamo machine to generate electricity for the whole crushing plant, and light up the battery and mine as well. The last, and not the least, advantage, is that there will be a great saving of labour at the battery, as all blanketing may be done away with, should the electric current deal with the pyrites as expected by the inventor. The tray containing the quicksilver can be removed at pleasure, or as soon as it is well charged with gold, and a tray of fresh mercury put in its place with hardly a moment's delay. The silver is then retorted in the usual way. The apparatus can be fixed anywhere, so long as the tailings pass through it, but it is better to remove all quicksilver and copper plates and fix the apparatus at the first delivery from the stamper boxes.

"The first experiment produced 4dwt. of gold; the second, 8dwt. 15gr.; the third, from half-a-ton of old tailings of Welshman's Reef, 4dwt. These experiments were witnessed by the following gentlemen:—C. T. Nicholls, chairman of the Welshman's Company; John Opie, mine-manager; John Watson, of Melbourne; and J. Mackie, J.P., of Newstead, and several others."

Melbourne Argus, 14*th June*, 1884.—"From a statement sent to us on behalf of Messrs. Rowe Bros., of Fryerstown, we give the following particulars of a series of trials at their mine of the above apparatus:—The first trial consisted of one ton of quartz crushed in the usual way, the apparatus being placed below the ripple tables, all the sand having to pass over the ripples and copper plates before coming in contact with the patent apparatus. After retorting the silver, the yield of gold was found to be 15gr., a very good test of the gold-saving capabilities of the patent, as these 15gr. are in excess of the yield by ordinary appliances from very poor quartz. The second trial was on the 5th instant, when a small quantity of raw pyrites was put through. The third trial took place on the 6th instant, when a third of a ton of roasted pyrites was put through before being ground in the Chilian mills. The yield was 1dwt. 6gr. gold. These trials seem to show that the patent apparatus will at least save the cost of roasting or the cost of grinding in Chilian mills, either way a great saving. Future experiments with a full-sized apparatus will set this question at rest. The fourth trial took place on the 9th and 10th instant, when one ton of tailings was put through. These tailings were taken from 20 different places from the large pile at the old machine, the result being a yield of 24gr. of gold. The first trial was considered the best, as the quartz crushed does not give an average yield of more than 3dwt. to the ton. The apparatus is particularly adapted for the treatment of tailings as they leave the stamp boxes, the gold in every instance being of the very finest description, and any quicksilver escaping during the usual process is caught and retained by the patent apparatus. In dealing with tailings this is very apparent, as after retorting more quicksilver was obtained than the quantity put into the tray of the patent apparatus. In the opinion of Messrs. Rowe Brothers, the apparatus will prove to be a great success. The experiments were witnessed by a number of gentlemen from Fryerstown and the surrounding districts."

In the Melbourne *Argus* of the 13th September, 1884, however, the following account of some further experiments of an unsuccessful character is given:—"Several gentlemen connected with the Egerton Quartz Mining Company yesterday visited Mr. A. Parker's metallurgical works at Footscray, to witness the final operations of the testing of 500lb. weight of tailings from the Egerton mine by Mr. Otto's electric gold-saving apparatus system. By that system the tailings, or débris from quartz crushings, are passed over a quicksilver surface, and electricized by a dynamo machine, one point being connected with platina and the other with carbon plates. Mr. Otto claims for his process that no particle of gold can come into contact with the quicksilver without being retained by it, in consequence of the magnetic attraction of the electricity. A number of successful trials of the apparatus had been made previous to yesterday, with tailings from different quartz mines, and the directors of the Egerton Company had sent down their tailings with the view of ascertaining whether an undue quantity of gold had been left in them. The average return of the company's crushings at the mine is about 4¾ dwt. of gold per ton, which is a payable yield, all above 3dwt. per ton being profit, and of course if more gold could be obtained from the tailings the returns would be larger. The result of the trial yesterday was, however, disappointing to the gentlemen present at it, as it was found that only 1·9gr. of gold had been extracted from the 500lbs. weight of tailings, or at the rate of 9gr. per ton."

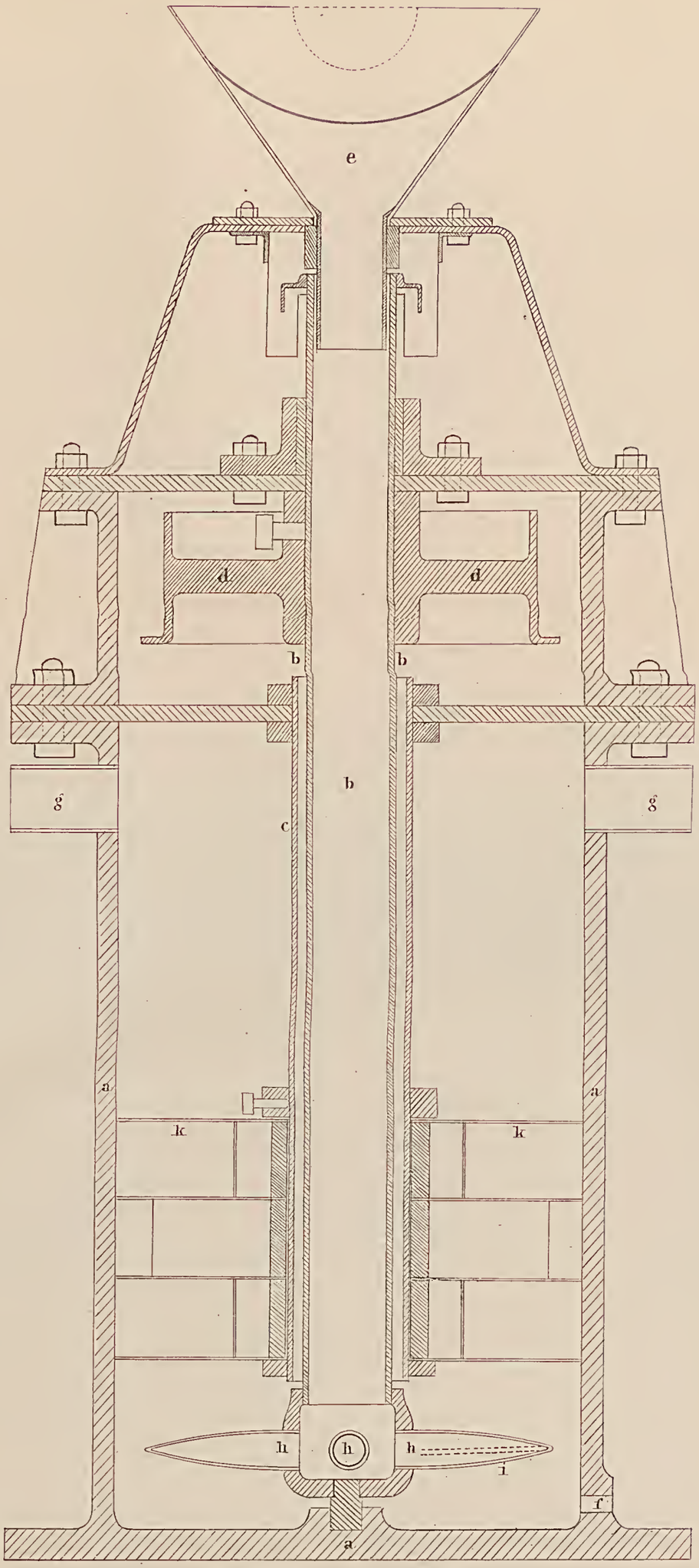
Huntington and Koch's Patent Amalgamator.—This amalgamator has recently attracted a good deal of attention, particularly in the Sandhurst district, where, it is said, the new process, at a competitive trial, gave an increase of 20 per cent. more gold than the usual appliances. The patentees are Mr. A. K. Huntington, professor of metallurgy in King's College, London, and Mr. J. E. O. Koch, who has recently arrived in this colony from England, with the object of disseminating information respecting the contrivance. The following description has been supplied by the latter gentleman:—

The Huntington and Koch amalgamator (see sketch) consists of a cast-iron vessel or pan (*a*), which has an outlet (*f*) at the bottom for running off the amalgam or emptying the amalgamating metal from the pan; also several outlets (*g*) at the top, through which the tailings are discharged. Passing down the centre of the pan is a vertical pipe (*b*), into which the ore or tailings are fed through the fixed hopper (*e*). They are then discharged, or sucked, into the amalgamating metal from the pipe (*b*) by means of the tubular arms or nozzle (*h*), made of a tapering ovate form, with an elongated slit (*i*) on the hinder side relatively to the direction of rotation. These arms create a vacuum in passing through the amalgamating metal. *C* represents a stationary pipe or sleeve, which prevents the contact of the revolving pipe (*b*) and the amalgamating metal. Attached to the sleeve are vertical and horizontal screens (*k*), to prevent the rotation of the amalgamating metal, and to ensure the mingling of ore or tailings with same. *D* is a pulley by which the pipe (*b*) is driven.

In operating with this apparatus, the ore or tailings, after being crushed in a battery or other suitable appliances, are delivered continuously into the hopper (*e*); they then descend the revolving pipe (*b*), and are ejected from the slits (*i*) of the arms (*h*), so that they are mingled with, and rise through, the

HUNTINGTON AND KOCH'S

AMALGAMATOR



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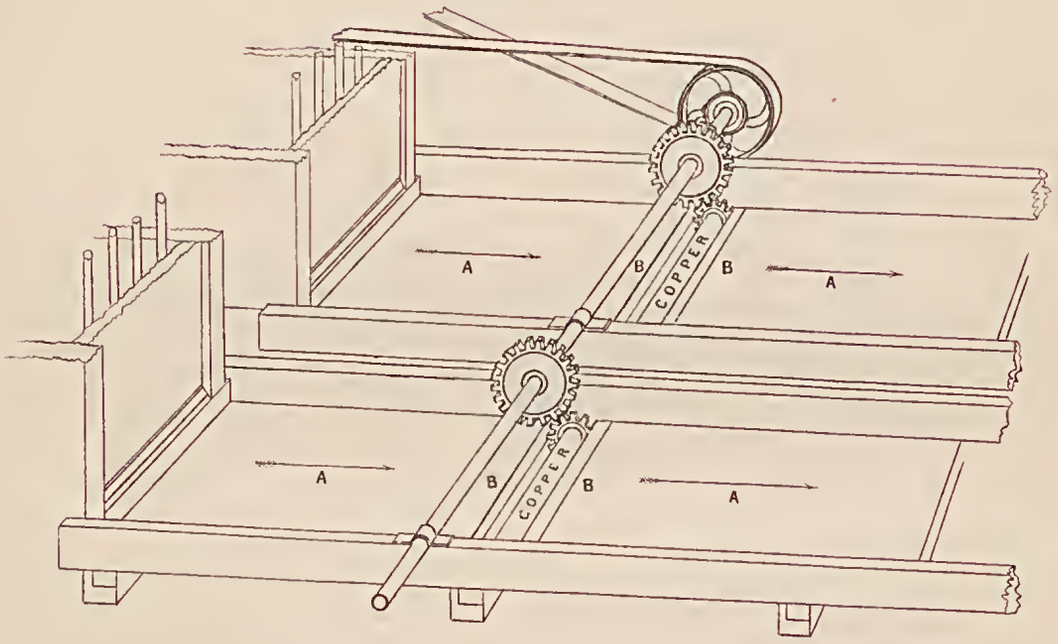
BARRY'S

PATENT GOLD SAVING AMALGAMATOR



amalgamating metal. The worked material, being discharged through the outlets (*g*), flows thence to a pan containing rakes revolving at a slow speed; from this they are discharged to the tailing heaps. Either mercury "when ore is crushed wet," or molten lead with dry pyrites, can be used as the amalgamating metal in this apparatus.

On upwards of 100 tons of ore put through, in competition with ordinary appliances at Sandhurst, the results were, according to the nature of the ores, from 11·33 to 18·2 per cent. more gold than from batteries with tables, ripples, blankets, &c. All the workings were publicly conducted, and the machine has been unanimously pronounced the best amalgamator ever seen in the colonies, and the only amalgamator capable of treating tailings efficiently and economically. The cost of working does not exceed that of present appliances, and with a plant specially erected for its use the cost will be materially lessened. The machine can be connected with batteries, doing away with all tables, ripples, blankets, &c. With ores containing pyrites, a very large percentage of the gold therein is saved. In late workings, the pyrites in tailings showed there was not sufficient gold left to pay for treatment.

Barry's Patent Gold-saving Amalgamator.—The advantages claimed for this apparatus, a sketch of which is here given, are that it will save 5 dwt. more gold than the ordinary tables, that "sickening" is entirely avoided, and that the loss of mercury is smaller than with any other process. The following is a reference to the sketch:—

A is an ordinary copper table; *B* the quicksilver trough or well; *C* a tube or bar with an amalgamable surface set with a small portion of its surface above the quicksilver, and revolving slowly against the flow of the auriferous pulp. The quicksilver surface of the roller attracts the fine gold, and carries it back into the well, where it will deposit itself at once, or so soon as the accumulation has become sufficiently heavy. By this process a fresh surface of mercury is constantly presented to the flowing gold, and thus "sickening" is avoided.

Manes' Electric Pulverizer and Amalgamator.—"Mr. James Manes, of Colorado, U.S.," says the *Mining Journal*, "has designed an electric pulverizer and amalgamating machine for saving the rusty and fine gold, and also quicksilver, hitherto lost in hydraulic washing for gold. The electric-amalgamator, it is claimed, will save from 50 to 75 per cent. of all the gold and quicksilver that passes through the machine, as the rusty gold will be perfectly scoured and electro-plated with quicksilver, and thoroughly amalgamated by the rapid action of the electrical steel brushes and steel mullers that revolve inside of the series of steel cylinders in the machine, placed one above the other, and made cone shape, and connected with spouts; the large end of one cylinder is placed under the bottom of the small end of the next one, and so on, forming inclined planes for the sand or crushed ore to run down by its own gravity, which is assisted by streams of water and quicksilver, constantly fed into the machine from a hopper on the upper part of the machine; and the powerful current of electricity is constantly passing through the sands or ore as it passes from one cylinder to another; and, as it is thoroughly mixed at the same time with the quicksilver by the steel brushes, no gold escapes without having been thoroughly amalgamated. The material passes through a moveable iron spout into settling tanks, where the cleaning-up is done. The machine only stops when repairs are needed, tail-water is used for driving, and only one man is required for each machine. This apparatus can be used in stamp mills for amalgamating purposes, and will surpass the old process of treating gold and silver ores."

MISCELLANEOUS.

Skids or Guides.—Some mining managers appear to consider it unnecessary to carry the skids or guides of mining shafts all the way up to the poppet-heads. I referred the matter for the opinion of the Travelling Inspector of Machinery (Mr. Meekison), who reports as follows:—

I am of opinion that it is necessary to carry the skids to the top of the poppet-heads, as safety cages are provided with grippers which are made to catch on the skids. In the event of the cage being overwound to the top of the poppet-heads, should no skids be there to catch it or guide it on to the safety doors below, the cage, as soon as it left the skids, would be liable to swing clear of the safety doors, and fall either to the lower brace or the ground, and the men or trucks be thrown out.

In the Ballarat division there was only one mine (the Victoria Co., Ballarat East) in which the skids did not go to the top of the poppet-heads. Both Mr. Inspector Stewart and myself reported on the necessity of this being done; and the company stopped work below until it was done. In the Sandhurst division I know of no mine where the skids are not carried to the top; and the fact of the practice being so general, proves, I think, its necessity. Unless the skids are carried to the top, I consider the safety hook and disengaging gear direct sources of danger.

Where general rule 25 is complied with by affixing spring catches or automatic tumblers to the guides to prevent the fall of cages down the shaft, there the guides should be connected with the cap of the poppet-heads. But at mines like to the Aroona, where self-acting doors and a fenced overwinding brace are constructed at just the proper distance below the cap of the poppet-heads, it is not a matter of importance that the guides should be connected with the cap.

Mr. Inspector Grainger writes:—

In reference to the question as to whether it is a necessity that the skids or guides should be carried to the poppet-heads or not, I beg to report as follows. If the skids are carried high enough, so that when the safety hook disengages the cage will still be in them, there is really no absolute necessity for them to be carried all the way to the poppet-heads. This depends on the length of the connecting chains between the safety hook and the cage. In a case of overwinding, it will be seen that the cage cannot go above a certain point in the skids (which point is determined by the length of the connecting chains), as, the hook coming in contact with the thimble, the rope is detached, and the cage, as a consequence, cannot be raised higher after the detachment takes place.

I may add, however, that I much prefer having the skids all the way up, as I consider they would be stronger and better stayed, and, of the two, would be the safer.

Mr. Stewart (Ballarat) on the same subject writes:—

I agree with Mr. Meekison as to the absolute necessity for all skids or guides being taken to the poppet-heads, for the following reasons, viz.:—All safety cages have grippers for acting on the skids, and although these grippers are of different construction, nearly all of them are fixed near the top of the cage; hence, unless the skids are up close, the grippers cannot act. It is not enough to have a second brace, or automatic or self-acting catches, for the reason that, in a case of overwinding, if the skids are not close up when the safety hook strikes the disconnecting ring and before the cage can settle on the catches, the concussion twists the cage, and it is likely to fall either on the brace or the surface, and thus either kill men, or destroy property, or perhaps both.

In the mine of the Countess Company, Ballarat East, in a case of overwinding, the catches were of no use whatever, for the skids, not being to the top, the cage, when it struck the poppet-head, fell over on to the housing, and had not a rafter of the roof gone through the cage, it and the truck of quartz would have fallen on to the brace. The chains referred to by Mr. Inspector Grainger would not alter things in this district, as all hooks are on the cages. The skids or guides fixed right up to the poppet-heads must be much safer than those not so fixed; hence they should, in my opinion, be enforced. I shall always suggest them in my district, and I am sure no manager will ever think of objecting. They are very little extra expense, and they are most certainly an extra precaution.

This Department quite approves of the recommendation that all skids of mining shafts be carried up to the poppet-heads. No doubt it is true that the arrangements and precautions about some mines are such that it might be unnecessary to do this. But the cost is very inconsiderable. And, moreover, it is the conduct of the careless, not the careful, engine-driver that has to be considered. If an exhibition of want of precaution be conceived possible in the case of careful men, what can be looked for from the careless? There is much force in the above remarks of Mr. Inspector Stewart, and there can be no doubt that, in view of the careless habits engendered by constant contact with a certain degree of danger, no reasonable safeguard, and especially one so inexpensive as this, should be omitted.

Lowering or Raising Men.—It has been pointed out to this Department that, in a great many instances, the engine-driver, in lowering or raising men, merely gives the engine a stroke by hand, and then throws it into gear. The Travelling Inspector of Machinery (Mr. Meekison) has suggested that mining companies be requested to make it a rule of their mines that engine-drivers, when men are on, must hand-work the engine till the ropes in the shaft have travelled a greater distance than between the surface and poppet-heads. If this rule were adopted, Mr. Meekison points out that, in the event of the engine having been wrongly started, it would not have the same *way* on, and could be more readily stopped, thus affording considerable protection against accidents from overwinding.

Mr. Inspector Stewart concurs in this suggestion, and adds—

In giving my evidence before the coroner's inquest at Gordon, on the death of Charles Neal, who was killed at the Parker's United Mine, on September the 4th, 1882, in consequence of the engine having been started the wrong way, and having taken the cage to the poppet-heads, I made the same suggestion, and have on many occasions, when in mining engine-houses, advise the drivers to adopt the practice; but they seldom do so. If mining managers made it rule of the mine, and informed the engine-drivers that for any violation of it they would be discharged, it would, I believe, have a salutary effect.

Acting on Mr. Inspector Meekison's suggestion, this Department issued, early last year, circulars to all mining managers requesting them to be so good as to adopt

the rule recommended, and I am pleased to be able to report that this has been done at a great majority of the mines.

A most melancholy accident which marred the close of the year 1883, and by which four men were instantly killed, had its origin in the neglect of the precaution here recommended. In that case the engine-driver (John Jones) at the Duke Company's Mine, Maryborough, instead of lowering the men down the shaft, wound them to the poppet-heads. Jones was tried for manslaughter, on the 15th February, 1884, and sentenced to six months' imprisonment. A petition in favour of a mitigation of the sentence was presented to the Government, and in supporting it the local press made the following remarks:—

From the evidence adduced at the trial, no jury could have conscientiously varied the verdict recorded, since it was clearly proved that the momentary negligence of the accused hurried four men into eternity. The sentence passed was an extraordinarily light one for the offence of manslaughter, but in recording it the judge tempered justice with mercy, which will, we think, be generally approved of by all who consider the awful position in which the prisoner stood. A man of unblemished reputation, one who for many years had performed his duties with the utmost care, and was regarded as a trusted person for the position he occupied, has his reputation, position, and means of livelihood shattered by a momentary forgetfulness of his responsibility. The result was terrible, and must have been so felt by the most callous; but to a man of Jones' temperament the effect of his own negligence must have been, and will probably continue to be, well nigh agonizing. It is easy to believe that the remorse felt by the unfortunate man, the awful recollection that he had, although unintentionally, been the cause of terminating the lives of four of his fellow creatures, would be a punishment heavier than could be ordained by man, and probably, whilst awaiting trial, his sufferings were as keen as those now experienced whilst expiating his negligence. It is sad to know that any expiation, however severe, cannot undo the result of such a calamity; it cannot restore to life and prime manhood those who were the victims, or fill the void which their awful deaths made in the hearts of their friends and relatives. But the punishment justice demands for such offences as a deterrent to others, has, in the sad case under notice, been meted out, and where those who have known the unfortunate cause of the catastrophe the best—those who, as it were, held every circumstance in their mind—petition for his release, we trust that an extension of the mercy which tempered the sentence inflicted will not be withheld by the Executive.

The petition was duly considered, with the result that His Excellency the Governor, acting on the advice of the Executive Council, refused to remit any portion of the sentence.

In connexion with this accident, a suggestion was made by the Maryborough Mining Board to the effect that it should be made compulsory that two engine-drivers should be present in the engine-house while men were being raised and lowered in any shaft. I referred the suggestion for the opinion of Inspector Stewart, who replied as follows:—

In my opinion, the adoption of the suggestion would be of little value. At first the engine-drivers would be dissatisfied, and would not be likely to give any extra attention if compelled to remain an hour later. They would, after a time, become reconciled, and during the process of changing men would most likely be talking together, and thus increase the liability to accident rather than decrease it. It appears to me, also, that the adoption of the suggestion would be a violation of section 6 of the Act. I may observe that during my long experience I have known many accidents to occur through people talking to the engine-drivers, and, as a rule, the driver prefers to be alone.

In connexion with engine-drivers at mines, I have for years suggested that they should not change shifts or relieve each other at the same hour as the miners, but should do so either one hour before or after, for the reason that, as any practical engine-driver knows, there are many things that can be done about an engine during his absence which will make it at first a little different in handling. Even the process of packing a gland or stuffing-box will make a very material difference in the handling. The height of steam or water and other things also make a difference; but if a man had been at the engine for (say) an hour or more, he would have the handling perfect, and would not, in my opinion, be so liable to start the wrong way. It often happens that just when an engine-driver relieves his mate the cage is at the surface and miners ready to get into it, and it is then that accidents such as that under notice frequently occur.

Even in case of sudden illness or death, I question whether, if this suggestion were acted upon, the second man would be near enough to prevent accidents; for the drivers, although compelled to be there, would have such confidence in each other that they would not stand close by, but would likely be doing something about the place away from the engine. On the whole, I do not believe it would be of any practical use or value.

The Senior Inspector considers that the suggestion would have been a valuable one prior to the passing of Act No. 783, but that it is now unnecessary, because the provisions contained in general rule 25 of section 8 of that Act, which are designed to prevent overwinding, are generally adopted. Cases of overwinding by engine-drivers will still occur, but the Senior Inspector believes they will not be attended by loss of life.

Mr. Inspector Grainger (Sandhurst) writes:—

I do not consider the suggestion a practical one, as many of the mines work only one shift, and, therefore, only one driver is employed. Even in mines where two or three drivers are employed, that is where two or three shifts are worked, the drivers would be obliged to work more than eight hours, which is not allowed by the Act. The suggestion, in my opinion, is not a reasonable one, and would be harassing alike to the mine owners and to the engine-drivers. If the special appliances provided for by the Act are in use, the accidents caused by the drivers will be reduced to a minimum.

STATEMENT No. 1.

SHOWING THE PARTICULARS OF EACH MINING ACCIDENT WHICH HAPPENED IN VICTORIA DURING THE YEAR 1884.

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
1	2nd Jan.	Maryborough	Amherst ...	Union G. M. Tribute Co.	Fall of cage ...	...	4	Four men were descending in a cage to their work underground, when the spider became loosened and began to revolve on the iron winding shaft. The cage was uncontrollable by the engine-driver, and its speed becoming rapidly increased, it fell a distance of about 60 feet down the mining shaft to the main level, where it smashed through the well boards into the well, and became stationary through the lower parts of the skids slanting inwards. The rope was jerked out of the shoe in which the end was fixed on to the drum, and its whole weight fell upon the cover of the cage. Fortunately the cover was sufficiently strong to sustain the great weight of the rope, or the four men would have been instantly killed. When the rope was removed, it was found that the cage was—with the exception of two feet—submerged by the water in the well; and the space of 24 inches bounded by the iron cover above and the water beneath was the whole area in which the sufferers could breathe. It was with the greatest difficulty that the men were ultimately rescued. Two men had each a leg broken, and one of these had his elbow dislocated also; of the remaining two, one had his ankle dislocated and the other was injured internally. They all received severe shocks to the system, in addition to their other injuries. The local Inspector was of opinion that the accident was caused by the negligence of the engineers, in not securely keeping the spider or drum to the winding shaft; but sufficient evidence was not obtainable to warrant proceedings being taken against them.
2	2nd Jan.	Sandhurst ..	Sandhurst ...	Hustler's Reef Co....	Splintering of quartz	...	1	The man was engaged in breaking up a piece of loose quartz at the 434-foot level when a very small piece flew out and struck him in the eye, considerably injuring it.
3	8th Jan.	Maryborough	Inglewood ...	Odin Q. M. Co. ...	Fall of earth in a drive	...	1	The accident occurred in an old drive, 170 feet from the surface and 30 feet south from the main shaft. By some means the leg of a set of timber was displaced, and the men were about to put it back in its place when the ground suddenly fell from the roof and side of the drive and struck one of the men on the leg and severely bruised it.
4	8th Jan.	Sandhurst ...	Sandhurst ...	Princess Dagmar Co.	Explosion of lithofracteur or nitro-glycerine	...	1	The sufferer was just commencing to bore a hole with a rock-borer in a cross-cut at the 680-foot level when an explosion suddenly occurred, inflicting cuts to the man's finger and leg. The Inspector stated that the only way in which he could account for the accident was that some nitro-glycerine had exuded from a hole previously charged with lithofracteur higher up the face, which exploded upon contact with the rock-borer.
5	9th Jan.	Ballarat ...	Smythesdale	Trunk Lead G. M. Co.	Fall of earth & timber in a drive	1	...	Verdict at magisterial inquiry:—"Accidentally killed." The deceased and his mate, who were both Chinamen, were at work in a blocking drive. One of the men left the drive with a truck-load of dirt, and on his return found that his mate, whom he left apparently quite safe, had been smothered by a fall of earth. The body could not be extricated until about four hours had elapsed. The ground was quite dry and safe to work with ordinary care, but the deceased drove the laths too far without putting in a false set, and also neglected to use dogs, of which plenty were provided by the management. The Inspector reported that the deceased was alone to blame for the accident.
6	9th Jan.	Maryborough	Maryborough	New Kong Meng G. M. Co.	Fall of earth in a blocking strip	1	...	Verdict at inquest:—"Accidental death." The deceased and his mate were engaged in a blocking strip off the No. 5 drive, distant about 1,800 feet from the shaft. The strip was 13 feet 6 inches in length from the blocking drive, and three sets of timber had been placed in position, and while putting up a fourth set the whole fell in towards the face, completely covering both men, and instantly killed one of them. The laths when falling, however, caught on one side of the drive, and by this means prevented the weight of the fallen earth and timber from crushing the mate of the deceased, who miraculously escaped without injury. It is supposed that, while driving a tight lath, the deceased struck one of the cap-pieces with his hammer, and so caused the whole set to fall. The Inspector reported that no breach of the Regulations occurred in connexion with this accident.

7	11th Jan.	Sandhurst ...	Sandhurst ...	Phœnix Co. ...	Cage accident ...	...	1	The sufferer was being lowered with three other miners in the cage to the 640-foot level, and as he was about to step off the cage on to the plat, the cage moved down a short distance, and the man became jammed between it and the shaft, sustaining painful injuries. The engine-driver was to blame for allowing the cage to move after stopping without receiving a signal to do so, and proceedings were taken against him under the *Regulation of Mines Statute*, and a penalty of £5 and £2 17s. costs was imposed.
8	15th Jan.	Ballarat ...	Buninyong ...	Imperial Co.'s Tributers (Messrs. Meade and Overhall)	Falling down a shaft...	...	1	The injured man was being lowered by the aid of a windlass down a shaft about 70 feet deep, and when down 30 feet the rope broke, and he fell the remaining distance, but beyond some bruises and a severe shaking he was not hurt. The Inspector reported that the rope, which had been in use a considerable time, was perfectly rotten, and he was surprised that the men did not notice it some time previously.
9	15th Jan.	Sandhurst ...	Sandhurst ...	Victoria Gold Mines Co.	Fall of a piece of stone from a shoot	...	1	The man was engaged at the 430-foot level in filling a truck from a shoot, when another barrowful of quartz was sent down the shoot, which was nearly empty, and a piece of stone instead of going into the truck glanced off and struck him on the arm and side, inflicting painful but not serious injuries. The Inspector reported that the sufferer was himself to blame for standing so near to the truck while it was under the shoot.
10	18th Jan.	Ballarat ...	Creswick ...	Dowling Forest Estate Co.	Fall of a column of pipes down a shaft	...	1	A draw-lift column of 12-inch pumps was being connected with the plunger workings, and to do this it was necessary to lift about 210 feet of the pumps, equal to about 8 tons in weight. Good blocks and ropes attached to a capstan and crab-winch were being used for the purpose, and the pumps were raised as high as was needed. The injured man was below with one of his mates, and while they were attempting to bear the column of pumps over to the plunger workings, in order to form a connexion, the top pump suddenly snapped short off, about 2 feet 7 inches from the top, and the whole column went down the shaft by the run, and carried the sufferer with it, crushing him so severely as to cause fractures of the dorsal vertebræ and ribs, punctured lungs, and lacerated head and body. The local Inspector was of opinion that the accident was mainly due to the manner in which the chains were attached to the column of pumps, and that a great want of knowledge was shown in the way they were put on, as instead of having one chain on each side, so as to lift the column and allow it to hang perpendicularly in the shaft, both chains were attached to one side, so that the column hung at as great an angle as the shaft would admit, thus throwing a great strain upon the topmost pump, and this strain was materially increased when the two men below added their strength to bear the bottom pump over to the plunger.
11	24th Jan.	Sandhurst ...	Eaglehawk ...	United Devonshire Co.	Explosion of a charge (gunpowder)	...	1	Four miners were working together at the 500-foot level, and after they had charged some holes with blasting powder and ignited the fuses, they retired to a safe distance to await the result of the blasts: but they very reprehensibly omitted to give the customary warning to those miners working within danger. Immediately after the fuses were lit, the injured man left his work to obtain some drills which were stored near to where the holes were charged, and the explosion occurred simultaneously with his arrival there, and he was severely cut about the arms and face by some fragments of quartz. Proceedings were instituted against the four men under the 19th section of Act 783, and a fine of 40s., with 27s. costs, was imposed in each case.
12	25th Jan.	Sandhurst ...	Sandhurst ...	Acott's Co. ...	Fall of timber ...	...	1	Four men were engaged in putting in a set of timber at the 220-foot level, and as a leg of the set was not in a perpendicular position, one of the men began to strike it, in order to make it stand upright, when the whole set fell down upon another man, and inflicted a scalp wound and a slight injury to his spine. The sufferer was alone to blame, as he was warned by his mate that he was standing in a dangerous place, but he did not move.
13	28th Jan.	Ballarat ...	Creswick ...	Madame Berry G. M. Co.	Fall from an elevated tramway to surface (truck accident)	1	...	Verdict at inquest:—"Died from injuries received from an accidental fall from a high tramway." The deceased, who was a young man, was employed as assistant braceman, and as he was returning along the tramroad from the mullock tip, where he had been to deposit a truck-load of reef, he jumped upon the empty truck, in order to ride; but his doing so caused the fore-wheels to tip up, and the truck ran across the road and struck the fence on the opposite side. The concussion threw the unfortunate young man over the topmost rail of the fence, and he fell to the surface, a distance of 50 feet, and received such injuries that death resulted about two hours afterwards. The tramway was in excellent order and condition, the accident being solely the result of the deceased's own recklessness.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons Injured.	Particulars.
14	30th Jan.	Ballarat ...	Creswick ...	Ristori G. M. Co. ...	Breaking of a rope ...	1	...	Verdict at inquest:—"Accidentally killed." The deceased was surface manager and pitman, and had occasion to go down the shaft to take measurements for a new pump-rod, which was required to replace one that had been recently broken. A windlass was kept at the mine, with a rope always upon it, for the sole use of the deceased; and it was his duty, as surface manager, to examine and keep in order this as well as all the other ropes in use at the mine. He descended the shaft once, returned safely, and went down a second time to complete his measurements, and having done this, he was again raised to the surface; but just as he arrived at the mouth of the shaft, and placed his hand upon the surface-frame, the rope broke, and he was precipitated down the shaft, a distance of 200 feet, being literally smashed to pieces. The man who was standing over the shaft, steadying the rope and attending to deceased's orders, felt a defect in the rope as it passed through his hands, and when it parted, he clutched it tightly and attempted to jam it against the plank; but the weight upon it proved too much for his strength, and the rope slipped through his hands, taking the skin off as it went. On examination, the rope appeared to have been cut by some unknown means, both in the place where it broke and at about two feet above; and if the deceased had examined it, as he should have done, before trusting himself to it, he could not have failed to notice its defective condition.
15	31st Jan.	Ballarat ...	Creswick ...	Australasian Consols	Fall of stone in a drive	...	1	This accident was a trifling one. Two contractors, while engaged in working down some ground that had been loosened by a shot, came upon a large piece of hard reef in the face of the drive, which when sounded appeared to be quite solid, but upon cutting the ground away from the side of it the stone suddenly slipped out and struck one of the men, inflicting slight injuries to his scalp and legs.
16	31st Jan.	Sandhurst ...	Sandhurst ...	New Chum Railway Co	Explosion of a charge (gunpowder)	1	...	Verdict at inquest:—"Accidentally killed," and the jury condemned the practice of firing one charge and then returning to fire other holes previously charged. The deceased and his mate were engaged in the stopes above the 1,026-foot level, and had bored three holes in the face, which they charged with ordinary blasting powder, with the intention of firing them all before knocking off work. They ignited the fuse of one of the charges, and then retired to a place of safety. In due course the charge exploded, and the deceased returned to fire another charge. When he arrived within a few feet of the face, a second explosion took place, and the unfortunate man received the full force of the stones dislodged by it. He was terribly mutilated, and expired shortly after the accident. There can be no reasonable doubt but that the second explosion was caused by a spark from the first, which was only about two and a half feet away. The practice of boring a number of holes within short distances of each other, charging them with explosives, and then firing them singly, unfortunately carried out in many mines, is an extremely dangerous one, and a circular letter, counselling the discontinuance of the practice, was forwarded from this department to all mining managers throughout the colony immediately after the occurrence of the accident.
17	8th Feb.	Ballarat ...	Creswick ...	Lone Hand G. M. Co.	Fall of a drill down a shaft	...	1	It appears that several drills were sent up from below to be sharpened, and the braceman, instead of sending them at once to the blacksmith's shop, as was the recognised rule, kept them on the brace about half-an-hour, until the men were changing shifts at midnight. One load of men had been landed, and eight other men were standing in the cage at the bottom of the shaft, a distance of 630 feet, waiting to be hauled up. At this time the braceman took the drills off the brace, which was about 70 feet high, in order to place them on the other cage, intending to ride down to the surface with them, when, by some unexplained means, one of the drills fell down the shaft, and going through the cover of the cage, struck the sufferer on the face, just below the eye, and penetrated through the chin. The men in the cage heard the drill falling down the shaft, and seven of them jumped out on to the plat, but the eighth man had not time to escape. A prosecution under section 19 of Act 783 was instituted against the braceman, but the magistrates before whom the case was heard did not think the evidence adduced sufficient for a conviction, and dismissed the case without costs.
18	8th Feb.	Sandhurst ...	Sandhurst ...	United Hustler's and Redan Q. M. Co.	Explosion of a charge (lithofracteur)	1	1	Verdict at inquest:—"Accidentally killed." Two miners, named George Crossman and Richard Cornish, were engaged with a rock-borer at the face of a cross-cut, west of the 420-foot level. The drill had been worked to form lift-holes, as they are called; and when inserted beneath a slab to the depth of about 2 feet, a violent explosion took place. Crossman, who was exposed to the full force of the blast, was instantly killed, while Cornish was cut and bruised about the face, hands, and arms. The latter,

								however, in spite of his severe injuries, managed to grope his way to the shaft, a distance of about 1,000 feet, and signalled for assistance. The only feasible surmise with regard to the cause of the accident appears to be that the drill came into contact with a hole previously made containing some unexploded lithofracteur in its crevices, and consequently no blame could be attached to any one.
19	9th Feb.	Beechworth...	Beechworth..	G. W. Reid and Francis Robson (Rocky Mountain Co.'s Tributers)	Fall of earth in a drive	...	1	No person witnessed the accident. The two tributers had put in a drive at the foot of an old abandoned face, about 35 to 40 feet high. The ground was composed of very hard cemented granitic drift, and had been worked by shafts some 25 or 30 years previously, consequently the winter rains during that time had penetrated into the old workings and caused the ground to crack in all directions. The injured man, who had followed the occupation of a miner for more than 30 years, did not take the state of the ground into consideration, and continued to drive without using any timber, and whilst so doing, during the temporary absence of his partner, a lump of heavy washdirt fell from the face of the drive and broke his left leg below the knee. The sufferer had previously assured his mate, who, until a few weeks before, had never worked in a drive, that the ground was perfectly safe to work without timber, and he was naturally guided by this opinion, so that the accident was the result of the injured man's own negligence, but, in view of the injuries received by him, no action under Act 783 was considered advisable.
20	11th Feb.	Ballarat ...	Creswick ...	New Australasian G. M. Co.	Cage accident ...	...	1	Four men were being lowered down the shaft in a cage, and when the top plat was reached, one of the men attempted to step out on to the landing, but as the cage was in motion he was immediately caught by the cover and knocked back again, but very luckily he escaped with slight injuries to his knee and shoulder. A light was always kept burning at the top plat, and the injured man stated that on seeing this light he mistook it for the bottom of the shaft, and thinking that the cage was being lowered too fast he tried to jump out before it touched. It was a most reckless act, and the sufferer could not blame any one but himself for the injuries he received.
21	11th Feb.	Maryborough	Amherst ...	Sing You (deceased)	Fall of earth from a bank	1	...	Verdict at magisterial inquiry:—"Deceased met his death by gross carelessness whilst following his avocation as a miner." The deceased, a Chinese, was working by himself undermining the bank of an open cutting from 5 feet to 6 feet deep. From the evidence given at the inquiry there can be no doubt but that he came by his death through mining in a loose formation without timber. No person witnessed the accident, which the local Inspector reported could have been prevented by the most ordinary care.
22	11th Feb.	Maryborough	Maryborough	The Duke Co. ...	Machinery accident ...	...	1	The injured man had stopped the air engine for the purpose of oiling the bearings, and, in order to start it again, he pushed the arm of the small fly wheel with his foot, which slipped and was caught in the revolving wheel, breaking his leg. He managed to shut off the steam and release himself.
23	12th Feb.	Ballarat ...	Creswick ...	New Australasian Co.	Fall of earth and timber	1	...	Verdict at magisterial inquiry:—"Killed by a fall of timber and earth," to which the following rider was added by the magistrate:—"I am of opinion that the fall of timber and earth was caused by a certain amount of carelessness on the part of William Johnstone and John Featherstone, in not putting one of the props which fell upon a firm foundation, and also on the part of Henry Treloar for not having taken steps, as captain over the last-named men, to have remedied the fault committed by them." Two men were working in a blocking drive, and, having put in a set of timber, they were engaged in cleaning up the drive, so as to leave it ready for the next shift, when they noticed that one of the props put in by the previous shift (Johnstone and Featherstone) was too near to an air drive, which was close beside and about 10 inches deeper than the blocking drive in which they were employed. One of the men went immediately to obtain another prop to replace the one that appeared unsafe, when the timber suddenly fell and let the earth down upon the other man and smothered him. The men who put in the set of timber which fell were undoubtedly to blame for not ascertaining the level of the air drive, and guarding against the possibility of accident, as was also the captain of the shift for failing to notice, when inspecting the set, its dangerous position; but, in view of the fact that the deceased and his mate worked for nearly eight hours under the timber before they suspected anything was wrong, it was considered that an action under Act 783 against the men named could not be sustained.
24	13th Feb.	Castlemaine	Tarrengower	South Parkins' Reef Q. M. Co.	Fall down a shaft ...	1	...	Verdict at inquest:—"Accidental death." The deceased and his two mates were employed in sinking the shaft at a depth of 250 feet, and, after completing their shift, they all three got on to the edge of the bucket to be raised to the surface; but when they had ascended about 20 feet, the deceased fell to the bottom of the shaft and was instantly killed. As he uttered no cry when he fell, it is thought that he must have fainted before losing his hold. Deceased was himself to blame; ladders were provided, by which the men should have ascended, and they were knowingly acting in direct opposition to the rules of the mine by using the bucket. A breach of general rule 28, section 8, of Act 783 was also committed, by not securely staying themselves to the rope, and proceedings were accordingly instituted against the other two men, who were each fined 10s., with £4 1s. 9d. costs.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
25	14th Feb.	Sandhurst ...	Sandhurst ...	Hustler's Reef Q.M. Co.	Fall down a pass ...	...	1	The injured man was attempting to clear a pass at the 150-foot level, which had got choked with rubbish, and after several efforts had been made to shoot the stuff that obstructed the pass, the whole mass suddenly gave way, and he was precipitated down the shoot a distance of about 20 feet, and completely buried by the fallen material. He could not be extricated until about three-quartors of an hour had elapsed, but was not hurt, beyond a few abrasions to his hands and face and a stiffness of the body. His good fortune in escaping with his life was ascribed to the peculiar stooping position into which he was forced by the falling mass.
26	14th Feb.	Sandhurst ...	Sandhurst ...	South Devonshire Q. M. Co.	Fall down a winze ...	...	1	The injured man was engaged in a drivo at the 510-foot level. Two blasts were about to be fired in the face of the drive, and to avoid their effects he had run a distance of about 100 feet along the drive, when the shots exploded and blew out the light which he carried. As he was endeavouring to strike a fresh light, he walked on a few paces and stumbled into a winze and fell to the bottom, a distance of about 20 feet, and broke the small bone of each of his legs. He was alone to blame, as he knew of the vicinity of the winze, and should have used more caution.
27	15th Feb.	Sandhurst ...	Sandhurst ...	Pearl Q. M. Co. ...	Explosion of a charge (gunpowder)	...	1	Two men were engaged in a cross-cut, at the 550-foot level, and had drilled what is termed "an upper hole"—that is, a hole put in the face of a drive in a slanting or almost perpendicular direction. This hole was charged with compressed powder and the fuse lighted, but the charge was not sufficiently powerful to throw its burden of stone. The men then proceeded to re-charge the hole with Hall's powder, and the injured man put the usual charge of powder into a paper bag, in order to prevent it from falling out when placed in the hole, this being necessary in consequence of the acuteness of the angle at which the hole was bored. He then put a portion of an old bag in the hole, for the purpose of keeping the explosive material secure, prior to tamping it with mullock; and having done this, he took a burning candle and held it close to the charge, in order to see if the fuse and powder were suitably settled before tamping. Almost simultaneously the charge exploded and struck the sufferer full in the face, and knocked him with great force against the wall of the cross-cut. The unfortunate man was fearfully burned and cut all over the eyes and the top of the head. His mate was also knocked down by the force of the explosion, but was not injured to any extent. The accident was entirely the result of the sufferer's carelessness in holding a lighted candle so close to the charge.
28	19th Feb.	Gippsland ...	Stringer's Ck.	Long Tunnel G. M. Co.	Machinery accident ...	...	1	The sufferer, a lad of about 19 years of age, was engaged in grinding magnetings in a Berdan mill, and while in the act of cleaning the shaft or cog-wheels, on which he had put too much oil, the thumb of his left hand was caught by the revolving cogs, and so severely crushed that it was found necessary to amputate it at the first joint. The accident was the result of the lad's own carelessness.
29	21st Feb.	Ararat ...	Raglan ...	Royal Saxon G. M. Co.	Fall of reef in a drive	...	1	Two men were working together in a prospecting drive, when a piece of reef slipped from the side of the drive close to the face, and struck one of them on the leg and fractured the bone below the knee. Both men sounded the ground a few minutes prior to the accident, and it appeared perfectly safe. The drivo had also been examined the day previous by the local Inspector, and he was of opinion that it was perfectly safe to work. No blame could be attached to any one.
30	22nd Feb.	Castlemaine	Fryer's Creek	Lodovico Franzi (deceased)	Fall of earth from the roof of a tunnel	1	...	Verdict at magisterial inquiry:—"Accidentally killed." The deceased had been in the habit of fossicking alone for several years in an old tunnel that was abandoned by the first owners about 20 years before. When it became known that he was missing, search was made, and his body was discovered about 400 feet from the mouth of the tunnel, under about a ton of earth, which had evidently fallen from the roof and killed him. During the whole period that the deceased had been working in the tunnel he used very little timber to protect himself, and it was to his negligence in this respect that the accident was due.
31	25th Feb.	Sandhurst ...	Sandhurst ...	North Hustler's and Redan Q. M. Co.	Fall of stone in a drive	...	1	The injured man was engaged in a drive, at the 270-foot level, in removing a large quantity of mullock and quartz that had been loosened by a blast, when a large piece of stone suddenly came away from the roof of the drive and struck him on the foot and crushed it. The occurrence was purely accidental. The sufferer sounded the ground before commencing work, and it then appeared to be quite safe.
32	29th Feb.	Castlemaine	St. Andrew's	William Henry Paine (deceased)	Fall of earth ...	1	...	Verdict at magisterial inquiry:—"Accidental death." No person witnessed the accident. The deceased was working alone in old ground, and had cut a drive in the bank of a gully; but, in consequence of the soil having been loosened by former workings, a large quantity of earth fell upon his head and shoulders and killed him. A son of the deceased discovered the body a short time after the accident.

