

**THIRD AND FOURTH REPORTS**

FROM THE

**SELECT COMMITTEE**

ON

**ACCIDENTS IN COAL MINES;**

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

**MINUTES OF EVIDENCE,**

AND AN

**I N D E X**

**TO THE FOUR REPORTS.**

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*Ordered, by The House of Commons, to be Printed,  
1 & 26 June 1854.*

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**T H I R D**

**R E P O R T**

**FROM THE**

**SELECT COMMITTEE**

**ON**

**ACCIDENTS IN COAL MINES ;**

**WITH THE**

**MINUTES OF EVIDENCE,**

**TAKEN BEFORE THEM.**

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*Ordered, by The House of Commons, to be Printed,*  
*1 June 1854.*

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*Martis, 14<sup>o</sup> die Februarii, 1854.*

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*Ordered, THAT* a Select Committee be appointed to Inquire into the Causes of the numerous ACCIDENTS IN COAL MINES, with a view of suggesting the best Means for their Prevention.

Committee nominated, of—

Mr. Hutchins.  
Mr. Cayley.  
Mr. Stephenson.  
Mr. Ingham.  
Mr. Cumming Bruce.  
Mr. Hussey Vivian.  
Mr. Henry Austin Bruce.  
Mr. Mostyn.

Mr. Locke.  
Mr. Cobbett.  
Mr. Farrer.  
Mr. Baird.  
Mr. Fitzroy.  
Colonel Pennant.  
Mr. Child.

*Ordered, THAT* the Committee have power to send for Persons, Papers, and Records.

*Ordered, THAT* Five be the Quorum of the Committee.

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*Veneris, 7<sup>o</sup> die Aprilis, 1854.*

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*Ordered, THAT* the Committee have power to report the Minutes of Evidence taken before them, from time to time, to The House.

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*Jovis, 27<sup>o</sup> die Aprilis, 1854.*

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*Ordered, THAT* Mr. Thicknesse be added to the Committee.

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*Jovis, 4<sup>o</sup> die Maii, 1854.*

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*Ordered, THAT* Colonel Pennant be discharged from further attendance on the Committee, and that Viscount Goderich be added thereto.

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**T H I R D   R E P O R T .**

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**THE SELECT COMMITTEE** appointed to inquire into the Causes of the numerous **ACCIDENTS IN COAL MINES**, with a view of suggesting the best Means for their Prevention, and who were empowered to Report the **MINUTES OF EVIDENCE** taken before them, from time to time, to The House,—

**H**AVE taken further Evidence on the Matters to them referred, which they have agreed to Report to The House.

1 *June* 1854.

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1. *Particulars as to the System of Education ; its Effects :*

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2. *State of Education in particular Districts.*
3. *Act of 5 & 6 Vict. c. 89.*
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5. *Proposition by Mr. Tremenheere for continuing the Education of Boys at Work between the Ages of Ten and Fourteen.*
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1. *Great Importance of Remedying the present want of Education among Miners:*

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Objections to preventing boys from working till they are twelve years old, with a view to their better education, *Taylor* 1213-1216; *Smyth* 1850, 1851; *Evans* 2408-2412; *Wood* 3595-3599—Advantages of their still being allowed to commence work when ten years old, *Tremenheere* 1234, 1235. 1267-1273; *Woodhouse* 2292, 2293. 2308. 2311-2316—Respects in which the age of ten is too young for a boy to commence work in a colliery, *Evans* 2345.

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6. *Evidence in consideration of Mr. Tremenheere's Scheme:*

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7. *Other Proposals for supplying the required Instruction:*

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See also *Dowlais Works*, 1. *Mining College.* *Mining Schools.* *Prize System of Education.* *Staffordshire, &c. District.* *Strikes.*

*Elliott, George.* (Analysis of his Evidence.)—Agent of the Marquis of Londonderry, 1—Is owner of several collieries, 2—Has had the official management of collieries for about eighteen years, 3—The ventilation of coal mines has been much improved since the Lords' Committee on the subject in 1849; 4-6—There has been a great improvement effected in the furnaces, which are now made broader, and have increased power, 7-9—It is doubtful whether, as a rule, more ventilation is obtained by passing fresh air over the furnace than by passing return air, 10-12.

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1. *As favourable to the Furnace :*

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## I.