33	1st Mar.	Ballarat ...	Smythesdale	Linton Park Co ...	Fall of washdirt in a drive	1	...	Verdict at magisterial inquiry:—"Accidentally killed." A charge of powder had been put into the wash and exploded by the men working in the previous shift; but the ground was only shaken thereby, and the deceased, a Chinese, while on his knees attempting to ease down the ground loosened by the shot, was struck by about 1 cwt. of washdirt, which suddenly fell from the face of the drive. His neck was broken, and death must have been instantaneous, for he never moved or spoke afterwards, although no earth remained upon him. The local Inspector reported that no timber would have prevented the accident, which was due either to a want of knowledge of sounding unsafe ground, or carelessness on the part of the deceased.
34	11th Mar.	Sandhurst ...	Eaglehawk ...	Rose of Denmark Q. M. Co.	Fall down a shaft ...	...	1	The sufferer was lowered to the 210-foot level by the cage working in the east compartment of the shaft, on one side of which a barrier had been raised to prevent the risk of stone being blown down the shaft during blasting operations. A special path from the cage to the workings had been prepared and was pointed out to this man, but he persisted in walking round on the narrow ledge between the barrier and the shaft, into the west compartment of which he almost immediately stumbled. Strange to say, he was not killed, although he fell through a distance of 150 feet, but both his legs were broken. His own reckless foolhardiness in going where he did was the primary cause of the accident.
35	11th Mar.	Ararat ...	Raglan ...	Hobart Pasha G. M. Co.	Truck accident ...	...	1	Two men were engaged in trucking dirt to the shaft. One of them, in endeavouring to pass the other where there was not sufficient room, got the third finger of his right hand crushed between the trucks, and it was found necessary to amputate it at the second joint. The Inspector reported that if any one was to blame it was the sufferer, as he should not have tried to pass the other man until there was sufficient space to do so.
36	14th Mar.	Sandhurst ...	Sandhurst ...	Hercules & Energetic Q. M. Co.	Explosion of a charge (gunpowder)	...	1	Two men were engaged in the stopes above the 600-foot level, and as one of them was in the act of charging a hole with Keam's powder, it suddenly exploded and slightly burned him about the face and hand. Fortunately only a small quantity of powder had been inserted when the explosion took place. The sufferer used a "charger," or as it is generally termed by the miners a "spoon," with which to place the powder in the hole, and whilst so doing it is supposed that the "charger" came into violent contact with the powder and caused it to ignite.
37	15th Mar.	Ballarat ...	Creswick ...	Port Phillip and Colonial Q. M. Co.	Fall down a shaft ...	...	1	While the injured man was descending the pump shaft, greasing the pump rods, a toe plate attached to one of his boots, having become loosened, caught in a rung of the ladder and caused him to fall a distance of 76 feet down the shaft on to the plat at the No. 1 level. Whilst falling he managed to keep catching hold of the rungs of the ladder with his hands, and by this means kept his body in an upright position, and this doubtless saved his life. He passed through the man-holes of two stages that were placed in the shaft, but landed safely on a third stage with no other injuries than a few bruises about the lower part of the body.
38	20th Mar.	Ballarat ...	Smythesdale	Ang Eng and Co. (Chinese Co-operative Company)	Injured whilst stepping across the shaft	...	1	The accident was not witnessed. It appears that as the sufferer, a boy of 15 years of age, was stepping across the shaft from one plat to another, he unexpectedly received a severe blow upon the head which caused a scalp wound seven inches long and fractured his skull. He was unable to state what injured him, but as a truck load of laths were being sent down the shaft in a cage about the time the accident happened, he fancied that one must have fallen out, although this opinion was not shared by the Chinese owners of the claim. The only other conclusion to arrive at was that the descending cage must have struck him.
39	28th Mar.	Sandhurst ...	Sandhurst ...	Belmont and Saxby Q. M. Co.	Fall of quartz and mullock	1	...	Verdict at inquest:—"Accidentally killed." The deceased with three other miners was working in the stopes 50 feet above the 728-foot level, and in order to strengthen a set of timber that had been put in by the previous shift, they were placing an additional leg between the two side legs of the set, when almost without any warning a mass of stone and mullock came down, completely burying the deceased, who was working nearest the face, and pinning two other men to the ground. Notwithstanding that the two men were apparently only slightly held by the fallen mass, some considerable time elapsed before they could be extricated, but the local Inspector stated that their injuries were so slight as not to be worth serious mention in his report. It was not until about five hours after the accident occurred that the body of the deceased was recovered, when it was found that death had not been instantaneous, but resulted from suffocation about 15 or 20 minutes after the fall of stone took place.
40	28th Mar.	Maryborough	Avoca ...	No. 5 Tribute Co. ...	Fall down a shaft ...	...	1	A slight inburst of water and drift occurred in the chamber where the injured man was assisting to slab up the opening set. There was no real danger, but the sufferer became alarmed, and attempted to ascend the shaft by holding on to the wet tail rope of a bucket. He had only ascended about 20 feet, however, when he relaxed his hold, and, falling to the bottom, broke the small bone of his leg just above the ankle joint.
41	29th Mar.	Sandhurst ...	Sandhurst ...	United Devonshire Q. M. Co.	Injured while setting timber	...	1	It appears that the injured man was engaged with two other miners in putting a set of timber in a cross cut from the 500-foot level, when one of the legs of the set "canted" over and severely crushed his hand against the wall of the cross-cut. The occurrence was purely accidental.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
42	31st Mar.	Sandhurst ...	Sandhurst ...	Lansell's Collman and Tacchi's Co.	Machinery accident ...	...	1	The injured man was employed working an air winch at the 950-foot level, when the valve became loose, and before the driver could shut off the air, the sufferer's hand was caught by the pulley wheel and one of his fingers severely lacerated.
43	1st April	Ballarat ...	Ballarat ...	North Band and Barton Co.	Fall of stone in a drive	...	1	Two men were engaged in a main drive taking down stone that had been shaken by a shot which they had fired a short while before, when a large slab of sandstone, about 10 cwt., suddenly fell from the hanging or head wall and completely buried one of them. He was quickly released, and very fortunately escaped without fatal injury, but his head and face were severely lacerated, and his back was bruised. The stone came away from a slide or cross course, going across the face of the drive, and was so thick that it was not possible by sounding to discover that it was loose.
44	4th April	Sandhurst ...	Waranga ...	Phœnix Co. ...	Fall of mullock ...	...	1	The injured man was employed about 12 feet east from the bottom of the shaft, which was about 40 feet deep, when a piece of mullock weighing about 1 cwt. fell from a "greasy head" in the hanging wall, and inflicted slight injuries to his head, arm, and leg. The ground was securely timbered, and the sufferer had also sounded it before commencing work, so that no blame could be attached to any one. Notice of the accident, as required by the provisions of section 21 of Act 783, was not sent to the local Inspector, and proceedings were accordingly instituted against the mining manager, and he was fined 20s. with 41s. costs.
45	5th April	Castlemaine...	Tarrengower	German Reef Tribute Co.	Fall down a shaft (cage accident)	1	...	Verdict at magisterial inquiry:—"That Thomas Roberts came by his death on the 5th April by falling down the shaft of the German Reef Tribute Company, through the brake of the winding gear having been insufficiently pinned by Simeon Robins, the engine-driver, and through the latter leaving his engine without proper supervision, contrary to rule 31, section 8, Act 783." T. Roberts (deceased) and his mate F. Young were employed at the 230-foot level, and at "knock-off" time the cage was sent down to bring them to the surface. Deceased got into the cage, and his mate followed, after giving the customary signals to haul up, but instead of ascending the cage immediately began to descend, and Young, calling out to deceased, "Look out, the cage has run away," sprang out, and, catching the edge of the landing board, managed to climb back into the level by means of the air pipe, but upon finding that deceased had not followed his example, he proceeded down the ladders to the bottom of the shaft, a distance of about 200 feet, and there found the mangled remains of the unfortunate man. It was supposed that the deceased applied the safety lever to the cage, and that the shock of its sudden stoppage threw him out. Assistance was at once procured, and the body taken to the surface. It appears that the engine-driver, after lowering the cage to the 230-foot plat and securing it in this position by pinning the brake of the winding gear, left the engine-house, and in accordance with his usual custom, and by the direction of the mining manager, who was also the father of the deceased, went away to signal through another shaft to the men below. During his absence the two men got into the cage, and, as the brake had been insufficiently applied, their weight caused the winding gear to revolve, and the cage to descend at a rapid rate. Notwithstanding that he was acting under instructions from the mining manager in leaving the charge of his engine, the driver was guilty of a breach of the *Regulation of Mines Act* in so doing; and proceedings were instituted against him under general rule 31, section 8, of Act 783, resulting in a fine of £6, with £4 13s. 6d. costs.
46	7th April	Beechworth...	Beechworth...	Colin Fraser and William Wiseman	Fall of earth from the side of a shaft	...	1	The injured man was on his knees at the bottom of the shaft, which was about 30 feet deep, when a portion of the hanging wall slipped from the side about five feet from the bottom, and almost covered him. His mate was at the top, but hearing him cry out, immediately went to his assistance, and succeeded in extricating and raising him to the surface. He was found to be severely bruised about the side and thighs, but not otherwise hurt. The shaft had just been timbered down to the point where the slip occurred, and the sufferer had sounded the piece of ground which fell only a few minutes previously, and considered it to be sound enough to remain secure until a fresh set of timber could be put in. The Inspector reported that no blame was attachable to any one, it being at most an error of judgment on the part of the sufferer.

47	8th April	Sandhurst ...	Sandhurst ...	North Johnson's Co.	Truck accident ...	...	1	The man was engaged trucking on the surface, and the running of the truck knocked out of its position a "dog" that fastened one of the rails, thus displacing the rail, and causing the truck to fall over. The sufferer also fell, and sustained a cut to his right eye. The accident was of a trifling nature, and purely accidental.
48	8th April	Gippsland ...	Stringer's Ck.	New Tubal Cain Co.	Suffocation by foul air	2	...	Verdict at magisterial inquiry:—"Death caused in each case by asphyxia resulting from the presence of foul air." An underlay shaft had been sunk from the surface to the end of the northern drive, and was carried down from that point a further depth of about 90 feet. Bad air had become troublesome on the morning of the accident in the lower portion of the underlay shaft, which had an air partition for only 40 feet down, and one man had become ill and ceased work in consequence. One of the deceased men—Evan Thomas, the mining manager—after going below once or twice, prepared and sent down a nail-can full of burning charcoal to purify the air, but as the bottom came out of the can and the fire was extinguished, another fire was soon after prepared in the same way, and lowered down the shaft. Thomas then descended again, and commenced baling water, the other miners being at that time absent, at "crib," excepting two men who were working the windlass for the deceased. After sending up several buckets of water, the men at the windlass heard Thomas fall with a splash. They called to him, but got no answer, and one of the men went for help, the other meanwhile continuing to bale water, with a view of improving the air. After some delay several men arrived, and two of them, named Owen Williams and John Hughes, bravely went to the assistance of Thomas, whom they found still alive, but breathing very laboriously. With great difficulty they succeeded, although the air was almost overpowering, in passing a rope round his body, and he was then raised towards the surface. Williams went first, guiding the helpless man up the airway of the shaft, and Hughes followed to steady and assist. When they had by this means proceeded about 50 feet up the shaft, Hughes became overpowered by the air, and fell back into the shaft, and was not again seen alive. His body could not be recovered until several hours afterwards, when it was found that, although badly hurt by the fall, the immediate cause of death was asphyxia from foul air. Williams managed to get within three feet of the top, and was just about to fall off, when he was seized by those above and carried into the fresh air, where after a time he recovered. The body of Thomas was hauled to within about 15 feet of the brace, when it became fast in the shaft, which was extremely narrow at that point, and fully half an hour must have passed before it was extricated, the foul air preventing assistance being sooner rendered. When eventually brought to the surface, Thomas was quite dead. The local Inspector, however, was of opinion that if an effort had been made to release Thomas by going down the shaft about 15 feet, it would have proved successful. There can be no doubt but that the means of ventilation in use at the mine were extremely defective, and that the fumes of the burning charcoal sent down to cause a draught aggravated rather than improved the condition of the air in the shaft; but the whole blame appears to rest upon the deceased manager, in a noble attempt at whose rescue Hughes also lost his life.
49	10th April	Ballarat ...	Creswick ...	New North Clunes Co.	Explosion of a charge (dynamite)	...	1	The injured man was employed at the 1,100-foot level. He had charged a hole with dynamite, and after placing the usual piece of lighted candle under the fuse, he retired to a place of safety; but, on looking back, he did not see any light, and supposing that the candle had fallen over and gone out, he very foolishly returned for the purpose of re-lighting it, when the charge exploded, and severely injured his breast, hands, and face, and completely destroyed the sight of both his eyes. The sufferer was clearly guilty of a breach of the provisions of paragraph (*g*), general rule 2, section 8, of Act 783; but, in consequence of the serious nature of the injuries he received, no action was taken against him.
50	10th April	Sandhurst ...	Raywood ...	Bruhn's Tribute Co.	Fall of a "leg" from a set of timber	...	1	It appears that the injured man had fired a shot at the 250-foot level, which knocked out one of the legs of a set of timber, and whilst he was endeavouring to replace it, it canted over and struck him on the leg, the small bone of which was broken by the blow. No blame attached to any one in the matter.
51	16th April	Beechworth...	Indigo ...	Chiltern Valley Gold Mines Co.	Cage accident ...	...	1	The sufferer was engaged in clearing away the débris from a truck which had accidentally fallen to the bottom of the shaft, when the cage, which had been stopped in its descent when the first accident took place, slowly descended and crushed him severely. He called out to his mates to give the signal to haul up, which was at once done and complied with, and he was released. From the statements made by the sufferer and his two mates, it appeared that the accident was due to a want of precaution on the part of the engine-driver, who was accordingly proceeded against under section 19 of Act 783; but, in consequence of the confused nature of the evidence given by the injured man in reference to the system of signalling in operation at the mine, the case was dismissed.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued*.

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
52	19th April	Sandhurst ...	Sandhurst ...	Lansell's No. 222 Co.	Fall down a shaft ...	1	...	Verdict at inquest:—"Accidentally killed." The deceased and his mate were engaged at the 1,090-foot plat in removing a pent-house, so as to allow baling operations to be carried on. The logs of which the pent-house was composed were wet and slippery, and caused the lever with which the two men were raising the pent-house to slip, and the suddenness of the jerk precipitated the unfortunate man down the shaft. He was at once raised to the surface and taken to the hospital, but died from the effects of his injuries the same night. The accident was clearly due to a breach of the provisions of general rule 7, section 8, Act 783, by some person who could not be identified, and the deceased and his mate were also to blame for knowingly working in so dangerous a position. It appears that a strong horizontal bar of hardwood had been securely fixed across the entrance to the shaft at the 1,090-foot level, in accordance with rule 7 of Act 783, and if allowed to remain it would have effectually prevented any such accident as the one under notice; and another bar had also been placed about two feet higher up; but the lower bar was removed several days prior to the accident, in order to facilitate the placing of a shoot—to divert water into a tank—at the entrance to the shaft; and as this shoot was soon afterwards taken away, it was the duty of the person who removed it to replace the bar across the entrance; but this was not done, and the entrance to the shaft was thus left unprotected. Therefore, the person who removed the shoot and failed to replace the bar was mainly responsible for the accident. Unfortunately, however, in consequence of the time which had elapsed, and the fact that work had not been regularly carried on in the mine for some time, the culprit could not be traced.
53	21st April	Ballarat ...	Smythesdale	Racecourse Co. ...	Cage accident ...	...	1	Three men were engaged at the top of the balance shaft in sending down some rails and air pipes, but as the cage had not been used for about five weeks it was a little stiff, and in order to force it down so as to allow of the air pipes being put in, two of the men jumped upon it, when it immediately went down the shaft. One of the men jumped off at once and escaped uninjured, but the other man was carried to the bottom, a distance of 56 feet, and was thrown out by the shock into the drive and his knee cap broken. They were themselves to blame for getting upon the cage without any one being at the brake, but they imagined that it would not move.
54	25th April	Beechworth...	Indigo ...	Joseph Grace and James Downie (deceased)	Fall down a shaft ...	1	...	Verdict at magisterial inquiry:—"Accidentally killed." The accident was not witnessed. The deceased was at the bottom of the windlass shaft, which was 148 feet deep, and as some bark was being lowered to him from the surface, it became fast in the shaft, and the deceased ascended about 60 feet in order to free it, but he either lost his hold or the bark suddenly becoming free forced him from his position, for he fell to the bottom and received such injuries as resulted in death the following day. The accident was solely due to the deceased man's indiscretion in venturing so far up the shaft to clear away an obstruction without ladders or some other means of protection.
55	5th May	Ararat ...	Pleasant Creek	J. Frost and party	Fall of earth underground	...	1	The injured man with his mates was engaged in timbering a drive, when a piece of cement came away from the face and struck him, causing fracture of both bones of the fore arm and compound dislocation of the wrist. The occurrence was purely accidental.
56	9th May	Sandhurst ...	Sandhurst ...	New Chum United Co.	Fall from a stage at the 950-foot level	...	1	The sufferer was standing on a stage at the 950-foot level, engaged in putting in a hole, when a scraper he was using fell down, and in endeavouring to catch it, he slipped and fell on to the floor of the level, a distance of only about 3 feet, but the level was strewn with pieces of broken quartz, the sharp edges of which cut his arm. The Inspector reported that the occurrence was of a trifling nature and quite accidental.
57	9th May	Maryborough	Inglewood ...	Maxwell's Co. ...	Fall down a winze ...	...	1	At the time the men were relieved by the next shift, the sufferer made a rush to ascend the shaft first, and for this purpose he went up a winze which was used for raising quartz from the bottom to the 375-foot level, but when he had proceeded about 10 feet up the winze, his foot slipped from the timber and he slid down, fracturing the small bone of his arm.
58	17th May	Maryborough	Amherst ...	South Greenock Co.	Fall of earth ...	1	...	Verdict at magisterial inquiry:—"Accidentally killed." The deceased was employed with another miner in a blocking-out strip off the east drive from the No. 1 jump-up, and whilst "clearing away" from the points of the laths, which his mate was driving home, he came upon a large stone. The laths were driven half home, and there was a panel under the points of them. The deceased told his mate to cease driving the laths until he had removed the boulder, but he had scarcely accomplished this when

								the earth and timber came down with a crash and completely smothered him. His body could not be recovered until four or five hours afterwards. The Inspector was of opinion that there was no negligence shown by men or managers in their method of working the ground, and, from expert evidence given at the inquiry, there can be no doubt but that the accident was caused by the cap-piece being knocked off in driving the laths, which should have been noticed by the deceased, but his attention was distracted by the appearance of the boulder.
59	23rd May	Sandhurst ...	Raywood ...	Nil Co.	Fall of a piece of sandstone	...	1	The accident was not witnessed. It appears that the injured man was engaged in building a wall of mullock in the stopes at the 386-foot level, when a piece of sandstone suddenly fell from a "greasy back" in the hanging wall, and, rolling against his leg, broke the small bone of his ankle. The occurrence was purely accidental.
60	24th May	Sandhurst ...	Sandhurst ...	Koch's Pioneer Co.	Fall from a stage down the shaft	...	1	The man was engaged in timbering the shaft at about 280 feet from the surface, and for this purpose he had erected a stage, upon which he was standing, when it suddenly gave way and he fell to the bottom, a distance of 18 or 20 feet. Fortunately he fell upon his feet, and escaped with a slight sprain to his ankle. The sufferer himself was responsible for the security of the staging, but the occurrence was purely accidental.
61	30th May	Sandhurst ...	Sandhurst ...	New Argus Co. ...	Cage accident ...	...	1	The sufferer was being lowered down the shaft in a cage, and when about 50 feet down from the surface he attempted to put his hand into his pocket, and his arm was caught between the shaft timbers and the cage, and the bone broken. He was alone to blame.
62	30th May	Sandhurst ...	Heathcote ...	Bombay G. and A. Co.	Fall of a piece of sandstone	...	1	A shot had been fired at the 134-foot level, and the ground loosened thereby was being "worked down" by the sufferer, when a piece of sandstone suddenly fell upon him and inflicted slight cuts to his head and a shock to his system. The Inspector reported that if any one was to blame it was the injured man himself.
63	3rd June	Ballarat ...	Steiglitz ...	Little Forest Sluicing Co.	Fall of earth in an open cutting	1	...	Verdict at inquest:—"Accidentally killed." The deceased, with three other miners, was working in an open cutting about 15 feet wide and 7 feet high, when about 7 cwt. of earth suddenly, and without the slightest warning, fell upon him, but although he was immediately released he never spoke, and died about twenty minutes afterwards. The ground was not undermined more than about 6 inches, and was being worked in a careful manner, so that the other miners were at a loss to account for the reason of its falling. The local Inspector, however, reported that immediately above the earth which fell there stood the stump of an old tree, the roots of which went straight down into the ground like the prongs of a fork, and he was of opinion that the rain water had from time to time penetrated along the course of these roots, and thus loosened the earth around them, and caused it to fall.
64	3rd June	Sandhurst ...	Eaglehawk ...	Johnson's Reef Co....	Explosion of charge (lithofracteur)	...	1	The injured man was in the act of descending a shaft to re-adjust a "snuff" which he had applied to a hole just charged, when the explosion took place, and he was struck on the forehead by a fragment of the dislodged stone.
65	5th June	Sandhurst ...	Eaglehawk ...	Williams' United Co.	Fall of earth in a stope	...	1	The man was working in a stope at the 250-foot level, when a small piece of ground slipped away and rested on him, inflicting some trifling injuries. The Inspector reported that the occurrence was purely accidental.
66	11th June	Ballarat ...	Creswick ...	Lone Hand Co. ...	Fall down a "jump-up"	...	1	Contrary to rule, the injured man was carrying two picks in his hand up the ladders of a "jump-up," when, as he reached the top, he lost his hold and fell to the bottom, a distance of 26 feet, sustaining a fracture of the right leg above the ankle. The Inspector reported that no blame could be attached to the management, the injured man himself being wholly responsible for the accident.
67	12th June	Sandhurst ...	Sandhurst ...	New Chum United Co.	Fall down a shaft ...	1	...	The deceased was standing on a stage, the boards of which he was engaged in removing and sending up in a bucket to the plat above, when the bucket caught the stage, displacing the board on which he stood, which fell with him into the well at the bottom of the shaft, a distance of 160 feet. According to the medical evidence, death resulted from asphyxia and shock to the system. At the inquest a verdict of "accidental death" was returned.
68	12th June	Maryborough	Maryborough	Keep-it-dark Claim	Fall of timber down a shaft	...	1	The injured man neglected to secure properly a piece of timber he was sending up to the surface, and when it had been raised about 30 feet it slipped and fell upon him, inflicting severe injuries to his left side. The Inspector stated that, had the man stepped into the plat whilst the log was being raised instead of remaining in the shaft, he would have been shielded from the effects of the accident.
69	14th June	Ballarat ...	Creswick ...	New Australasian Co.	Fall of "reef" in a "jump-up"	...	1	The sufferer was putting in a "jump-up," and had reached a height of about 4 feet from the cap-piece of the main drive, when a large block of "reef," measuring 4 feet long, 2 feet wide, and 1 foot 2 inches thick, suddenly came away. Fortunately for himself, the injured man had allowed the débris to accumulate under him, so that momentum gained by falling was not added to the weight of the ponderous mass, or he could not possibly have escaped death; as it was, the block forced him down and slid past him, causing no more serious injuries than bruises to his foot and side. The ground had been tested shortly before, and then appeared safe. The Inspector stated that no blame could be attached to any one in the matter.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
70	14th June	Ballarat ...	Creswick ...	New Australasian Co.	Fall of a pick down a "jump-up"	...	1	A rise was being put up by three men, of whom at the time of the accident two were working in the higher portion, whilst the other was at the bottom, filling a truck. By some means, which has not been explained, a pick was allowed to fall from the upper part of the rise, and struck the man who was below, inflicting a nasty wound on the head. The Inspector reported:—"This is one of those accidents over which legislation can have no control, nor can any one be blamed."
71	16th June	Sandhurst ...	Eaglehawk ...	Rose of Denmark Co.	Explosion of compressed gunpowder	1	...	The deceased was smoking his pipe at the moment of the accident, which occurred whilst he was removing pellets of compressed gunpowder from the keg where they were stored. It is surmised that a spark from the pipe caused the explosion, or possibly the deceased allowed his lighted candle to drop into the keg. Death resulted on the following day from the injuries occasioned. At the inquest the finding was to the effect that the occurrence was attributable to the deceased's own negligence. In connexion with this accident it was discovered that the powder had been stored at the place of the explosion in contravention of one of the provisions of section 8 of the *Regulation of Mines Act* 1883, and a prosecution was accordingly instituted against the mining manager, who was fined £2, with £3 1s. 6d. costs.
72	17th June	Ballarat ...	Ballarat ...	Last Chance Extended Co.	Getting out of a cage in motion	...	1	The injured man was being lowered to the No. 4 or deepest level, but tried to get out as the cage passed the No. 3 level, which is 32 feet higher. In consequence he was struck by the cage-cover, and jammed between the cage and the side of the shaft, and in this position he was dragged to the bottom, where it was found that his right leg was broken. The mistake appears inexplicable, inasmuch as a light was burning in the No. 4 level, whilst there was none in No. 3, and of these facts the injured man must have been cognizant, as he had already travelled up and down the shaft several times that day.
73	19th June	Maryborough	St. Arnaud	Deceased was working on his own account	Fall of earth (surface)	1	...	From his own account it would appear that shortly after the deceased went to his work in some old alluvial ground, on the morning of the 19th June, a fall of earth occurred, from which he was unable to extricate himself, and he remained pinned to the spot until the afternoon of the 21st June, when he was discovered by a boy who was looking for cows. The police were communicated with, and the sufferer was conveyed towards the hospital, but he died before that place could be reached. A *post-mortem* examination showed the cause of death to have been fracture of the spine, together with exhaustion resulting from exposure. An inquest was held, at which a verdict of "accidental death" was returned.
74	21st June	Castlemaine	St. Andrew's	Ah Chin (deceased)	Fall of earth (near surface)	1	...	The accident was not witnessed, but after reviewing the circumstances connected with the case, the Inspector of Mines concluded that the lack of judgment exhibited by the deceased in attempting to work the loose and shallow ground without timbering led to the occurrence of the fatality.
75	26th June	Sandhurst ...	Sandhurst ...	Extended St. Mungo Co.	Fall down a shaft ...	...	1	The Inspector considered that the blame in this case lay with the injured man, for whose neglect, however, a slight excuse might be found in the fact that he was but a novice in shaft duty. He omitted to make use of the straps provided for security in descending by the windlass rope from the 470-foot plat to the bottom of the shaft, and when about a quarter of the way down he lost his hold, and fell through the remaining distance of about 27 feet, fortunately escaping, however, with some slight cuts and bruises.
76	2nd July	Ballarat ...	Ballarat ...	Band of Hope and Albion Consols Co.	Fall of quartz (underground)	...	1	Whilst the sufferer was at work in a drive, a piece of quartz fell from the roof and cut his neck. The occurrence was purely accidental.
77	2nd July	Sandhurst ...	Sandhurst ...	Shenandoah Co. ...	Explosion of lithofracteur	1	1	The deceased man, Patrick Carmody, was charging a hole with lithofracteur, which suddenly exploded, inflicting injuries which afterwards resulted in his death. Another man, standing in the plat 70 feet above, was struck by some of the débris and sustained a fracture of the skull. The Inspector reported:—"The accident is rather a mysterious one;" but Carmody before his decease attributed it to the "swelling" of the ground. At the inquest a verdict of "accidental death" was returned.
78	5th July	Sandhurst ...	Sandhurst ...	New Chum United Co.	Slipping of windlass handle	...	1	The sufferer was lowering tools by a windlass, the handle of which he allowed to slip from his hand, and in consequence the windlass began to revolve rapidly, and the handle struck him on the face, inflicting some nasty bruises.
79	7th July	Sandhurst ...	Sandhurst ...	Hercules and Energetic Co.	Slipping of a lever ...	...	1	The man was moving mullock with a lever, which accidentally slipped, canted up, and struck him, inflicting a cut on the forehead.
80	7th July	Sandhurst ...	Eaglehawk ...	New Moon Co.	Fall of earth (underground)	...	1	The ground had been loosened by a blast, but the injured man neglected to sound it on returning to work at the spot; hence the accident.

81	9th July	Sandhurst ...	Eaglehawk ...	United Devonshire	Cage accident ...	...	1	The injured man carelessly allowed his foot to project from the ascending cage in such a manner that on arriving at the surface it was caught by the "flat-sheet" and crushed.
82	11th July	Maryborough	Inglewood ...	Unity Q. M. Co. ...	Explosion of nitro-glycerine	1	...	Deceased was sent to the fire of the mining forge to warm a can of water for the purpose of thawing some lithofracteur, but had scarcely entered the forge before the can was shattered to pieces by an explosion, which drove two of the fragments into deceased's thigh, severing the femoral artery, and causing almost instant death from hæmorrhage. It appeared at the inquest that the can had previously been used for thawing cartridges, the operation having been effected by soaking them in lukewarm water. Mr. Newbery, C.M.G., the Departmental Analyst and Inspector of Explosives, in reporting on the occurrence, condemned this practice most strongly. He says:—"*When dynamite is put in water, the nitro-glycerine must exude, and, being heavier than water, it would fall to the bottom of the vessel. A very little elevation of temperature would then cause it to explode.*" A verdict of "accidental death" was returned.
83	22nd July	Ballarat ...	Ballarat ...	Band of Hope and Albion Consols Co.	Dropping of mullock down a winze	1	...	Deceased was working in a drive close under a winze 30 feet in height extending to the level above. To obtain the timber requisite for the proper carrying on of his work, it was necessary to have it brought into one of the levels connected with the shaft, and passed thence through one of the winzes into the drive. The custom has usually been to haul the timber from the lower levels, but latterly deceased had that for his use brought into the upper level and thrown down the winze. On this occasion a piece of timber fell across and stuck in the winze, and deceased went up, it is supposed, to free it, when a trucker in the level above tipped down the winze a load of stone, which fell on deceased, and occasioned a fracture of the base of the skull, causing instant death. The Inspector of Mines expressed his disapproval of the system of throwing timber down shafts and winzes, as practised in this case, preferring to have it lowered by means of a windlass and rope. This opinion was endorsed by the jury, in a rider to their verdict of "accidental death."
84	23rd July	Ararat ...	Raglan ...	New Victoria ...	Collision of trucks ...	...	1	The sufferer was returning into the workings with an empty truck, and happened to pass in front of the mouth of an inclined cross-drive just as another man came down it with a loaded truck, which, on the incline, could not be stopped with sufficient readiness to prevent a collision from taking place. The empty truck was tipped up by the shock and caught the sufferer's leg, fracturing it above the ankle. The occurrence was purely accidental.
85	23rd July	Ballarat ...	Creswick ...	New North Clunes	Fall	...	1	The injured man was stepping out of the way of a piece of loose stuff that was being brought down, when his foot caught in the timbering and he fell, breaking his leg.
86	23rd July	Maryborough	Maryborough	Pearce and Co. ...	Fall of bucket down shaft	...	1	A bucket that was being lowered from above became detached from the rope, and fell to the bottom of the shaft, where it struck the sufferer and broke his knee. The Inspector considered the accident attributable to the carelessness of the man who lowered the bucket, and instituted proceedings against him, which resulted in the infliction of a fine of £1, with 10s. costs.
87	29th July	Sandhurst ...	Eaglehawk ...	South Devonshire ...	Explosion of charge (powder)	...	1	The injured man and his mate had retired to a place of safety after charging a hole with blasting powder, when, they state, they heard a report, and the sufferer accordingly approached the spot again to resume work. However, from some cause or other another explosion took place, and the man's hand was cut by some fragments of the flying débris. The Inspector reported that the occurrence was purely accidental, and considered that the semblance of a double explosion might be due to a "knot" in the fuse, or to some loose powder having caught fire at the side of the hole.
88	31st July	Sandhurst ...	Sandhurst ...	New Chum United	Fall of slate (underground)	...	1	The injured youth was traversing the stopes where some loose ground was being worked down, when a piece of it fell away and struck him on the back.
89	31st July	Beechworth...	Beechworth...	Try Again Co. ...	Machinery accident ...	1	...	Deceased, who was in charge of the engines, was doing some work in connexion with the machinery, when his left leg in some manner became caught in the wheels, and was so severely crushed that amputation became necessary. The operation, however, was not successful in saving the man's life, as pyæmia supervened, and death resulted on the thirteenth day after the accident. No inquest was held.
90	31st July	Gippsland ...	Omeo ...	Ahn Yen and another	Fall of earth (surface)	1	...	Deceased was working in an open cutting through which water flowed, when part of the bank fell and almost buried him, at the same time obstructing the passage of the water and causing it to rise above the man's head. A magisterial inquiry resulted in a verdict of "accidental death."
91	7th Aug.	Ballarat ...	Ballarat ...	Prince Regent Co. ...	Machinery accident ...	...	1	The injured man first set the mine battery in motion, and then proceeded to grease such parts of the machinery as appeared to require it. Whilst thus engaged with the under surface of one of the disks he failed to observe the revolution of the cam shaft, so that his hand was caught between the cam and the disk, and the thumb and first finger were crushed away. The sufferer himself was to blame for the occurrence.
92	11th Aug.	Sandhurst ...	Sandhurst ...	New Chum Railway Co.	Fall of slate (underground)	...	1	The injured man was close by some loose ground that another man was working down, when a portion of it fell on him, cutting his head and breaking a rib.
93	11th Aug.	Ballarat ...	Creswick ...	Lone Hand Co. ...	Fall down shaft from a ladder	...	1	The ladder was short, and of first-class construction, therefore the Inspector inclined to the belief that the accident was due to the injured man's own carelessness in descending. The mining manager took the same view of the case, and ordered the man's dismissal, as a warning to others.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
94	12th Aug.	Castlemaine	Daylesford ...	Sailor Prince Extended Tribute Co.	Fall of earth (underground)	1	...	Deceased was working alone in a cross-cut from a tunnel at the time of the accident, and there is, therefore, no definite evidence as to how the occurrence took place. From the position of the body when recovered, the Inspector of Mines considered it probable that deceased had accidentally knocked away a cap-piece in attempting to drive some laths into position, and thus occasioned the fatality. An inquest was held, at which the jury returned a verdict of "accidental death."
95	14th Aug.	Beechworth...	Beechworth...	F. Florimel ...	Fall of earth (surface)	...	1	A continuous frost for thirty-three nights together, followed by heavy rains, had thoroughly disintegrated the banks and faces of all the neighbouring ground, but in spite of the evident danger the sufferer worked his claim as usual. Suddenly a portion of the earth fell upon him, dislocating and fracturing his hip.
96	15th Aug.	Castlemaine...	St. Andrew's	Band of Hope Q. M. Co.	Fall from a ladder ...	...	1	The injured man was descending an underlay shaft for the purpose of commencing his work. The fixed ladderway terminated about 10 feet from the bottom, and a short length additional was used to complete the descent. This short length was not fixed in any manner, being supported only by the natural batter of the footwall of the shaft. As the man was passing from the first ladder on to the other, the lower one gave way, causing him to fall through a distance of about eight feet, thereby sustaining a severe shock to the system. It is surmised that the injured man did not use sufficient care in treading upon the ladder, which he must have known was insecure; but in any case the management must be blamed for having neglected to take sufficient precautions to ensure safety.
97	19th Aug.	Ararat ...	Ararat ...	Ararat Grand Junction Co.	Fall of stone (underground)	1	...	Deceased, who was at work timbering, was alone at the moment of the accident; however there appears no reason to doubt that the occurrence was caused by his accidentally knocking away a cap-piece, thus allowing the earth to fall. His mates soon arrived at the spot and set to work to extricate him; but when they reached him they found life to be extinct. At the magisterial inquiry a full exculpation was accorded to the management, and a verdict of "accidental death" was recorded.
98	25th Aug.	Ararat ...	Pleasant Ck.	Al Perthshire Co. ...	Fall of stone (underground)	1	...	Deceased was picking down ground that had been loosened by a shot, when a flake of mullock fell from the headwall, causing injuries to the man's back and shoulder. No serious consequences were at first anticipated, but a fatal termination ensued on the fourth day after the accident. No inquest was held, nor was blame attributed to any one.
99	27th Aug.	Ararat ...	Raglan ...	Royal Saxon Co. ...	Fall from a ladder ...	...	1	The sufferer was a lad who, at the change of shifts, was in such a hurry to get away that he could not wait for the cage by which ascents and descents were usually made, but rushed down the ladders in a winze instead. The result was that his foot slipped, and he fell to the bottom, getting his back thoroughly bruised.
100	28th Aug.	Ballarat ...	Smythesdale	Racecourse Co. ...	Cage accident ...	...	1	The sufferer, when passing the shaft, on his return to duty from an excursion to the engine-house, felt seized with an unconquerable desire to gossip with the platman below. Accordingly he thrust his head into the opening of the shaft, quite oblivious of the fact that a cage was descending right above him. The result was a cut over the left eye, and another at the back of the head, but it is a wonder that the top of his skull was not taken off by the cage.
101	30th Aug.	Sandhurst ...	Eaglehawk ...	Princess Alexandra Co.	Fall of drill down a shaft	...	1	A man who was about to send a bucket full of drills down the shaft, carelessly allowed his burden to drop. His son, who with another man was working below, received one of the drills on his head, but fortunately the only injury inflicted was a scalp wound. It was marvellous that both the men were not killed; and the fact of their escape could not be held to be in any way palliative of the gross carelessness of the man above, who was accordingly prosecuted under the 19th section of Act No. 783, and fined £5, with £2 6s. costs.
102	3rd Sept.	Sandhurst ...	Sandhurst ...	North Garden Gully and Passby Co.	Giving way of a stage	...	1	The injured man was standing on a stage erected for the purpose of enabling him to drill a hole in the wall of a stope, when the stage slipped, and he fell about three feet, sustaining fractures of two ribs. Considering that he was underground manager, it might have been expected that he would have seen that the stage was made properly secure before going to work upon it.
103	4th Sept.	Sandhurst ...	Sandhurst ...	Unity Co. ...	Giving way of a stage	...	1	The sufferer stood on the end of one of the stage planks, and in consequence it canted up and precipitated him to the floor of the level. He sustained a fractured rib as the result of his carelessness.
104	17th Sept.	Ballarat ...	Smythesdale	Deceased and another	Fall of earth (underground)	1	...	The accident happened at the bottom of an old shaft which was being dismantled by deceased and his mate. They had worked it for some time, but, finding no gold, resolved to abandon it; but deceased was unwilling to allow the slabs which had been put in to be lost, and, just prior to ascending the shaft, struck at them several times with his pick. This had the effect of causing all the bottom of the shaft to