## INCE HALL COAL AND CANNEL WORKS:

1. *Explosions at the Arley Mine; origin of the more recent one considered.*
2. *System of Working.*
3. *Ventilation generally.*
4. *How far expedient to sink another Shaft.*
5. *Other Evidence and Suggestions; Precautions now taken.*
6. *Experiments with the Furnace and the Steam-jet.*

1. *Explosions at the Arley Mine; origin of the more recent one considered:*

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Experience of witness as to the different modes of ventilation of collieries, 1461-1468—Objection to ventilation by machinery as uncertain, expensive, and complicated, 1468-1471—Decided preference of the steam-jet to the furnace, 1472, 1473—Necessity of the application of the jet being properly understood, 1473, 1497, 1499—Advantages of the steam-jet in deep as well as in shallow mines, 1474—Results of experiments with the jet at Seaton Delaval Colliery adverted to, as showing its great power in large mines, 1474-1478—Reference to the application of the jet to certain manufactories on the Tyne as proving its action by propulsion against the law of expansion, 1479, 1480.

Evidence to the effect that the experiments tried by the Government inspectors and others in regard to the power of the steam-jet were not conducted fairly or correctly, 1481-1497—Advantages, in applying the jet, of having the boiler fires at the bottom of the pit, 1490, 1491—Importance of feeding the furnace or boiler fires with fresh air, instead of passing any return air over them, 1491-1496—Necessity of not extending the jet beyond one foot sectional area, or thereabouts, 1497—Large area adopted, nevertheless, in Mr. Wood's experiments, *ib.*—Advantages due to the controversy on the subject of the steam-jet and the furnace, 1498—Inexpediency of the Committee recommending the adoption of any definite mode of ventilation, 1499, 1500.

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Inexpediency of allowing the miners to set their own timber or props, 1539-1542—Necessity for walling round the heads of the pits, 1543—Care to be taken in winding the men up and down the shaft; advantage of slides, 1544-1549—Care taken in Northumberland in winding up the pit, 1550, 1551—Discretion to be left to the viewer as to the class of person who should work the engine in winding up, 1552, 1553—Duty of the inspector to look after the machinery, &c., 1554, 1555—Insecurity and danger attendant upon the use of the ordinary Davy lamp, 1556, 1578-1583—Anticipated security from proper ventilation without any auxiliaries, 1557, 1582—Extent to which the lamp should still be employed, 1557, 1558, 1582.

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to several lamps as improvements upon that of Sir H. Davy, 1584-1588—Recommended use of Mr. Hall's lamp as the best yet invented, and as ensuring perfect safety; its advantages as compared with the Davy lamp, 1588-1597—Evidence opposed to the use of gunpowder where the Davy lamp is employed, or *vice versa*, 1598-1610—Danger of entrusting the firing of the shot to a deputy specially appointed, if a lamp is in use, 1599. 1605—Instance of this in some shots fired at the East Cramlington Pit, 1599-1601—Naked lights rather than the safety-lamp should be used where blasting is employed, 1608-1610.

Approval of Government inspection, 1611—Insufficiency of the number of the inspectors, 1612-1615. 1620—Each mine should be visited every three or four months, 1613. 1615—The inspector should see that the coal is being worked not only safely, but without waste, 1615, 1616. 1619—Class of persons who should comprise the inspectors, 1617, 1618—Insufficiency of their present salaries, 1618—Expediency of appointing sub-inspectors, whose duties should be to examine and report to the chief inspectors, but not to decide, 1620-1628—But for the expense, a sufficient number of inspectors would be better than sub-inspectors, 1622—Means by which the responsibility of the viewers should be regulated in case of explosions, 1629-1640—Attention to be given by viewers to the suggestions of the inspectors, who should be the superior authority in intelligence as well as in position, 1633-1640.

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*Meadows Pit.* Witness delivers in a paper, showing an analysis of experiments made by him at the Meadows Pit for the purpose of testing the steam-jet, *Elliott's Ev. (First Rep.)*, p. 7-9—Greater power of the furnace as shown thereby, *ib.*—Quantities of air ascending the upcast shaft by furnace ventilation, *ib.* 9—Different ways in which the jets were applied in these experiments, *Elliott* 54—The experiments prove that the furnace is more efficient as the pit is deeper, *ib.* 280, 281.