								eave in, the disturbance extending for many yards to a number of other shafts, the ground breaking and sinking in all directions. It was absolutely impossible to attempt to remove the body by way of the shaft that had given way, and there was no greater hope of being able to sink a new shaft at hand for the purpose, owing to the broken and rotten nature of the old ground. It was at last decided to descend a shaft some distance off, and put in a drive towards the spot where the fall had taken place. After two days' work the task was accomplished, and the body of deceased brought to the surface. An inquest was held in due course, and a verdict of "accidentally killed" was brought in, with the addition that no blame could be attributed to any one but the deceased.
105	17th Sept.	Ballarat ...	Ballarat ...	Clark and Sons ...	Fall of quartz (underground)	...	1	The sufferer was preparing to resume work in a drive, when a piece of quartz fell away from the roof between two of the laths and fractured his thigh.
106	19th Sept.	Gippsland ...	Stringer's Ck.	Long Tunnel Extended Co. (tribute party)	Fall down a shaft ...	...	1	The injured man with his mates had fired a shot in the No. 8 level, and, as the hour was early, did not ring for the cage to remove the party to a place of safety, but instead started to climb up the ladderway in the pump shaft towards the next higher level. Owing to the progress of works in the pump shaft there was a breach of about 12 feet in the ladder-way, this space being usually crossed when required by climbing up the slabs. As the sufferer was nearing the higher ladders the shot exploded, and the rush of air blew out his light. At the same time, either the slab on which he was depending slipped slightly, or the explosion and darkness took him by surprise and caused him to miss his grasp, and he fell through a distance of about 20 feet to the bottom, receiving a severe scalp wound.
107	22nd Sept.	Sandhurst ...	Sandhurst ...	Garibaldi Co. ...	Fall of slate (underground)	...	1	The injured man was working down some loose ground when a portion of it came away, and then rolled over upon his heel, inflicting a slight cut.
108	24th Sept.	Sandhurst ...	Sandhurst ...	North Garden Gully and Passby Co.	Fall of rock (underground)	...	1	The injured man was about to work down some loose ground, when a portion of it came away and struck him, inflicting cuts on his arm and forehead.
109	24th Sept.	Ballarat ...	Creswick ...	New Australasian Co.	Fall of earth (underground)	2	...	The two men who suffered by the accident were placing centre props under the cap-pieces of an old blocking strip, and it seems certain from the evidence that one of the centres was too long, and required forcing to set it in place, and that whilst hammering it to get it under they accidentally displaced the cap, and the earth above it fell in and buried them. At the inquest a verdict of "accidental death" was returned.
110	25th Sept.	Ballarat ...	Smythesdale	Linton Park Co. ...	Fall of earth (underground)	...	1	The ground was so hard as to require blasting, by which means a portion of it had been loosened. This should have been worked down carefully in the manner generally adopted in such cases, with gad and hammer, but the sufferer, although warned of the danger he was incurring, persisted in going to the spot to undermine the loose stuff as though it had been solid ground. Soon a large piece of cement fell upon him, and injured his back. He was, however, more frightened than hurt.
111	30th Sept.	Sandhurst ...	Sandhurst ...	Great Extended Hustler's Co.	Fall down shaft ...	1	...	Whilst engaged in effecting repairs to the shaft, deceased had occasion to step from the cage into the 1,000-foot level, and placed his knee on the *middle* of one of the boards which were nailed across the bottom of the entrance. His weight, with the added leverage, caused the boards to wrench away, and he fell some 400 feet to the bottom of the shaft, in which there was a large accumulation of water. Death resulted almost instantly from the combined causes of shock and asphyxia. At the inquest a verdict of "accidental death" was returned.
112	11th Oct.	Castlemaine	St. Andrew's	Crichton's Freehold Co.	Fall down shaft ...	1	...	The absence of the deceased from his post at the brace was noticed, and upon search being made his dead body was found at the bottom of the shaft. As it was night time, and very dark, it is probable that he made a false step when about to close the door of the shaft, and so fell down. An inquest was held, at which a verdict of "accidental death" was returned.
113	11th Oct.	Sandhurst ...	Eaglehawk ...	Johnson's Reef Co.	Cage accident ...	...	1	The injured man went into the shaft from the 864-foot level, in order to fix some lining boards, but omitted to take the precaution of looking to see if the shaft was clear. Whilst he was engaged, the cage descended, inflicting slight injuries about the eye and shoulder.
114	14th Oct.	Sandhurst ...	Eaglehawk ...	Extended St. Mungo Co.	Fall of rock (underground)	...	1	Some stone fell from where he was working, and rolled against him, slightly bruising his shoulder and hip.
115	21st Oct.	Sandhurst ...	Sandhurst ...	Ellesmere Co. ...	Fall of mullock (underground)	...	1	Two men were working near to some abandoned ground that had been filled up with mullock. They happened to break through to this place, and the mullock at once ran out, and before they could get away one of them was overtaken by the loose stuff and partly buried. He was got out in about four hours' time, with no further hurt than a few cuts and bruises. His mate also was shut in by the mullock, but sustained no injury.
116	21st Oct.	Sandhurst ..	Raywood ...	No. 20 Bruhn's Co....	Fall of sand (underground)	1	...	Deceased went to clear out a winze that had become choked with sand, and about two hours afterwards he was found at the bottom, buried head downwards in the sand and quite dead. It was surmised that the accident was due to a want of care on the part of deceased. At the inquest a verdict of "accidental death" was returned.
117	23rd Oct.	Maryborough	Maryborough	Joint Stock G. M. Co.	Fall of stone (underground)	...	1	The sufferer was struck by a piece of stone which fell from a slippery "cross-head," and sustained a fracture one of the bones of the ankle.

STATEMENT No. 1.—Showing the Particulars of each Mining Accident which happened in Victoria during the Year 1884—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Name of Company or Mine Owner.	Nature of Accident.	Persons killed.	Persons injured.	Particulars.
118	24th Oct.	Ballarat ...	Smythesdale	Little Wonder Co....	Fall down a shaft ...	...	1	Whilst being lowered down the shaft in question, by means of a rope, the sufferer lost his hold, and fell to the bottom, a distance of about 15 feet, fortunately escaping with a cut to the back of his head.
119	28th Oct.	Sandhurst ...	Eaglehawk ...	New St. Mungo Co.	Explosion of a charge (dynamite)	...	1	The injured man had fired a hole charged with blasting powder, with no other result than the blowing out of the tamping, and decided to re-charge with dynamite. He waited for a few minutes to allow the hole to cool, and then inserted the cartridges, when suddenly an explosion took place, and he was burnt and cut about the face, but fortunately was not seriously injured. It is supposed that the ground had not become cool enough to allow of the safe use of dynamite at the time when he attempted to re-charge the hole.
120	30th Oct.	Ballarat ...	Blackwood ...	Countess Co. ...	Explosion of a charge (dynamite)	...	1	The injured man had gone to a place of safety after firing a shot, but not immediately hearing a report, went back, just in time to encounter the force of the explosion, sustaining, in addition to numerous cuts and bruises, a broken arm and the loss of his left eye. The accident was the direct outcome of a serious violation of the law (Act No. 783, sect. 8, rule 1, sub-section 9), but, on account of the severe punishment the sufferer had already undergone by reason of his injuries, no prosecution was instituted.
121	5th Nov.	Sandhurst ...	Eaglehawk ...	Pearl Tribute Co. ...	Fall of hammer down shaft	...	1	A hammer in some manner fell from a stage in the shaft, and bruised the back of the sufferer, who was working below.
122	10th Nov.	Sandhurst ...	Sandhurst ...	New Chum United Co.	Fall of rock (underground)	...	1	The injured man was engaged in shifting quartz to a "pass," when a block of stone fell away from the hanging wall, and bruised his body and legs.
123	16th Nov.	Ballarat ...	Creswick ...	Berry Consols Co....	Fall of bucket and rope down shaft (caused by breakage of machinery)	...	2	Four men were working at the bottom of the shaft, and had just sent a bucket load of sand and water up to a height of about 130 feet, when the crank shaft of the winding engine broke, and the winding gear, being thus left free and without control, allowed the bucket to run rapidly down to the bottom. Strangely enough, the bucket fell clear of all four men, but the heavy 9-inch rope, which followed it down, struck two of them, and inflicted serious injuries. One man escaped with fractures of the right arm and shoulder; the other, in addition to much severer hurts of a similar nature to the foregoing, sustained two scalp wounds, a broken rib, and profuse internal hæmorrhage.
124	19th Nov.	Ararat ...	Pleasant Ck.	E. Clohosy (deceased) and others	Fall of earth (underground)	1	...	The system of mining adopted was very unskilful. The earth had been cut away all around the bottom of the shaft leaving the overhanging portion without any support. Whilst deceased was working at the face, throwing washdirt towards the shaft, the roof of the cutting gave way and fell upon him, causing almost instant death. Deceased himself was chiefly to blame, as his mates were wholly ignorant of underground mining and had to rely upon his judgment as to what was necessary to be done. At the inquest a verdict of "accidental death" was returned.
125	21st Nov.	Sandhurst ...	Eaglehawk ...	Virginia Co. ...	Explosion of charge (powder)	...	1	The injured man commenced to deepen a hole left by the previous shift, when the friction or percussion of drilling ignited a quantity of powder that had remained unexploded at the bottom. Fortunately the explosion did not occasion any more serious injuries than some burns to the sufferer's hand and arm. The accident could not have been guarded against, and no blame was imputed to any one.
126	22nd Nov.	Ballarat ...	Creswick ...	New Australasian Co.	Fall on the barriers at the top of a shoot	...	1	The mine lights had been extinguished, and the sufferer was hurrying to leave the workings, when, owing to his too great speed, the candle which he carried was blown out. Although he had matches with him he did not wait to re-kindle the light, but ran on, and in the darkness missed the drive by which he should have ascended, and maintained his pace until he was suddenly stopped by falling across the mouth of the main shoot. As it happened, barriers were in use here to prevent the trucks from being tipped into the shoot, otherwise he would have fallen a distance of 80 feet to the bottom; as it was, he escaped with bruised ribs, caused by his collision with the "buntings." He admitted that he was himself to blame for the accident.

127	22nd Nov.	Sandhurst ...	Sandhurst ...	New Chum and Victoria Co.	Fall of rock (underground)	...	1	A fall of rock occurred where the man was working, and struck him on the side, inflicting some bruises. The occurrence was wholly accidental.
128	25th Nov.	Sandhurst ...	Heatheote ...	Hip Ack (deceased)	Fall of earth (surface)	1	...	Deceased was working a sluicing claim, when the bank gave way and partly buried him. He was discovered at 7 p.m. on the same day, and attended to by some Chinese comrades, but died at midnight from the injuries he had sustained. At the magisterial inquiry a verdict of "accidental death" was returned.
129	25th Nov.	Ararat ...	Pleasant Ck.	Wonga and Birmingham Tribute Co.	Giving way of a stage	...	1	Two men were engaged in placing a prop, for which purpose they had to stand on a stage about 18 feet high, which, whilst they were upon it, suddenly gave way. One of the men escaped with a few bruises, but the other sustained a simple fracture of both bones of the right leg. The Inspector reported that the stage must have appeared perfectly safe immediately prior to its giving way, and that no person could be blamed for the accident.
130	29th Nov.	Ballarat ...	Creswick ...	Bute and Downes Amalgamated Co.	Machinery accident ...	1	...	The indicator had to be adjusted alternately as the engine served for hauling from one or the other of the two working levels. Deceased had stopped the engine in such a position that a spoke of the fly-wheel prevented him from reaching with his hand to where the indicator was fixed. He should then have allowed the piston to move until the spoke was out of the way, but instead he attempted to accomplish his object by leaning over the protecting railing and thrusting his head through the apertures of the wheel. The brake was not properly on, and the wheel then revolved slightly, one of the spokes descending and breaking deceased's neck. The deceased by his rashness brought the accident upon himself, and no blame was attributed to the company. The Inspector of Mines, however, recommended an alteration in the fixing of the indicator, by the adoption of which the possibility of the occurrence of a similar accident in future would be precluded.
131	1st Dec.	Sandhurst ...	Eaglehawk ...	Virginia Co. ...	Fall of stone (underground)	...	1	The injured man was struck by a piece of sandstone which slipped away in the stope where he was working, and sustained some bruises to the hip and back. The occurrence was purely accidental.
132	5th Dec.	Sandhurst ...	Eaglehawk ...	Golden Age Co. ...	Fall of stone (underground)	...	1	The sufferer sustained a fracture of the left leg, owing to some loose ground that he was working down falling upon him. The occurrence was wholly accidental.
133	9th Dec.	Sandhurst ...	Eaglehawk ...	Virginia Co. ...	Fall of stone (underground)	...	1	The injured man was putting in a hole in a stope, when a small piece of stone fell and fractured his skull, but not severely. No one was to blame for the accident.
134	12th Dec.	Ballarat ...	Steiglitz ...	Britannia Co. ...	Fall of stone (underground)	...	1	Two men were at work undermining a block of quartz, and when they thought they had cut far enough beneath it, one of them went away to get some boring tools, in order to put in a blast hole; during his absence the other man was tempted by the solid aspect of the block to try to undermine it a little further, but, owing to the hitherto unsuspected presence of a "head" or natural joint at the back of the quartz, the mass fell, and the adventurous miner received severe injuries to his back and the lower part of his body. The danger could not well have been foreseen, and therefore nobody was to blame, but the frequency of joints and faces in quartz reefs should be more often taken into consideration than it generally is in estimating the amount of undercutting that can be safely executed.
135	12th Dec.	Sandhurst ...	Sandhurst ...	Koch's Pioneer ...	Fall of stone (underground)	...	1	The sufferer was working down some ground that had been loosened by a shot, when a piece of it accidentally came away, and, falling upon him, fractured his left leg.
136	12th Dec.	Ballarat ...	Creswick ...	Lone Hand Co. ...	Fall down a jump-up	...	1	A young man employed in the mine was descending the jump-up by means of the ladder-way, which was in admirable condition, and in some unexplained manner lost his footing, and fell some 10 or 12 feet, dislocating and otherwise injuring his ankle.
137	20th Dec.	Gippsland ...	Stringer's Ck.	Long Tunnel Co. ...	Fall	...	1	The sufferer was levering down a piece of loosened dyke, and whilst he was in the act of applying pressure the rock came away unexpectedly, and the worker no longer being supported by its resistance, lost his balance, and fell forward upon a block of the stone, sustaining a fracture of one of his left ribs. The occurrence was entirely accidental.
138	22nd Dec.	Gippsland ...	Stringer's Ck.	Long Tunnel Co. ...	Fall of rock (underground)	...	1	The mate of the injured man had drawn the attention of the latter to an insecure portion of the hanging wall. The sufferer commenced to pick it down, standing fairly opposite to it, when a larger portion than was anticipated came away, separating into two slabs, the smaller of which knocked the man down, whilst the larger, weighing about 6 cwt., rolled on to him, inflicting a severe bruise on the back. If any one was to blame it was the sufferer himself.
139	31st Dec.	Maryborough	Dunolly ...	North Birthday Freehold Co.	Fall of earth (underground)	...	1	Whilst the sufferer was cutting a hole to receive some timber to support the ground, portion of the latter came away and struck him, occasioning a bruise on the right thigh. The occurrence was quite accidental.

STATEMENT No. 2.

Fatal Accidents.

Showing the Number of Persons Killed in Alluvial and Quartz Mining respectively in each of the several Mining Districts of Victoria in every Year from 1874 to 1884 inclusive.

District.	Alluvial Mining.											Quartz Mining.											Total.										
	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
Ballarat ...	16	14	11	14	7	9	7	9	32	8	10	10	6	12	8	5	4	8	9	5	6	1	26	20	23	22	12	13	15	18	37	14	11
Beechworth	5	6	4	4	2	6	5	4	3	2	1	3	3	...	1	...	3	2	1	2	2	1	8	9	4	5	2	9	7	5	5	4	2
Sandhurst...	2	5	2	2	...	1	2	2	...	...	1	21	25	7	12	11	11	12	21	10	17	9	23	30	9	14	11	12	14	23	10	17	10
Maryborough	7	6	9	5	1	3	1	4	6	9	4	3	2	1	1	4	1	...	1	1	5	1	10	8	10	6	5	4	1	5	7	14	5
Castlemaine	6	3	4	4	2	5	3	7	3	3	5	7	3	...	4	2	3	3	4	2	3	2	13	6	4	8	4	8	6	11	5	6	7
Ararat ...	1	6	1	4	1	1	3	2	3	...	2	5	2	4	4	4	1	2	6	1	1	1	6	8	5	8	5	2	5	8	4	1	3
Gippsland...	1	2	...	...	1	...	1	1	3	...	1	3	...	...	1	...	...	1	1	...	3	2	4	2	...	1	1	...	2	2	3	3	3
Totals ...	38	42	31	33	14	25	22	29	50	22	24	52	41	25	31	26	23	28	43	21	37	17	90	83	55	64	40	48	50	72	71	59	41

STATEMENT No. 3.

Showing the Causes of Fatal Accidents in each of the last Eleven Years (1874–1884).

Cause of Death.	Number of Persons killed in—											Total for Eleven Years.
	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	
Falls of earth or rock underground	35	45	26	20	16	17	22	28	19	18	14	260
Falls of earth on surface ...	10	13	9	9	5	12	8	12	7	4	7	96
Men falling down shafts... ...	19	6	7	15	7	8	8	5	5	12	7	99
Men falling down winzes or shoots	3	...	...	2	...	1	2	1	1	3	...	13
Falls of materials down shafts ...	2	3	4	3	4	3	1	7	4	4	1	36
,, ,, winzes, &c.	...	...	...	...	...	...	...	...	1	...	1	2
Cage accidents	2	3	2	5	2	2	3	7	6	10	1	43
Falls of timber underground ...	...	3	...	4	1	...	1	...	...	...	...	9
Machinery in motion	5	2	1	...	...	...	2	4	1	...	2	17
Flooding of mines	...	...	...	...	...	...	...	...	23	...	...	23
Explosion of charges of powder ...	2	4	2	...	2	1	...	2	1	1	1	16
,, nitro-glycerine compounds	5	1	...	1	1	1	...	3	...	2	3	17
,, gun-cotton... ...	1	...	...	...	...	...	...	...	...	...	...	1
Explosions of fire-damp... ...	...	...	1	...	...	...	...	...	...	...	...	1
Explosions of stored explosives ...	...	1	...	...	2	...	...	1	1	...	1	6
Explosions of boilers	...	...	...	...	...	...	...	...	1	...	...	1
Truck accidents	1	...	...	1	...	...	...	...	...	1	1	4
Foul air	...	1	...	2	...	...	...	...	1	...	2	6
Miscellaneous	5	1	3	2	...	3	3	2	...	4	...	23
Totals... ...	90	83	55	64	40	48	50	72	71	59	41	673

STATEMENT No. 4.

SHOWING the Names of Persons Killed by Mining Accidents during the Year 1884, their condition and the Number of Children left by them.

Accident. No.	Accident. Date.	District.	Division.	Name.	Condition.	No. of Children.
5	9th January ...	Ballarat ...	Smythesdale ...	Sun Gip	Married	
6	9th January ...	Maryborough	Maryborough	Thomas Worthington ...	Single.	
13	28th Jauuary...	Ballarat ...	Creswick ...	William Hy. McDonald ...	Married ...	Five dependent.
14	30th January...	Ballarat ...	Creswick ...	James Mather	Single.	
16	31st January...	Sandhurst ...	Sandhurst ...	John Hardy	Married ...	Seven.
18	8th February...	Sandhurst ...	Sandhurst ...	George Crossmau	Married ...	One.
21	11th February	Maryborough	Amherst ...	Sing You...	Widower.	Nene.
23	12th February	Ballarat ...	Creswick ...	John Bowker	Single.	
24	13th February	Castlemaine ...	Tarrengower...	John Shearer	Married ...	One.
30	22nd February	Castlemaine ...	Fryer's Creek	Lodovico Franzi	Single.	
32	29th February	Castlemaine ...	St. Andrew's...	William Henry Paine ...	Married ...	Four.
33	1st Mareh ...	Ballarat ...	Smythesdale ...	Lim Ah You	Single.	
39	28th Mareh ...	Sandhurst ...	Sandhurst ...	Robert Bell	Married ...	Four.
45	5th April ...	Castlemaine ...	Tarrengower...	Thomas Roberts, jun. ...	Single.	
48	8th April ...	Gippsland ...	Stringer's Creek	John Hughes	Married ...	Four.
				Evan Thomas	Married ...	Four.
52	19th April ...	Sandhurst ...	Sandhurst ...	James Coad	Married ...	None.
54	25th April ...	Beechworth ...	Indigo ...	James Downie	Married ...	Four.
58	17th May ...	Maryborough	Amherst ...	Gustav Adolf Schroeder ...	Married ...	Four.
63	3rd June ...	Ballarat ...	Steiglitz ...	John Mason	Married ...	None.
67	12th June ...	Sandhurst ...	Sandhurst ...	Benjamin Webster ...	Married ...	None.
71	16th June ...	Sandhurst ...	Eaglehawk ...	Charles Shaw	Single.	
73	19th June ...	Maryborough	St. Arnaud ...	Robert Simpson	Single.	
74	21st Juue ...	Castlemaine ...	St Andrew's...	Ah Chin	Single.	
77	2nd July ...	Sandhurst ...	Sandhurst ...	Patrick Carmody	Married ...	Six.
82	11th July ...	Maryborough	Inglewood ...	James Franeis Delbridge ...	Single.	
83	22nd July ...	Ballarat ...	Ballarat ...	Samuel King	Married ...	Four dependent.
89	31st July ...	Beechworth ...	Beechworth ...	John McGregor	Married ...	Eleven.
90	31st July ...	Gippsland ...	Omeo ...	Ahn Yee	Single.	
94	12th August ...	Castlemaine ...	Daylesford ...	Michael Kennedy	Single.	
97	19th August ...	Ararat ...	Ararat ...	Len Hing	Single.	
98	25th August ...	Ararat ...	Pleasant Creek	Lewis Lewis	Married ...	Three.
104	17th September	Ballarat ...	Smythesdale ...	Ah Nam	Single.	
109	24th September	Ballarat ...	Creswick ...	Andrew Drummond ...	Married ...	Three.
				David Taylor	Single.	
111	30th September	Sandhurst ...	Sandhurst ...	John McIntosh	Married ...	Nine.
112	11th October ...	Castlemaine ...	St. Andrew's...	John McNaught	Single.	
116	21st October ...	Sandhurst ...	Raywood ...	George Marehmont ...	Married ...	Seven.
124	19th November	Ararat ...	Pleasant Creek	Edward Clohosy	Single.	
128	25th November	Sandhurst ...	Heatheote ...	Hip Aek	Single.	
130	29th November	Ballarat ...	Creswick ...	Gilbert Steel	Married ...	Family not dependent.

NOTE.—For particulars of each of the above-mentioned accidents, see Schedule, page 66.

STATEMENT No. 5.

Non-Fatal Accidents.

Showing the Number of Persons Injured in Alluvial and Quartz Mining respectively in each of the several Mining Districts of Victoria during Eleven Years (1874–1884).

District.	Alluvial Mining.											Quartz Mining.										Total.									
	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
Ballarat ...	45	45	29	18	17	11	5	8	12	17	17	27	24	30	29	9	15	14	18	20	14	11	72	69	59	47	26	26	19	26	32	31	28
Beechworth	13	6	7	11	5	5	4	8	4	4	3	11	6	3	5	1	3	1	2	7	2	1	24	12	10	16	6	8	5	10	11	6	4
Sandhurst...	2	2	1	3	...	4	2	2	1	2	...	68	62	41	46	37	32	29	26	52	59	51	70	64	42	49	37	36	31	28	53	61	51
Maryborough	15	24	18	13	7	12	9	12	4	2	8	3	6	7	6	7	10	4	6	7	6	4	18	30	25	19	14	22	13	18	11	8	12
Castlemaine	7	4	7	5	1	2	3	3	6	1	...	34	11	13	11	10	10	5	5	12	10	1	41	15	20	16	11	12	8	8	18	11	1
Ararat ...	4	3	1	1	...	1	1	2	1	6	5	9	17	8	3	11	6	6	8	2	1	1	13	20	9	4	11	7	7	10	3	7	6
Gippsland ...	...	...	1	...	...	...	5	5	...	1	...	7	7	4	3	1	1	1	3	2	3	4	7	7	5	3	1	1	6	8	2	4	4
Totals ...	86	84	64	51	30	35	29	40	28	33	33	159	133	106	103	76	77	60	68	102	95	73	245	217	170	154	106	112	89	108	130	128	106

STATEMENT No. 6.

Showing the Causes of Non-fatal Accidents in each of the Eleven Years from 1874 to 1884 inclusive.

Cause of Injury.	Number of Persons injured in—											Total for Eleven Years.
	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	
Falls of earth or rock underground	60	58	53	49	41	41	29	39	46	45	33	494
Falls of earth on surface ...	15	8	11	12	4	9	2	4	1	6	1	73
Men falling down shafts	21	19	13	12	10	8	10	5	13	12	9	132
Men falling down winzes, shoots, passes, &c.	9	10	2	4	2	2	6	6	6	10	4	61
Fall of materials down shafts, passes, &c.	19	18	19	12	8	8	10	9	12	10	10	135
Cage accidents	2	16	5	8	10	7	5	7	9	5	13	87
Injured in setting timber ...	4	2	1	5	1	4	1	...	...	...	1	19
Truck accidents	...	5	8	5	1	3	...	4	5	4	3	38
Machinery in motion	15	8	8	10	1	4	3	3	3	4	4	63
Explosion of charges of powder ...	13	15	8	17	11	11	7	7	11	10	5	115
„ nitro-glycerine compounds	21	5	4	2	1	1	...	2	3	4	7	50
„ gun-cotton ...	6	1	3	...	...	...	...	...	...	...	...	10
Explosions of boilers	1	1	1	...	2	...	...	...	...	...	...	5
Explosions of fire-damp	2	10	2	...	5	...	...	...	1	...	...	20
Explosions of stored explosives ...	...	4	3	6	1	1	5	5	3	...	...	28
Miscellaneous	57	37	29	12	8	13	11	17	17	18	16	235
Totals	245	217	170	154	106	112	89	108	130	128	106	1,565

STATEMENT No. 7.

Showing the Names and Condition of Persons Injured through Mining Accidents during the Year 1884.

Accident.		Mining District.	Division.	Names of Persons Injured.	Condition.
No.	Date.				
	1884.				
1	2nd January ...	Maryborough ...	Amherst	John Reher	Married
				John Sellborn	Single
				John Beckmann	Single
				M. Whelan	Married
2	2nd January ...	Sandhurst ...	Sandhurst ...	Thomas Sterry	Married
3	8th January ...	Maryborough ...	Inglewood ...	James Beattie	Single
4	8th January ...	Sandhurst ...	Sandhurst ...	Wm Steebles	Married
7	11th January ...	Sandhurst ...	Sandhurst ...	Samuel Davey	Married
8	15th January ...	Ballarat ...	Buninyong ...	John Meade	Married
9	15th January ...	Sandhurst ...	Sandhurst ...	John Williamson	Single
10	18th January ...	Ballarat ...	Creswick ...	William Jayne	Married
11	24th January ...	Sandhurst ...	Eaglehawk ...	John Dunstan	Married
12	25th January ...	Sandhurst ...	Sandhurst ...	Walter Luckswald	Married
15	31st January ...	Ballarat ...	Creswick ...	Michael Duffy	Widower
17	8th February ...	Ballarat ...	Creswick ...	Patrick Guthrie	Single
18	8th February ...	Sandhurst ...	Sandhurst ...	Richard Cornish	Married
19	9th February ...	Beechworth ...	Beechworth ...	Francis Robson	Married
20	11th February ...	Ballarat ...	Creswick ...	John Armstrong	Married
22	11th February ...	Maryborough ...	Maryborough ...	Edward Nicholls	Single
25	14th February ...	Sandhurst ...	Sandhurst ...	Henry Bell	Married

STATEMENT No. 7.—Showing the Names and Conditions of Persons Injured, &c.—*continued.*

Accident. No.	Accident. Date.	Mining District.	Division.	Names of Persons Injured.	Condition.
	1884.				
26	14th February ...	Sandhurst ...	Sandhurst ...	William White	Married
27	15th February ...	Sandhurst ...	Sandhurst ...	Richard Bennetts	Married
28	19th February ...	Gippsland ...	Stringer's Creek ...	William Thompson	Single
29	21st February ...	Ararat ...	Raglan ...	Thomas Cummins	Married
31	25th February ...	Sandhurst ...	Sandhurst ...	Archibald F. Martin	Married
34	11th March ...	Sandhurst ...	Eaglehawk ...	John Tweed	Married
35	11th March ...	Ararat ...	Raglan ...	Charles Ready	Single
36	14th March ...	Sandhurst ...	Sandhurst ...	J. George	Married
37	15th March ...	Ballarat ...	Creswick ...	John Lomas	Married
38	20th March ...	Ballarat ...	Smythesdale ...	William Sparks	Single
40	28th March ...	Maryborough ...	Avoca ...	William Plowright	Married
41	29th March ...	Sandhurst ...	Sandhurst ...	Henry Rothacker	Single
42	31st March ...	Sandhurst ...	Sandhurst ...	John Thomas	Married
43	1st April	Ballarat ...	Ballarat ...	William Saunders	Single
44	4th April	Sandhurst ...	Waranga ...	Stephen Prideux	Married
46	7th April	Beechworth ...	Beechworth ...	Colin Fraser	Single
47	8th April... ...	Sandhurst ...	Sandhurst ...	Thomas Whitford	Married
49	10th April ...	Ballarat ...	Creswick ...	Thomas Hancock	Single
50	10th April ...	Sandhurst ...	Raywood ...	George Young	Single
51	16th April ...	Beechworth ...	Indigo ...	John Pennington	Married
53	21st April ...	Ballarat ...	Smythesdale ...	Ludwig Wangler	Widower
55	5th May	Ararat ...	Pleasant Creek ...	Joseph Frost	Widower
56	9th May	Sandhurst ...	Sandhurst ...	Joseph Harris	Single
57	9th May	Maryborough ...	Inglewood ...	William Dier	Married
59	23rd May... ...	Sandhurst ...	Raywood ...	Thomas Helles...	Married
60	24th May... ...	Sandhurst ...	Sandhurst ...	Francis Agnew	Married
61	30th May... ...	Sandhurst ...	Eaglehawk ...	William Motherson	Single
62	30th May... ...	Sandhurst ...	Heatheote ...	Charles Schwartze	Married
64	3rd June	Sandhurst ...	Eaglehawk ...	William Rule	Married
65	5th June	Sandhurst ...	Eaglehawk ...	Philip Williams	Married
66	11th June ...	Ballarat ...	Creswick ...	James Pearce	Single
68	12th June ...	Maryborough ...	Maryborough ...	Thomas Jenkins	Married
69	14th June ...	Ballarat ...	Creswick ...	Richard Woolcock	Married
70	14th June ...	Ballarat ...	Creswick ...	Richard Pope	Married
72	17th June ...	Ballarat ...	Ballarat ...	Henry Maynard	Married
75	26th June ...	Sandhurst ...	Sandhurst ...	George Eddy	Single
76	2nd July	Ballarat ...	Ballarat ...	George Simpson	Married
77	2nd July	Sandhurst ...	Sandhurst ...	Samuel Laity	Married
78	5th July	Sandhurst ...	Sandhurst ...	William Richards	Single
79	7th July	Sandhurst ...	Sandhurst ...	William Andrews	Widower
80	7th July	Sandhurst ...	Eaglehawk ...	John Shea	Single
81	9th July	Sandhurst ...	Eaglebawk ...	George McWilliams	Married
84	23rd July... ...	Ararat ...	Raglan ...	John Steele	Married
85	23rd July... ...	Ballarat ...	Creswick ...	Richard Lewis	Widower
86	23rd July... ...	Maryborough ...	Maryborough ...	Donald Holmes	Single
87	29th July... ...	Sandhurst ...	Eaglehawk ...	John Reed	Married
88	31st July	Sandhurst ...	Sandhurst ...	Thomas Richards	Single
91	7th August ...	Ballarat ...	Creswick ...	William Pettigrew	Married
92	11th August ...	Sandhurst ...	Sandhurst ...	John Roughan	Married
93	11th August ...	Ballarat ...	Creswick ...	James Meaney	Married
95	14th August ...	Beechworth ...	Beechworth ...	F. Florimel	Married
96	15th August ...	Castlemaine ...	St. Andrew's ...	John Philip	Married
99	27th August ...	Ararat ...	Raglan ...	James Charlton	Single
100	28th August ...	Ballarat ...	Smythesdale ...	William Hockridge	Single
101	30th August ...	Sandhurst ...	Eaglebawk ...	John Matthews	Single
102	3rd September ...	Sandhurst ...	Sandhurst ...	Edward Vine	Married
103	4th September ...	Sandhurst ...	Sandhurst ...	Walter Hardiman	Married
105	17th September ...	Ballarat ...	Ballarat ...	William Rees	Married
106	19th September ...	Gippsland ...	Stringer's Creek ...	William Scales...	Single
107	22nd September ...	Sandhurst ...	Sandhurst ...	Henry Doble	Single
108	24th September ...	Sandhurst ...	Sandhurst ...	James Walker	Married
110	25th September ...	Ballarat ...	Smythesdale ...	Ling Si	Single
113	11th October ...	Sandhurst ...	Eaglehawk ...	W. H. Roberts	Married
114	14th October ...	Sandhurst ...	Eaglehawk ...	William Horrel	Married
115	21st October ...	Sandhurst ...	Sandhurst ...	Patrick Mead	Married
117	23rd October ...	Maryborough ...	Maryborough ...	William Williams	Single
118	24th October ...	Ballarat ...	Smythesdale ...	Solomon McColl	Married
119	28th October ...	Sandhurst ...	Eaglehawk ...	Hugh Long	Married
120	30th October ...	Ballarat ...	Blackwood ...	Daniel Cronin	Single
121	5th November ...	Sandhurst ...	Eaglehawk ...	Absalom Ellis	Married
122	10th November ...	Sandhurst ...	Sandhurst ...	William Hardy	Single
123	16th November ...	Ballarat ...	Creswick ...	W. Wearmouth	Widower
				George Saddler	Married
125	21st November ...	Sandhurst ...	Eaglehawk ...	James Galloway	Single
126	22nd November ...	Ballarat ...	Creswick ...	Wm. Cartner	Married
127	22nd November ...	Sandhurst ...	Sandhurst ...	Henry Sheppard	Married
129	25th November ...	Ararat ...	Pleasant Creek ...	W. H. Seaborn	Married
131	1st December ...	Sandhurst ...	Eaglehawk ...	John Gill	Single
132	5th December ...	Sandhurst ...	Eaglehawk ...	Joseph Rogers	Single
133	9th December ...	Sandhurst ...	Eaglehawk ...	John Yarwood	Married
134	12th December ...	Ballarat ...	Steiglitz ...	John Barrett	Married
135	12th December ...	Sandhurst ...	Sandhurst ...	Wm. Zalinsky	Married
136	12th December ...	Ballarat ...	Creswick ...	John Kragger	Single
137	20th December ...	Gippsland ...	Stringer's Creek ...	Thos. Sowden	Married
138	22nd December ...	Gippsland ...	Stringer's Creek ...	Patrick Norton	Married
139	31st December ...	Maryborough ...	Dunolly ...	J. Montgomery	Single

NOTE.—For particulars of each of the above-mentioned accidents, see Schedule, page 66.

STATEMENT No. 8.

SHOWING the Mean Number of Miners employed, the Average Number of Accidents per 1,000 Miners, and the Average Number per 1,000 Killed and Injured in each of the Mining Districts of Victoria, during the Year 1884.

Mining District.	Mean Number of Miners employed.	Average Number of Mining Accidents per 1,000 persons employed.	Average Number of Persons killed by Mining Accidents per 1,000 persons employed.	Average Number of Persons injured by Mining Accidents per 1,000 persons employed.
Ballarat	6,625·25	5·584	1·660	4·226
Beechworth	3,977·25	1·508	0·502	1·005
Sandhurst	5,105·50	11·556	1·958	9·989
Maryborough	4,963·75	2·820	1·007	2·417
Castlemaine	4,444·75	1·799	1·574	0·224
Ararat	2,225·25	4·044	1·348	2·696
Gippsland	1,840·25	3·260	1·630	2·173
For Victoria	29,182·00	4·763	1·404	3·635

STATEMENT No. 9.

SHOWING the Mean Number of Miners employed, the Number of Accidents, Number of Persons Killed and Injured respectively thereby, and the Average Proportions of Killed and Injured per 1,000 Miners in each of the Eleven Years 1874–1884 inclusive.

Year.	Mean Number of Miners Employed.	Number of Accidents.	Number of Persons		Total Killed and Injured.	Average per 1,000 Killed.	Average per 1,000 Injured.
			Killed.	Injured.			
1874	46,512	296	90	245	335	1·93	5·26
1875	42,058	275	83	217	300	1·97	5·15
1876	41,531	209	55	170	225	1·32	4·10
1877	38,860	213	64	154	218	1·65	3·96
1878	37,212	121	40	106	146	1·07	2·85
1879	37,195	146	48	112	160	1·29	3·01
1880	38,076	134	50	89	139	1·32	2·34
1881	38,436	157	72	108	180	1·87	2·81
1882	37,446	165	71	130	201	1·89	3·47
1883	33,927	171	59	128	187	1·74	3·77
1884	29,182	139	41	106	147	1·40	3·63
For eleven years { Totals	...	2,026	673	1,565	2,238	...	...
For eleven years { Means	38,221	184	61	142	203	1·59	3·71

STATEMENT No. 10.

SHOWING the proportions of Killed and Injured per 1,000 Miners employed in Alluvial and Quartz Mining during each of the Eleven Years 1874–1884 inclusive.

Years.	Alluvial Mining.		Quartz and other Lode Mines.		All Classes of Mining.	
	Number per 1,000.		Number per 1,000.		Number per 1,000.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1874	1·21	2·75	3·40	10·39	1·93	5·26
1875	1·52	3·03	2·84	9·23	1·97	5·15
1876	1·15	2·38	1·64	7·25	1·32	4·10
1877	1·37	2·11	2·11	7·00	1·65	3·96
1878	0·61	1·32	1·79	5·25	1·07	2·85
1879	1·11	1·55	1·57	5·25	1·29	3·01
1880	0·96	1·27	1·82	3·90	1·32	2·34
1881	1·30	1·76	2·66	4·21	1·87	2·81
1882	3·10	1·73	0·98	4·78	1·89	3·47
1883	1·15	1·73	2·49	6·39	1·74	3·77
1884	1·48	2·044	1·303	5·59	1·40	3·63

STATEMENT No. 11.

Showing the Number of Mining Accidents which occurred in Alluvial and Quartz Mining in the several Divisions of each Mining District during the Year 1884.

Mining District.	Division.	In Alluvial Mining.			In Quartz Mining.		
		Number of Accidents.	Killed.	Injured.	Number of Accidents.	Killed.	Injured.
Ballarat ...	Ballarat	...	...	...	6	1	5
	Buninyong	...	...	...	1	...	1
	Smythesdale	7	3	4	1	...	1
	Blackwood	...	...	...	1	...	1
	Steiglitz	1	1	...	1	...	1
	Creswick...	16	6	12	3	...	3
	Totals	24	10	16	13	1	12
Beechworth ...	Beechworth	4	1	3	...	...	...
	Indigo	...	...	...	2	1	1
	Yackandandah	...	...	...	...	...	...
	Buckland	...	...	...	...	...	...
	Goulburn	...	...	...	...	...	...
	Mitta Mitta	...	...	...	...	...	...
	Totals	4	1	3	2	1	1
Sandhurst ...	Sandhurst and Eaglehawk	...	...	...	53	8	47
	Raywood...	...	...	...	3	1	2
	Heathcote	1	1	...	1	...	1
	Waranga...	...	...	...	1	...	1
	Kilmore	...	...	...	...	...	...
	Totals	1	1	...	58	9	51
Maryborough ...	Amherst	3	2	4	...	...	...
	Avoca	1	...	1	...	...	...
	Dunolly	...	...	...	1	...	1
	Tarnagulla	...	...	...	...	...	...
	Inglewood	...	...	...	3	1	2
	Maryborough	4	1	3	1	...	1
	St. Arnaud	1	1	...	...	...	...
	Wedderburn	...	...	...	...	...	...
	Totals	9	4	8	5	1	4
Castlemaine ...	Castlemaine	...	...	...	...	...	...
	Fryer's Creek	1	1	...	...	...	...
	Taradale	...	...	...	...	...	...
	Tarrengower	...	...	...	2	2	...
	Daylesford	1	1	...	...	...	...
	St. Andrew's	4	3	1	...	...	...
	Totals	6	5	1	2	2	...
Ararat	Ararat	1	1	...	...	...	...
	Pleasant Creek	2	1	1	2	1	1
	Barkly	...	...	...	...	...	...
	Raglan	4	...	4	...	...	...
	Totals	7	2	5	2	1	1
Gippsland ...	Stringer's Creek	...	...	...	5	2	4
	Russell's Creek	...	...	...	...	...	...
	Omeo	1	1	...	...	...	...
	Mitchell River	...	...	...	...	...	...
	Crooked River	...	...	...	...	...	...
	Jericho	...	...	...	...	...	...
	Donnelly's Creek	...	...	...	...	...	...
	Totals	1	1	...	5	2	4
	Grand Totals	52	24	33	87	17	73

STATEMENT No. 12.