*Mechanical Ventilation.* Objection generally to ventilation by machinery as uncertain, expensive, and complicated, *Mather* 1468-1471—Objection to any mechanical means of ventilation; *Woodhouse* 1977, 1978.

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*Middle Duffryn Colliery.* See *Struvé's Apparatus.*

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*Miners.* Better character of the North Wales than of the Lancashire miners, *Darlington* 681. 717—Depraved habits of the latter; effect of the same upon their children, *ib.* 707-711—The men do not wash themselves daily, *ib.* 713-717—Improvement of late years in the moral character of the miners, *Elliott* 943, 944—Difficulty in finding men sufficiently intelligent to make efficient officers, *ib.* 955, 956.

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*Mining College.* Resolution of coalowners, &c., in favour of establishing a central mining school or college, *Third Rep.*, p. 70, 71—Explanation of this resolution, *Wood* 3602.

*Mining, Operations.* Immense improvements which have been effected of late years in mining operations, *Sir H. De la Beche* 1391, 1392.

*Mining Schools.* Expediency of the superior workmen having better means of information on the scientific branches of mining, *Elliott* 953-955, 957-959—Class of schools proposed by witness for the instruction of colliers, *Sir H. De la Beche* 1400-1404—Contemplated inculcation of matters relating to mining only, *ib.* 1404—Practical establishment at present of a system of instruction in mining through means of parties specially prepared and sent into the mining districts for the purpose, *ib.*—Anticipated establishment of mining schools through means of voluntary subscriptions, *ib.* 1404-1439-1445—Contemplated establishment of mining schools by voluntary subscription in Cornwall and at Newcastle, *ib.* 1441-1443.

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*Minister of Mines.* Suggested appointment of a Minister of Mines responsible to Parliament, *Mather* 1670, 1671.

*Misconduct or Negligence of Miners.* Expediency of greater power in the magistrates to punish all reckless acts committed by workmen, *Darlington* 599-601; *Mather* 1659—General sufficiency of the present law with respect to carelessness on the part of the workmen, *Elliott* 936—Principal offences against safety committed by miners, *Woodhouse* 2055-2059—Occurrence of accidents generally attributed to neglect, *Dobson* 2886—This is especially the case in South Wales, *ib.*—Occurrence of explosions and accidents through negligence, *Wynne* 3139-3144.

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*Monklands (Scotland).* Beneficial results of Messrs. Murray's efforts to improve the education of the workmen at this establishment, *Tremenheere* 1913-1915.

*Mormonites.* Paucity of Mormonites as miners; their character, *Darlington* 695, 696.

*Morton, Mr.* Competency of Mr. Morton, the inspector of the Midland district, *Woodhouse* 2217, 2220.—Mr. Morton has not reported his opinion upon the propositions of the other inspectors, *Dickinson* 3686.

*Museum of Economic Geology.* Means by which the children of colliers may be able to receive instruction at the Museum of Economic Geology in London, and thereby qualify themselves for superior positions in connexion with collieries, *Tremenheere* 1899—Practical use which may be derived from this museum, *Dickinson* 3724, 3725.



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*Naked Lights.* Greater safety of collieries in proportion with the greater exclusion of naked lights, *Elliott* 785-788—Frequency of accidents occurring through the naked lights used in firing the shots for blasting, *ib.* 810, 811—Difficulty of excluding the use of naked lights, *ib.* 817, 818—Explosions mainly occur through the use of naked lights, *Taylor* 1068-1070—Opinion of the Committee that the ventilation of mines should be kept so good, that under ordinary circumstances it would be safe to work with naked lights, *Fourth Rep.*, p. 5—See also *Blasting. Safety Lamps*, 1.

*Natural Brattice.* Occasions of witness having seen a natural brattice, *Darlington* 244-246.

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*Newcastle Mining Institute.* Value of the Mining Institute at Newcastle adverted to, *Dickinson* 3726—Reference thereto by the Committee, *Fourth Rep.*, p. 9.

*Newton Pit (Scotland).* Reference to the proceedings for damages consequent on an accident in the Newton Pit, as illustrating the hardship of the law upon the owners, *Landale* 2817, 2837-2839.

*Nits Hill Colliery.* Depth of the Nits Hill Colliery; its condition generally, *Landale* 2692-2698.