SHOWING the Results of Prosecutions under *The Regulation of Mines and Mining Machinery Act* during the Year 1884.

Date.	Prosecution instituted against.	Where Prosecution took place.	Offence. (See Synopsis of Act No. 783, page 92.)	Result.	Remarks.
1884.					
3rd January ...	Ah Man and Ah Yen ...	Ballarat East ...	Violation of section 19 of Act No. 783	Case dismissed	The defendants were proceeded against for contributory negligence to accident No. 167, 1883.
10th January	James Sampson, manager Exhibition No. 1 Co.	Maldon ...	Violation of section 13 of Act No. 583	Fined £2,* with £5 14s. costs...	*Fine ordered by the bench to be given to T. Marks, who was injured by the accident of 26/7/83. (No. 105, 1883.)
10th January	Ditto	Maldon ...	Violation of general rule XVIII. of section 6 of Act No. 583	Fined £1, with £1 19s. costs.	
2nd February	Joseph Hocking, engine-driver of Phœnix Co.	Eaglehawk ...	Violation of section 19 of Act No. 783	Fined £5, with £2 17s. costs	Contributory negligence to accident No. 7, 1884.
9th February	Jas. Trewsdale, M. Owen, and two others	Eaglehawk ...	Violation of section 19 of Act No. 783	Each man (4) fined £2, with £1 7s. costs	
15th February	A. Oates, manager Webb's Freehold Co.	Buninyong ...	Violation of general rule XXIV. of section 8 of Act No. 783	Fined £5, with £1 3s. 6d. costs.	
15th February	John Rowe, manager South Imperial Co.	Buninyong ...	Violation of general rule XXIV. of section 8 of Act No. 783	Fined £5, with £2 4s. 6d. costs.	
15th February	E. D. Fattorini, owner Young Band Extended Co.	Ballarat ...	Violation of section 5 of Act No. 783	Fined 1s., with £1 10s. costs	For employing a boy under the age of 14 years.
21st February	F. Schultz, manager Union G. M. Co.	Talbot ...	Violation of general rule XXIV. of section 8 of Act No. 783	Fined £5, with £1 18s. costs.	
21st February	Ditto	,,	Violation of general rule XXV. of section 8 of Act No. 783	Fined £1, with £1 18s. costs.	
22nd February	E. Clifton, mining manager Young Band Extended Co.	Ballarat ...	Violation of section 19 of Act No. 783	Case dismissed	See accident of 23/11/83, No. 162.
29th February	A. Campbell, captain of shift	Ballarat ...	Violation of section 19 of Act No. 783	Fined £5, with £2 4s. costs	
6th March ...	Jas. Bromfield and Richd. Grigg	Maldon ...	Violation of general rule XXVIII. of section 8 of Act No. 783	Fined 10s. each, with £4 1s. 9d. costs each...	See accident No. 24, 1884.
19th March ...	James Madden	Allendale ...	Violation of section 19 of Act No. 783	Case dismissed	See accident No. 17, 1884.
17th April ...	Chas. Buckholdt, engine-driver Eureka Extended Co.	Sandhurst ...	Violation of section 7 of Act No. 783	Fined £10, with £4 8s. 6d. costs	For gross negligence in lowering two men into the well on 31/3/84. £5 of the fine to be equally divided between the men.
1st May ...	Simeon Robins, engine-driver German Reef Tribute Co.	Maldon ...	Violation of general rule XXXI. of section 8 of Act No. 783	Fined £6, with £4 13s. 6d. costs	See accident No. 45, 1884.
15th May ...	David Thomson, manager Phœnix G. M. Co.	Rushworth ...	Violation of section 21 of Act No. 783	Fined £1, with £2 1s. costs	Neglect to report accident No. 44, 1884.
,,	P. Greeves, engine-driver Chiltern Valley G. M. Co.	Chiltern ...	Violation of section 19 of Act No. 783	Case dismissed	See accident No. 51, 1884.
17th June ...	J. Fox, owner Fox's Freehold Co.	Smythesdale ...	Violation of general rule XXV. of section 8 of Act No. 783	Fined £2, with 15s. 6d. costs.	
,,	Ditto	,,	Violation of general rule XXXV. of section 8 of Act No. 783	Fined £2, with 15s. 6d. costs.	

STATEMENT No. 12.—Results of Prosecutions under *The Regulation of Mines and Mining Machinery Act* during the Year 1884—*continued.*

Date.	Prosecution instituted against.	Where Prosecution took place.	Offence. (See Synopsis of Act No. 783, page 92.)	Result.	Remarks.
17th June ...	H. Edwards, manager Linton Park	Smythesdale ...	Violation of general rule XXIV. of section 8 of Act No. 783	Fined £2, with 15s. 6d. costs.	
17th June ...	E. Marks, owner Cement Works	Smythesdale ...	Violation of general rule XXXV. of section 8 of Act No. 783	Fined £2, with 15s. 6d. costs.	
„ ...	Ditto	„ ...	Violation of general rule XXXV. of section 8 of Act No. 783	Case dismissed	Boiler unprovided with steam gauge.
5th July ...	J. Wild, manager Rose of Denmark Co.	Eaglehawk ...	Violation of paragraph *b*, general rule II., section 8, of Act No. 783	Fined £2, with £3 1s. 6d. costs.	
2nd September	Jno. Abrew	Maryborough ...	Violation of section 19 of Act No. 783	Fined £1, with 10s. costs	Fine ordered to be paid to D. Holmes, the man who was injured by Abrew's carelessness. See accident No. 86, 1884.
9th September	Jno. Norris	Malmsbury	Violation of section 19 of Act No. 783	Fined £2, with £2 9s. costs	This man was prosecuted in consequence of an explosion of lithofracteur, caused by his carelessness, in No. 1 South Queen's Birthday mine, Malmsbury, whereby a man was slightly injured and a horse was killed.
10th September	Wm. Hatton	Ararat	Violation of general rule XXXVI. of section 8 of Act No. 783	Fined £2	For dismantling shaft of Phœnix Co., Armstrongs.
20th September	Wm. Mathews	Eaglehawk ...	Violation of section 19 of Act No. 783	Fined £5, with £2 6s. costs	See accident No. 101.
29th September	D. Dash, engine-driver United Devonshire Co.	Eaglehawk ...	Violation of section 7 of Act No. 783	Fined £5, with £2 15s. costs	Company's boiler became damaged through Dash's carelessness.
4th December	Ah Him	Linton ...	Violation of paragraph *g*, rule II. of section 8 of Act No. 783	Fined £1, with £5 9s. cos ts ...	For returning to missed-fire shots before 30 minutes had elapsed from period of firing.
4th December	Jno. Conroy	Linton ...	Violation of paragraph *g*, rule II. of section 8 of Act No. 783	Fined £2, with £4 costs	

STATEMENT No. 13.

SHOWING the Amounts Paid during the Year 1884 to Persons Injured, and to the Relatives of Persons Killed, through Mining Accidents.

Date of Accident.	No. (See List of Accidents.)	Person Injured.	Person Killed.	Amount Paid.	By whom Paid.	Remarks.
1883.						
13th February...	22/1883.	... ...	Michael Shallue ...	£500	Long Tunnel G. M. Co., Walhalla.	
1884.						
2nd January ...	1/1884	Jno. Reher	... ...	The company paid each of the men half dividend for the first three months	Union G. M. Tribute Co., Talbot	A public subscription of £300 was collected, and is being paid to the men proportionately to the injuries sustained and number of family.
		Jno. Sellhorn	... ...			
		Jno. Baehmann ...	... ...			
		Morris Whelan	... ...			
9th January ...	6	... ...	Thos. Worthington ...	Funeral expenses paid, and £50 presented to deceased's mother	New Kong Meng G. M. Co., Majorca.	
18th January ...	10	Wm. Jayne	... ...	£40	Dowling Forest Estate Co.	
30th January ...	14	... ...	Jas. Mathers	Funeral expenses paid, and £100 paid to relatives	Ristori Co., Allendale.	
31st January ...	16	... ...	Jno. Hardy	£20 paid to widow	New Chum Railway Reserve Co., Sandhurst.	
8th February ...	17	P. Guthrie	... ...	£150	Lone Hand Co., Allendale.	
8th February ...	18	... ...	Geo. Crossman	£20	United Hustler's and Redan, Sandhurst.	
11th February...	22	Edwd. Nicholls ...	... ...	£10 during period he was unable to work	The Duke Co., Timor.	
12th February...	23	... ...	Jno. Bowker	£25	New Australasian Co., Creswiek.	
13th February...	24	... ...	Jno. Shearer	A subscription was got up to aid the widow, to which the company contributed £3 3s.	South Parkin's Reef G. M. Co., Maldon.	
15th February...	27	Richd. Bennetts ...	... ...	Was paid his wages until he resumed work	Pearl Co., Eaglehawk.	
11th March ...	34	Jno. Tweed	... ...	£20	Rose of Denmark Co., Eaglehawk.	
28th March ...	39	... ...	Robt. Bell	Widow will receive half wages (£1 2s. 6d. per week) for two years from date of accident	Belmont and Saxby Co., Eaglehawk.	
17th May ...	58	... ...	G. A. Schroeder ...	£10 paid for funeral expenses, and £1 per week for one year to widow from date of accident	South Greenock G. M. Co., Talbot.	
12th June ...	67	... ...	Benjn. Webster ...	£50 paid to widow	New Chum United, Sandhurst.	
2nd July ...	77	... ...	Patk. Carmody... ...	Widow is being paid half wages (£1 5s. per week)	Shenandoah Co., Sandhurst.	
22nd July ...	83	... ...	Saml. King	£32 5s. 6d. funeral and other expenses, and £155 paid to relatives	Band of Hope and Albion Consols Co., Ballaarat.	
31st July ...	89	... ...	Jno. McGregor	£100 raised by public subscription for widow and children	Try-Again Co., Eldorado.	
25th August ...	98	... ...	Lewis Lewis	£25	Al Perthshire Co., Stawell.	
28th August ...	100	Wm. Hoekridge ...	... ...	Medical expenses £2 10s.	Racecourse Co., Haddon.	
19th September	106	Wm. Seales	... ...	£40	Long Tunnel Extended Co., Walhalla.	
24th September	109	... ...	A. Drummond	£50 and funeral expenses	New Australasian Co., Creswiek.	
			D. Taylor	£25 and funeral expenses		
30th September	111	... ...	Jno. McIntosh	£50 and funeral expenses	Great Extended Hustler's Co., Sandhurst.	
21st October ...	116	... ...	Geo. Marchmont ...	£20 and funeral expenses	No. 20 Co., Raywood.	
10th November	122	Wm. Hardy	... ...	15s. per week until he resumes work	New Chum United, Sandhurst.	

NOTE.—The amounts stated above are exclusive of those paid by the various miners' associations as accident pay, &c.—See Statement No. 14.

STATEMENT No. 14.

SHOWING the Number of Benefit Members on the Books of the various Branches of the Amalgamated Miners' Association throughout the Colony on the 31st December, 1884, the number of Accidents to Members during the Year, and the Amount paid by way of Allowances.

Branch.	No. of Benefit Members on Books on Dec. 31st, 1884.			Accidents to Members during the Year.			No. of Claims on Fund.	Amount Paid during the Year.		
	Employed.	Unemployed.	Total.	Fatal.	Serious.	Not Serious.		Death Allowance.	Accident Allowance.	Total.
								£ s. d.	£ s. d.	£ s. d.
1. Sandhurst	1,960	200	2,160	9	10	305	216	180 0 0	1,059 3 4	1,239 3 4
2. Stawell	370	...	370	1	3	56	60	50 0 0	265 5 0	315 5 0
3. Creswick	1,650	110	1,760	4	21	364	378	305 0 0	1,387 8 0	1,692 8 0
4. Harrietville ...	20	10	30	...	...	...	...	...	...	...
5. Ballarat	750	150	900	1	18	162	181	37 9 0	598 0 0	635 9 0
6. Waterloo	276	26	302	...	2	75	77	...	243 5 8	243 5 8
7. Buninyong... ...	142	...	142	...	...	43	7	...	64 13 8	64 13 8
8. Haddon	140	20	160	...	9	41	31	...	205 10 10	205 10 10
9. Egerton	122	...	122	...	...	33	33	...	106 0 0	106 0 0
10. Chiltern	120	...	120	...	...	22	22	...	41 18 4	41 18 4
11. Majorca	215	...	215	1	1	47	49	20 0 0	100 3 8	120 3 8
12. St. Arnaud ...	100	4	104	...	...	19	6	...	32 3 4	32 3 4
13. Homebush... ...	230	35	265	...	1	37	38	...	101 15 6	101 15 6
14. Maldon	220	...	220	2	2	32	14	40 0 0	144 6 8	184 6 8
15. Walhalla	128	10	138	1	...	14	10	20 0 0	26 6 8	46 6 8
16. Daylesford... ...	272	45	317	...	1	44	9	...	128 13 4	128 13 4
17. Malmsbury ...	400	...	400	...	1	48	49	...	108 1 8	108 1 8
18. Fryerstown ...	191	2	193	...	3	49	52	...	136 16 8	136 16 8
19. Amherst	60	65	125	1	2	24	7	20 0 0	41 9 6	61 9 6
20. Wandiligong ...	20	50	70	...	...	...	...	...	...	...
Totals	7,386	727	8,113	20	74	1,415	1,239	672 9 0	4,791 1 10	5,463 10 10

NOTE.—Under the head "Serious Accidents" are included members disabled three months or over. Under "Not Serious" are included members disabled from work for any period under three months. Slight accidents which did not necessitate absence from work are not included.

STATEMENT No. 15.

SHOWING the Number of Inspections made by the Inspectors of Mines in each Quarter of the Year 1884, and the Number of Fatal and Non-fatal Accidents which occurred in the Mines under their supervision.

Name of Inspector.	Number of Mines Inspected.				Inspections made.				Number of Accidents.				Number of Men Killed.				Number of Men Injured.			
	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.
H. B. Nicholas ...	85	93	77	71	110	111	91	93	7	3	2	1	4	2	1	...	6	1	1	1
W. H. Grainger ...	75	101	106	108	97	115	126	126	17	13	14	14	3	3	2	2	15	10	13	12
C. Stewart	116	172	126	119	145	172	147	131	14	8	13	7	5	1	5	1	9	7	9	7
W. G. Couchman ...	35	36	59	55	87	49	68	67	1	2	1	1	...	1	1	...	1	1	...	1
H. Davidson ...	30	27	15	20	30	52	15	30	1	1	2	...	...	...	1	...	1	1	1	...
H. C. Bate	9	15	8	12	18	50	11	30	...	1	1	2	...	...	1	1	...	1	...	1
A. B. Ainsworth ...	8	20	17	20	8	20	21	28	...	...	...	...	...	...	...	...	...	...	...	...
D. W. Spreull ...	14	16	17	23	18	20	19	26	...	1	...	...	...	...	...	...	...	1	...	...
R. Fennelly ...	5	5	6	3	10	5	12	6	...	...	...	...	...	...	...	...	...	...	...	...
R. Arrowsmith ...	6	8	10	3	13	21	10	9	...	2	...	...	...	1	...	...	...	1	...	...
A. Armstrong ...	11	9	9	11	15	14	15	13	1	1	1	1	1	1	...	1	...	...	1	...
O. P. Whitelaw ...	7	8	5	6	9	10	5	7	1	1	1	2	...	2	...	...	1	...	1	2
A. W. Craven ...	4	...	2	8	4	...	2	8	...	...	...	...	...	...	...	...	...	...	...	...
J. G. Peers... ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...
	405	510	457	459	564	639	542	574	42	33	36	28	13	11	12	5	33	23	26	24

SUMMARY.

1884.	Mines Inspected.	Inspections made.	Number of Accidents.	Men Killed.	Men Injured.
Quarter ended 31st March	405	564	42	13	33
" " 30th June	510	639	33	11	23
" " 30th Sept.	457	542	36	12	26
" " 31st Dec.	459	574	28	5	24
Totals	1,831	2,319	139	41	106

APPENDICES.

APPENDIX A.

SYNOPSIS OF "THE REGULATION OF MINES AND MINING MACHINERY ACT 1883" (47 VICTORIA, No. 783).

Sec.	Sub-Sec.	Synopsis of Act No. 783.
1	...	Short title of Act, as above.
2	...	Former Acts, Nos. 583 and 719, repealed.
3	...	Interpretation of terms: "Minister," "machinery" "mining manager," "mine," "owner."
4	...	An accident occurring in a mine shall be *primâ facie* evidence that such accident occurred through some negligence on the part of the owner.
5	...	No boy under the age of fourteen years, nor any female, to be employed underground. No boy under eighteen to be employed as lander or braceman; and no person to be employed for more than eight hours in any day, except in cases of emergency.
6	...	No person in charge of machinery to be employed for more than eight hours a day, exclusive of any time occupied in raising steam, &c., except in cases of emergency.
7	...	A person in charge as aforesaid guilty of negligence by which any property is destroyed or damaged, shall be guilty of an offence against this Act. (See Penalty, sec. 25.)
8	1	An adequate amount of ventilation to be constantly produced in every mine.
,,	2	Gunpowder or other explosive to be only used as hereunder provided. (Sub-secs. *a* to *l*.)
,,	*a*	It is not to be stored on the surface of, or adjacent to the mine, unless magazine and quantity be approved of, in writing, by the "Minister."
,,	*b*	Only quantity required for use during twelve working days to be stored in the mine.
,,	*c*	Not more than eight pounds, in a secured case or canister, to be taken into the workings for use.
,,	*d*	A workman not to have more than one such case or canister at one time.
,,	*e*	No person to enter a powder magazine, &c., with a naked light.
,,	*f*	No iron or steel pricker to be used in blasting.
,,	*g*	A "missed-fire" charge to be drawn with a copper pricker, such charge not to be visited until one hour has elapsed from the time of lighting same. This does not apply to electric firing.
,,	*h*	No boy under eighteen to charge or fire explosives.
,,	*j*	No hole to be bored within 3 feet below, or within 1 foot in any other direction from the site of a previously exploded charge of any nitro-glycerine compound.
,,	*k*	Sulphate of iron to be used in dispersing the fumes arising from a blast of any nitro-glycerine compound.
,,	*l*	Companies to supply miners with the means of thawing such compounds and producing sulphate of iron spray.
,,	3	Underground planes to be provided with proper means of signalling and man-holes.
,,	4	Underground roads, where horses are used, to be provided with places of refuge.
,,	5	Man-holes and places of refuge to be kept clear.
,,	6	Entrances to shafts to be fenced or covered, except during repairs, &c.
,,	7	Horizontal bar to be placed across such entrance when fencing or covering has been temporarily removed.
,,	8	Where the natural strata are not safe, shafts to be securely lined.
,,	9	Man-holes to be cut for places of refuge during sinking of shafts, and ladders to be provided.
,,	10	Drives and excavations to be made safe.
,,	11	Miners to be provided with protected lights when travelling in the main drives, and the entrance to winzes and jumps-up to be illuminated by fixed lights.
,,	12	Shafts to be fenced off in divisions when used for different purposes.
,,	13	Proper means of communicating signals from the bottom of shafts and entrances between the top and bottom of shafts to be provided; a line or other appliance to be provided in each shaft, to admit of danger signals being communicated to the engine-driver.
,,	14	The engine-driver to have a clear view between his station and the shaft.
,,	15	All methods of signalling to be clear and distinct.
,,	16	Provision to be made for signalling from the drives to the plats in alluvial mining.
,,	17	Cages to have sufficient covering overhead when used for raising or lowering persons in a working shaft.
,,	18	Braces to be properly covered to protect workmen from the weather.
,,	19	In shafts where no machinery is used for lowering or raising men, proper ladders or foot-ways to be provided.
,,	20	Single-link chains not to be used for lowering or raising persons in any shaft or plane.
,,	21	Ropes and chains to be tested before being used in shafts.
,,	22	Appliances to prevent the ropes from slipping to be on the drum of machines used for lowering or raising persons in a shaft.
,,	23	Brakes to be attached to every machine used for lowering or raising persons; also indicators to show the position of cages in shafts.
,,	24	Cages to be fitted with suitable appliances, to prevent their sudden fall down a shaft; also to prevent them colliding with the poppet-heads.

Synopsis of "The Regulation of Mines and Mining Machinery Act 1883" (47 Victoria, No. 783)—*continued.*

Sec.	Sub-Sec.	Synopsis of Act No. 783.
8	25	Spring catches or other appliances to be affixed to skids or guides, to prevent the fall of any cage down a shaft when detached from the rope or chain by overwinding.
„	26	The rate of speed in lowering or raising men not to exceed 200 feet per minute within 100 feet of the surface, or 500 feet per minute in any other part of a shaft.
„	27	Safety cages to be tested in the presence of the local inspector of mines before use.
„	28	Persons descending or ascending shafts exceeding 20 feet in depth, in which cages are not used, to be securely stayed to the rope employed in lowering or raising.
„	29	Ladders to be placed at the most convenient angle which the space in which the ladders are fixed, allows.
„	30	Accommodation, other than the engine-house, to be provided, to enable the persons employed in a mine to dry and change their dresses.
„	31	No persons under eighteen years of age to have charge of machinery. No person in charge of machinery to absent himself during the time it is working.
„	32	All machinery to be examined by an inspector appointed for that purpose.
„	33	All machinery to be kept in good order and condition.
„	34	All exposed and dangerous parts of machinery shall be securely fenced.
„	35	Steam boilers to be provided with a steam gauge and water gauge, and to be tested once in twelve months.
„	36	No person shall wilfully damage, remove, or render useless any appliance or thing provided in compliance with this Act, and no person shall remove anything from a disused or abandoned shaft without the consent of the Minister.
„	37	Boring rods to be used in workings approaching places likely to contain dangerous accumulation of water or fire damp, for the purpose of perforating the rock in advance of such working.
„	38	Additional escape drives, chambers, &c., to be constructed in alluvial mines liable to inbursts of water for the safety of workmen.
„	39	Ladders to be provided in each jump-up or passage giving access to workings at a higher level.
„	40	Mining managers to inspect cages and safety gear once in twenty-four hours, and machinery buildings and workings, &c., once in each week, under a penalty.
„	...	A printed copy of the rules provided for in section 8 and sub-sections, to be posted in a conspicuous place at every mine.
9	...	The Governor in Council to appoint persons to act as a Board of Examiners under this Act, the said Board to examine persons who may be desirous of qualifying themselves as engine-drivers, and to grant certificates of competency to persons who pass the examination.
10	...	The Board of Examiners to grant certificates of service to persons who have been in charge of machinery worked by steam for twelve months prior to the passing of this Act. Such certificates to be equal to certificates of competency.
11	...	Certificate to specify name, place, and date of birth of the person to whom it is issued.
12	...	Twelve months after the appointment of a Board of Examiners has been notified, any person not holding a certificate, or who is deaf or partially deaf, or whose sight is defective, or who is subject to any infirmity, and who takes charge of machinery in which steam, water, or air is used as a motive power (and every person who employs such a person) shall be guilty of an offence against this Act.
13	...	Any person holding a certificate under this Act, who is charged with offence or misconduct, to be called upon by the Board of Examiners to show cause why he should not be disqualified.
14	...	Plans and sections of all underground workings in a mine, considered to contain dangerous accumulations of water, to be furnished to the warden nearest to such mine.
15	...	Such plans and sections to be drawn to a scale of not less than two chains to an inch, and to be open for inspection.
16	...	In cases where vertical or overhanging ladders are used at the passing of this Act, fixed platforms to be constructed at intervals, and such ladders to have sufficient spaces for footholds; but no new vertical or overhanging ladders to be constructed, either in substitution for old ones or otherwise.
17	...	If any person employed in or about a mine suffer any injury or be killed, owing to the non-observance of any of the provisions of this Act by the owner of the mine, his agents, or servants, the person so injured, or the representatives of the person so killed, may recover from the owner compensation by way of damages, &c.
18	...	An inspector of mines under this Act, or any authorized person, to have access to and inspect any mine or machinery at any time, for the purpose of ascertaining whether the provisions of this Act are being complied with.
19	...	Every person who does not comply with any of the provisions of this Act, and who is guilty of negligence, by which any person is injured or killed, to be guilty of an offence against this Act.
20	...	Every person employed in or about a mine, who may deem any appliances or workings unsafe, shall immediately notify the same to the person under whose immediate control he may be, and also, on changing his shift, inform the person relieving him of the state of the workings and appliances.

SYNOPSIS OF "THE REGULATION OF MINES AND MINING MACHINERY ACT 1883" (47 VICTORIA, No. 783)—*continued.*

Sec.	Sub-Sec.	Synopsis of Act No. 783.
21	...	The manager of every mine to give notice to the local inspector of mines of any accident attended with serious injury to any person within twenty-four hours of the occurrence.
22	...	On any proceedings being taken under this Act against any manager or person in charge of a mine, the burthen of proving that he is not such manager or person to be on the defendant.
23	...	Mining companies to appoint a manager, who shall be deemed the mining manager under this Act, the name and address of such manager to be notified, in writing, to the local inspector of mines, and also to the Minister of Mines.
24	...	With respect to coroners' inquests on the bodies of any persons whose death may have been caused in mines, any person having a personal interest in, or employed in connexion with the mine in which the accident occurred, shall not be qualified to serve on the jury. Nevertheless, where practicable, half the jury shall be miners.
25	...	Any owner or manager of a mine guilty of an offence against this Act to be liable to a penalty not exceeding Fifty pounds, and any other person Ten pounds for each offence.

APPENDIX B.

MINING ENGINE-DRIVERS.

"THE REGULATION OF MINES AND MINING MACHINERY ACT 1883."

The Administrator of the Government in Council has approved of the subjoined regulations.

J. F. LEVIEN, Minister of Mines.

Department of Mines, Melbourne.

REGULATIONS FOR THE ISSUE OF CERTIFICATES OF COMPETENCY OR SERVICE TO ENGINE-DRIVERS.

Preliminary Requirements.

1. Each applicant for a certificate of competency or service must forward to the Secretary for Mines, Mining Department, Melbourne, notice in writing of his intention to present himself for examination, such notice to be given not less than fourteen clear days prior to the date of examination.

The notice must be accompanied by cash, post-office order, or stamps to the amount or value of 10s.

Should the applicant pass the prescribed examination, the deposit shall, in each instance, go towards payment of the fee for certificate; in the event, however, of the failure of the candidate to pass the examination, such amount shall be forfeited to the Consolidated Revenue.

No certificate shall be issued until full payment of the fee required shall have been made to the Secretary for Mines.

Certificates of Competency.

2. The certificates of competency to be issued by the Board of Examiners shall be of two classes, namely, *first* and *second*:—

A first-class certificate shall entitle the holder thereof to drive any engine used for mining purposes.

A second-class certificate shall entitle the holder thereof to drive any engine used for mining purposes, except a winding engine.

3. An applicant for a second-class certificate must produce to the Board satisfactory evidence—

(*a.*) Of his respectability of character.

(*b.*) That within a period of two (2) years prior to the date of examination he has, during not less than six months, been assisting in the working of engines used for mining purposes.

(*c.*) That he is at the date of examination not under the age of eighteen (18) years, nor over the age of fifty (50) years.

(*d.*) That neither his eyesight nor his hearing is defective, and that he is not subject to any other mental or bodily infirmity likely to interfere with the efficient discharge of his duties.

A document signed by the mining manager and engineer or by the mining manager and legal manager of the company by whom the applicant is or has been employed, bearing on this clause, may be considered satisfactory evidence.

4. An applicant for a first-class certificate must produce to the Board satisfactory evidence—

(*a.*) Of his respectability of character.

(*b.*) That he has been the holder of a second-class certificate, under these regulations, for a period of not less than twelve months, and that he has had at least three months' experience during that period in assisting at a winding engine.

(*c.*) That he is at the date of examination not under the age of eighteen (18) years, nor over the age of fifty (50) years.

(*d.*) That neither his eyesight nor his hearing is defective, and that he is not subject to any other mental or bodily infirmity likely to interfere with the efficient discharge of his duties.

A document signed by the mining manager and engineer or by the mining manager and legal manager of the company by whom the applicant is or has been employed, bearing on this clause, may be considered satisfactory evidence.

5. Provided nevertheless that at the first examination, held at any place, of candidates for certificates of competency, the Board may grant a first-class certificate to any applicant upon production by him of satisfactory evidence that he has had experience in driving, and is fully competent to drive any and every kind of engine used for mining purposes.

Certificate of Service.

6. Any applicant for a certificate of service must produce to the Board satisfactory evidence that he has been in charge of and has efficiently managed, for a period of not less than twelve months prior to the 3rd November, 1883, winding, pumping, and crushing engines, with boilers and appendages, or any of them.

A document signed by the mining manager and engineer or by the mining manager and legal manager of the company by whom the applicant is or has been employed bearing on this clause, may be considered satisfactory evidence.

(Forms of application for certificates of competency or service may be obtained from any Inspector of Mines or from the Secretary to the Board.)

Examinations.

7. Examinations will be conducted by the Board at such time and place as may from time to time be notified by the Secretary in the *Government Gazette* and in a newspaper published or circulated in the locality, and candidates will be examined according to priority of receipt of notice required by clause 1; a list of the candidates and the order in which they will be examined shall, if necessary, be published in a newspaper as aforesaid.

8. Candidates for certificates of competency will be examined as to their practical knowledge and working of machinery, including steam and other engines, boilers, furnaces, stampers, winding and pumping gear, or any other machinery used for mining purposes.

9. If a candidate shall fail to pass the examination prescribed, he shall not again present himself until a period of not less than six months shall have elapsed from the date of his last examination.

Copies of Certificates.

10. Whenever any person proves to the satisfaction of the Board of Examiners that he has, without fault on his part, lost or been deprived of any certificate previously granted to him under the provisions of *The Regulation of Mines and Mining Machinery Act* 1883, such Board shall, upon payment of such fee, if any, as they may direct, but not exceeding the fee specified in the schedule hereto, cause a copy of the certificate to which the applicant appears to be entitled to be made out and certified by the Secretary to the Board and delivered to the applicant, and any copy so made and certified as aforesaid shall have the effect of the original certificate. The fee, if any, herein referred to shall be paid to the Secretary for Mines (in cash, stamps, or post-office order), and shall by him be paid into the Consolidated Revenue.

Complaints.

11. If at any time representations be made to the Board of Examiners that any engine-driver holding a certificate of competency or service is by reason of incompetency or gross negligence unfit to discharge his duties, or has been convicted of an offence against the *Regulation of Mines and Mining Machinery Act* 1883, the Board may, if they think fit, inquire into the conduct of such engine-driver; and with respect to such inquiry the following provisions shall have effect:—

(1.) The inquiry shall be held at such time and place as the Board may appoint, due notice of which shall be forwarded to the engine-driver.

(2.) The Secretary to the Board shall, before the commencement of the inquiry, furnish to the engine-driver a statement of the case upon which the inquiry is instituted.

(3.) The engine-driver shall attend such inquiry, and may produce such evidence as may be considered necessary.

(4.) The Board shall, upon the conclusion of the inquiry, forward to the Minister of Mines a report containing a full statement of the case and their opinion thereon.

Schedule referred to.

To be paid by an applicant for a certificate of competency (either first or second class) ...	£1	0	0
To be paid by an applicant for a certificate of service	0	10	0
To be paid for a copy of a certificate	0	2	6

E. R. Meekison,
Chairman.

Robert Fulton,
Jno. Naylor,
John Coats,
Members.

Dated 24th March, 1884.

Additional Regulation (10*th February*, 1885).

No. 12. If a candidate attempt to obtain a certificate of service by means of false testimonials, he shall not be allowed to again present himself until a period of not less than twelve months shall have elapsed from the date of his last examination.

NOTICE.

With reference to the foregoing regulations, the attention of engine-drivers and others is directed to the following extracts from the *Regulation of Mines and Mining Machinery Act* 1883, viz.:—

General Rules 26 *and* 31 *of Section* 8.

26. *Rate of speed in lowering or raising men.*—When men are being lowered or raised in any shaft by means of machinery, the rate of speed for the descent or ascent of such men shall not exceed, within one hundred feet of the surface of a mine, two hundred feet in each minute of time, and shall not in any other part of a shaft exceed five hundred feet in each minute of time.

31. *Person in charge of machinery.*—No person under the age of eighteen years shall be placed in charge of or have the control of any steam engine or boiler used in connexion with the working of any mine. No person in charge of steam machinery in connexion with the working of any mine shall under any pretext whatever, unless relieved by a competent person for that purpose, absent himself or cease to have continual supervision of such machinery during the time it is used in working the mine.

Sections 10, 11, 12, *and* 13.

10. *Certificates of service for engine-drivers.*—The Board of Examiners shall also grant a certificate of service to every person who furnishes to the said Board satisfactory evidence that he has been in charge of and has efficiently managed machinery worked by steam for a period of twelve months prior to the passing of this Act, and such certificate shall confer the same privileges as a certificate of competency.

11. *Certificates to contain particulars.*—Every certificate of competency or service under this Act shall specify the name, place, and date of birth of the person to whom such certificate is issued.

12. *Offence.*—Twelve months after the first appointment of a Board of Examiners has been notified in the *Government Gazette*,* any person who is not the holder of a certificate of competency or of service from the said Board, or who is wholly or partially deaf, or whose sight is defective, or who is subject to fits, giddiness, or any other infirmity likely to interfere with the efficient discharge of his duties, and who takes charge of machinery in which steam, water, or air, or any two or more of them, are used as motive power, and every other person who employs any such person as aforesaid, shall be guilty of an offence against this Act. The provisions of this section shall not apply to air winches or boring machines worked underground.

13. *Disqualification of holder of certificate.*—Any person holding a certificate of competency or of service under this Act as an engine-driver, and who is charged with any offence or misconduct likely to be detrimental to the proper or efficient discharge of his duties, may be called upon by the Board of Examiners to show cause why he should not be disqualified as a certificated engine-driver; and if he fails to satisfy the said Board, he may by an Order of the Governor in Council published in the *Government Gazette* be disqualified for any period from acting as an engine-driver ; and any such person shall after such order deliver into the charge of the said Board his certificate of competency or of service, which shall be retained by the said Board during the period of his disqualification; and no such person shall during the period of such disqualification take charge of any machinery in which steam, water, or air, or any two or more of them are used as motive power.

APPENDIX C.

RULES AND REGULATIONS FOR THE GUIDANCE OF ENGINE-DRIVERS AND MINERS ADOPTED AT SOME OF THE PRINCIPAL MINES IN VICTORIA.

Loughlin G. M. Co. No Liability.—Notice to Employés.

1. The engine-drivers, before taking charge at the change of shifts, must look over and see that everything is in perfect order belonging to their department before any men are raised or lowered in the shaft.

2. The engine-drivers must not allow miners or strangers to enter the engine-house when in full work, without an order from the manager.

3. The engine-drivers must allow no books or newspapers in the engine-house during working days (Sundays excepted, when no work is going on other than pumping).

4. The engine-drivers must keep watch, when no work is going on other than pumping, during the absence of the watchman.

5. The head braceman, before taking charge at the change of shifts, must inspect the ropes, chains, shackles, and cage, and see that everything is in good order before any men are lowered or raised.

6. The braceman must take notice when the signal is given to the engine-driver that the cage goes the right way, and to stand by the knocker while the shift is being changed, and allow no men to rush the cage; any man disobeying must be reported to the manager, or captain of the shift in his absence.

7. The miners, on being lowered or raised, should put themselves in a position that, should anything give way with the winding apparatus, they could stop the cage with the levers on the top part of the cage, which, by pulling down the two knobs, would stop the cage instantly ; *but on no account to pull on them during the good working of the cage; by doing so, the result would be serious.*

8. The miners, in getting in and out of the cage, must obey the orders of the braceman.

9. The miners, on leaving off work on Saturday nights, must collect all their tools in an empty truck, and bring them back to main drives or a safe place.

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* The twelve months referred to will expire on 3rd March, 1885.

10. The miners must point out to the manager or captains anything whatsoever in connexion with the works that they may consider dangerous to life or property immediately on observation.
11. The miners must not collect around top of shaft until the hour is up for changing.
12. The miners, after coming up the shaft, must go direct to the changing house.

Signals:—

One knock: Heave up, or stop the cage if in motion.
Two knocks: Mullock, or lower the cage.
Two knocks and one knock: Men going down.
Three knocks: Communication.
Three knocks and one knock: Men coming up.
Four knocks: Heave up empty cage.
Five knocks: Ease the pumps.
Six knocks: Start the pumps, or pump faster.
Eight knocks: Stop the pumps.

Signals and Regulations for the Guidance of the Engineer, Engine-drivers, and Miners employed by the Victory and Pandora Amalgamated Company.

Signals for winding:—

1st. One knock: Stop immediately.
2nd. Two knocks: To lower.
3rd. Three knocks: To haul up.
4th. One and four knocks: Men coming up.
5th. One and two knocks: To lower men or cage from any of the intermediate plats.
6th. Five knocks: Send down tea bottles.

Signals for pumps:—

7th. Six knocks: To go faster.
8th. Seven knocks: To go slower.
9th. Eight knocks: To stop.
10th. Nine knocks: To work.

The engine-drivers will require to take notice of the rope or ropes on drum, before putting them into gear, in case of any wrong signal being given.

Rules for Underground Working.

1. Whilst the work is carried on in eight hours' shifts, no man will be permitted to leave the face where he may be working until relieved.
2. If the shift does not take place at the proper time, the captain of the shift must report the same to mining manager.
3. Before going up, the men relieved will inform the men taking their place of any circumstances connected with the work needful for them to know, as regards missed shots, cracked or unsafe ground requiring timber, &c., &c.
4. The captain of the shift will also, previous to going up, give full particulars of the work going on, and transmit any instructions given him to the captain taking his place.
5. If a blast miss fire, no person allowed to go near the place for at least one hour.
6. If any one considers the place where he is working unsafe, he must at once report to the captain of the shift, who shall at once take steps to secure it, or suspend work for the time.
7. Every man working for the company is expected to give attention to and report to the captain of shift or mining manager any flaw or deficiency in the appliances used in or about the mine, either in the way of ropes, ladders, tamping bars, powder, fuse, or other materials. The captain of the shift or mining manager must then immediately take the necessary steps to supply deficiency.
8. All employed by the company are expected to take proper care of tools and materials used in or about the mine. Any infraction of this or any other of the regulations, disobedience or insolence to the captains of shifts or mining manager, will be met with by instant dismissal.

Additional Rules when using Lithofracteur or Dynamite.

1. All charges to be gently and slowly pushed down the hole with a wooden stick or copper bar, and no iron or steel tool to be used when charging or after having been charged.
2. All missed holes to be re-charged and fired before work is resumed, and the bottom of all exploded holes to be searched with a copper pricker to see if any of the charges remain unexploded.
3. The men are always to report to the captain of the shift when any holes have missed fire, giving him full particulars.
4. In no case any hole or part of a hole to be re-drilled, whether exploded or not, where the above articles have been used.
5. Miners are not to charge more holes than they intend firing at one time.

General Rules to be observed for the Safety of the Workmen and Tributers in the employment of the New Chum and Victoria Gold Mining Co., Registered.

The following signals shall be used when communicating with the surface by the knocker:—

1 shall signify "Stop."
2 „ „ "Lower."
3 „ „ "Pull up."
4 „ „ "Men coming up."

And by ringing "One" when the cage is at rest, you call the attention of the lander or engineer to the telephone.

Engineers before taking charge shall examine all machinery committed to their care, and, should they perceive any defect, shall report the same, so that it may be remedied immediately; and the man being relieved shall report to his mate taking charge anything which may have gone amiss during the shift.

Safety valves and water gauges to be particularly attended to, and, without authority, you shall not allow any strange person to handle the engine or any machinery connected therewith.

Pay attention to the signals, and if they are not run distinctly neither raise nor lower the cage, until they are rung so as to be clearly understood.

While men are on the cage, ascending or descending, drive at a moderate speed, and never leave the brake nor lose full control of the engine.

In the absence of the manager or other person in charge, allow none but workmen or persons properly authorized to descend the mine.

Braceman will look to the ropes and safety gear daily, and report if faults or any defects are observed. He will not leave the brace while the shifts are changing, and must allow no one to descend who is intoxicated or the worse of liquor.

Miners are requested to ring the signals distinctly so that they may be clearly understood.

If working three shifts, do not leave your place until relieved; then point out to your mates any source of danger, should such exist, also report the same to the manager.

While travelling in the shaft, keep well within the cage, and on no account lean over the winding shaft, from the plats, or attempt to get on or off the cage while it is in motion.

All tools are to be placed securely in a truck before being sent up or down the shaft.

You must not incur unnecessary risk from want of timber, or baulked ground, in your stopes, and before starting work see that everything is safe around you.

Attend strictly to the instructions contained in the Act for the Regulation and Inspection of Mines, and the directors and managers cordially invite the co-operation of all employed in the mine in reducing accidents to a minimum.

APPENDIX D.

REPORT OF THE BOARD OF EXAMINERS FOR MINING ENGINE-DRIVERS.

To the Honorable J. F. Levien, M.P., Minister of Mines for Victoria, &c., &c., &c.

Sir,

We have the honour to report that the first series of examinations of mining engine-drivers is now completed, and we trust that the results will be found to be satisfactory. Several instances of persons endeavouring to obtain certificates of service by means of incorrect and misleading testimonials having occurred at the commencement of our labours, it became necessary to exercise every care to guard against the possibility of such attempts proving successful; and, in view of this, we took the precaution, in doubtful cases, to make applicants furnish affidavits as to the correctness of the testimonials presented.

We found throughout the examinations that it taxed all our practical experience to obtain from candidates such evidence as would justify us in passing them for "competency" certificates, as only a few were able to make even the most simple mechanical calculations, so that their claims for certificates rested entirely upon the practical experience they possessed of mining machinery in operation.

When candidates for "competency" failed to satisfy us as to their practical knowledge of steam machinery, we granted them "service" certificates, provided they furnished us with satisfactory evidence in accordance with the provisions of section 10 of Act No. 783.

Since the date of our appointment (3rd March, 1884), examinations have been held in every mining centre of importance in the colony, viz.:—At Sandhurst (2), Ballarat (2), Melbourne (3), Stawell, Beechworth, Bright, Walhalla, Bairnsdale, Egerton, Scarsdale, Creswick, Allendale, Daylesford, Clunes, Beaufort, Castlemaine, Maryborough, St. Arnaud, Inglewood, Jamieson, and Gaffney's Creek; altogether 80 sittings.

The total number of applications for certificates was 1,487, and the fees received from candidates amounted to £813 10s. The applications were dealt with as follows:—

First Class Service Certificates issued.	Second Class Service Certificates issued.	First Class Competency Certificates issued.	Second Class Competency Certificates issued.	Candidates who failed.	Persons who did not produce satisfactory evidence to entitle them to Service Certificates.	Applications not relevant to the examinations.	Applications in Abeyance.
1,021	217	111	42	21	8	13	54

Note.—The holders of 1st class certificates of either service or competency are entitled to drive any engine used for mining purposes. The holders of 2nd class certificates of service or competency are entitled to drive any engine used for mining purposes *except a winding engine*. The name and address of each candidate who passed will be found in Appendix E, page 100.

If every competent mining engine-driver is not the holder of a certificate by this date, it is certainly his own fault, for every facility has been afforded to persons to present themselves for examination, each applicant having been advised a week beforehand where and when he would be examined.

Applicants for "service" certificates have been readily dealt with in cases where testimonials of a satisfactory nature were produced; but a great number of candidates presented themselves without having apparently even looked over the printed regulations to ascertain what form of testimony was required to enable them to obtain certificates. This neglect gave us, and particularly our secretary, a great amount of trouble, and was productive of much delay.

In examining candidates for "competency," we found many engine-drivers of over twenty years' experience who were quite ignorant of the action of steam on an engine, further than that the moving of a lever in a certain direction would cause an engine to move one way, and that by an opposite motion of the lever the engine would move in another way. We found some candidates very intelligent, and they quickly satisfied us as to their efficiency, while many occupied our attention for a considerable time, taking in some cases from an hour to an hour and a half, before satisfactory answers could be elicited.

We found great diversity of opinion existing among engine-drivers as to the proper standard for testing boilers, as provided for in general rule 35 of section 8 of *The Regulation of Mines and Mining Machinery Act* 1883. The lowest test recognised by Lloyd's rules and by the Board of Trade (England) is, that a boiler should be subjected to a hydraulic pressure of not less than one and a half times that at which the safety valve blows off; and we impressed upon every candidate for competency the necessity for adopting this rule for his future guidance in the testing of boilers.

We also found that some engine-drivers are very negligent in performing the various duties devolving upon them in the management of machinery. One man admitted that, although try-cocks had for years been fixed in the front of a boiler of which he had charge, he scarcely ever used them, because when he turned them they "made a mess in front of the boiler." This shows that, although a boiler may be provided with all the mountings necessary for its safe working, the person in charge may, either through ignorance or negligence, defeat the object in view in providing the appliances.

The method of raising and lowering men in shafts was another matter which occupied our attention. We gave a supposititious case to candidates as follows :—Suppose the poppet-heads at a shaft to be 60 feet in height, and you were lowering men from the surface—what distance would you work the engine *by hand* before throwing it into gear?

The replies to this question varied considerably; some would lower the cage 20 feet, some 30 feet, some 40 feet, and some 50 feet, but very few admitted that they would lower the cage by hand for a distance of 60 feet. Now, it is evident that if the engine were worked by hand for a distance of less than 60 feet in the supposed case, and it had been accidentally started the wrong way, it would be out of the driver's control, and the cage would be at once carried to the top of the poppet-heads; whereas, if the engine were worked by hand for at least the distance between the surface and the top of the poppet-heads, it would not have the same *way* on, would be under control, and could be much more readily stopped than if it were in gear.

We notice that early last year the Department issued a circular letter to mining managers and others with respect to this matter, and we cannot too strongly urge that the suggestion therein made should receive the best attention of mining managers and engine-drivers, with a view to its adoption at every mine where steam machinery is used.

It has occurred to us, in the course of the examinations, that it would be to the advantage of the mining community if the following alterations were made in any future amendment of Act No. 783, and we submit them for your consideration :—

In lieu of rule 35 of section 8 substitute the following—

> "Every boiler shall be provided with a proper steam pressure-gauge and a glass water-gauge, and not less than two try-cocks, to show respectively the pressure of steam and the height of water in the boiler, and with a proper safety valve, which shall not be connected with either the steam pipe or steam stop-valve. At least once in every six months every boiler shall be thoroughly cleansed, and once in every twelve months every such boiler shall be subjected to a hydraulic test of not less than one and a half times the pressure at which the safety valve blows off; nevertheless, an inspector may at any time, if he think fit, cause any boiler to be subjected to a hydraulic test of twice the pressure at which the safety valve blows off. The date and full description of every such test and cleansing shall be entered in a book to be kept for that purpose by the person in charge of the machinery, and the entries in such book shall on demand be open to the perusal of an inspector *under this Act*."

New General Rule—

> "Before any boiler shall be built in position for use in connexion with any mine it shall be examined by an inspector, both internally and externally, and it shall be subjected to a hydraulic test of not less than one and a half times the pressure at which it is proposed to work such boiler; nevertheless, an inspector may, if he think fit, cause such boiler to be subjected to a hydraulic test of twice the pressure at which it is proposed to work such boiler.
>
> "The inspector shall, after the boiler has been examined by him and been tested, give a certificate which shall state—(1) That such boiler has been examined by him, and has been tested in accordance with the provisions of this general rule; (2) the pressure to which such boiler has been subjected, and (3) the working pressure of steam such boiler shall be allowed to carry.
>
> "Any person who shall work, or cause to be worked, a boiler at a pressure of steam greater than that mentioned in the certificate herein referred to shall be guilty of an offence against this Act."—[See Synopsis of Act, Appendix A, page 92.]

You will observe by the schedule on page 3 that a large majority of engine-drivers applied for and obtained "service" certificates, but in many instances they have subsequently applied for and obtained "competency" certificates, which latter are guarantees that the holders possess a practical knowledge of steam machinery, and are capable of being placed in charge thereof.

In conducting all future examinations for "competency," we contemplate slightly raising the standard by requiring candidates to possess a more thorough practical knowledge of the working of steam machinery.

Since the commencement of the examinations we have observed a marked desire on the part of engine-drivers to acquire a more perfect knowledge of the construction and working of machinery, and a large demand has, we have ascertained, set in throughout the various mining centres for all publications treating of the subject. On our recent visit to Ballarat, we learnt that Mr. Reed, foreman of the Phœnix Locomotive Foundry, had established a night school for the education of engine-drivers, and he then had 35 students under tuition. A sectional engine showing all the working parts in motion is provided for their use, and they are examined thereon.

During the year 1884 two cases of overwinding by engine-drivers were brought under our notice. In one case the driver was cautioned, and informed that, should a similar occurrence take place at any mine where he was engine-driver, the matter would be strictly investigated, and, in the event of a decision adverse to him being arrived at, his former offence would be considered in awarding the punishment. In the other case the driver admitted that he was to blame for the accident, and, upon our recommendation, his certificate was suspended for three months, in accordance with the provisions of section 13 of Act No. 783.

As regards future examinations, we are of opinion that meetings should be held in the principal mining centres at intervals of not less than six months. We think a good work has been commenced in establishing these examinations, and that a few years will show a marked improvement in the status of engine-drivers; and although we have had many candidates who taxed our patience to a considerable extent, we have dealt with them as temperately as possible, and, on the whole, we think that the system of examination adopted has been generally accepted in a favorable light by the engine-drivers of the colony.

In conclusion, we cannot allow this opportunity to pass without complimenting our Secretary, Mr. W. H. Clegg, for the manner in which the clerical business of the Board has been conducted by him. We consider the successful issue of our labours is to a great extent attributable to his assiduity, and have to thank the Department for allotting to us so efficient an officer.

We have the honour to be, Sir,

Your most obedient servants,

E. R. MEEKISON, Chairman,
ROBERT FULTON, Member,
JOHN NAYLOR, Member,
JOHN COATS, Member.

Board of Examiners for Mining Engine-drivers.

Melbourne, 3rd March, 1885.

APPENDIX E.

NAME AND ADDRESS OF EACH MINING ENGINE-DRIVER HOLDING A CERTIFICATE FROM THE BOARD OF EXAMINERS ON THE 3RD MARCH 1885.

HOLDERS OF CERTIFICATES OF SERVICE (authorizing the holder to Drive any Engine used for Mining Purposes).

Name.	Address.*	No. and Date of Certificate.
		1884.
Hannau, Thos. Pringle ...	Moran-street, Sandhurst	1 24 June
Tregear, Thomas	off Reviere-street, Little Ironbark, Sandhurst	2 24 June
Lapthorne, Henry Julius ...	Booth-street, Sandhurst	3 24 June
Robertson, James D.	McClure-street, Ironbark, Sandhurst	4 24 June
Jones, Samuel	Barnard-street, West Sandhurst	5 24 June
Borrman, Charles Henry ...	Burrowes-street, Golden Square	6 24 June
Harvey, William	Booth-street, Sandhurst	7 24 June
Watson, John	Grant-street, Inglewood	8 24 June
Coats, John	Harrison-street, Sandhurst	9 24 June
Jeffery, Henry	Honeysuckle-street, Sandhurst	10 24 June
Lowery, George Barlow ...	Woodward-road, Sandhurst	11 24 June
Lewis, Benjamin	High-street, Sandhurst	12 24 June
Olsson, Andrew Christian ...	Golden Square, Sandhurst	13 24 June
Russell, James Johnson ...	Craven's Co., Sandhurst	14 24 June
Medland, William	Bullock Creek-road, Golden Square	15 24 June
Miller, Edward	Lockwood Post Office	16 24 June
Matthews, Joe	Inglewood	17 24 June
Steen, Andrew	Golden Gully, Sandhurst	18 24 June
Bailey, John	Don-street, Sandhurst	19 24 June
Exeter, William Thomas ...	American Reef, Long Gully, Sandhurst	20 24 June
Andrew, Richard	Booth-street, Sandhurst	21 24 June
Wigley, Charles...	Bray-street, Sandhurst	22 24 June
Grenfell, William	Violet-street, Sandhurst	23 24 June
Brown, John	Barnard-street west, Sandhurst	24 24 June
Melling, James	Russell-street, Sandhurst	25 24 June
Muir, Henry	Pitt-street, New Chum, Sandhurst	26 24 June
Palmer, John	Sparrowhawk, Long Gully, Sandhurst	27 24 June
Boys, Frederick	Hope-street, Sandhurst...	28 24 June
James, John	Wade-street, Golden Square, Sandhurst	29 24 June
Tregear, John	Long Gully, Sandhurst...	30 24 June

* NOTE.—Certificate holders are requested to notify any change of address to the Secretary for Mines, Mining Department, Melbourne.

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.
		1884.
Thomas, John	Sheepshead, Sandhurst	31 24 June
Jeffrey, Edward	Buttlers-street, Sandhurst	32 24 June
Thomas, William	Phillips-hill, Sandhurst	33 24 June
Davies, James	New Chum and Victoria, Sheepshead, Sandhurst	34 24 June
Stephenson, Matthew	Bray-street, Ironbark, Sandhurst	35 24 June
Boyland, John	Bray-street, Little Ironbark, Sandhurst	36 24 June
Donaldson, William	King-street, Sandhurst	37 24 June
Masters, John	Nettle-street, Sandhurst	38 24 June
Holman, James	Don-street, Sandhurst	39 24 June
Ryan, Simeon	Hargreaves-street west, Sandhurst	40 24 June
Macdonald, David	Victoria-street, Sandhurst	41 24 June
Croker, Thomas	Diamond Hill Post Office	42 24 June
Hosking, Henry	Bullock Creek-road, Sandhurst	43 24 June
Schadenhorff, Peter	Green-street, Sandhurst	44 24 June
Curnow, John	Wattle-street, Sandhurst	45 24 June
Paton, David	Arnold-street, Sandhurst	46 24 June
Franck, John	Hustler's Reef, Sandhurst	47 24 June
Andrew, Joseph Burn	Don-street, Sandhurst	48 24 June
Neumhoeffes, Frederick	Hay-street, Sandhurst	49 24 June
Lanyon, William	Diamond Hill, Sandhurst	50 24 June
Gambetta, Charles	Princess Dagmar G. M. Co., California Gully	51 24 June
Quick, James	Myrtle-street, Sandhurst	52 24 June
Gray, George Alexander	Brown-street, Eaglehawk	53 24 June
Loug, James William	Redan-hill, Long Gully	54 24 June
Henderson, Theophilus Charles	Don-street, Sandhurst	55 24 June
Bartle, William	Hargreaves-street, Sandhurst	56 24 June
Blight, Alfred	High-street, Sandhurst	57 24 June
Ellis, Thomas	Phillip-street, Long Gully, Sandhurst	58 24 June
Tyler, John	care of H. Blight, Hight-street, Sandhurst	59 24 June
Allen, Richard Henry Yourne	Bannerman-street, Little Ironbark, Sandhurst	60 24 June
Harvey, Richard	Caldwell's-road, Eaglehawk	61 24 June
Bain, Thomas	Wattle-street, Sandhurst	62 24 June
Jackson, George	Sailor's Gully, Sandhurst	63 24 June
Michell, Robert	Nettle-street, Sandhurst	64 24 June
Phillips, Richard	Monument-hill, Sandhurst	65 24 June
Martin, William James	High-street, Sandhurst	66 24 June
Bishop, Robert	Wattle-street north, Sandhurst	67 24 June
Davis, William James	Pegleg-road, Eaglehawk, Sandhurst	68 24 June
Lee, William	Violet-street, Sandhurst	69 24 June
Roberts, John B.	California Gully	70 24 June
Lamb, Joseph	Harrison-street, Sandhurst	71 24 June
Old, Theophilus	Long Gully, Sandhurst	72 24 June
Rogers, George Morris	Bannister-street, Sandhurst	73 24 June
McBeth, George	Golden Square, Sandhurst	74 24 June
Gray, John Theophilus	Golden Square, Sandhurst	75 24 June
Drake, George	McDongall-road, Golden Square	76 24 June
Turnbull, Jonathan	Staly-street, California Gully	77 24 June
Vithie, John	California Gully, Eaglehawk	78 24 June
Rowe, John	Brown-street, Long Gully	79 24 June
Webster, William	Hustler's Reef, Anderson-street, Sandhurst	80 24 June
Vinton, William	Vinton-street, California Gully, Sandhurst	81 24 June
Pattison, John	Gladstone-street west, Quarry Hill, Sandhurst	82 24 June
West, Edward	Duncan-street, Long Gully, Sandhurst	83 24 June
Osborne, Frederick Knight	Booth-street north, Sandhurst	84 24 June
Berryman, William Henry	Long Gully, Sandhurst	85 24 June
Rogers, Benjamin	Thistle and McKenzie streets, Sandhurst	86 24 June
Prideaux, Henry	Arnold-street, Sandhurst	87 24 June
Morgan, Charles	Wattle-street, Sandhurst	88 24 June
Edwards, John	Nettle-street, Sandhurst	89 24 June
Button, Alfred	St. Just Point, Long Gully, Sandhurst	90 24 June
Fasham, John	No. 12 Stewart-street, Sandhurst	91 24 June
Webster, John	High-street, Golden Square, Sandhurst	92 24 June
Freestone, Benjamin	Barnard-street, Sandhurst	93 24 June
Dann, William Swiffen	Ophir-street, Sandhurst	94 24 June
Eman, Thomas	City of Sandhurst G. M. Co., Sandhurst	95 24 June
Garrett, James	Parkin's Reef-road, Sandhurst	96 24 June
Howard, Andrew	Lily-street, Sandhurst	97 24 June
Woods, Robert	New Chum, Sandhurst	98 24 June
Casley, William	Casley-street, Sandhurst	99 24 June
Kennedy, John	Arnold-street, Sandhurst	100 24 June
Lonsdale, Robert	Lily-street, Sandhurst	101 24 June
Ferguson, Edward Charles	View-street, Sandhurst	102 24 June
Whitehair, William	No. 4 Langston-street, Sandhurst	103 24 June
Little, Richard	Bannerman-street, Sandhurst	104 24 June
Husband, Peter	Early-street, California Gully, Sandhurst	105 24 June
Wright, John Bracewell	Nelson-street, California Gully, Sandhurst	106 24 June
Campbell, Stephen	McDougall-road, Golden Gully, Sandhurst	107 24 June
Thomas, Thomas	Wilson-street, Long Gully, Sandhurst	108 24 June
King, John	Oliuda-street, Quarry Hill, Sandhurst	109 24 June
Olds, Tobias Mitchell	Booth-street, Golden Square, Sandhurst	110 24 June
Hooper, John Thomas	Specimen Hill, Eaglehawk, Sandhurst	111 24 June
Letcher, Edwin	Eaglehawk, Sandhurst	112 24 June
Pentreath, Benjamin Corvasso	Long Gully, Sandhurst	113 24 June
Whitehair, Joseph	No. 4 Langston-street, Sandhurst	114 24 June
Rowland, Francis	Eaglehawk, Sandhurst	115 24 June
Paul, Arthur	Barnard-street west, Sandhurst	116 24 June
Collins, Charles	California Gully, Sandhurst	117 24 June

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Todd, Benjamin	Farnsworth-street, Eaglehawk	118	24 June
Gray, Samuel	Lily-street, Sandhurst	119	24 June
Leyshon, William Henry	California Gully, Sandhurst	120	24 June
Comber, George	50 McKenzie-street, New Chum, Sandhurst	121	24 June
Crowther, Thomas	Market-street, Eaglehawk	122	24 June
Leed, Thomas	Barrett-street, Eaglehawk, Sandhurst	123	24 June
Leed, Robert	Caldwell's-road, Eaglehawk, Sandhurst	124	24 June
Payne, William	near Bird's Reef, Kangaroo Gully, Sandhurst	125	24 June
Thomas, John	Church-street, Eaglehawk, Sandhurst	126	24 June
Keam, Samuel	View-street, Sandhurst	127	24 June
Rowe, Josiah	Duncan-street, Long Gully, Sandhurst	128	24 June
Williams, William Henry	Ironbark, Sandhurst	129	24 June
Cording, Henry	Ophir-street, Sandhurst	130	24 June
Matthews, William	Long Gully, Sandhurst	131	24 June
Northcott, James	Lily-street, Sandhurst	132	24 June
Carlton, William	Brown-street, Sandhurst	133	24 June
Snowdon, John James	Barrett-street, Eaglehawk	135	24 June
Davidson, Jeremiah	Bannerman-street, Sandhurst	136	24 June
Dennis, Samuel	Williams-street, Long Gully, Sandhurst	137	24 June
Phillips, Henry	McDougall-road, Golden Square, Sandhurst	138	24 June
Campbell, Andrew	McClure-street, Little Ironbark, Sandhurst	139	24 June
Walker, William Wilson	Sailors' Gully-road, Eaglehawk	140	24 June
Hunter, William	Backhaus-street, Long Gully, Sandhurst	141	24 June
Fulton, Henry Edward	Ironbark, Sandhurst	142	24 June
Montgomery, Samuel	Maple-street, Sandhurst	143	24 June
Bowen, William	Eaglehawk, Sandhurst	144	24 June
Guy, James	White Hills, Sandhurst	145	24 June
Pratt, Thomas	Cambridge Crescent, White Hills, Sandhurst	146	24 June
Benson, William	Bennett-street, Long Gully	147	24 June
Hicks, William	California Gully, Sandhurst	148	24 June
Andrews, Robert	Ironbark, Sandhurst	149	24 June
Richardson, William	Belmont and Saxby Co., Eaglehawk	150	24 June
Laity, William Henry	Casley-street, Ironbark, Sandhurst	151	24 June
Arthur, Edwin	Snob's Gully, Eaglehawk	152	24 June
Eaton, John	Eaglehawk	153	24 June
Hollingworth, Frederick	Upper California Gully-road, Sandhurst	154	24 June
Arthur, Anthony	Eaglehawk	155	24 June
Webb, Charles	Panton-street, Golden Square, Sandhurst	156	24 June
Thomas, Robert	Dowding-street, California Gully, Sandhurst	157	24 June
Waters, Richard Congdon	Wade's Gully, Sandhurst	158	24 June
Holt, John	California Gully, Sandhurst	159	24 June
Meurer, Charles	Eaglehawk, Bendigo	160	24 June
Murdoch, Andrew	Eaglehawk, Bendigo	161	24 June
Nelson, John	View-lane, Sandhurst	162	24 June
Thomas, Richard	Rae-street, Long Gully, Sandhurst	163	24 June
Jones, Joseph Arscott	Panton-street, Golden Square, Sandhurst	164	24 June
Ebbott, Frederick Francis	California Gully, Sandhurst	165	24 June
Walker, Robert Peter	Eaglehawk	166	24 June
Lloyd, Daniel	Turnbull-street, Sandhurst	167	24 June
Hocking, Josiah	King-street west, Sandhurst	168	24 June
Zimmerman, Henry	High-street, Sandhurst	169	24 June
Glanville, Simon Thomas	Harrison-street, Sandhurst	170	24 June
Carlton, George	Valentine-street, Hustler's Hill, Sandhurst	171	24 June
Flight, William John	North Old Chum, Sandhurst	172	24 June
Martin, William C.	Booth-street, Sandhurst	173	24 June
Ellery, James	Booth-street, Sandhurst	174	24 June
Hocking, Edward	Short-street, Eaglehawk	175	24 June
Berman, Carl	Hargreaves-street west, Sandhurst	176	24 June
Hocking, James	near Railway Station, Eaglehawk	177	24 June
Bailey, Samuel	Sebastian	178	24 June
Redpath, Thomas Veitch	St. Just Point, Long Gully, Sandhurst	179	24 June
Crichton, Robert	Victoria-street, Eaglehawk	180	24 June
Hartley, William James	Maxwell's Reef, Inglewood	181	24 June
Neate, William	Job's Gully, Eaglehawk	182	24 June
Baxter, Matthew James	California Gully, Sandhurst	183	24 June
Michell, Thomas	Eaglehawk, Sandhurst	184	24 June
Tonkin, William	Bright-street, Eaglehawk	185	24 June
Golightly, Henry	Monument Hill, Sandhurst	186	24 June
Strugnell, George	care of Mrs. Flintze, Victoria-street, Sandhurst	187	24 June
Dewar, Robert Alexander	care of Mrs. Flintze, Victoria-street, Sandhurst	188	24 June
Guy, Benjamin	Little Ironbark, Sandhurst	189	24 June
Snell, Richard May	Eaglehawk	190	24 June
Mason, Charles	South Taradale	191	24 June
Lindsay, John	Taradale	192	24 June
Combe, Matthew Tomlinson	Campbell's Creek, Castlemaine	193	24 June
Combe, Matthew Charles	Campbell's Creek, Castlemaine	194	24 June
Lee, Robert	Campbell's Creek	195	24 June
Caldwell, James Henry	Market Square, Inglewood	196	24 June
Rees, Rhys Edmund	Webster-street, Ironbark, Sandhurst	197	24 June
Taylor, Charles Henry	High-street, Taradale	198	24 June
Sinclair, William	Malmsbury	199	24 June
Pearson, Tyson Asbridge	Eaglehawk, Sandhurst	200	24 June
Johnson, William	Welshman's Reef Post Office	201	24 June
Cundy, Thomas Wilson	Booth-street, Sandhurst	202	24 June
Robertson, John	Sebastian, Sandhurst	203	24 June
Ross, Daniel	Hodgson-street, Eaglehawk	204	24 June
Dunne, Thomas	South Taradale	205	24 June

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Rogers, Eli	Wade-street, Golden Square, Sandhurst	206	24 June
Richards, Stephen	Caldwell's-road, Eaglehawk	207	24 June
Tremayne, Samuel	Butler-street	208	24 June
Kinnekey, William Sanders	Maldon	209	24 June
Drummond, James	Brazier-street, Eaglehawk	210	24 June
Wittscheibe, Frederick Adolph	Rayne-street, Sandhurst	211	24 June
Muller, Joseph	Taradale South	212	24 June
Hunter, George	Kirkwood-street, Eaglehawk, Sandhurst	213	24 June
Pinch, William	St. Just's Point, Long Gully, Sandhurst	214	24 June
Fincher, Francis	Golden Gully, Fryerstown	215	24 June
Addison, Walter Weston	Spring Gully, Fryerstown	216	24 June
Lane, William Arthur	Campbell's Creek, Castlemaine	217	24 June
Morris, William	Eaglehawk, Sandhurst	218	24 June
Ratcliffe, Peter	Diamond Hill Post Office	219	24 June
Paterson, Donald	Webster-street, Ironbark	220	24 June
Matthewson, Thomas	Inglewood	221	24 June
Carnie, Alexander Coutter	Barnard-street, Sandhurst	222	24 June
Obermeyer, Joseph	Maldon	223	24 June
Jones, William	Scott's-parade, Ballarat East	224	11 July
Salter, William	Tyson-street, South Ballarat	225	11 July
Chessell, William	York-street, Ballarat East	226	11 July
Trainor, Thomas James	Wheeler's Bridge, *viâ* Smeaton	227	11 July
Richards, Mitford	Victoria-street, Ballarat East	228	11 July
Taylor, William	Wheeler's Bridge, Smeaton	229	11 July
Herbertson, Robert	Wheeler's Bridge, Smeaton	230	11 July
Lewis, Richard	Bowenvale	231	11 July
Crougey, James	Princes-street, Ballarat East	232	11 July
Vincent, Thomas	Rice-street, Scott's-parade, Ballarat East	233	11 July
Loveland, William	Main-street, Ballarat	234	11 July
Williams, George	care of John Williams, Egerton	235	11 July
Berry, William	54 Talbot-street, Ballarat	236	11 July
Rodway, John	Trees-street, Mt. Pleasant, Ballarat	237	11 July
Campbell, John	114 Peel-street, Ballarat	238	11 July
Williams, Thomas	Allendale	239	11 July
Stevens, Edmund Hall	Sebastopol, Ballarat	240	11 July
Jones, William	Grant-street, Ballarat East	241	11 July
Whitburn, Edmund	136 Humffray-street, Ballarat	242	11 July
Neilson, James	Peel-street south, Ballarat East	243	11 July
Henderson, James	Napier-street, Ballarat	244	11 July
Briggs, Joseph	P.O., Creswick	245	11 July
Roberts, William	Waterloo, near Beaufort	246	11 July
Thompson, Thomas	118 Dana-street, Ballarat	247	11 July
Murray, Matthew George	Waterloo, Beaufort	248	11 July
Richards, Henry	Allendale	249	11 July
Downie, Daniel	Haddon	250	11 July
Quick, Richard Major	Haddon	251	11 July
Webb, Zachariah	North Creswick	252	11 July
Campbell, Alexander	Gordons	253	11 July
Jackson, Thomas	Scarsdale	254	11 July
Downing, John	49 Havelock-street, Ballarat	255	11 July
Faux, Louis	Burke's Flat	256	11 July
Burgess, William	Humffray-street N., Ballarat E.	257	11 July
Guyatt, Frederick	Waterloo, near Beaufort	258	11 July
Hamilton, Robert	Albert-street, Sebastopol, Ballarat	259	11 July
Jones, Ezra	Magpie P.O.	260	11 July
Jones, Edward	Magpie P.O.	261	11 July
Davis, James	Morris street N., Ballarat E.	262	11 July
Hocking, John	Mount Prospect	263	11 July
Ogilvie, Joseph	Waterloo, Beaufort	264	11 July
Angus, John	Linton	265	11 July
McKelvey, William	Smeaton	266	11 July
Harris, Henry	Pascoe-street, N. Creswick	267	11 July
Richards, George	Albert-street, Sebastopol, Ballarat	268	11 July
Roddy, Frank	P.O., Smeaton	269	11 July
Sharpe, Andrew Hawthorn	Eureka-street, Ballarat E.	270	11 July
Bowley, Edwin	King-street, Creswick	271	11 July
George, Abraham Thomas	Mt. Egerton	272	11 July
Peters, Charles	Gordons	273	11 July
Pollard, Thomas	Long Point-road, Creswick	274	11 July
Maddern, James	Survey Corner, Ballarat	275	11 July
Clennell, Anthony	Bald Hill P.O., near Creswick	276	11 July
Richards, John	Albert-street, Sebastopol, Ballarat	277	11 July
Wall, John	N. Creswick	278	11 July
Yole, Walter Bramwell	Barry's Reef, Blackwood	279	11 July
Lepage, Peter	Egerton	280	11 July
James, Nicholas	164 Albert-street south, Ballarat	281	11 July
Treloar, William	84 Eyre-street, Ballarat	282	11 July
Denham, John	Allendale	283	11 July
Heron, John	Newlyn	284	11 July
Wansley, John	Kooroocheang	285	11 July
David, William Howell	Albert-street, Sebastopol	286	11 July
Brimblecombe, George	116 Skipton-street, Ballarat	287	11 July
Polkinghorn, John	148 Peel-street north, Ballarat	288	11 July
Noble, William	Allendale, near Creswick	289	11 July
Holst, Peter Arnold	Yarrowee-street, Sebastopol	290	11 July
Dixon, Joseph	Haddon	291	11 July
McIntyre, Joseph	Haddon	292	11 July

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.
		1884.
Scott, William	Haddon, Ballarat	293 | 11 July
Roddy, Thomas	Trunk Lead	294 | 11 July
Matthews, William	Albert-street, Sebastopol, Ballarat	295 | 11 July
Rodda, William	Skipton-street, Ballarat	296 | 11 July
Odgers, Richard	P.O., Yarrowee	297 | 11 July
Backhouse, William Edward	Waterloo, *viâ* Beaufort	298 | 11 July
Pickering, Frank	Smeaton	299 | 11 July
Wood, Jacob	Hollingwood, *viâ* Creswick	300 | 11 July
Phillips, William	Bridge-street, Sebastopol, Ballarat	301 | 11 July
Clough, Thomas	North Creswick	302 | 11 July
Forrester, Andrew	21 Darling-street, Ballarat	303 | 11 July
Spargo, James Richard	North Creswick	304 | 11 July
Williams, John	118 Talbot-street, Ballarat	305 | 11 July
Watkins, William	Mt. Pleasant, Ballarat East	306 | 11 July
Shorten, William Samuel	Egerton	307 | 11 July
Whitrick, George	Eyre-street, Ballarat West	308 | 11 July
Jackson, George John	Egerton-road, Gordons	309 | 11 July
Symons, James	Red Streak, Creswick	310 | 11 July
Fairish, John	81 Sebastopol-street, Ballarat	311 | 11 July
Thomas, Morris	Barkly-street, Ballarat	312 | 11 July
Magor, Thomas	Humffray-street, Ballarat	313 | 11 July
Robinson, Matthew	40 Ascot-street, Ballarat	314 | 11 July
Lewis, Hugh	40 Ascot-street, Ballarat	315 | 11 July
Bennett, Absalom	Albert-street, Sebastopol, Ballarat	316 | 11 July
Jeffery, Christopher	60 Berkly-street, Ballarat	317 | 11 July
Treloar, John	Magpie street, Golden Point, Ballarat	318 | 11 July
Hicks, William	Darling-street, Ballarat	319 | 11 July
Hicks, John	Kent-street, Sebastopol, Ballarat	320 | 11 July
Stokeld, Robert	254 Sturt-street, Ballarat	321 | 11 July
Newcomb, Peter	American Club Hotel, Ballarat East	322 | 11 July
David, John	Haddon	323 | 11 July
Pearce, William	Buninyong	324 | 11 July
Johnson, James	Trunk Lead, Haddon	325 | 11 July
Kerr, William Daniel	P.O., Amherst	326 | 11 July
Olds, Richard	Snake Valley, Carngham	327 | 11 July
Taylor, Neil	Palmerston-street, Buninyong	328 | 11 July
Nichols, Charles Prout	Humffray-street north, Ballarat East	329 | 11 July
Buchanan, James	English-street, Ballarat	330 | 11 July
Reynolds, Edwin	King and Humffray streets, Ballarat	331 | 11 July
Heath, Francis George	Mt. Clear P.O.	332 | 11 July
Harris, James	Gordon	333 | 11 July
Salter, John	Nerrina, Ballarat	334 | 11 July
Alexander, Peter	Bradshaw-street, Ballarat East	335 | 11 July
Jones, James	Leslie-street, Clunes	336 | 11 July
Brown, James	54 Windermere-street, Ballarat	337 | 11 July
Johns, James	Humffray-street north, Ballarat East	338 | 11 July
Palmer, William	Yandoit	339 | 11 July
Watts, Martin	Gordons	340 | 11 July
Leece, Samuel	17 Adair-street, Ballarat West	341 | 11 July
Ewart, William	21 Pleasant-street, Ballarat	342 | 11 July
Russell, James	Australasian Consols Co., Hollingwood	343 | 11 July
Tootell, Edward	36 Ascot-street, Ballarat	344 | 11 July
Kidd, George	Main-road, Ballarat East	345 | 11 July
Wilson, John Mutrie	110 Wills-street, Ballarat	346 | 11 July
Spargo, Nicholas	5 Neil-street, Ballarat	347 | 11 July
Crebbin, Thomas	23 Adair-street, Ballarat	348 | 11 July
Harrison, Joseph	105 Drummond-street, Ballarat	349 | 11 July
Cleverley, William Arthur	Victoria and Princess streets, Ballarat East	350 | 11 July
Lippiatt, Charles	Simpson-street, Buninyong	351 | 11 July
Maukey, Thomas Henry	Yarrowee, Buninyong	352 | 11 July
Buchanan, Robert	English-street, Golden Point, Ballarat East	353 | 11 July
Hancock, James	151 Dana-street, Ballarat	354 | 11 July
Dow, George Graham	Fawkner-street, Ballarat	355 | 11 July
Moyle, William	Speedwell mine, Ballarat East	356 | 11 July
Swedberg, Sven	Steiglitz	357 | 11 July
Craig, William James	Yarrowee, Buninyong	358 | 11 July
Morris, Samuel Caleb	Dyte-parade, Ballarat East	359 | 11 July
Townsend, Thomas	Albert-street, Sebastopol, Ballarat	360 | 11 July
Jones, Hugh Clegir	Trees-street, Mount Pleasant, Ballarat East	361 | 11 July
Davy, James Henry	Waterloo, near Beaufort	362 | 11 July
Gullan, James	22 Talbot-street south, Ballarat West	363 | 11 July
Judd, Henry	Hobart Pasha Co., Waterloo, Beaufort	364 | 11 July
Laidlaw, Walter	Hobart Pasha Co., Waterloo, Beaufort	365 | 11 July
Rasmuson, Charles	Goldsborough, near Dunolly	366 | 11 July
Caird, John C.	Windermere-street south, Ballarat	367 | 11 July
Black, David	Waterloo, near Beaufort	368 | 11 July
Lightfoot, George	North Creswick	369 | 11 July
Ellis, Pascoe	44 Eyre-street, Ballarat	370 | 11 July
Rowley, Joseph	Hiscocks, near Buninyong	371 | 11 July
Harvey, Edwin	Yandoit	372 | 11 July
McLeish, William	Trunk Lead, Haddon	373 | 11 July
Ralph, John	Leslie-street, Clunes	374 | 11 July
Sweeney, Robert	Waterloo, near Beaufort	375 | 11 July
Hocking, Henry	Albert-street, Sebastopol, Ballarat	376 | 11 July
Jobling, Ralph	Hollingwood	377 | 11 July
Hawkins, Henry	Snake Valley, Carngham	378 | 11 July
Curnow, William Glasson	Mount Egerton	379 | 11 July

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.
		1884.
Jones, Hugh	Buninyong	380 11 July
Williams, William	Millbrook P.O.	381 11 July
Gullan, Robert	22 Talbot-street, Ballarat South	382 11 July
Dix, William	Lal Lal-street, Ballarat East	383 11 July
Sharp, Alexander	Regent Hotel, Ballarat East	384 11 July
Lawson, Peter	Grant-street, Ballarat	385 11 July
Williams, John	Lal Lal-street, Ballarat East	386 11 July
Watson, John Foster	53 Ascot-street south, Ballarat	387 11 July
Mazzuchelli, Matthew	Duke-street, Stawell	388 18 July
Clarke, Peter	Wonga and Birmingham, Stawell	389 18 July
Cairns, John	Ararat	390 18 July
Snibson, John	Barkly-street east, Ararat	391 18 July
Byrne, John Robinson	High-street, Ararat	392 18 July
Ballantine, William	Waterloo, near Beaufort	393 18 July
Murray, James Robert	Waterloo, near Beaufort	394 18 July
James, Richard	Oriental Co., Stawell	395 18 July
Thomas, Benjamin	Kofoed-street, Stawell	396 18 July
Seaborn, William Hatton	Skene-street, Stawell	397 18 July
Gregan, Mathew	Wakeham-street, Stawell	398 18 July
Minto, Francis	View Point, Ararat	399 18 July
Trescowthick, Elisha	Magdala, Stawell	400 18 July
Dare, George Walroud	Wimmera-street, Stawell	401 18 July
Matthews, James	Londonderry, Moyston	402 18 July
Matthews, William Henry	Londonderry, Moyston	403 18 July
Skinner, William Allan	Stawell	404 18 July
Chellow, William, junior	Albert-street, Beaufort	405 18 July
Noye, Henry Fitzwilliam	Reedy Creek	406 23 July
Reed, William Edward	Reedy Creek	407 23 July
Addis, Harry Hall	Reedy Creek	408 23 July
Stephens, Abraham, senior	Specimen Hill, Golden Square, Sandhurst	409 23 July
Moffatt, Robert	Ringwood	410 23 July
Burns, Archibald	Reedy Creek	411 23 July
Davies, Charles	Gembrook	412 23 July
Allen, Thomas Francis	Diamond Creek	413 23 July
O'Brien, John Smith	Gembrook	414 23 July
Lloyd, Edward Alfred	Reedy Creek	415 23 July
Taylor, Frederick George Perkins	Reedy Creek	416 23 July
Griffiths, Hugh	Reedy Creek	417 23 July
Stephens, Abraham, junior	Specimen Hill, Golden Square, Sandhurst	418 23 July
Davison, John	Chiltern	419 6 August
Beck, John William	Chiltern	420 6 August
Grieves, Patrick	Chiltern	421 6 August
Hutchison, Thomas	Chiltern	422 6 August
Mellor, Isaac	Chiltern	423 6 August
Morgan, James	Chiltern	424 6 August
Bray, Alfred	Granya	425 6 August
Edwards, Septymus Walter	Granya	426 6 August
Goldsworthy, Martin	Chiltern	427 6 August
Thomas, William	Chiltern	428 6 August
Gaggioni, Joseph	Chiltern	429 6 August
Hall, James	Diamond Creek	430 23 July
Rowe, Samuel	Wandiligong	431 9 August
Phelps, Joseph Joshua	Wandiligong	432 9 August
Jones, Peter	Harrietville	433 9 August
Cameron, Alexander	Bright	434 9 August
Wilson, Thomas	Bright	435 9 August
Forsyth, Robert McMillan	Bright	436 9 August
Watters, Thomas	Wandiligong	437 9 August
Lowerson, Henry	Myrtleford	438 9 August
Stuart, William	Wandiligong	439 9 August
Snell, Richard	Wandiligong	440 9 August
Mitchell, William Henry, junior	Wandiligong	441 9 August
Mitchell, William Henry, senior	Wandiligong	442 9 August
Wilson, John	Bright	443 9 August
Edgar, John	Wood's Point	444 4 September
Parker, William Charles	Walhalla	445 4 September
Renshaw, Joseph	Walhalla	446 4 September
Lee, James Thomas	Walhalla	447 4 September
Healy, Daniel	Walhalla	448 4 September
Brown, Andrew	Walhalla	449 4 September
Waddell, John	Walhalla	450 4 September
Watt, Thomas	Walhalla	451 4 September
Clarke, Robert	Toombon	452 4 September
Orchard, Thomas	Walhalla	453 4 September
Jones, Robert Benjamin	Walhalla	454 4 September
Ryan, Daniel	Walhalla	455 4 September
Rowlands, Edward	Walhalla	456 4 September
Brockwell, Charles Henry	Walhalla	457 4 September
Baren, James	Reedy Creek	458 23 July
Armstrong, William	Walhalla	459 4 September
O'Toole, John	Toombon	460 4 September
Smith, John Thomas	Walhalla	461 4 September
McLachlan, James	Walhalla	462 4 September
Llowellyn, Thomas	Egerton	463 16 September
Ling, William	Egerton	464 16 September
Harrison, Thomas	Egerton	465 16 September
Knuckey, Richard Kendall	Egerton	466 16 September

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Griffiths, Lewis	Egerton	467	16 September
Treloar, William Henry	Egerton	468	16 September
Williams, John	Egerton	469	16 September
Lyons, Charles	Egerton	470	16 September
McCalhm, Jas.	Searsdale	471	19 September
Pryor, Joseph	Happy Valley	472	19 September
Cooke, Albert	Cape Clear	473	19 September
McIntyre, James	Snake Valley, Carngham	474	19 September
Ebbels, Thomas	Snake Valley, Carngham	475	19 September
Crosier, Henry	Happy Valley	476	19 September
McIntyre, James, junior	Linton	477	19 September
Mark, John Joseph	Linton	478	19 September
Pender, Robert	Kangaroo	479	19 September
Longridge, John	Snake Valley, Carngham	480	19 September
Evers, Hans	P. O., Ballarat E.	481	19 September
Pender, Claud	Kangaroo	482	19 September
Carr, Watkin	Haddon	483	19 September
Masterson, Patriek	Staffordshire Reef	484	19 September
Lee, William	Staffordshire Reef	485	19 September
Williams, Joseph Syddall	Linton	486	19 September
Humble, John	Sobastopol, Ballarat	487	19 September
McLachlan, John Lindsay	Walhalla	488	4 September
Goode, William Henry	Barry's Reef, Blackwood	489	23 July
Porter, Thomas Henry	East-street, Ballarat	490	19 September
Carter, William	6 Talbot-street, Ballarat	491	19 September
Ward, Henry	Staffordshire Reef	492	19 September
Conn, James	Staffordshire Reef	493	19 September
McColl, Solomon	Kangaroo, Smythesdale	494	19 September
McGregor, Daniel	Newtown	495	19 September
Taylor, Archibald	Rokewood Junetion	496	19 September
Tresidder, William	Deptford	497	8 September
Richmond, John	Hollingwood	498	24 September
Pollard, William Charles	Union Hill, Creswiek	499	24 September
Hauser, Conard	Mount Prospeet	500	24 September
Temant, Neil	Eastern Hill, Creswick	501	24 September
Treloar, Thomas	Reed-street, Creswick	502	24 September
Grubb, James	Creswick	503	24 September
Borlase, Henry	North Creswiek	504	24 September
Robins, Thomas	Raglan-street, Creswick	505	24 September
Williams, Colin	North Creswiek	506	24 September
Trenfield, Thomas	Lal Lal-street, Ballarat East	507	24 September
Stephens, Martin	Church-street, Creswiek	508	24 September
Parsons, Henry	Magpie P. O.	509	24 September
Paynter, Charles Frederick	Sulky Gully, Creswick	510	24 September
Liston, Alexander	Red Streak, Creswick	511	24 September
Crowl, William Charles	109 Drummond-street, Ballarat	512	24 September
Smith, William	4 Eddy-street, Ballarat East	513	24 September
Bryant, Thomas	138 Raglan-street, Ballarat	514	24 September
Harris, James	Creswick	515	24 September
Clydesdale, Alexander	127 Humffray-street, Ballarat	516	24 September
Crisp, George William	Smythesdale	517	19 September
Williams, William John	Allendale	518	27 September
Cowie, Alexander	Wheeler's Bridge	519	27 September
Neil, Robert Barrie	Broomfield	520	27 September
Parry, David	Allendale	521	27 September
Reed, Thomas	Mount Prospeet	522	27 September
Riekard, Richard	Kingston	523	27 September
Prout, John	Creswiek	524	27 September
Strong, Henry	Allendale	525	27 September
Coombs, George	Allendale	526	27 September
Baister, Robert	Allendale	527	27 September
Price, John	Allendale	528	27 September
Miller, John William	Allendale	529	27 September
Stone, Simon	Kingston	530	27 September
Pearce, John Walter	Creswick	531	27 September
Parkes, William	Creswick	532	27 September
Hanby, Edward	Allendale	533	27 September
Mounsey, John	Broomfield	534	27 September
McDiarmid, John	147 Mair-street, Ballarat	535	27 September
Black, David	Allendale	536	27 September
Drummond, Peter	Peel-street north, Ballarat	537	27 September
Ellis, Thomas	Smeaton	538	27 September
Brown, John	Wheeler's Bridge	539	27 September
Barnett, William	Allendalo	540	27 September
Melnerney, Thomas	Broomfield	541	27 September
Trevan, John	Kingston	542	27 September
Bath, Henry	Beaconsfield, near Creswick	543	27 September
Bourehur, Gideon	Allendale	544	27 September
Sheehan, Martin	Smeaton	545	27 September
Eva, William	Kooroocheang	546	27 September
White, Thomas	Talbot-street south, Ballarat	547	27 September
Betts, James	Hollingwood	548	27 September
Hill, John	83 Lyons-street south, Ballarat	549	27 September
Wilson, William James	Smeaton	550	27 September
Wetzel, George	Daylesford	551	3 October
Maleohn, John	Daylesford	552	3 October
Victor, William	Daylesford	553	3 October

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	1884.
Procter, Charles	Newbury	554	3 October
Henwood, John Reynolds	Blackwood	555	3 October
Avery, John	Barry's Reef	556	3 October
Moody, Robert John	Trentham	557	3 October
Jones, David	Newbury	558	3 October
Holman, James	Stanhope-street, Daylesford	559	3 October
Rowe, William Henry	Grenville-street, Daylesford	560	3 October
Griffiths, William	Shepherd's Flat, near Daylesford	561	3 October
Bennett, John	Garlick's, near Trentham	562	3 October
Rose, John	Malmsbury	563	3 October
Roberts, John	Vincent-street, Daylesford	564	3 October
Brown, Robert	Malmsbury	565	3 October
Morgan, Lewis	Yandoit	566	3 October
Hammond, Thomas	Daylesford	567	3 October
Bedford, Thomas	Newbury	568	3 October
Kneen, Robert	Coomoora	569	3 October
Johnson, John	Daylesford	570	3 October
Speers, John	Newbury	571	3 October
Richards, Josiah James	Victoria-street, Daylesford	572	3 October
Strachan, Charles	Barkstead	573	3 October
Blakely, William	Daylesford	574	3 October
Gilbert, William	East-street, Daylesford	575	3 October
Jenkin, William Daniel	Daylesford	576	3 October
Mason, George	Eastern Hill, Eganstown	577	3 October
Rohs, Thomas	Daylesford	578	3 October
Ford, William	Daylesford	579	3 October
Chapman, Abraham	Wombat Flat, Daylesford	580	3 October
Tippett, Richard	Daylesford	581	3 October
Freeman, John	Victoria-street, Daylesford	582	3 October
Richardson, John	Daylesford	583	3 October
Hogg, John Millar	Hill-street, Daylesford	584	3 October
Hocking, John	Stanley-street, Daylesford	585	3 October
Edwards, William	Stanley-street, Daylesford	586	3 October
Caughey, John	Iguana Creek, *viâ* Coongulmerang	587	8 September
McCracken, James	Barry's Reef, Blackwood	588	3 October
Mathews, John	Talbot-road, Clunes	589	7 October
Featonby, Newark	Clunes	590	7 October
Wild, James	Clunes	591	7 October
Jones, Thomas Stradling	Clunes	592	7 October
Bullock, John	Bailey-street, Clunes	593	7 October
Salkeld, John Miller	Albert-street, North Clunes	594	7 October
Davies, Pierce	Clunes	595	7 October
Taylor, John Henry	Clunes	596	7 October
Fryer, Theodore Joseph	Clunes	597	7 October
Hancock, Alfred	Clunes	598	7 October
Featonby, William, senior	Suburban-street, Clunes	599	7 October
Featonby, William, junior	Clunes	600	7 October
Harland, John G.	Smith-street, Clunes	601	7 October
Parslow, Thomas William	Templeton-street, Clunes	602	7 October
Oates, James	Clunes	603	7 October
Usher, Jabez	Clunes	604	7 October
Steel, Gilbert*	Clunes	605	7 October
Duncan, Robert James	Clunes	606	7 October
Jose, William Henry	Service-street, Clunes	607	7 October
Wearmouth, John	Camp Hill, Clunes	608	7 October
Richards, Edward	Post Office, Clunes	609	7 October
Dunstan, John	Mount Pleasant, Ballarat	610	7 October
Meyer, Henry	Creswick	611	7 October
Clark, James	Albert-street, Clunes	612	7 October
Sweet, George	Golden Point, Blackwood	613	3 October
Grenfell, Thomas Pascoe	Mount Pleasant, Ballarat	614	7 October
Greenwood, John	Moonlight Hill, Stawell	615	9 October
Smith, James	Southern Cross, Beaufort	616	9 October
George, Isaac	12 Brougham-street, Ballarat	617	9 October
Tiley, Edmund	Raglan	618	9 October
Backhouse, Edward	Opossum Gully, Ararat	619	9 October
Kreuger, Frederick	Beaufort	620	9 October
Smith, James	Waterloo, near Beaufort	621	9 October
Harris, Henry	Brougham and Doveton streets, Ballarat	622	9 October
Symonds, Richard	Macarthur-street, Ballarat	623	9 October
Hancock, Sydney	Beaufort	624	9 October
Duly, Alfred	Stawell	625	9 October
Reynolds, William	Smeaton	626	7 October
Grenfell, Abel Samuel	Service-street, Clunes	627	7 October
McAlpine, Walter	Taradale South	628	24 October
Morrison, William	Taradale South	629	24 October
Guest, Edward	Green-street, Loug Gully, Sandhurst	630	24 October
Cordy, George	Taradale S.	631	24 October
Logan, William Andrew	Malmsbury	632	24 October
Trembath, Richard	Taradale S.	633	24 October
McClure, John	Deake-street, Malmsbury	634	24 October
Mudd, John	Taradale	635	24 October
McHattie, Richard	Beehive Chambers, Sandhurst	636	24 October
Jones, Thomas Christopher	Wilson's Reef, Maldon	637	24 October
Connor, James	Campbell-street, Malmsbury	638	24 October
Jones, John	Church-street, Maldon	639	24 October
Bowen, John	Maldon	640	24 October

* Killed by an accident, at Bute and Downes mine, on 29 November, 1884.

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Jenkins, William	Maldon	641	24 October
Stephenson, John	Adamson-street	642	24 October
Hill, William Edmund	Nuggety Flat, Maldon	643	24 October
Harper, John	Malmsbury	644	24 October
Johns, Edwin	Mantou's Gully, Maldon	645	24 October
McLean, Archibald	Barker's Creek, Castlemaine	646	24 October
Bonney, Jesse	Heathcote	647	24 October
Horsburgh, Alexander	Heathcote	648	24 October
Carter, Joseph	Strathloddon	649	24 October
Story, Robert	Heatheote	650	24 October
Morgan, Robert Lloyd	Lauriston	651	24 October
McAlpine, James	South Taradale	652	24 October
Lloyd, Alphonse	Lauriston	653	24 October
Leach, George	Maldon	654	24 October
Morgan, Joseph	Maldon	655	24 October
Tougne, George William	Barker's Creek, Castlemaine	656	24 October
McMillan, Alexander	Laanecoorie	657	24 October
Hatt, Frederick Charles	Fryerstown	658	24 October
Seedsman, James	Church-street, Maldon	659	24 October
Hattam, Richard	Campbell's Creek, Castlemaine	660	24 October
Douthat, Emanuel	Waanyarra	661	24 October
Middling, William	Welshman's Reef, near Maldon	662	24 October
Wildman, Charles James	Taradale	663	24 October
Remfry, Samuel	Maldon	664	24 October
Boreham, Philip	Maldon	665	24 October
Murray, John Rial	Chewton	666	24 October
Armstrong, Frank	Fryerstown	667	24 October
Arnold, Edward	Taradale	668	24 October
Andrew, Nicholas	Stawell	669	24 October
Middleton, Matthew Smith	Lauriston	670	24 October
Brown, Elisha	Chewton	671	24 October
Gwillim, Richard	Duke-street, Castlemaine	672	24 October
McIntosh, James	Maldon	673	24 October
Norris, Nathan	Barker's Creek, Castlemaine	674	24 October
Gwillim, Thomas	Fryerstown	675	24 October
Endey, William	Fryerstown	676	24 October
Kitto, Francis Henry	Fryerstown	677	24 October
Cook, Alfred James	Fryerstown	678	24 October
McCulla, James	Fryerstown	679	24 October
Martin, Stephen	Fryerstown	680	24 October
Odgers, Henry	Chewton	681	24 October
Archbold, George	Chewton	682	24 October
Kemp, James	Wattle Gully, Chewton	683	24 October
Andrew, Richard	Harker-street, Maldon	684	24 October
Mullins, Mathew	Drummond	685	24 October
James, William	Templeton-street, Maldon	686	24 October
Tearle, Henry	Malmsbury	687	24 October
Williams, William Davey	Campbell's Creek, Castlemaine	688	24 October
Smyth, John Wright	Taradale	689	24 October
Ramsay, David	Guildford	690	24 October
Ramsay, Robert Tosh	Guildford	691	24 October
Elsbury, George	Chewton	692	24 October
Gill, George	Spring Gully, Fryerstown	693	24 October
Waterhouse, John	Chewton	694	24 October
South, James	Maldon	695	24 October
Wells, James	Chewton	696	24 October
Ross, David	Guildford	697	24 October
McPherson, Adam	Taradale	698	24 October
Davies, Edward	Guildford	699	24 October
Brown, Michael	Wattle Gully, Chewton	700	24 October
Allan, Robert	Vineyard Reef, Castlemaine	701	24 October
Arthur, John Andrews	Malmsbury	702	24 October
Page, George Hills	Albert-street, Daylesford	703	24 October
Rennie, William Muir	Guildford	704	24 October
King, Edwin Paul	Fryerstown	705	24 October
Parsons, William Bennetts	Fryerstown	706	24 October
Meyer, Cordt	Chewton	707	24 October
Hird, Henry	Clydesdale	708	24 October
Bryan, John	Guildford	709	24 October
Yule, William	Yapeen	710	24 October
George, Samuel	Welshman's Reef, Maldon	711	24 October
Pattison, Edward	Malmsbury	712	24 October
Evans, Noah	Chewton	713	24 October
Thomas, William	Chewton	714	24 October
Davies, Sidney	Happy Valley, Sandhurst	715	24 October
Grose, Thomas	Campbell's Creek, Castlemaine	716	24 October
Kellaway, Henry	N. Maldon	717	24 October
Galloway, John	Welshman's Reef, Maldon	718	24 October
Hill, Joseph	Springs, Maldon	719	24 October
Williams, John	Fryerstown	720	24 October
Rowe, Edward William Prouse	Fryerstown	721	24 October
Wingate, Gabriel	Lauriston	722	24 October
Pollard, James	N. Maldon	723	24 October
Penrose, William	Maldon	724	24 October
Redford, Burdus	Harcourt	725	24 October
Rayfield, John William	Green Valley, Castlemaine	726	24 October
Croke, Timothy	Long Gully, Maldon	727	24 October

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Pollard, Mark	Fryerstown	728	24 October
Davidson, Joseph	Inkerman-street, Maryborough	729	30 October
Hall, John	Dunolly	730	30 October
Bell, Thomas	Dunolly	731	30 October
Armstrong, John	Goldsborough, near Dunolly	732	30 October
Dilworth, James	Homebush	733	30 October
Oppy, James	Homebush	734	30 October
Stephens, John	Craigie	735	30 October
Magan, Patrick	Talbot	736	30 October
Thomas, Charles	Homebush	737	30 October
Brown, James	Amherst	738	30 October
Simmons, James	Amherst	739	30 October
Hancox, Frederick	Narrigal	740	30 October
Hellyar, Thomas	Bowenvale	741	30 October
Hellyar, Richard	Maryborough	742	30 October
Calcott, Thomas	Homebush	743	30 October
Howells, John Thomas	Homebush, Lower	744	30 October
Kinnear, James	Inkerman-street, Maryborough	745	30 October
Kenden, Charles	Carlyle-street, Maryborough	746	30 October
West, Wright Dover	Carisbrook	747	30 October
Bryant, William	Majorca	748	30 October
Young, George	Majorca	749	30 October
Farr, William	Barkly-street, Maryborough	750	30 October
Matthews, Lewis	Mosquito Flat, Maryborough	751	30 October
Bullock, Joseph	Carisbrook	752	30 October
Retallick, William	Lower Homebush	753	30 October
Matthews, John Charles	Bowenvale	754	30 October
Mayman, David	Carisbrook	755	30 October
Tattersall, Samuel	Commercial-road, Tarnagulla	756	30 October
Eudey, Edward	Goldsborough	757	30 October
Laidlaw, Walter	Tarnagulla	758	30 October
Allan, William Pitt Harvey	Carisbrook	759	30 October
Scott, Henry	Maryborough	760	30 October
Tredinnick, John	Bowenvale	761	30 October
McLeod, Angus	Bowenvale	762	30 October
McNee, Duncan	Goldsborough	763	30 October
Andrew, Thomas	Craigie	764	30 October
Astbury, Daniel	Craigie	765	30 October
Deason, Thomas	Goldsborough	766	30 October
Carter, Ralph	Avoca	767	30 October
Mitchell, William	Talbot	768	30 October
Parkinson, John	Goldsborough	769	30 October
Vivian, Johnson William	Lauriston	770	30 October
Wilson, Robert	Dunach	771	30 October
Dempster, John	Timor	772	30 October
Whyte, David	Angus-street, Clunes	773	30 October
Parks, William	Maryborough	774	30 October
Roscholler, George	Chinaman's Flat, Maryborough	775	30 October
Jones, Hugh	Maryborough	776	30 October
Cock, William	Chinaman's Flat, Maryborough	777	30 October
Woolf, Thomas	Bowenvale	778	30 October
Sapsed, William	Talbot	779	30 October
Hancock, Frederick	Albert-street, Maryborough	780	30 October
Freeman, Edward	Amherst	781	30 October
Mitchell, David	Homebush	782	30 October
Stark, William	Dunolly	783	30 October
Bromley, Robert	Dunolly	784	30 October
Elliott, James	Homebush	785	30 October
Enstice, William Henry	Talbot	786	30 October
Snibson, Thomas	Barkly-street, Ararat	787	30 October
Sheils, James Neil	Talbot	788	30 October
Cox, James	Dunach	789	30 October
Haberle, Andrew	Bet Bet	790	30 October
Donovan, Thomas	Talbot	791	30 October
Kransgrill, Christoph	Bowenvale	792	30 October
Davies, Ivor	Maryborough	793	30 October
Richards, George	Maryborough	794	30 October
Timper, Lewis	Majorca	795	30 October
Harvey, Thomas	Avoca	796	30 October
Donovan, James	Clayton-street, Ballarat	797	30 October
Trueman, Alfred	Maryborough	798	30 October
Llewellyn, William	Tarnagulla	799	30 October
Hardefeldt, Otto	Dunach	800	30 October
Oliver, George	Goldsborough	801	30 October
Watkins, William	Tarnagulla	802	30 October
Drummond, Duncan	Rutherford-street, Avoca	803	30 October
Matthews, William	Avoca	804	30 October
Mitchell, Andrew	Talbot	805	30 October
Fletcher, George	New Bendigo, St. Arnaud	806	31 October
Ruddick, Joseph Matthias	Silver Mines-road, St. Arnaud	807	31 October
Howes, John	Silver Mines-road, St. Arnaud	808	31 October
Bieske, Herman	Lord Nelson Co., St. Arnand	809	31 October
Martin, Sampson	St. Arnand	810	31 October
Tucker, Edwin John	Silver Mines-road, St. Arnaud	811	31 October
Hosking, George	St. Arnaud	812	31 October
McLeod, George Alexander	St. Arnaud	813	31 October
Smitheram, Charles	N. W.-road, St. Arnaud	814	31 October

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Hall, Thomas	St. Arnaud	815	31 October
De Ross, William	Amherst	816	30 October
Williams, William Taylor	Bowenvalo	817	30 October
Parry, Charles David	Golden Point, Chewton	818	24 October
Jamieson, William George	Toombon	819	4 September
Casley, Richard	Rutherford-street, Avoca	820	30 October
Crawford, Robert Romney	Moyston	821	30 October
Noell, William	Craigie	822	30 October
Hill, Henry	Maldon	823	24 October
Andrews, Silas	Bulumwaal	824	8 September
Williams, Stephen Taylor	Long Gully, Sandhurst	825	26 November
Davey, William Stevens	Shellback-road, Eaglehawk	826	26 November
Williams, William	Duke-street, Castlemaine	827	26 November
Boland, James	Old High-street, Sandhurst	828	26 November
Kent, Edwin William	High-street, Sandhurst	829	26 November
Morton, William	California Gully, Sandhurst	830	26 November
Back, Robert James	Bailey-street, California Gully, Sandhurst	831	26 November
Treloar, Thomas	Golden Square, Sandhurst	832	26 November
McPherson, Alexander	Church-street, Kangaroo Flat	833	26 November
Lonsdale, John	Old High-street, Sandhurst	834	26 November
Kirkley, Anthony William	King-street west, Sandhurst	835	26 November
Robertson, Charles	Honeysuckle-street, Sandhurst	836	26 November
Griggs, William	Long Gully, Sandhurst	837	26 November
Dower, John Williams	Job's Gully, Sandhurst	838	26 November
Young, John	Happy Valley, Sandhurst	839	26 November
Hollick, Tom	Sailor's Gully, Eaglehawk	840	26 November
Dunkin, Joseph	Maldon	841	26 November
Turner, Thomas	Sailor's Gully, Eaglehawk	842	26 November
Allen, Edwin	Thompson-street, Long Gully, Sandhurst	843	26 November
Nancarrow, William	Allingham-street, Sandhurst	844	26 November
Priddeth, Charles	Allingham-street, Sandhurst	845	26 November
Arthur, Robert	Eaglehawk	846	26 November
Matthews, James	Eaglehawk, Maldon	847	26 November
Pithie, William	High-street, Eaglehawk	848	26 November
Nicholls, William	California Gully, Sandhurst	849	26 November
Pyne, Charles	Snob's Hill, Eaglehawk	850	26 November
Cowan, William	Long Gully, Sandhurst	851	26 November
Wilson, John Henry	Wattle-street, Sandhurst	852	26 November
Stephens, Albert Williams	South Taradale	853	26 November
Benson, Walter Harry	Moore-street, Hustler's Hill, Sandhurst	854	26 November
Watson, George	Camp-street, Eaglehawk	855	26 November
Cameron, James	California Gully, Sandhurst	856	26 November
John, Daniel	Manton's Gully, Maldon	857	26 November
Sparnon, Henry	Long Gully, Sandhurst	858	26 November
Steen, Fenem	Wattle-street, Sandhurst	859	26 November
Jewell, John	Long Gully, Sandhurst	860	26 November
King, James	California Gully, Sandhurst	861	26 November
Robertson, Alexander	Thompson-street, Ironbark, Sandhurst	862	26 November
Bryant, Richard Henry	Raywood	863	26 November
Selover, George Woodhull	Raywood	864	26 November
King, George	Sebastian	865	26 November
Semmens, Absalom	Sebastian	866	26 November
Hocking, Thomas	Caldwell's-road, Eaglehawk	867	26 November
Buzza, John	California Gully, Sandhurst	868	26 November
Ross, James	Sailor's Gully, Sandhurst	869	26 November
Trewren, Henry	Ophir-street, Sandhurst	870	26 November
Cresswell, Alexander	Holdsworth-road, Long Gully, Sandhurst	871	26 November
Clelland, David	Costerfield	872	26 November
Young, Charles	Costerfield	873	26 November
McLeod, Donald	Costerfield	874	26 November
Dabron, John	Sobastian	875	26 November
Exelby, William John	Eaglehawk	876	26 November
Bird, George Walker	Upper-road, California Gully, Sandhurst	877	26 November
Clarke, David Howell	Smith-street, Sandhurst	878	26 November
Toy, Edward	Turner-street, California Gully, Sandhurst	879	26 November
Smith, George Edward	Thorne-street, Sandhurst	880	26 November
Walker, John Naylor	Korong-road, Job's Gully, Sandhurst	881	26 November
Jones, John	P.O., Huntly	882	26 November
Borrman, Theodore	Kangaroo Flat	883	26 November
Orr, Hugh	Raywood	884	26 November
Levie, Alexander	Huntly	885	26 November
Berryman, William	Maldon	886	26 November
Williams, David	California Gully, Sandhurst	887	26 November
Jamieson, John	Long Gully, Sandhurst	888	26 November
Jones, Richard David	Quarry Hill, Sandhurst	889	26 November
Lewis, David William	Dry Diggings, *viâ* Daylesford	890	26 November
Bruce, Charles	Moon Reef, Eaglehawk	891	26 November
Dressler, William	Diamond Hill P.O.	892	26 November
Lewis, David	Dry Diggings, *viâ* Daylesford	893	26 November
Liddell, John Oswald	Inglewood-road, Sandhurst	894	26 November
Laity, William	Mackenzie-street, Sandhurst	895	26 November
Berry, George	Mackenzie-street, Sandhurst	896	26 November
Llewellyn, William	Golden Gully, Golden Point, Chewton	897	26 November
Robertson, Martin	Sailor's Gully-road, Eaglehawk	898	26 November
Nash, Charles	Inglewood	899	27 November
Bishop, William Henry	Inglewood	900	27 November
Chisholm, James	Inglewood	901	27 November

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.
		1884.
Powell, Thomas Frederick	Inglewood	902 27 November
Taylor, William	Inglewood	903 27 November
Rees, Abel	Inglewood	904 27 November
Reade, Andrew	Inglewood	905 27 November
Nettleton, John Thomas	Inglewood	906 27 November
Waters, Joseph	Inglewood	907 27 November
David, Thomas	Inglewood	908 27 November
Deason, Hugh	Moliagul	909 27 November
Jessen, Theodore	Inglewood	910 27 November
McKay, John	Darling-street, Ballarat	911 27 November
Smith, Job	Inglewood	912 27 November
Waymau, Charles	Inglewood	913 27 November
Lavercombe, William	Maldon	914 26 November
Johns, Nicholas	Thistle-street, Sandhurst	915 26 November
Joyce, William	Eaglehawk	916 26 November
Davidson, John	10 Ireland-street, West Melbourne	917 26 November
Doig, James	Lester-street, Eaglehawk	918 26 November
Liddell, Robert Joseph	Don-street, Sandhurst	919 26 November
Stevens, John	German Reef, Maldon	920 26 November
Britt, Frederick James	Huntly	921 26 November
Kelly, John	Campbell-street, Eaglehawk	922 26 November
Bentley, Adam	Garden Gully, Sandhurst	923 26 November
Carthew, John	Silver Mines-road, St. Arnaud	924 31 October
Blomely, George	Kilcunda, Western Port	925 19 December
Jones, Henry	Panton Hill	926 19 December
Pope, Matthew	Whroo	927 19 December
Clark, Alexander	Panton Hill	928 19 December
Le Deux, Jean Claude	Coy's Diggings, Bailieston	929 19 December
Martin, Thomas	Rooney-street, Richmond	930 19 December
Bradley, William Arthur	Costerfield	931 19 December
Faul, Edward Thomas	Huntly, near Sandhurst	932 19 December
Westerman, Samuel	Huntly, near Sandhurst	933 19 December
Robins, Simeon	Parkin's Reef, Maldon	934 19 December
Freeman, Frederick	Kangaroo Flat	935 19 December
Kennedy, Henry	Wood's Point	936 19 December
McLoughlin, John Peter	Kangaroo Flat	937 19 December
Sennuens, Thomas	Rushworth	938 19 December
Spence, David Guthrie	Malmsbury	939 19 December
Hargreaves, John	Gembrook	940 19 December
Peart, Joseph	Drummond	941 19 December
Gray, Robert	Armadale (weighbridge)	942 19 December
Cooper, George	5 Collins-street east, Melbourne	943 19 December
Cairns, Joseph	Eaglehawk	944 19 December
Hill, William Henry	Reedy Creek	945 19 December
Taylor, George Perkins	Reedy Creek	946 19 December
		1885.
Anthony, John	Young-street, Golden Point, Ballarat East	947 12 January
Mayne, Richard	Queen-street, Ballarat East	948 12 January
Borlase, George	Albert-street, Sebastopol	949 12 January
Dale, John Henry	Dyto's-parade, Ballarat East	950 12 January
Kent, Nicholas, junior	Albert-street, Sebastopol	951 12 January
Anthony, Joseph	Main-street, Ballarat East	952 12 January
Dunston, James	Barkly-street, Ballarat East	953 12 January
Tronnee, Richard	16 Webster-street, Ballarat	954 12 January
Butler, Thomas	Sebastopol	955 12 January
Inch, John	Victoria-street, Maryborough	956 12 January
Gilbert, Charles Waghorn	Grant-street, Ballarat	957 12 January
McLean, James	Cape Clear	958 12 January
Stevens, Andrew	Newtown, *viâ* Scarsdale	959 12 January
Bufford, George William Donald	Ballarat North P.O.	960 12 January
Holman, William	Nightingale-street, Newington, Ballarat	961 12 January
Clark, George Young	Cambrian Hill, Sebastopol, Ballarat	962 12 January
Gray, James	Eureka-steet, Ballarat East	963 12 January
Smith, John	Steiglitz	964 12 January
Ballhausen, Charles John Ernest	Barkly-street south, Ballarat East	965 12 January
Muhlhan, Gustav	St. Arnaud	966 12 January
Murray, Timothy	Waterloo	967 12 January
Woolcock, James	Magpie, near Ballarat	968 12 January
Bray, Josiah Nicholas	Grant-street, Ballarat East	969 12 January
Millett, James	Humffray-street north, Ballarat East	970 12 January
Smith, Thomas	Main-street, Ballarat	971 12 January
Ninnes, Daniel	Haddon	972 12 January
Rogers, Henry	Goldsborough	973 12 January
Arthur, Joseph	Queen-street south, Ballarat East	974 12 January
Quick, William	Nerrina, Ballarat	975 12 January
Miller, William	27 Otway-street, Ballarat East	976 12 January
Butters, Benjamin	25 Barkly-street north, Ballarat	977 12 January
Chapman, Almond William, senior	Black Lead	978 12 January
Carvosoe, Thomas	98 Ripon-street, Ballarat	979 12 January
Denham, William	Dooen, near Horsham	980 12 January
Odgers, Richard, junior	Yarrowee, *viâ* Buninyong	981 12 January
Shaw, Henry Rankin	64 Victoria-street, Ballarat	982 12 January
Portlock, John	care of W. H. Mitchells, Ballarat West	983 12 January
Rose, Jonathan	Grant-street, Golden Point, Ballarat	984 12 January
Sword, Joseph	106 Peel-street north, Ballarat East	985 12 January

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1885.
Wilson, Frank	Stony Creek, Daylesford	986	12 January
Taylor, John	Haddon	987	12 January
McColl, John Elder	P.O., Gordons	988	12 January
Mathews, John Henry	Red Hill, Blackwood	989	12 January
Thomas, James	Avoca	990	12 January
Butler, William	Trunk Lead, Haddon	991	12 January
			1884.
Woolcock, William	Jamieson	992	3 December
			1885.
Ruddick, John Joseph	St. Arnaud	993	24 February
Griffiths, William	Reedy Creek	994	24 February
Morton, Edward	Fryerstown	995	24 February
Stephenson, James Henry	Adamson-street, Malmsbury	996	24 February
Tangey, John Morgan	Malmsbury	997	24 February
Pollock, James	P.O., Allan's Flat	998	24 February
Irwin, Henry	Kensington, near Newmarket	999	24 February
Williams, Thomas Green	Granya, Upper Murray	1000	24 February
Bruggy, Patrick Mathew	Taradale	1001	24 February
Dodd, Hugh	Alma	1002	24 February
Cowling, James	Campbell's Creek, South Taradale	1003	24 February
Nelson, John	12 Cardigan-street, Ballarat	1004	24 February
Duery, Joseph	18 Gold-street, Collingwood	1005	24 February
Jenkins, John	Granya, Upper Murray	1006	24 February
Greenwood, John	Rokewood Junction	1007	25 February
Masterman, George Thomas	P.O., Raywood	1008	25 February
Crammond, James	Huntly	1009	25 February
Tate, Charles	Magenta Mill, Chiltern	1010	25 February
Thorn, Thomas Cook	Mount Korong-road, Sandhurst	1011	25 February
Rielley, Daniel	Barker's Creek	1012	26 February
Jose, John	Daylesford	1013	26 February
Pearce, Joseph Palmer	Maldon	1014	26 February
Fulton, Hugh	Stanley	1015	26 February
Tate, William Henry	3 William-street, Collingwood	1016	26 February
Hawking, William Henry	Rushworth	1017	26 February
Tate, Henry	Chiltern	1018	26 February
Sutherland, James Roy	Scotchman's Lead, near Buninyong	1019	12 January
Oats, Matthias	Hurdle Flat, near Beechworth	1020	26 February
English, John	Anderson-street, Ironbark, Sandhurst	1021	27 February
Allott, Thomas	Hurdle Flat, Beechworth	1022	26 February
			1884.
Roberts, John Read	Welshman's Reef P.O.	1023	19 December
			1885.
Holman, Thos. Henry	Walhalla	1024	27 February
Blackwell, John	Walhalla	1025	27 March
Tomlinson, Arthur Jas.	Yarraville	1026	27 February

HOLDERS OF CERTIFICATES OF SERVICE (authorizing the holders to Drive any Engine used for Mining Purposes, except a Winding Engine).

Name.	Address.	No. and Date of Certificate.	
			1884.
Stevenson, William Robert	Bullock Creek-road, Golden Square, Sandhurst	1	24 June
White, Robert	Mt. Korong-road, Eaglehawk	2	24 June
Fischer, Hans Christian	Eaglehawk	3	24 June
Hunter, Robert	California Gully, Sandhurst	4	24 June
May, Henry	Simpson's-road, Eaglehawk	5	24 June
Russell, George	Epsom	6	24 June
Nichols, Charles	American Gully, Sandhurst	7	24 June
Barrow, James Herbert	Victoria-street, Sandhurst	8	24 June
Duncan, Alexander	Long Gully, Sandhurst	9	24 June
Calverley, Martin	Long Gully, Sandhurst	10	24 June
Runge, Carl	Victoria Hill, Sandhurst	11	24 June
Adams, Thomas	Sebastian	12	24 June
Doig, James	Lester-street, Eaglehawk	13	24 June
Randall, Henry	Allingham-street, Golden Square	14	24 June
Watters, William	Long Gully, Sandhurst	15	24 June
Smith, Edward	Sailor's Gully, Eaglehawk	16	24 June
Zöller, Johannes	New Chum and Victoria, Sandhurst	17	24 June
Payne, Charles	Rae-street, Sandhurst	18	24 June
Smith, John	California Gully, Eaglehawk	19	24 June
Maasdyke, John	Wattle-street, Sandhurst	20	24 June
Nankervis, Henry Thomas	Smith Creek, Daylesford	21	24 June
Ebsworthy, Richard	Humffray-street north, Ballarat East	22	11 July
Pearce, William Henry	North-parade, Creswick	23	11 July
Redpath, Francis	Nerrina, Ballarat	24	11 July
Williams, Morgan	Clunes	25	11 July

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine except a Winding Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Klug, Charles	Dutch Harry Hotel, Ballarat East	26	11 July
Thomas, James	Victoria-street, Ballarat East	27	11 July
Tipping, Jerman	Barkly-street south, Ballarat	28	11 July
Heinrichsen, Ernest Wilhelm	Albert-street, Sebastopol	29	11 July
Mark, Edwin Ritson	Grant-street, Ballarat East	30	11 July
James, John	Humffray-street north, Ballarat East	31	11 July
Edwards, John	Peake-street, Ballarat East	32	11 July
Richards, William Henry	Bradshaw-street, Ballarat East	33	11 July
Curnow, Charles	Lofren-street, Ballarat East	34	11 July
Gibson, William	Alfred-lane, Stawell	35	18 July
Gray, Edmund	Fisher-street, Stawell	36	18 July
Bartley, Andrew	Darlington-road, Stawell	37	18 July
Goldsworthy, Richard Morcom	Skene-street, Stawell	38	18 July
Gowland, Joseph	Wonga Wonga, Stawell	39	18 July
Willoughby, William Henry	St. George-street, Stawell	40	18 July
Drummond, Alexander	Blackwood	41	23 July
Grant, Lewis Dudley	Warraudyte	42	23 July
Greene, William Henry	Hillsborough	43	6 August
Grant, Peter William	Granya	44	6 August
Johnston, George	Rose Hill, Beechworth	45	6 August
Grant, David Edwin James	Granya	46	6 August
Portch, George	Magenta Reef, Chiltern	47	6 August
Sandercock, Richard	Wandiligong	48	9 August
Kennedy, Allan	Smoke Flat, Freeburgh	49	9 August
Gregory, James William	Wandiligong	50	9 August
Hewitson, John	Wandiligong	51	9 August
Beach, Henry Edward	Walhalla	53	4 September
Deadman, Charles	Walhalla	54	4 September
McDowall, Charles	Walhalla	55	4 September
Smith, William	Donnelly's Creek	56	4 September
Dare, George	Donnelly's Creek	57	4 September
Dendy, Henry	Walhalla	58	4 September
Shaw, Donald	Fulton's Creek	59	4 September
Ralston, Alexander	Bairnsdale	60	8 September
Calder, Allan	Grant	61	8 September
Rose, Benjamin	Deptford	62	8 September
Oakes, John	Bairnsdale	63	8 September
Reford, Lewis Alfred	Grant	64	8 September
Sondewit, Hans	Dargo	65	8 September
Griffiths, Richard Robert	Grant	66	8 September
Jorgenson, Hans Christian	Dry Gully, Omeo	67	8 September
Hynes, Michael	Elaine	68	16 September
Deru, Alexander	Mount Egerton	69	16 September
Phillips, William	Mount Egerton	70	16 September
Smith, John	Staffordshire Reef	71	19 September
Hiscock, John	Staffordshire Reef	72	19 September
Guy, William Samuel	Staffordshire Reef	73	19 September
Wilson, William	Staffordshire Reef	74	19 September
Low, William	Staffordshire Reef	75	19 September
Law, Robert	Smythesdale	76	19 September
Ashbery, Richard	Newtown, Scarsdale	77	19 September
Hanlon, William	Creswick	78	24 September
Gardner, Charles Eustace	Creswick	79	24 September
Phillips, Edmund	Ballarat East	80	24 September
Richards, Richard Ninnes	Creswick North	81	24 September
Lowe, Ralph	Creswick North	82	24 September
Drew, George Henry	Drew and Humffray streets, Ballarat	83	24 September
Garrard, Arthur George	Kingston	84	27 September
Wrigley, John	Allendale	85	27 September
Whittle, Charles	Kingston	86	27 September
English, Joseph	Allendale	87	27 September
Lucas, Alfred	Omeo	88	8 September
Lane, Robert	Daylesford	89	3 October
Watt, Thomas Johnson	Blackwood	90	3 October
Sampson, John	Stanley-street, Daylesford	91	3 October
Wilson, George	Lyell, near Redesdale	92	3 October
Pascoe, William Henry	Barry's Reef, Blackwood	93	3 October
Perry, Thomas	Vincent-street north, Daylesford	94	3 October
Wallis, Robert	East-street, Daylesford	95	3 October
Olds, William	Duke-street, Daylesford	96	3 October
Burr, John Henry	Hillside, Daylesford	97	3 October
Thomas, John Frederick	Grenville-street, Daylesford	98	3 October
Denman, Joseph	Simmons' Reef, Blackwood	99	3 October
Nankervis, Andrew James	Victoria-street, Daylesford	100	3 October
Lawry, William	Duke-street, Daylesford	101	3 October
Thomas, George	Victoria-street, Daylesford	102	3 October
Thomas, Joseph	Raglan-street, Daylesford	103	3 October
Mounter, Richard	Barry's Reef, Blackwood	104	3 October
Mounter, John	Barry's Reef, Blackwood	105	3 October
Mounter, George	Barry's Reef, Blackwood	106	3 October
Darcy, Patrick	P.O., Daylesford	107	3 October
Hattam, John	East-street, Daylesford	108	3 October
Hill, Edward	Red Hill, Blackwood	109	3 October
Datson, Thomas	Leggat-street, Daylesford	110	3 October
Stark, John	Albert-street, Clunes	111	7 October
Broad, William	Upper Frazer-street, Clunes	112	7 October
Leonard, Frederick	Talbot-road, Clunes	113	7 October

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine except a Winding Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Nelson, Adolph	Clunes	114	7 October
Wilson, James	Talbot-road, Clunes	115	7 October
O'Leary, Cornelius	Clunes	116	7 October
Rowland, David	Clunes Weir, Smeaton	117	7 October
Lightly, John	Barry's Reef, Blackwood	118	3 October
Christensen, Lars	Ligar-street, Stawell	119	9 October
Huse, George	Beaufort	120	9 October
Edwards, David James	Granya	121	6 August
Jeffery, Edward	Maldon	122	24 October
Watts, William	Harker-street, Maldon	123	24 October
Fischer, Detlev	Lady Gully, Castlemaine	124	24 October
Dieckmann, Henry William	Newstead	125	24 October
Brown, Richard	Chewton	126	24 October
Hocking, Philip	Baker-street, Chewton	127	24 October
Trembath, John	Eureka, Castlemaine	128	24 October
Schroeder, Heinrich	Chewton	129	24 October
Hokin, William	Maldon	130	24 October
Botten, Henry Thomas	Don-street, Sandhurst	131	24 October
Salter, Edwin	North Maldon	132	24 October
Hocking, Henry	Chewton	133	24 October
Edwards, John	Junction Hotel, Malmsbury	134	24 October
Lawton, Ezekiel	Castlemaine	135	24 October
Hurford, William	Llanelly	136	30 October
Williams, William	Llanelly	137	30 October
Nichols, William	Avoca	138	30 October
Birch, Thomas	87 Urquhart-street, Ballarat	139	30 October
Fyght, Charles	Mount Clear	140	30 October
Reade, James Kay	Bowenvale	141	30 October
Webb, George	Burke's Flat	142	31 October
Gladstone, James	Grant	143	8 September
Bythell, William Redfern	Monument Hill, Castlemaine	144	24 October
Cox, John	Happy Valley, Sandhurst	145	26 November
Forbes, David	Butler-street, California Gully, Sandhurst	146	26 November
Sayer, Alfred	Specimen Hill, Sandhurst	147	26 November
Watts, Isaac	Dowding-street, California Gully, Sandhurst	148	26 November
Jose, James Henry	Victoria-street, Sandhurst	149	26 November
Watson, John	Sailor's Gully-road, Eaglehawk	150	26 November
Rule, Samuel	Sebastian	151	26 November
Edwards, Joseph	Eaglehawk	152	26 November
Goldsworthy, John	Honeysuckle-street, Sandhurst	153	26 November
Heyes, George	Golden Gully, Sandhurst	154	26 November
Heyes, James Parkinson	Golden Gully, Sandhurst	155	26 November
Love, James	Eaglehawk	156	26 November
Liddell, Thomas Jones	Forest-street, Sandhurst	157	26 November
Rooney, William	California Gully, Sandhurst	158	26 November
Fleming, John	Violet street, Sandhurst	159	26 November
Hayward, George	Sebastian	160	26 November
Strugnell, Robert	Sebastian	161	26 November
Jones, William Evan	care of Nettleton, Inglewood	162	27 November
Lawrence, Joseph	Inglewood	163	27 November
Deeble, Daniel	Barnard-street, West Sandhurst	164	26 November
Featherstone, John	Job's Gully, Sandhurst	165	26 November
Roberts, Christopher	Bull-street, Sandhurst	166	26 November
Reddan, George John	Axedale	167	26 November
Leahy, Andrew	Vinton-street, California Gully	168	26 November
Watson, George	Caldwell's-road, Eaglehawk	169	26 November
Tole, Michael	Loyola	170	3 December
Tattersall, Robert	Gaffney's Creek	171	5 December
Dickson, Fredrick	Gaffney's Creek	172	5 December
Millea, Richard	Gaffney's Creek	173	5 December
Cantieni, Peter	Gaffney's Creek	174	5 December
Whitelaw, James Crooke	Gaffney's Creek	175	5 December
Burness, John	Enoch's Point	176	5 December
Willnott, Samuel	Wood's Point	177	5 December
Birrell, George McKenzie	Gaffney's Creek	178	5 December
Bolle, Nicholas, junior	Whipstick	179	19 December
Rennie, William	Gobur	180	19 December
Prideaux, Stephen	Rushworth	181	19 December
Keogh, Joseph Patrick	Rushworth	182	19 December
Harrison, George	Rushworth	183	19 December
Holden, Joseph	Rushworth	184	19 December
Collins, William	Rushworth	185	19 December
Fraser, Charles	Bright	186	19 December
Anderson, John	69 Lygon-street, Carlton	187	19 December
Folks, Allen	Matlock	188	5 December
			1885.
McMullen, William John	Main-street, Stawell	189	12 January
Matthews, William Henry	George-street, Redan, Ballarat West	190	12 January
Hicks, Thomas	Mount Pleasant, Ballarat East	191	12 January
Magor, William Malachi Hitchens	Hiscocks, near Buninyong	192	12 January
Day, George Porter	Dunn-street, Golden Point, Ballarat East	193	12 January
Wightman, David James	Barry's Reef	194	12 January
Merlin, Thomas	77 Albert-street, Ballarat West	195	12 January
Chapman, Almond William, junior	Black Lead	196	12 January

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of Certificates authorized to drive any Mining Engine except a Winding Engine—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1885.
Carnegie, James	Terrible Gully, near Sebastopol	197	12 January
Davies, Benjamin	87 Armstrong-street south, Ballarat	198	12 January
Ritchie, William	105 Humffray-street, Ballarat West	199	12 January
Brownfield, Edward	Ballarat East	200	12 January
Woodyatt, Robert	Mount Egerton	201	12 January
Owens, Edward	Mosquito Flat	202	12 January
			1884
Grant, John	Inglewood	203	27 November
Darroch, Robert	Whroo	204	19 December
Darroch, John	Whroo	205	19 December
Darroch, James	Whroo	206	19 December
			1885
Cock, Alfred	Golden Gully, Fryerstown	207	24 February
Bolle, Nicholas, senior	Whipstick, Eaglehawk	208	24 February
Gibbins, William	Taradale	209	24 February
Wilkinson, John	Matlock	210	24 February
Singleton, John	P.O., Walhalla	211	24 February
Cousins, John	Aberfeldy	212	24 February
Hillier, Henry	Granya	213	24 February
Ellis, Thomas	Grecian Gully, Amherst	214	25 February
Carlile, Albert	Aberfeldy	215	25 February
Hollis, William Montague	Reedy Creek	216	25 February
Hutcheon, William	Talbot	217	25 February
Place, Thos.	Chiltern	218	25 February

HOLDERS OF FIRST CLASS CERTIFICATES OF COMPETENCY.

Name.	Address.	No. and Date of Certificate.	
			1884.
Fargher, Philip	Specimen Hill, Eaglehawk	1	24 June
James, Henry William	Golden Square, Sandhurst	2	24 June
Pithie, Daniel	High-street, Eaglehawk	3	24 June
Eyre, William	Sailor's Gully-road, Eaglehawk	4	24 June
Kemp, Thomas	Wattle Gully, Chewton	5	24 June
Williams, Joseph Knecbone	Tariff-street, Eaglehawk	6	24 June
Hunter, George Wales	Sebastian	7	24 June
Bassett, Joseph	Commercial-road, Tarnagulla	8	24 June
Roots, Richard	McDougall-road, Sandhurst	9	24 June
Faulkner, William Jeyes	Campbell's Creek, Castlemaine	10	24 June
Collins, Charles Robert Thomas	Graham-street, Quarry Hill, Sandhurst	11	24 June
Reed, John	Lilac-street, Sandhurst	12	24 June
Christian, Edward	Havilah-road, Long Gully, Sandhurst	13	24 June
Neilson, Thomas	Brown-street, Eaglehawk	14	24 June
Eva, William Henry	Long Gully, Sandhurst	15	24 June
Christian, William	Lower-road, California Gully, Sandhurst	16	24 June
Power, Frank	Grant-street, Ballarat East	17	11 July
Greenfield, Francis George	Charlotte-street, Sebastopol	18	11 July
Dunlop, Thos.	Malmsbury	19	11 July
Spencer, Michael	Hedrick-street, Bunninyong	20	11 July
Crichton, David	Smeaton	21	11 July
Wingate, James	Smeaton	22	11 July
Wall, Robert, junior	Mac-street, North Creswick	23	11 July
Allan, Robert	Allendale	24	11 July
Park, Duncan	Eddy-street, Ballarat	25	11 July
Thomas, William	George-street, Ballarat West	26	11 July
Lamb, Charles Henry	Smeaton	27	11 July
Gough, Thomas	Dyte-parade, Ballarat	28	11 July
Wasley, Josiah	92 Erard-street, Ballarat	29	11 July
Watts, Thomas	20 Market-street, Ballarat	30	11 July
Walsh, Thomas	164 Skipton-street, Ballarat	31	11 July
Wootton, George	Waterloo, near Beaufort	32	11 July
Lamb, Ralph	Waterloo, near Beaufort	33	11 July
Wilson, George	Haddon	34	11 July
McGregor, Donald	Franklin-street, Sebastopol, Ballarat	35	11 July
Noble, Thomas	Nerrina, Ballarat	36	11 July
Nylander, Albert	Raglan-street south, Ballarat	37	11 July
Cuming, Stephen	Pennyweight Hill, Ballarat East	38	11 July
Fitches, George Henry	Allendale	39	11 July
Petrie, George	281 Sturt-street, Ballarat	40	11 July
Brehant, George	Fisher-street, Stawell	41	18 July
Hyslop, Robert	Jennings-street, Stawell	42	18 July
Thomas, William	Lilian-street, Stawell	43	18 July
Middleton, John	Stawell	44	18 July
Davis, Thomas	Stawell	45	18 July
Gibbons, John	Stawell	46	18 July
Tauschke, Frederick William	Stawell	47	18 July
Bates, James	Stawell	48	18 July
Wild, George	Stawell	49	18 July

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.

Holders of First Class Certificates of Competency—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Phillips, William Joseph	Stawell	50	18 July
Clark, Robert	Stawell	51	18 July
Preece, William Edward	Maldon	52	23 July
Thomas, Thomas	Diamond Creek	53	23 July
Cook, John	Chiltern	54	6 August
Pender, David	Haddon	55	19 September
Davies, Joseph	Snake Valley	56	19 September
Norton, George	Winter's Flat, near Buninyong	57	24 September
Boyd, James	Mining Exchange, Ballarat	58	24 September
Dare, George Walroud	Stawell	59	24 September
Hanlon, Christopher	Broomfield	60	24 September
Welham, John	Ballarat	61	24 September
Petrie, Robert	Smeaton	62	27 September
Moyle, Alfred	Stanbridge-street, Daylesford	63	3 October
Fyfe, Edward Highton	Leggat-street, Daylesford	64	3 October
Booth, George Frederick	Frazer-street, Daylesford	65	3 October
McPhee, Daniel	Allendale	66	7 October
Bennett, Henry Goulding	North Clunes	67	7 October
Witty, George Francis	Stawell	68	9 October
McAlpine, James	Stawell	69	9 October
Jenkins, Robert Allan	Stawell	70	9 October
Wootton, George, junior	Waterloo Flat	71	9 October
James, Richard	Stawell	72	9 October
Cuthbertson, George	Beaufort	73	9 October
Pope, John	Terminus Hotel, Stawell	74	9 October
Davey, William	Chewton	75	24 October
Millar, Alexander	Central Chinaman's, Maryborough	76	30 October
Crudace, William Mellanby	Moonlight-street, Stawell	77	30 October
Brideson, John	Tarnagulla	78	30 October
Procter, Thomas	Bowenvale	79	30 October
Salter, William	Miners' Arms, Timor	80	30 October
Smith, Enoch	Inglewood	81	27 November
Treharne, Rees Maddock	Maxwell's claim, Inglewood	82	27 November
Kemp, James	Wattle Gully, Chewton	83	29 November
Langdon, John	Long Gully, Sandhurst	84	29 November
Stephens, James	Tarnagulla	85	29 November
Wittscheibe, Fredrick Adolph	Sandhurst	86	29 November
Borrman, Charles Henry	Burrowes-street, Golden Square, Sandhurst	87	29 November
Townson, John Jenkins	Reedy Creek	88	19 December
Wilson, William James	Bailieston	89	19 December
Anderson, Thomas Spence	Walhalla	90	19 December
Rowse, Anthony	Maldon	91	19 December
Lewis, John	Maldon	92	19 December
Harvey, George Isaac	Campbell's Creek	93	19 December
Morgan, David	Gembrook	94	19 December
Rowe, James	Jackson-street, Long Gully	95	19 December
Britt, Thomas	Huntly	96	19 December
			1885.
Clarke, John Henry	Fisher-street, Stawell	97	12 January
Rowe, John	Trevor-street, Ballarat East	98	12 January
Wright, Thomas	Waterloo Flat	99	12 January
Treweek, William Pryor	Magpie P.O.	100	12 January
Nicholson, Alexander	Newstead	101	12 January
Woodman, John	Muckleford	102	12 January
Pearson, Thomas	Burnt Creek	103	12 January
Collier, Thomas	Mount Egerton	104	12 January
Clennell, John	Wendouree P.O., Ballarat West	105	12 January
Borlase, John	Cheshunt-street, Sebastopol	106	12 January
Parsons, Henry	Sebastopol P.O.	107	12 January
Kennedy, Alexander	Lintons	108	12 January
Shepherd, John	Trunk Lead, Haddon	109	12 January
Raselli, Francis Celeste	Panton Hill	110	25 February
Uddman, Charles	Reedy Creek	111	26 February

HOLDERS OF SECOND CLASS CERTIFICATES OF COMPETENCY.

Name.	Address.	No. and Date of Certificate.	
			1884.
Fulton, Edward Clarke	Ironbark, Sandhurst	1	24 June
Kay, Archibald	Elaine	2	11 July
Prior, Joseph	Stawell	3	18 July
McGinley, John	Moonlight Hill, Stawell	4	18 July
Gray, William	Fisher-street, Stawell	5	18 July
White, David Hunter	Wimmera-street, Stawell	6	18 July
Candy, Henry	Stawell	7	18 July
Jenkins, John	Dargo	8	8 September
Bartley, Andrew	Darlington-road, Stawell	9	24 September
Barnett, William	Allendale	10	27 September
Lawry, Henry Champion	Allendale	11	27 September

APPENDIX E.—Name and Address of each Mining Engine-driver holding a Certificate.
Holders of Second Class Certificates of Competency—*continued.*

Name.	Address.	No. and Date of Certificate.	
			1884.
Hosking, Benjamin Edward ...	Blackwood	12	3 October
Davies, David	Kingston	13	7 October
Munro, William	Alfred-lane, Stawell	14	9 October
Harris, Joseph Barkly	Sherriff-street, Stawell	15	9 October
Stuart, Alexander Leslie ...	Beaufort	16	9 October
May, Silas	California Gully, Sandhurst	17	29 November
Neunhoeffer, Frederick Henry	Hayes-street, Ironbark, Sandhurst	18	29 November
Nancarrow, Stephen Henry ...	Panton-street, Eaglehawk	19	29 November
Sturzaker, George Thomas ...	Wood's Point	20	5 December
Steele, Edward	Kilcunda P.O.	21	19 December
Llewellyn, John Henry ...	Chewton P.O.	22	19 December
Wilkinson, John Fell	Raywood	23	19 December
Leyshon, William, junior ..	Upper-road, California Gully, Sandhurst	24	19 December
Ryan, Thomas	Booth-street, Golden Square, Sandhurst	25	19 December
Butler, James William ...	Butler-street, Sandhurst	26	19 December
Rockes, Michael	Simpson's-road, Eaglehawk	27	19 December
Forrester, William Abner ...	Lauriston	28	19 December
Clarkson, George Francis ...	Lauriston	29	19 December
Duncan, Peter	Long Gully, Sandhurst	30	19 December
Smith, William George ...	Bailieston	31	19 December
			1885.
Davies, Thomas	Yandoit P.O.	32	12 January
Pooley, Charles	Stanhope-street, Daylesford	33	12 January
Dodd, William	Drummond	34	12 January
Smyth, Thomas Lee	Broomfield	35	12 January
McPherson, Alexander Walter	Rutherglen	36	24 February
Roberts, William	Golden Gully, Sandhurst	37	24 February
Taylor, William	California Gully, Sandhurst	38	25 February
Christesen, John	Baarmutha, Beechworth	39	25 February
West, William	Laanecoorie P.O.	40	25 February
Routh, William	Laanecoorie P.O.	41	25 February
Angwin, Christopher	Queensbury-street, Daylesford	42	26 February

APPENDIX F.

REPORT OF THE INSPECTOR OF EXPLOSIVES TO THE HONORABLE THE MINISTER OF MINES FOR YEAR 1883.

[Presented to both Houses of Parliament pursuant to section 14 of *The Explosives Act* 1877.]

To the Honorable J. F. Levien, M.P., Minister of Mines, &c., &c., &c.

Melbourne, 9th July, 1884.

SIR,

I have the honour to submit the following Report in accordance with section 14 of *The Explosives Act* 1877:—

Local factories.

The manufacture of explosives at the works of the Australasian Lithofracteur Company at Braybrook, and at the safety blasting powder factories at Stawell and Sandhurst, has been conducted without accident, and, as a rule, the quality has been good. A license was granted for the manufacture of ordinary blasting powder at works erected at Black Hill, Ballarat, but the works have been closed for the present.

Increased use of dynamite.

The demand for dynamite for mining purposes is steadily increasing, and large quantities have been imported as well as manufactured during the year. The quantity of the latter in stock is under control, as the amount allowed in the factory magazine at Braybrook is limited, and the output of the works is regulated by the demand, but with imported explosives there is no limit to the amount that may accumulate at any one time. In 1881 the amount used was comparatively small, and the Explosives Board then sitting recommended that all nitro-glycerine compounds should be stored below water-level in hulks containing not more than 5 tons each; but since that time the imported explosives have arrived in such quantity that we have had 70 or 80 tons of dynamite in the Bay at one time, which would require a flotilla of some 14 or 16 small hulks anchored about the Bay. To meet the difficulty, I suggested that a shore magazine should be provided, so as to relieve the hulk, in which the dynamite was so packed that inspection was impossible. But, owing to various causes, shore magazines were not constructed; and to meet the necessity of the case, the Department of Customs provided a new hulk so fitted that from 50 to 60 tons of explosives could be stored below water-level. This capacity was considered sufficient at the time, not only by myself, but by the merchants whom I consulted and the officers of the Customs Department, and there can be no question as to the inadvisability of storing a larger quantity in one magazine near any large centre of population; but at times during the past year the quantity in the hulk has been as much as 80 tons, and recently, owing to my having found explosives of an inferior quality in the hulk, the vessel has been removed from the old anchorage in Hobson's Bay to a position off Point Cook, some five miles below the Gellibrand lightship. This step no doubt ensures the safety of the city of Melbourne, but it does not provide safe or proper storage for a large quantity of dynamite, and to ensure this safety some further provision must be made. I am still of the opinion that a shore magazine will be the most suitable, and as a site cannot be found near Melbourne which is not objected to by neighbouring property owners, I

Hulks.

have suggested a locality in the Macedon State Forest Reserve, where the magazine will be far from habitations, and may be easily reached by a siding from the railway. This site would not be inconvenient, as by far the largest quantity used is carried over the railway to Sandhurst and the branch lines. The hulk in the Bay would then become, as intended, merely a place for temporary storage, and the regulations passed by the Governor in Council dated the 28th November, 1882, could be carried out. At present they are ignored, as they contain a clause prohibiting the storage of dynamite in the hulk for a period exceeding two months, while, as a fact, dynamite has remained in the hulk for twelve months. This breach of the regulations was pointed out by the Customs officer in charge of dynamite; but, as there was no other place to store it, I recommended that it should be allowed to remain in the hulk while in a sound condition, and that some system of constant inspection should be adopted; but, owing to the divided responsibility of the various departments having control of explosives, the inspections have been carried out in a most irregular manner and without any system, at my own personal risk, responsibility, and expense, till within the past six weeks, when I was authorized by the Honorable the Premier to take such steps as were necessary to ensure immediate public safety.

The new Explosives Bill to be introduced during the present session of Parliament will probably consolidate all the provions gunpowder and explosives Acts, and some one department of the Government will be made to take the whole responsibility of admitting only good sound explosives to stores, magazines, and mines, and controlling the storage.

Detonators. Owing to the large amount of dynamite in store, there is an equivalent quantity of dynamite detonators, which, up to the present time, have been treated as ordinary merchandise, and stored in warehouses and shops. The number recently in Melbourne was about 800,000. Since the removal of the Government gun-cotton from the small magazine within the Maribyrnong Magazine enclosure, I have recommended that this building should be set apart for detonators, and I have no doubt that merchants would gladly avail themselves of this safe storage and limit the quantity in any of their stores to one case containing 10,000 detonators.

Stowage in ships. I may here mention the careless stowage of explosives on board ships arriving here from abroad, to which I think the attention of the authorities in England should be called. When inspecting the dynamite on board the ship *North American*, in the early part of the year, I noted that directly over some 20 tons of dynamite, 200,000 detonators, several tons of gunpowder, and thousands of ammunition cartridges, there were several cases of explosives marked by the War Department as not to be placed in a magazine with other explosives under any circumstances whatever. The notice had been entirely disregarded by those who placed the explosives on board the ship.

Country magazines. The Government dynamite magazine has been opened at Sandhurst, and seems at present to meet the requirements of the district—though I fear it will soon be found too small, unless some general shore magazine is established; for, owing to the difficulty and expense of communicating with the hulk in its present position, larger quantities will be sent at one time, in order to save the cost of carriage between the hulk and the landing at Footscray. With the hulk in its old position, orders were sent for as few as two or three cases at a time; but now, owing to the cost of carriage, such orders could not be profitably executed.

Licenses for private magazines. During the year, licenses have been granted for storekeepers' and mining companies' magazines at the following places:—

Storekeepers.

R. H. Bake, Donnelly's Creek,	C. B. Cook, Wandiligong,
J. L. Roberts and Co., Walhalla,	S. Dabb, Maldon,
Thomas Calder, Maldon,	A. Harris, Walhalla,
M. Thomas, Sandhurst,	Cheri Mars, Gordon.

Mining Companies.

South Devonshire, Eaglehawk,	Toombon, Walhalla,
Johnston and Webster's, Eaglehawk,	Seymour, Sulky Gully,
Long Tunnel, Walhalla,	North Long Tunnel, Walhalla,
New Bendigo, St. Arnaud,	Port Phillip, Clunes,
Granya, Granya,	Madam Berry, Creswick,
Bungil, Granya,	Berry No. 1, Creswick.

Want of Government magazines in country. Government magazines are urgently needed in many of the more active mining districts, and some dissatisfaction has been expressed at my declining to advise the department to allow any dynamite to be stored in the powder magazines; but these buildings are wholly unsuited for the storage of dynamite or mixed explosives, and for the most part their situation has become, owing to the growth of the towns, such that, should an accident occur, habitations and public works would be destroyed.

New magazines, constructed of the lightest possible material consistent with safety from fire, should be erected in isolated places, or on reserved ground, at such distances from houses as may be deemed safe—protected by banks of earth, not sand or "mullock"—and the whole enclosed within a fence, to prevent access of unauthorized persons. The explosives in these magazines should be under the control of some competent inspector. Dynamite in a sound perfect condition is one of the safest explosives known, and may, while in a sound condition, be kept in a magazine for any time; but dynamite or any of the nitro-explosives in an unsound condition is unsafe to store, handle, or use; and, in my opinion, the responsibility and control of all explosives of this class should be centred in one department, and that the officers of that department should know the condition of every parcel of explosive from the date of its arrival, or of its manufacture, if of local origin, until it has been used.

Fumes. Numerous complaints are being made of the effect of the fumes produced by the explosion of dynamite charges in mines; and, as our mines get deeper, and ventilation becomes more difficult, the effects on the health of the miners will become greater. So far as I know, no mining company has yet tried the efficacy of the sulphate of iron spray recommended by the Explosives Board in 1882, and, with your sanction, I propose to have a spray apparatus sent to each mining district where there are deep mines, so that the miners may see the simplicity of the contrivance, and practically test it.

During the year there have been but few complaints about bad fuse; but I find that there are inferior fuses still sold, which to all appearances so closely resemble those made by well-known makers, that, except to an expert, it is impossible to distinguish between them, and it would be well if manufacturers were required to adopt some easily recognised trade mark or brand. Fuses.

I have the honour to be, Sir,

Your obedient servant,

J. COSMO NEWBERY,
Inspector of Explosives.

The following is a List of Licensed Manufacturers of Explosives, viz.:—

Name of Licensee.	Situation of Factory.	Explosives Manufactured.
Fritz Koenemann	Black Hill, Ballarat East ...	Blasting powder.
H. S. Chittenden	Stawell	The Champion safety powder.
J. T. Arblaster	Job's Gully, Eaglehawk ...	No. 1. Granulated compound powder. No. 2. Compressed powder in pellets. No. 3. Fine powder.
The Australian Lithofracteur Company, Kreb's Patent, Limited	Kororoit Creek, Braybrook ...	Guncotton; lithofracteur (three varieties); and dynamite.
The Bendigo Safety Blasting Powder Company	Long Gully, Sandhurst ...	Safety blasting powder (two varieties).
Perry, Hunter, and Co.	Wattle-street, Sandhurst ...	Safety fuse.
M. Cock, T. Featonby, and others ...	Spec Gully, Marong Shire ...	Blasting powder.
John Lohmann	Back Creek, Parish of Strathfieldsaye	Safety blasting powder.

APPENDIX G.

COPY OF PLACARD ORDERED TO BE POSTED UP AT MINES IN VICTORIA.

Nitro-Glycerine Compounds.

As the use of nitro-glycerine compounds (lithofracteur, dynamite, &c.) by persons who are unacquainted with their special properties still continues to be a frequent cause of accident, the Inspector of Explosives (J. Cosmo Newbery, C.M.G.) has, at the request of this department, framed some further suggestions for the guidance of those who employ these compounds in mining pursuits. These suggestions have been embodied with those dated the 23rd December, 1879, and are now published for general information.

C. W. LANGTREE, Acting Secretary for Mines and Water Supply.

Department of Mines, Melbourne, 1st November, 1884.

1. In mines these explosives should be kept in a metal box with a hinged cover. Dynamite must never be placed in water to soften or thaw it.
2. Frozen cartridges may be softened *without danger* by placing the explosives in a water-tight vessel, and then by placing that vessel in *warm* water.
3. Frozen cartridges should not be placed on any metal, stone, or brickwork, directly heated by fire, hot air, or steam pipes.
4. Frozen cartridges should not be placed in bore-holes, as they cannot be exploded by ordinary detonators.
5. It is highly dangerous to strike a thawing or partly frozen cartridge.
6. Packages containing cartridges must be kept dry.
7. Packages showing any exterior water damage should be carefully examined to see if any nitro-glycerine has exuded from the cartridges. If any nitro-glycerine has exuded into the folds of the cartridge wrapper, a light blow may cause an explosion.
8. Damaged packages must not be roughly handled or struck with any metal or hard substance.
9. Any nitro-glycerine which has exuded from cartridges should be absorbed by some soft dry substance, such as infusorial earth, sawdust, or blotting paper.
10. Waste material containing nitro-glycerine and fragments of cartridges must not be thrown into water; they should be destroyed by firing with a detonator, or by mixing them with an excess of sulphate of iron (copperas), or they should be burnt in small quantities at a time in an open fire.
11. In burning the waste, care should be taken not to inhale the fumes. The fume or vapour of nitro-glycerine is more poisonous than the substance itself.
12. Bore-holes in wet ground should be fired immediately after they have been charged, as the nitro-glycerine may flow into cracks leading into fresh ground, or, if the hole be bored upwards, the nitro-glycerine may flow out.
13. In wet ground a hole must not be put in below a missed shot.
14. Missed shots must not be bored out.
15. Powder must not be charged on top of dynamite or lithofracteur.

16. Charges should always be fired by a detonator.

17. The primer with cap affixed must never be rammed.

18. The cartridge should pass easily to the bottom of the bore-hole. Cartridges which fit the hole tightly must not be forced down by ramming.

APPENDIX H.

IMPORTATION OF EXPLOSIVE SUBSTANCES.—REGULATIONS.

[*From the "Victoria Government Gazette" of 1st December, 1882. No. 125.*]

Whereas by *The Importation and Custody of Gunpowder Statute* 1864 and the Act No. 440, and *The Explosives Act* 1877, power is given to the Governor in Council to make and to rescind regulations providing for the storage of gunpowder, guncotton, and any substance used for blasting or exploding mines, and to license on such conditions as he may deem fit any private magazine for the storage of any such substance as aforesaid, and by order to prohibit, either absolutely or subject to conditions or restrictions, the manufacture, keeping, or importation from any place out of Victoria, or the conveyance or sale of any of them, of any explosive which is of so dangerous a character that in the judgment of the Governor in Council it is expedient for the public safety to make such order: Now therefore His Excellency the Governor, by and with the advice of the Executive Council, having regard to the dangerous character of certain explosives, and it being in his judgment expedient for the public safety that the importation from places out of Victoria of such explosives and the keeping of the same should be subject to certain conditions and restrictions, doth in pursuance of such powers hereby make the following Regulations in lieu of the Regulations made on the 24th day of July, 1882, which are hereby rescinded (that is to say):—

1. *Interpretation.*—The words "explosive" and "ship" in these regulations shall have the same respective meanings as are assigned to them in the first section of *The Explosives Act* 1877, and the word "gunpowder" wherever the same occurs in these regulations shall mean any powder composed only of a mixture of nitre, sulphur, and charcoal, and the word "premises" shall mean any house, storehouse, warehouse, shop, cellar, yard, building, or enclosed space occupied by the same person or persons.

2. No person or persons shall, under any circumstances, import into Victoria any explosive, other than gunpowder, which has been manufactured for more than six months prior to the date of its arrival. Each case imported into Victoria containing any explosive shall be marked in legible and indelible characters showing the date of its manufacture, the name of the explosive, and the name of the consignee or importer.

3. *Explosives (except gunpowder) not to be landed without permission and inspection.*—No ship having on board any explosive other than gunpowder shall land such explosive in any port in Victoria, unless previous application in writing has been made to and permission in writing obtained from the Commissioner of Trade and Customs, and unless such explosive has been previously inspected by a Government inspector, and such permission shall be shown to any pilot or any officer of the Customs Department who may demand to see the same.

4. *Application to be accompanied by report of one competent expert.*—Such application shall in the case of any explosive other than gunpowder state the name or names by which such explosive is usually known, and shall be accompanied by a report of the components and properties of such explosive; such report shall state the date of their examination, and shall have attached thereto the duly attested signature of at least one competent expert who has examined the explosive previous to shipment.

5. *Ships with more than 20 lbs. may be ordered to any specified part of Port Phillip.*—Any ship arriving in Port Phillip Bay and having on board more than twenty pounds of any explosive other than gunpowder may be ordered by the Commissioner of Trade and Customs to lie in any part of Port Phillip Bay which the Commissioner may specify until such explosive be duly discharged, destroyed, or otherwise dealt with.

6. *Explosives may be temporarily stored on powder hulks.*—Explosives other than gunpowder in course of transit may be stored upon an explosives hulk temporarily only, and all such explosives shall be removed from any explosives hulk where the same have been temporarily stored as soon as conveniently may be to some duly licensed magazine or other place where the same may legally be kept, and no such explosives shall be permitted to remain on board an explosives hulk for more than two months.

7. No explosive other than gunpowder that has been manufactured more than nine months shall remain in any Government magazine or hulk or in any licensed magazine.

Licenses for Magazines for the Storage or Keeping of Explosives.

8. *Explosives not to be kept on unlicensed premises.*—No person (except a "dealer" within the meaning of Act No. 196) shall keep more than twenty-five pounds of gunpowder nor more than five pounds of any other explosive on any premises not duly licensed, and no person shall keep gunpowder on any such premises so long as there is any other explosive thereon.

9. *Ammunition for sporting purposes excepted.*—The preceding regulation shall not be deemed to extend or to apply to the making, keeping, or selling of cartridges and other ammunition used only for sporting purposes.

*10. (*See Order in Council of 19th June*, 1883, *page* 122.)

11. *Applications for licenses.*—Every application for a license for a private magazine must be in writing, addressed to the Minister of Mines, and before the Minister grants a license to the person making such application he shall cause such inquiry and report to be made in respect to such application as the circumstances of the case may seem to him to require.

12. *Maximum quantity to be stored to be named in license.*—The maximum quantity of explosives to be stored in each private magazine shall be stated in the license; but in no instance shall such maximum exceed one ton.

13. *Licensees to comply with certain rules.*—The licensees of magazines shall comply with the following regulations:—

(1.) Every package, except packages containing gunpowder, received therein shall be marked, in legible and indelible characters, with the date of the receipt of such package into the magazine, and no package shall be allowed to remain for more than three months in any magazine.

(2.) Any Government inspector may enter all magazines at any hour at which it may seem to such inspector reasonable or necessary that he should enter for the purposes of inspecting such magazine or the explosives therein.

14. *Revocation of license.*—If a holder of any license under these regulations be proved, to the satisfaction of the Minister of Mines, to have committed any breach of these regulations or conditions, or if it be shown, to the satisfaction of the Minister, that the continuance of such license is dangerous to the public, the Minister may thereupon revoke such license wholly or for such time as he thinks fit.

Factories.

15. *Manufacturers and dealers to keep a record of sales.*—Every occupier of any factory licensed for the manufacture of explosives, and every dealer selling any explosive except gunpowder, shall keep a record of the name and address of each person to whom and the date on which he sells such explosive, together with the description of such explosive and the quantity thereof sold.

Penalties.

16. *Penalty for contravention of regulations with regard to importation.*—*Sec.* 8, *No.* 592.—If any explosive is imported or conveyed in contravention of any of the preceding regulations, such explosives may be forfeited, and the owner or master of the ship in which the same is so imported or conveyed shall be liable to a penalty not exceeding Ten shillings for every pound of such explosive brought in such ship; and the Commissioner of Trade and Customs, the collectors, and all officers of Customs shall have the same power with regard to any such explosive, and the ship conveying the same, as they have for the time being with respect to any article prohibited to be imported by the laws relating to the Customs and the ship containing the same.

17. *Penalty for contravention of regulations with regard to keeping and selling.*—*Sec.* 8, *No.* 592.—If any explosive be delivered to any person, or if any person sell or keep any explosive in contravention of any of the preceding regulations, such explosive may be forfeited, and the person to whom such explosive is so delivered, and the person so selling or keeping the same, shall be liable to a penalty not exceeding Ten shillings for every pound of such explosive delivered or sold, kept or found in his possession.

18. *Penalty for contravention of regulations relating to storage.*—*Sec.* 1, *No.* 440.—If any person offend against any of the preceding regulations relating to the storage of explosives, he shall be liable to forfeit such explosive in respect of which he so offends, and he shall in addition be liable to a penalty not exceeding One hundred pounds sterling.

And the Honorable Robert Burrowes, Her Majesty's Minister of Mines for Victoria, shall give the necessary directions herein accordingly.

ROB. WADSWORTH,
Clerk of the Executive Council.

Notice.

With reference to the above order, the attention of masters of vessels and importers of gunpowder is directed to the following sections of "The Importation and Custody of Gunpowder Statute 1864*":—*

"Section 6.—The master of every ship arriving in any port of Victoria with gunpowder on board, whether as stores or cargo, shall at the time of making entry at the Custom House specially report the same, and if any gunpowder be not so reported it shall be forfeited, and the master neglecting to make such report shall forfeit and pay a penalty for such omission or neglect any sum not exceeding One hundred pounds."

"Section 7.—No gunpowder shall be landed from any ship except between the hours of seven in the morning and five in the afternoon, and any person who shall land or be concerned in landing any gunpowder contrary hereto shall forfeit and pay the sum of Five pounds for every barrel or package of such gunpowder so landed contrary to this provision."

"Section 8.—Every ship or vessel having gunpowder on board exceeding twenty pounds in all shall immediately on entering any port in Victoria hoist a union jack at the mainmast head, which union jack shall not be hauled down until the gunpowder on board is landed according to law."

"Section 9.—The importer of gunpowder at any port where a public magazine shall have been appointed, or a private magazine shall have been licensed, shall within twenty-four hours after the arrival of the importing ship enter such gunpowder at the Custom House, and shall obtain from the collector or other principal officer a permit for the same to be landed and deposited in one of such magazines, which permit shall describe the said gunpowder and name of the magazine in which it is to be deposited."

"Section 10.—No boat shall be used for the conveyance of gunpowder, either to or from any ship or wharf or other place, unless duly licensed for that purpose in accordance with the provisions of the Act now in force, or some Act hereafter to be in force, relating to the Customs, and no gunpowder shall be landed or conveyed from any ship until notice shall have been given to the water police, if any there be at the port or place where such ship shall lie, in sufficient time to enable the police to give such directions as may be necessary to prevent danger, which directions the officer or person in charge of such gunpowder shall in all things obey."

"Section 11.—No gunpowder shall be removed from any ship for conveyance to the magazine except between the hours of seven in the morning and four in the afternoon, or shall be permitted to be deposited in the magazine except between the hours of seven in the morning and four in the afternoon."

EXPLOSIVE SUBSTANCES.—REGULATIONS.

[*From the "Victoria Government Gazette" of 22nd June, 1883. No. 63.*]

At the Executive Council Chamber, Melbourne, the nineteenth day of June, 1883.

PRESENT:

His Excellency the Governor.

Mr. Service	Mr. Anderson
Mr. Berry	Mr. Sargood.
Mr. Kerferd	

Whereas by *The Importation and Custody of Gunpowder Statute* 1864 and the Act No. 440, and *The Explosives Act* 1877, power is given to the Governor in Council to make and to rescind regulations providing for the storage of gunpowder, guncotton, and any substance used for blasting or exploding mines, and to license on such conditions as he may deem fit any private magazine for the storage of any such substance as aforesaid: Now therefore His Excellency the Governor, by and with the advice of the Executive Council, doth by this present order rescind clause 10 of the regulations dated the 28th day of November, 1882, and with the advice aforesaid doth substitute the following clause in lieu thereof, viz.:—

*10. *Licenses for private magazines may be granted subject to certain conditions.*—The Minister of Mines may from time to time grant licenses to persons for private magazines at such places as he may think fit, subject to the conditions hereinafter specified and such other conditions as to the storage of explosives, the position and structure of the magazine and adjacent banks and enclosures, as the circumstances of each case may require.

And the Honorable Jonas Felix Levien, Her Majesty's Minister of Mines for Victoria, shall give the necessary directions herein accordingly.

ROB. WADSWORTH,
Clerk of the Executive Council.

APPENDIX I.

MANUFACTURE OF EXPLOSIVES.

REGULATIONS UNDER "THE EXPLOSIVES ACT 1877."

[*From the "Victoria Government Gazette" of 13th December, 1878. No. 127.*]

Sections referred to.

Section 5. Bye-laws or regulations may from time to time be made, altered, or repealed in and for any city, town (including the city of Melbourne and the town of Geelong), borough, or shire by the council thereof, hereinafter called the local authority, in accordance with the provisions of any Act for the time being in force relating to local government for any or all of the undermentioned purposes. Provided, however, that no such bye-laws or regulations shall be of any force or effect until confirmed by the Governor in Council; and that, if any local authority shall not make such bye-law or regulation within six months from the commencement of this Act, the Governor in Council may from time to time make, alter, or repeal any such regulations in lieu of such local authority:—

Clause 1. Licensing factories for the manufacture of explosives.

Clause 2. Prescribing the conditions upon which licenses will be issued, and the fees payable thereon to the local authority.

Clause 3. Proscribing the rules to be observed by the owner, occupier, and persons employed in the factory.

Clause 4. Prescribing the mode of construction, and the purposes for which such factory or any particular part thereof may be used.

Clause 5. Regulating the attaching of lightning conductors to the factory.

Clause 6. Defining the part of the factory in which any particular explosive or ingredient shall be kept, the quantity that may be so kept, and the mode in which it shall be packed.

Clause 7. Regulating the use or retention in the factory of charcoal, oiled cotton, and any articles liable to spontaneous ignition, the cleaning of the building, the quantity of any explosives or ingredients that may be allowed in the factory or any part thereof at any one time, and prescribing the materials of which tools used may be made.

Clause 8. Regulating in the factory or any part thereof the mixing, sifting, and carriage of any explosives, or the ingredients thereof, persons smoking, and the introduction of fire, lucifer matches, or any substance or article likely to cause explosion by fire, or any iron, steel, or grit.

Clause 9. Regulating the employment in the factory of persons under the age of sixteen years.

Clause 10. Prescribing the period for which licenses may be issued, and the effect (if any) of change of owners or occupiers of the factory; and

Clause 11. Generally for regulating any matter which public safety or convenience may require.

In the event of any breach (by any act or default) of any bye-law or regulation in any factory—

(*a*) All or any part of the explosive or ingredients thereof in respect to which or being in any building or machine in respect to which the offence was committed may be forfeited; and

(*b*) The occupier shall be liable to a penalty not exceeding Ten pounds, and in addition (in the case of a second offence) Ten pounds for every day during which such breach continues.

CLAUSE 1.—*Licensing Factories for the Manufacture of Explosives.*

1. A factory for explosives shall not be *allowed* except on the site and in the manner specified in a license for the same granted under this Act.

2. An applicant for such license shall submit to the *Minister* the draft of a license, accompanied by a plan (drawn to scale) of the factory or magazine (which plan shall be deemed to form part of and to be in this Act included in the expression "the license"); and

3. The draft license shall contain the terms which the applicant proposes to have inserted in the license, and shall specify such of the following matters as are applicable, namely:—

(*a*) The boundaries of the land forming the site of the factory or magazine, and either any belt of land surrounding the site which is to be kept clear, and the buildings and works from which it is to be kept clear, or the distances to be maintained between the factory or magazine, or any part thereof, and other buildings and works; and

(*b*) The situation, character, and construction of all the mounds, buildings, and works on or connected with the factory or magazine, and the distances thereof from each other; and

(*c*) The nature of the processes to be carried on in the factory, and in each part thereof; and the place at which each process of the manufacture, and each description of work connected with the factory [or magazine] is to be carried on, and the places in the factory [or magazine] at which *explosives*, and any ingredients of *explosives*, and any articles liable to spontaneous ignition, or inflammable, or otherwise dangerous, are to be kept; and

(*d*) The amount of explosives, and of ingredients thereof, to be allowed in any building wholly or partly mixed, or any process of the manufacture, or within a limited distance from such building [or machine], having regard to the situation and construction of such building, and to the distance thereof, from any other building or any works; and

(*e*) The situation, in the case of a factory, of each factory magazine, [and in the case of another magazine] of each building forming part of such magazine in which *explosives* are to be kept, and the maximum amount of explosives to be kept in each factory magazine, and in each building as aforesaid; and

(*f*) The maximum number of persons to be employed in each building in the factory; and

(*g*) Any special terms which the applicant may propose by reason of any special circumstances arising from the locality, the situation or construction of any buildings or works, or the nature of any process or otherwise.

4. The Minister, after examination of the proposal, may reject the application altogether, or may approve of the draft license with or without modification or addition, and grant to the applicant permission to apply to the local authority for their assent to the establishment of the factory on the proposed *site*, and such assent shall be first obtained and forwarded to the Minister before the application for a license is finally dealt with.

CLAUSE 2.—*Prescribing the Conditions upon which Licenses will be issued, and the Fees payable thereon to the local authority.*

1. On the preliminary approval of an application for a license the applicant shall complete the arrangement of the factory in accordance with the terms of the proposed license, and to the satisfaction of the local governing body, and of the inspector, before the license shall be actually issued; and

2. In every license a clause shall be inserted giving power to the Minister to summarily stop the manufacture of explosives at a factory, provided he deem such stoppage necessary in the interest of the public safety, and to compel the licensee or his agent to alter or amend the process of manufacture, or to alter or re-arrange the buildings in which the same may be carried on; and

3. In every license a clause shall be inserted authorizing the Governor in Council, upon the production of satisfactory evidence that a factory is not being conducted in accordance with the provisions of the Act and Regulations relating thereto, and that its further continuance will imperil the public safety, to declare the license void; and

4. There shall be payable in respect of licenses and continuing certificates granted by the Minister such fees as may be from time to time fixed by him, not exceeding—

For factory license, original	£10
Ditto, amending	£5
Ditto, renewal when lost	5s.
For importation license, first grant	£1
Ditto, renewal	10s.
For continuing certificate	£2

Such fees shall be paid by the licensee to the local authority of the district in which the factory is situated.

The *Minister* may also require an applicant for a new license to pay such sum as the *Minister* may think reasonable for expenses incurred upon any inquiry made by order of the *Minister* with respect to the grant of such license.

CLAUSE 3.—*Prescribing the Rules to be observed by the Owner, Occupier, and Persons employed in the Factory.*

In every *explosive* factory and magazine—

1. The factory or magazine, or any part thereof, shall not be used for any purpose not in accordance with the license; and

2. The terms of the license shall be duly observed, and the manufacture or keeping, or any process in or work connected with the manufacture or keeping of *explosives* shall not be carried on except in accordance with those terms; and

3. The factory or magazine and every part thereof shall be maintained in accordance with the license; and any material alteration in the factory or magazine by enlarging or adding to the site, or by externally enlarging or adding to any building thereon, or by altering any mound otherwise than by enlargement, or by making any new work, shall not be made except in pursuance of an amending license granted under the Act.

CLAUSE 4.—*Prescribing the mode of Construction and the purposes for which such Factory or any particular part thereof may be used.*

1. In a factory every factory magazine and in every building in which *explosives* are kept shall be used only for the keeping of *explosives*, and receptacles for or tools or implements for work connected with the keeping of such *explosives*; and

2. The interior of every building in which any process of the manufacture is carried on or in which *explosives* or any ingredients thereof, either mixed or partially mixed, are kept, or in the course of manufacture are liable to be, and the benches, shelves, and fittings in such building (other than machinery) shall be so constructed or so lined or covered as to prevent the exposure of any iron or steel in such manner, and the detaching of any grit, iron, steel, or similar substance in such manner, as to come into contact with the *explosives* or ingredients thereof in such building, and such interior shelves and fittings, *and all other portions of such buildings*, shall, so far as is reasonably practicable, be kept free from grit and otherwise clean; and

3. Two or more descriptions of explosives shall not be kept in the same store or registered premises, except such descriptions as may be prescribed in that behalf; and when so kept shall be kept subject to the proscribed conditions and restrictions; and

4. Before any repairs are done to or in any room or other part of a factory, that room or part shall, so far as practicable, be cleaned by the removal of all *explosives* and wholly or partly mixed ingredients thereof, and the thorough washing out of such room or part; and

5. If in any matter (which is not provided by any express provision of the Act) an inspector find any factory, magazine, or store for an explosive or any part thereof, or any thing or practice therein or connected therewith to be unnecessarily dangerous or defective so as in his opinion to tend to endanger the public safety or the bodily safety of any person, such inspector may require the occupier of such factory, magazine, or store to remedy the same.

CLAUSE 5.—*Regulating the attaching of Lightning Conductors to the Factory.*

Every factory or separate building connected with a factory or magazine shall be protected by sufficient lightning conductors.

CLAUSE 6.—*Defining the part of the Factory in which any particular explosive or ingredient shall be kept, the quantity that may be so kept, and the mode in which it shall be packed.*

1. The inspector shall define the part of the factory in which any particular explosive or ingredient shall be kept, the quantity that may be so kept, and the mode in which it shall be packed; and

2. There shall be on the outermost package containing the explosive the name of the explosive, with the addition of the word "Explosive."

CLAUSE 7.—*Regulating the use or retention in the Factory of Charcoal, Oiled Cotton, and any articles liable to spontaneous ignition, the Cleaning of the Building, the Quantity of any Explosives or Ingredients that may be allowed in the Factory or any part thereof at any one time, and prescribing the Materials of which Tools used may be made.*

1. Charcoal, whether ground or otherwise, and oiled cotton, oiled rags, and oiled waste, and any articles whatever liable to spontaneous ignition, shall not be taken into *any room containing explosives*, or *partly made explosives*, except for the purpose of immediate supply and work or immediate use in such building, and upon the cessation of such work or use shall be forthwith removed.

CLAUSE 8.—*Regulating in the Factory or any part thereof the Mixing, Sifting, and Carriage of any Explosives or the Ingredients thereof, Persons Smoking, and the introduction of Fire, Lucifer Matches, or any substance or article likely to cause explosion by fire, or any Iron, Steel, or Grit.*

1. Due provision shall be made by the use of suitable working clothes without pockets, suitable shoes, searching and otherwise, or by some of such means, for preventing the introduction into any factory of fire, lucifer matches, or any substance or article likely to cause explosion or fire, and for preventing the introduction of any iron, steel, or grit into any part of the factory where it would be likely to come into contact with *explosives* or the wholly or partly mixed ingredients thereof; but this rule shall not prevent the introduction of any artificial light of such construction, position, or character as not to cause any danger of fire or explosion; and

2. No person shall smoke in any part of the factory or magazine, except in such part (if any) as may be allowed by special rules.

CLAUSE 9.—*Regulating the Employment in the Factory of Persons under the age of Sixteen Years.*

A person under the age of sixteen years shall not be employed in or enter any factory except in the presence and under the supervision of some grown-up person.

CLAUSE 10.—*Prescribing the Period for which Licenses may be issued, and the effect (if any) of change of Owners or Occupiers of the Factory.*

1. The number of years for which a license shall be granted shall be decided by the Minister on the advice of the local authority, but in no case shall a license be granted for a term of more than five years; and

2. No person or persons shall carry on the business of a factory other than the licensee, and should such licensee desire to transfer his interest in such factory he shall apply for a transfer of the license to the name or names of the person or persons intended to supersede him, and such person or persons shall endorse the application for transfer; and

3. The Minister shall have power to grant or refuse any application for a transfer of license; and

4. A license shall be determined by a discontinuance of the business carried on in pursuance of any such license if such discontinuance continues for a period of two years or more, or if the factory or magazine is used for any purpose not authorized by the license.

CLAUSE 11.—*Generally for regulating any matter which public safety or convenience may require.*

1. No fire or light shall under any circumstances be taken inside any building forming part of a factory (other than those specified by an inspector), nor any light except an authorized lantern provided for that purpose, and that only by the foreman. All persons entering the factories, and before passing within the fencing thereof, shall examine their clothes to see that they have no matches or other dangerous articles in their pockets or about their persons, and the foreman shall satisfy himself that such examination is carefully carried out, and shall himself from time to time search the persons employed, and satisfy himself that they have no such dangerous articles about them ; and

2. No delivery whatever of explosives from the factory magazine shall be made without a written order from the licensee or his agent, duly signed by either of them, and such delivery shall be made only in the presence of the foreman ; and

3. The keys of the factory magazine shall remain in sole charge of the foreman, and in his unavoidable absence in charge of a deputy duly authorized in writing by the licensee or his agent ; and

4. The foreman shall keep a stock-book for each factory magazine, showing at all times the quantities *in store and the quantities* taken in and out ; and

5. The gates of the fences and the doors of the magazines shall be kept securely locked, except during inspection and at such times as explosives are being stored or removed. The foreman or other person in charge of the keys shall be responsible for the due observance of this rule.

6. No tools or instruments of any description shall be taken into the magazines for any purpose, nor used outside the magazines for opening or closing the cases of explosives, except those duly authorized and provided for that purpose ; and

7. No cases or boxes containing explosives which are broken or defective shall be admitted into the magazines, nor shall any explosive be admitted which is not apparently packed in the manner directed by the *Explosive Substances Act*. Any explosive which may be spilt shall at once be carefully taken up and destroyed; and

8. On the approach of a thunderstorm the magazines and other places pointed out by the inspector shall be closed, and every person engaged in and about them shall withdraw therefrom.

9. All carriages used in the conveyance of explosives along public roads shall be of good and substantial construction, suitably roofed, and capable of being securely closed by means of doors and locks, and shall have the word "Explosives" painted in plain and conspicuous letters on both sides thereof; and no explosive shall be conveyed along a public road in any such carriage after sunset or before sunrise.

Nevertheless ordinary blasting powder and sporting powder may be conveyed at all hours along a public road in any description of carriage, in quantities not exceeding one hundred pounds in weight.

10. Any safety fuse or other explosive, the manufacture and storage of which shall be considered to be unattended with danger, may be excepted from the operation of a part or the whole of these regulations by order of the Governor in Council.

"THE EXPLOSIVES ACT 1877."—ADDITIONAL REGULATION.

[*From the "Victoria Government Gazette" of 28th November 1879. No. 115, page 2786.*]

The Governor in Council has made the following additional Regulation under the provisions of section 5 of *The Explosives Act* 1877, viz.:—

The quantity of any explosives or ingredients that may be placed or stored at any one time in any factory licensed under the provisions of *The Explosives Act* 1877, or in any part thereof, shall not exceed such quantity as may from time to time be allowed, in writing, by the Honorable the Minister of Mines.

APPENDIX J.

REPORT TO THE RIGHT HON. THE SECRETARY OF STATE FOR THE HOME DEPARTMENT ON THE CIRCUMSTANCES ATTENDING AN EXPLOSION OF DYNAMITE AT THE TOWN HILL COLLIERY, DUNFERMLINE, ON 17TH DECEMBER, 1883; BY COLONEL VIVAN DERING MAJENDIE, C.B., R.M. CHIEF INSPECTOR OF EXPLOSIVES.

SIR, Home Office, 31st December, 1883.

I have the honour to report that in obedience to your order, made under the 66th section of the Explosives Act 1875, I have held an inquiry into the causes of and the circumstances attending an explosion of dynamite which occurred on the 17th December, 1883, at the Town Hill Colliery, Dunfermline, whereby one man was killed and another sustained injury.

In accordance with the provisions of the above-mentioned section of the Act, I beg to furnish the following report:—

I think it right to state at the outset that I found very considerable reluctance on the part of two of the survivors who were present at the accident, and whom I examined, to make any sufficient explanatory statements on the subject. They were apparently afraid of either fixing blame upon themselves or upon the man who was killed; and although it is possible they may not have actually witnessed what the deceased was doing at the moment the explosion occurred, I am satisfied that they could, had they so desired, have given me much fuller and more useful information in regard to the circumstances of the case than they actually did.

The accident appears to have occurred as follows :—

Four men (John Hutcheson, Edward Neilson, Henry Hunter, and Alexander Williamson) were engaged under a contractor, Hogg Neilson, in driving two headings in No. 7 pit of Town Hill Colliery, at

a depth of about 80 fathoms. For this purpose they had a few days previously decided to try some dynamite, and one of the men (Hunter), who lives in Dunfermline, obtained on Saturday, 15th December, a 5lbs. box from Mr. Hamilton, agent to Nobel's Explosives Company, who has business premises in Dunfermline.

A box of this description would contain about 35 cartridges and about 9 primers. Hunter appears to have taken out, and, as I understand, used, 10 of the cartridges, and possibly one or two primers, on the evening of Sunday, the 16th. The remainder were kept until the Monday at Hunter's house, and were then deposited (with a box of detonators) in the pit, near the place where the men were working, and within the shelter of a small "cundie" or sloping adit.

The five men concerned went to work at 2 p.m. on the day of the explosion. For the purpose of thawing the dynamite they had provided two tins, one a 7lbs. preserved meat tin, and the other a smaller cylindrical tin. It was their intention to place the cartridges to be thawed in the smaller tin, this tin being placed in water contained in the larger tin, the water being heated by the flame of a lamp, or (as is common in heating the tea in the men's cans) by placing the can over a small hole made for the purpose in the stone, and into which a little oil and a wick would be placed. But it was found on proceeding to this operation that the small tin leaked, and (as I am informed) the apparatus was therefore rejected as defective, and the water in the outer pan poured away; and some of the men resorted to the not uncommon (though objectionable) practice of thawing the cartridges by placing them inside their shirts in contact with their bodies. For some little time previous to the explosion Hogg Neilson and Alexander Williamson were at work in the west heading; Hunter and Edward Neilson were at work in the east heading, and John Hutcheson (deceased) seems to have been mainly engaged in preparing the charges. For this purpose it would be necessary for him to go occasionally into the "cundie" (which ran obliquely out of the main level, towards the east), where the explosive was kept, and back into the main level, and thence to the headings. Of the 25 cartridges which had been brought down, seven had been exploded in the east headings, seven in the west heading, with a proportion of primers, and there were found unexploded after the accident four and a half cartridges* (three and a half in the "cundie," and one which had been dropped or deposited by Williamson). This accounts for 18½ cartridges out of the 25. I also found remains, probably of half a cartridge, broken up in the "cundie." Accordingly, six cartridges remain to be accounted for, and as none of the holes were charged at the time, it must be assumed that these six cartridges were all involved in the explosion. A few seconds before the explosion Hutcheson showed Edward Neilson (who was working in the east heading) a cartridge, and asked him if it was soft enough. Neilson pointed out that one end of it was still hard, upon which Hutcheson said he would soon make it soft enough, and he went back towards the main level. Neilson thinks that he could not have gone more than two or three paces when the explosion occurred, but this must be a mistaken estimate, for, as can certainly be shown, Hutcheson must at the moment of the explosion have been distant about four or five yards within the main level, or about ten yards from the face of the east heading where Neilson was at work. But it is quite possible that not more than a few seconds elapsed between Hutcheson's conversation with Neilson and the explosion.

The effect of the explosion was to kill Hutcheson instantly, his head having been blown to pieces and the fragments scattered in various directions. Thus, portions were recovered from the roof of the level at the junction between the two headings, and some portions in the "cundie" which ran obliquely from a point in the main level five yards back from the junction of the two headings. It is therefore evident that at the moment of the explosion Hutcheson must have been standing in the main level approximately in a prolongation of the "cundie," otherwise portions of the unfortunate man's remains could not have been blown into the "cundie." His body was blown forward to the junction of the headings; it was not seriously injured, except the left hand, which was smashed. His lamp (of the sort ordinarily worn by miners on their caps) was found, a good deal knocked about, a short distance from his body.

The only other man who sustained injury (though not of severe character) was Edward Neilson, who appears to have been struck in the back by some projected *débris*.

Other evidence as to the spot where the explosion occurred is afforded by the recovery of a number of pieces of tin (forming part of the larger tin), which had been blown to pieces. These pieces of tin were distributed about the spot where, having regard to the recovery of a portion of the remains in the "cundie," Hutcheson must certainly have been standing; and the fact that the explosion did occur here is corroborated by the circumstance that immediately over the spot is an overhanging ledge of coal, on which were Hunter's and Williamson's jackets, and these were recovered after the explosion undisturbed and uninjured, a fact which goes to show that the explosion must have occurred under the projecting ledge of coal, which had shielded the jackets from its effects. Lastly, I am of opinion that some trace of a crater is observable at this point, though the irregular and broken character of the ground in the level renders this point rather doubtful.

What caused the accident? The nature of the injuries sustained by the deceased, taken by themselves, would perhaps suggest that it was the result of a gravely imprudent act on Hutcheson's part, which is, I regret to say, not unfrequently resorted to by miners, viz., when fitting a piece of fuze into a detonator, pinching the detonator together into the fuze with the teeth. An explosion occurring under these circumstances would naturally blow the man's head to pieces and injure the hand which held the charge to his mouth. But this explanation does not, I think, fit the present case, for—

(1.) It would not explain the explosion of six dynamite cartridges;
(2.) It would not explain the destruction of the tin can;
(3.) It would not explain the blowing of Hutcheson's body in the same direction as the greater part of his head;
(4.) It would not explain the appearances which indicate that the explosion had occurred on or near the ground;
(5.) It would be inconsistent with the probabilities of the case,—for if Hutcheson (as appears from his conversation with Neilson) was actively engaged in softening the cartridges, he is not likely to have been engaged also in fitting together a detonator, fuze, and charge.

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* The presence of the half cartridge is explicable by the fact that the men had cut a cartridge in two so as to use a half cartridge as a primer or to complete a hole.

I think there can be little doubt that the conversation between the deceased and Neilson, taken together with the recovery of the shattered tin, furnishes a perfectly reasonable conclusion as to the cause. Hutcheson was doubtless engaged in thawing the dynamite, and using the tin for the purpose. He probably was operating on six cartridges, viz., three for the east heading and three for the west heading;* and I venture to assume that he had taken one of the six to Neilson as a sample, and was in the act of replacing it with the others on the tin when the explosion occurred, shattering his hand, blowing off his head (which would be immediately over the cartridges), and throwing his body in the direction in which, from its position, it would be necessarily conveyed. This explanation fits all the known circumstances, as well as the probabilities of the case, very remarkably; thus—

(1.) It explains the disappearance of the exact number of cartridges (six) which have to be accounted for;

(2.) It explains the destruction of the tin case and the position of the recovered fragments exactly;

(3.) It is consistent with the nature of the injuries sustained by the deceased and with the direction in which his remains were conveyed;

(4.) It fixes the precise spot of the explosion as being near the ground, on which doubtless the tin rested;

(5.) It would be natural for Hutcheson at once to resume the thawing process on hearing from Neilson that the cartridge he had showed him was not sufficiently softened; and, indeed, Hutcheson had himself said to Neilson that he would at once complete the softening of the cartridge.

Some further support of this explanation is afforded by the following circumstances:—

(6.) If Hutcheson was thawing the cartridges he must have been employing some form of heat. The men whom I examined appeared anxious to suggest that after the rejection of the tin case the thawing was effected by placing the cartridges against the men's warm bodies. If Hutcheson had been employing this mode, it would not have been necessary for him, after ascertaining from Neilson that the sample cartridge was insufficiently thawed, to go back to the main level. He would have merely restored the partially thawed cartridge to interior of his shirt. But that he did go back immediately to the main level is proved by the fact that he was there when the explosion occurred, which, according to Neilson, was a very few seconds after the conversation. If Hutcheson had a thawing apparatus in the level it would be natural for him to promptly replace the partially thawed cartridge upon it; while, if he had no such thawing apparatus, it is difficult to understand why he should have gone to the main level at all.

(7.) Alexander Williamson is quite positive that when the two tins were rejected they were placed or thrown against the right wall of the east heading. The smaller tin was found there afterwards, and seen by myself in that position. The larger tin, as we know, had been removed to the spot where the explosion occurred. Who had removed it, and why? None of the four surviving men (as I understand) admit having removed it; but this point is of less immediate importance than the question of why it was removed. I ascertained beyond doubt that the tin had no other use than that to which Hutcheson (who had himself brought it down the mine for the purpose†) had intended to apply it, viz., for the thawing of dynamite (in conjunction with the smaller tin). Accordingly, we seek in vain for any object for the removal of the tin from the east heading to the main level, unless it were to be used in connexion with the thawing of the dynamite.

(8.) Some of the recovered pieces of tin have a blackened, smoked appearance, which tends to show that at some time or other the tin had been exposed to the action of a lamp or fire of some sort.

Taking all the circumstances into consideration, I have no hesitation whatever in expressing my opinion that the explosion was the result of the use by the deceased, John Hutcheson, of the meat tin for the thawing of the dynamite.‡

I have considered in what way it is likely Hutcheson was using the tin. The appearance of the recovered portions of the tin are inconsistent, I think, with an explosion of dynamite within the vessel. Such an explosion (especially of the quantity which we know had gone off) must have blown the tin into small fragments. Some portions have doubtless been so affected, for a great part of the tin has not been recovered. But the portions recovered are not in fragments, they are ripped and shattered, and have evidently been subjected to a good deal of violence; but they are not, as every part of the vessel must have been if the charge had exploded within it, blown to small pieces. Accordingly, I conclude that the explosion took place outside the tin.

It is, I think, probable that Hutcheson had placed the tin mouth downwards upon the ground, over the flame of a lamp,‖ or over a little oil and wick, in a depression in the coal, and had placed the cartridges to be thawed on the bottom of the tin. He may have thought that by this means he would be keeping the cartridges at a sufficient distance from the source of heat (viz., the height of the tin) to render the process a safe one, in fact that he would be merely availing himself of the agency of heated air instead of that of heated water to effect the thawing of the dynamite. Such a conception, if he entertained it, was fatally incorrect. It would be merely a question of time when the explosion would take place.

This suggestion as to the particular mode of thawing employed by Hutcheson has the merit of explaining (*a*) the total disappearance of portions of the tin, including the bottom, on which the charge rested; (*b*) the recovery of portions of the sides in a shattered condition, but not blown into small fragments; (*c*) the recovery of these pieces distributed about the spot where the explosion had taken place and

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* Hogg Neilson informed me that he had told Hutcheson he would shortly require three cartridges for the east heading. The same number were also required for the west heading.

† Alexander Williamson's evidence.

‡ A sample of the recovered and unexploded dynamite has been examined by Dr. Dupré, and proved to be of fairly normal and satisfactory quality.

‖ His own lamp, as stated, was recovered after the accident a good deal disfigured, but it is not very likely that this lamp had been used in the manner suggested. But as it was the original intention of the man to thaw the dynamite by heating water in the tin, it is quite possible that an extra lamp may have been taken down.

at no great distance from it; (d) the smoked and blackened appearance of portions of the tin. I may add that I not only believe that the explosion occurred under these conditions, but also that the survivors could, if they chose, doubtless corroborate this conclusion. I have formed the impression that although they could not perhaps see what Hutcheson was doing at the moment actually preceding the explosion, they were aware that he was employing such means as I have described for thawing the dynamite; it is very probable that they had, in the course of the afternoon, been assisting him in the operation.

It may be useful to remark that the operation of thawing dynamite by such means as those which I have suggested Hutcheson was employing is attended with the gravest risk. We have had, I regret to say, a large number of fatal accidents from the attempted thawing of dynamite by exposing it to direct contact with heated metal. So recently as the 7th December, a shocking accident occurred at Greengairs, near Airdrie, resulting in the deaths of two persons and the serious injury of two others, due to the explosion of some dynamite which was being thawed on a hob. And since the accident now under notice, another has occurred in the same county, at Cardenden, which there we know to have been due to an incautious attempt to thaw dynamite by the direct application of artificial heat.

Our annual reports since the Act came into operation contained notices of numerous accidents of this character, among which we may mention the following:—

		Killed.	Injured.
1st May, 1876.	Morrison's Haven, Preston Pans	1	2
26th Nov., 1877.	Minera Mine, near Wroxham	—	1
23rd Jan., 1878.	Dinorwic Quarries, near Llanboris	2	—
24th Jan., 1878.	Slate Quarry, near Llanberis	—	1
4th Dec., 1878.	Letterwood, between Oban and Dalmally ...	2	—
21st Dec., 1878.	Talargoch Mine, near Rhyl	1	1
9th Jan., 1879.	Halkyn, near Flint	—	—
29th Jan., 1879.	Ouseburn, near Newcastle-on-Tyne	—	3
29th Jan., 1879.	Tanygrisiau, Festiniog	—	2
13th Feb., 1879.	Auchnashellach	1	—
21st March, 1879.	Lowball Colliery, Ince, Wigan	—	3
14th April, 1879.	Praze, near Crowan	2	2
19th Jan., 1880.	Glenerntten Cutting, near Oban	—	2
14th March, 1880.	Montrose and Arbroath Railway	5	1
23rd April, 1880.	Hawkesbury Colliery, Bedworth	1	—
1st Dec., 1880.	Great Pant-y-Pydew Mine	—	2
18th Jan., 1881.	Berehaven Mines Co., Cork	2	5
15th Feb., 1881.	Beath, near Kelty	—	1
1st May, 1882.	Phœnix United Mines	—	1
26th Jan., 1883.	Glascood Llanbaddock, near Usk	—	3
2nd March, 1883.	Railway Tunnel being constructed between Bangor and Bethesda	1	2
29th March, 1883.	Southrigg Colliery, Airdrie, Lanark	1	1
2nd April, 1883.	South Phœnix Mine, Liskeard	—	3
8th Nov., 1883.	Plumbley Colliery, near Eckington, Derby ...	1	1
7th Nov., 1883.	Rhondda Merthyr Colliery	—	2
7th Dec., 1883.	Greengairs, near Airdrie	2	2
17th Dec., 1883.	Cardenden, Fifeshire	—	1

The risk from this cause is recognised and emphasized in the instructions issued by Nobel's Explosives Company with their dynamite. Each package of 5 lbs. contains, inside and outside, instructions (in English, Gaelic, and Welsh) with regard to the use of the explosive, and among these instructions appear the following:—

> "It is highly dangerous to place dynamite on or near fires, stoves, steam pipes, or any highly heated metal. Dynamite must never be put into warm water to thaw or soften. It ought always to be put first into a water-tight vessel, and then have that vessel placed in the warm water. Dynamite cartridges, when frozen, may be softened without danger in warm water warming pans, such as the company supply for the purpose."

Unfortunately, this important warning is too often left unread or unheeded, and the result is the numerous and often recurring accidents in thawing such as those above referred to.

I propose considering in what manner this warning can be best and most saliently brought under the notice of miners and other users of this class of explosives, and meanwhile the publication of this Report may perhaps serve some useful end in this direction.

It is worthy of consideration whether some charge of criminal recklessness might not be properly preferred against any person who can be proved to be guilty of an act which experience and the printed instructions issued with the explosive alike signalise as highly dangerous, and perhaps a conviction or two on such a charge would tend to attract attention to the risk, and make miners more careful.

In the present case the man who was presumably guilty of this recklessness has paid the penalty with his life, which of course puts on one side any question of legal proceedings. But if it could have been shown that any of the survivors had placed the dynamite in the tin, or actively assisted in establishing the state of things which eventuated in an explosion, it would be worthy of consideration whether proceedings should not be instituted.

I think it right to add to this Report that I have found that the Orders in Council, of 20th April, 1883, relating to the keeping of dynamite do not appear to have been enforced by the Burgh authorities in Dunfermline, inasmuch as it appears that persons have been keeping dynamite without having a police

certificate. Thus, Hunter, who bought the dynamite and kept it from the Saturday until the Monday, had no police certificate to cover such keeping, as by the Order in Council No. 12, of 20th April, 1883, he should have had; and indeed the chief officer of police of the Burgh admitted to me that no certificates had been granted to any miners within his jurisdiction under that Order.

I failed also to discover that any proper certificate had been granted to Mr. Robert Hamilton for keeping dynamite in his registered premises in Dunfermline as required by Order in Council No. 7 (a) of 20th April, 1883. In fact, the local authorities (viz., the magistrates and town council of the Burgh of Dunfermline) have allowed these Orders to be practically a dead letter.

I have the honour to be, Sir,

Your obedient servant,

V. D. MAJENDIE, Colonel,
H.M. Chief Inspector of Explosives.

The Right Hon. the Secretary of State,
Home Department.

APPENDIX K.

LIST OF PATENTS FOR IMPROVED MINING APPLIANCES GRANTED IN VICTORIA DURING THE YEAR 1884.

Calciner for Pyrites and other Ores.—On the 14th January, to Mr. H. Costin, of Ballarat, for improvements in roasting and more effectually treating pyrites and other ores, especially those requiring to be oxidized as a preliminary operation, to be known as "Costin's patent calciner for pyrites and other ores."

Pulverizing Apparatus.—On the 30th January, to Mr. Jas. Nicholas, of Illogan in Cornwall, mine agent, for a novel construction of pulverizing apparatus for treating material which has been previously reduced to a small size. It relates to that class of machines in which a crushing cylinder revolves inside a stationary one, and its peculiarities are:—1st. That the crushing cylinder consists of a series of inclined planes; 2nd. That the stationary cylinder is supplied with an easily removable false bottom; and 3rd. That the crushing cylinder is supported on sliding bearings, to which levers and weights or springs are attached, so as to determine the pressure of the crushing cylinder on the stationary one, and so regulate its crushing power and the weight the engine would have to revolve.

Improved Amalgamator.—On the 30th January, to Mr. E. Bazin, of Paris, civil engineer, for a series of improvements upon a previous invention patented by him for amalgamation under water. Mr. Bazin now adds a preparatory mixer to his former amalgamator, and supplies the mixed material through a hopper and pipe directly on to the mercury in his revolving submerged amalgamating basin. By reason of the revolution of said basin the mercury forms a lining or wall, into or on to which the material is driven, the lighter material rises upwards spirally, and passes over the edge of the amalgamating basin, into the surrounding tank, and is carried away as waste. An electric current is conducted to the mercury under water when the machine is at work.

Safety Cage.—On the 12th February, to Mr. Oliver Harris, of Eaglehawk, for a mining safety cage.

Pulverizing Machines.—On the 12th March, to Mr. T. K. Jordan, of London, for improvements in pulverizing machines in which two sets of beaters revolve on independent shafts in opposite directions inside a shallow drum, and are so set as to hurl the material from one set of arms to the other, and thus pulverize it. There is another marked peculiarity in this invention, and that is, the supply of currents of air, by which the pulverized material is discharged at a certain rate and at a certain degree of fineness. This rate of discharge is also partly regulated by telescopic discharge pipes, perforated or plain, the height of which regulates the discharge.

Amalgamators.—On 7th April, to Mr. T. K. Jordan, of London, for certain improvements in amalgamators.

Apparatus for Saving Gold and Pyrites.—On the 21st April, to H. W. Horsley, of Nolan-street, Sandhurst, for certain improvements in apparatus for saving gold and pyrites from crushed or other finely divided material.

Gold Extractor.—On the 10th June, to Mr. Edward Spencer, of No. 146 Canning-street, North Carlton, builder, for an invention for the extraction of gold from auriferous material and for saving any quicksilver which, in the case of tailings, may have become mixed with it. The residual product is a valuable pigment. In treating auriferous material containing sulphur and arsenic the inventor repeatedly washes it in a solution of Roche lime and washing soda so as to set the gold free. He does this in a series of closed wooden boxes, each containing an iron basin, into the first of which the material is fed and then agitated. It then overflows into and down a pipe in the centre of the bottom of such basin, falling on to a steeply inclined iron plate, to the bottom of which is attached a reciprocating curved rake. Above the rake is an elevator to carry so much of the material as does not deposit itself in said box into a second box of similar construction, and finally into a basin very similar to the other but lined with copper and charged with quicksilver for the amalgamation. The residuum in each box is finally treated by reciprocating rakes in a separate vessel, the light stuff at the top being removed for use as a pigment, while that at the bottom is re-treated in one of the aforesaid boxes.

Safety Cage.—On the 2nd July, to Mr. Edwin Clark, of Herbert-street, South Melbourne, engineer, for an invention of a safety cage, in which the gripper and the guide for the skid form one device, and the gripping part grips both sides of the skid at once by a peculiar mechanical arrangement set in motion when required. Part of this invention also consists in a novel construction of a disengaging hook, made in two halves, and with projecting tails, which latter open the hook when coming in contact with any sufficient obstruction, such as the poppet-heads. The improvements consist of a safety appliance for suspending the cage in case of the rope breaking, and a disconnecting hook to prevent overwinding. According to the inventor's designs, cages are made double, that is, the proper cage supported inside of another cage or frame to which the gripper and guide devices are pivoted. The

suspension bolt is screwed firmly into the bridge of the cage proper, and passes loosely through a hole in the outer cage, which is immediately above it. A socket is formed in the upper bridge around the suspension bolt to receive a spiral spring, which, when it is allowed to expand (by reason of the hook becoming disengaged or the rope breaking), assists to force the inner cage down. This inner cage has four studs (two on either side) which pass through slots provided in the sides of the outer cage or frame, and work in oblong holes formed therefor at the ends of the arms projecting from the four gripping and guide devices which are firmly pivoted to the side of the outer cage or frame. The top half on the one side and the lower half on the other side of the inner cheeks of the gripper and guide devices are serrated so as to grip the skids in the shaft, when the rope breaks, or when the whole weight of the inner cage is thrown on to the ends of the gripper arms. The disconnecting hook is formed on a continuation from the suspension bolt, and attached to the rope. A suitable thimble or rigid device is fitted on the uppermost end of the skids. The hook is fitted with projecting arms, and is so arranged that when the arms strike against the thimble or other rigid device the two parts of the hook become instantaneously disengaged, and so release the rope and prevent the cage from being overwound.

Improved Amalgamator.—On the 2nd July, to Mr. W. E. Barry, of Narrandera, in New South Wales, miner, for an invention relating to amalgamators, and consisting in the use of a tube or bar, having an amalgamable surface revolving in a quicksilver trough in an opposite direction to the flow of the auriferous material, the larger part of such tube or bar being submerged in the quicksilver. Its operation is to present a constantly renewed quicksilvered surface to the flow of the auriferous material, so as to catch, submerge, and deposit the gold in the quicksilver trough, and to allow the balance to pass over it.

Safety Cage.—On the 2nd July, to Mr. J. R. Hart, of Ferrars-street, South Melbourne, engineer, for an invention relating to safety cages for mining shafts and household and warehouse lifts, the essential feature of which lies in the use of long straight grippers carried on radius bars in recessed iron boxes on each side of the cage, the upper and lower ends of such boxes forming guides or shoes for passing over the skids. To the lower end of the suspension bar is attached a short cross bar to each end of which is connected a lever. These levers proceed to opposite sides of the cage, and each rests on a fulcrum on the top of the cage proper and is connected at its other end to the top of a connecting rod, the lower end of which is attached to a long gripper which is carried on two radius bars, pivoted to the side of the cage. The top of the cage is covered with an iron canopy through which the suspension bar passes to the shackle or safety hook as the case may be. Through this bar is placed a stud or pin above the canopy, and so prevents it from falling too far. Another stud is put through the bar underneath the canopy which abuts against its underside when the grippers are not gripping, and on this pin the cage is suspended. Two other studs are put through the lower end of the said bar to form a resistance for a spiral spring which passes round the bar and is compressed between them and the underside of the canopy. When the rope breaks the suspension bar falls of its own weight, accelerated by the pressure of the spring, and the grippers are instantaneously thrown on to the skids. Instead of the ordinary cam-faced or curved grippers, the inventor has substituted a long flat-faced gripper which by reason of the radius bars grips the skids equally along its whole length.

Safety Hook.—On the 14th July, to Mr. J. J. T. Noland, of Wimble-street, Castlemaine, cabinet-maker, for an improved safety disengaging hook, and for certain improvements in safety machinery for operating the grippers of mining cages.

Reciprocating Motion to Stampers.—On the 14th July, to Mr. R. H. Stone, of Brighton, civil engineer, for certain improvements in contrivances for giving reciprocating motion to parts of machinery (such as stampers), which contrivances consist of cams, or other gripping devices, to grip the stamper-shank and carry it, not only to the top of its stroke, but also to retain such grip on the down stroke, and so give it immense impetus in delivering its blow.

Improvements in Shaft Skids.—On the 14th July, to Mr. Francis Webster, of Tress-street, Ballarat, blacksmith, for making ratchet-faced skids for mining shafts, wholly of wood or wholly of iron, and for a special combination and arrangement of machinery for supporting a safety-cage from the rope, and for operating the safety pawls.

Amalgamating Machines.—On the 14th July, to Mr. Henry Moon, of Leicester, in England, for improvements in amalgamating machines of the shaking-table order.

Crushing Machinery.—On the 21st July, to Mr. Allan Butters, of Ballarat, for a machine for crushing quartz, grain, and other material.

Electric Gold Extractor.—On the 11th August, to Mr. C. M. Otto, for the extraction of gold by means of an electric current in direct contact with the mercury by means of a platina point in the centre of the bottom of the mercury pan connected with the electric generator, the other connexion being made by two carbons united by copper wire, in the centre of which the connecting wire is fixed.

Process of Treating New Caledonian Ores.—On the 20th August, to Mr. H. Herrenschmidt, of Sydney, for a process of treating two kinds of ores found in New Caledonia, viz.:—1st, manganiferous ores of cobalt and nickel; 2nd, plain ores of nickel. The first ores are boiled in a solution of proto-chloride of iron; then the nickel and cobalt are precipitated, and the supernatant liquor either crystallized or evaporated. In the latter case, the hydro-chloric acid is driven off to a suitable vessel, and the residual product is oxide of manganese. The second ores are first dissolved in the heated hydro-chloric acid; then the nickel is precipitated, and the remaining liquor evaporated to recover the hydro-chloric acid, with which to make proto-chloride of iron for recommencing the whole process.

Floating Apparatus for Sluicing.—To Mr. G. B. B. Elliott, of No. 2 Sydney-terrace, East Melbourne, for an improved portable floating apparatus for sluicing alluvial earths, the object of which is to work river banks and beds, and to make canals from the banks of creeks through alluvial flats for sluicing purposes. The apparatus consists—first, of a platform; second, of sluices; third, of tail-races for such sluices. The platform rests on a punt, which also supports an engine, a centrifugal pump, and an elevated tank. The sluices and tail-races each rest on other floating punts and buoys, while between each there is a water-jigger. The excavated material is lodged on the platform, and from thence conveyed to the sluice-head, where it is cleansed by a shower of water; second, when it reaches the jigger it receives a water pulsation, and finally is discharged down the tail-race.

Safety Hook.—On the 27th October, to Mr. J. R. Hart, of Ferrars-street, South Melbourne, engineer, for an improved disengaging safety hook for mining cages, in which the tails of the two halves of a hook are enclosed by a sleeve held up by a spiral spring, so that, when the end of the sleeve comes against

the poppet-heads, it will give to the pressure, and set free the tails of the hook, which then become instantly disconnected.

Air-blast Smelting Furnaces.—On the 12th November, to Mr. J. D. La Monte, of Sydney, metallurgist, for inventions relating to air-blast smelting furnaces, which are identical with one successfully at work at the Sunny Corners Silver Mines in New South Wales.

Improved Process for Treating Auriferous Material.—On the 17th November, to Mr. John Dye La Monte, of Sydney, for an improved process of treating finely divided auriferous and argentiferous material prior to smelting it. By this process each particle of material is coated with lead prior to smelting.

Improvements to Blast Smelting Furnaces.—On the 17th November, to Mr. Thos. Gillespie, of Sydney, for the addition of a subsidiary closed chamber to blast smelting furnaces for the purpose of preventing the accumulation of slag in the bed. This subsidiary closed chamber is built beside the bottom of the ordinary furnace, and into it the ore is allowed to run as it melts, so that slag and regulus form themselves in the chamber instead of in the furnace. The flame is allowed to pass into the chamber, so as to preserve its contents in a state of fusion. An upper and a lower hole are made in one of its walls, the lower one being closed until the slag has all run out of the upper one; then the upper one is closed, and the regulus tapped through the lower one.

Amalgamating Apparatus.—On the 2nd December, to Mr. Adam Miller, of Lime-street, London, engineer, for an amalgamating apparatus, consisting primarily of two vertical chambers connected at bottom by a bend, so as to form a U, one side of which is smaller than the other. In each side there are grids and helical blades. The material to be treated is fed into the smaller side, down which it passes through the quicksilver and rises in the larger side, leaving the precious metals behind. A modification of this consists in making the smaller chamber concentric with the outer and larger.

Amalgamating Apparatus.—On the 16th December, to Mr. J. T. Birchall, of Albert-street, East Melbourne, engineer, for an improved process of and apparatus for utilizing a current of air in amalgamating machinery.

Amalgamating Apparatus.—On the 16th December, to Mrs. E. B. Parnell, of Albert-street, East Melbourne, metallurgist, for a novel construction of amalgamating wheel, revolving automatically within a casing containing quicksilver, which is kept lively by an electric current.

Furnace for Treatment of Pyrites.—On the 31st December, to Mr. Conrad Icke, of Sydney, for "Icke's cupola oven or furnace, for the treatment of pyrites and other ores and substances."

In addition to the above the following patent was applied for, but lapsed in the absence of the necessary procedure:—

Safety Screw Brake for Mining Cages.—Invented by Mr. Frederick Coates, of Ballarat, Victoria.—The inventor's idea was that a hole should be bored through the sides of the cage near the top shoe or guide, and two pieces of forged iron about two inches thick, and an equal breadth as the band of the cage, and about two feet six inches in length, to be riveted on to the band each side of the cage (the inner side); a worm hole then to be bored through the centre of these pieces, and a screw to suit inserted, the inner side end of the screw to take the shape of a wheel with a handle attached, and when this is fixed the screw goes right through centre of shoe. Cages, as a rule, have a half-inch play between the skid and shoe. When the men are going up or down in the cage, one man on each side should have hold of handle of wheel, so that if the rope was to break or engine over-wind, a turn of the wheels would send the screws into the skids of the shaft and jam it, thus giving the men power to act for themselves.

APPENDIX L.

The following suggestions for the amendment of *The Regulation and Inspection of Mines Act*, No. 783, have been made to this Department (see Synopsis of Act, page 92):—

1. That the practice of boring and charging holes, and exploding them singly, be prohibited.
2. That self-closing gates, or two bars, be used at all entrances to shafts. (See general rule 7, section 8 of Act.)
3. That all chargers and scrapers, as well as tamping bars, be made of copper, or be copper-tipped. (See rule 2 of section 8.)
4. That the practice of engines being left without drivers, from the time when men are lowered until they are raised, be prohibited.
5. That every boiler be provided with a *glass* water-gauge, and not less than two try-cocks. That the safety-valve on a boiler be not connected with either the steam pipe or steam stop-valve. That all boilers be subjected to a hydraulic pressure of not less than $1\frac{1}{2}$ times that at which the safety-value blows off. (Gen. rule 35, sec. 8.)
6. That before any boiler be built in position it be examined internally and externally, and be subjected to a test of not less than $1\frac{1}{2}$ times the pressure at which it is proposed to work such boiler. That an Inspector of Mines may, if he think fit, cause a boiler to be tested to twice the pressure; the Inspector after examination to give a certificate stating—(1) that every such boiler has been examined; (2) the pressure to which it has been subjected; and (3) the working pressure of steam which such boiler shall be allowed to carry.
7. That two engine-drivers be present at the engine when men are being lowered or raised.
8. That the burden of proving that any person is *not* under the age prescribed by rule 31 of section 8 lie upon the mining manager of the company employing such person.

C. W. LANGTREE,
Acting Secretary for Mines and Water Supply.

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