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*Northumberland, Cumberland, and Durham District.* In nine cases out of ten there are schools at the collieries in Northumberland and Durham, *Elliott* 942—Tabular statement, showing the yearly averages of fatal accidents in coal mines, comparing Great Britain and the Continent with Northumberland and Durham, *Taylor* 1005, 1006—Sources whence this table has been compiled, *ib.* 1007—Explanation showing the comparative paucity of accidents in Northumberland and Durham, *ib.* 1007-1022—Causes to which attributable, *ib.* 1023-1025—Reference to certain returns which represent pretty nearly the average of accidents, &c., in Northumberland and Durham, *Taylor's Ev. (Second Rep.)*, p. 4-10.

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Considerable improvement of late in the management of mines in witness's district, which is in advance of any other, *Dunn* 3392-3395—Great decrease of accidents in proportion with the produce of coal, *ib.* 3396-3399—Such decrease attributed chiefly to the moral working of the Act, and to the scrutiny of the inspectors, *ib.* 3400-3404, 3409-3412—Frequent suggestions (always in writing) made by witness to owners or managers; they have been generally attended to, *ib.* 3405-3409—Instance of witness having made certain suggestions about the working of a mine, which were only partly attended to, *ib.* 3414-3418—Efficiency of the air-courses in the North, *ib.* 3448—Efficiency of the shafts generally, *ib.* 3449-3451.

Tabular statement, showing a synopsis of deaths from accident in the counties of Durham, Northumberland and Cumberland, since the commencement of the Mine Inspection Act, *Dunn* 3395 (*Third Rep.*, p. 52).

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**Notices of Accidents.** Recommendation by the inspectors that the local police give due notice to the inspector of every accident, *Third Rep.*, p. 44—Alteration in this recommendation proposed by the coalowners and mining engineers, *ib.* 70—Explanation of the inspectors' suggestion, *Dickinson* 3693-3708—Approval by the workmen of the proposal of the inspectors, *Swallow* 3734.

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**Owners.** Advantage of the local magistrates, rather than the Secretary of State, being empowered to punish negligence, &c., on the part of proprietors and their agents, *Darlington* 602-607—Objection to the Secretary of State having power to levy fines on the colliery owners, *Elliott* 935—Powerlessness of the law to punish owners who may persist in an unsafe mode of working, *Smyth* 1823, 1824; *Wynne* 3279-3282—Slight acquaintance of owners with mining operations, *Smyth* 1893-1895—Expediency of introducing into the Act certain rules, binding on the owners, *Wynne* 3227—Consideration of the mode of dealing with cases where accidents arise through the owner persevering in an unsafe mode of working, as at the Bent Grange Colliery, *Wood* 3562-3575, 3581-3583.

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**Panel Working.** Inapplicability of panel work to the Scotch mines, *Landale* 2657, 2658.

**Pemberton Colliery.** Reference to experiments in ventilation by Mr. Mackworth and Mr. Dickinson with the steam-jet at Pemberton, *Darlington* 87-89—Respects in which the power of the jets was not properly developed in this instance, *ib.* 89, 96, 97—Increase of 900 cubic feet per minute obtained nevertheless by the steam-jet over the furnace, *ib.* 90-95—The experiments show the superiority of the motive power of the jet simply, over that of the furnace simply, *ib.* 144, 145—Use of the steam-jet by night, and of the furnace by day in the Pemberton Pit, *ib.* 178, 179.

**Penalties.** Proposal of the inspectors for imposing penalties on the owners by arbitration, *Third Rep.*, p. 44—Objections to this proposition; the Act should impose specific penalties, *Wood* 3666-3673, 3675, 3676—Recommendation of the Committee for the infliction of penalties on owners or occupiers, in the event of neglect of certain proposed rules, *Fourth Rep.*, p. 8.

**Percy Main Colliery.** Reference to the irruptions of gas at the Percy Main Colliery (which is a very fiery mine), as showing that, with due ventilation, explosions need not be feared, *Mather* 1565-1576.

**Pillar-and-Stall System.** Greater waste of coal, greater expense, greater difficulty of ventilation, and greater liability to accident, under the pillar-and-stall system, than under long-wall work, *Wynne* 3091-3110.—See also *Long-wall Work*. *Splitting the Air*.

**Pittington Colliery.** Witness delivers in a paper, showing an analysis of experiments made by him at the Adelaide and Antrim pits, Pittington Colliery, for the purpose of ascertaining the comparative value of the furnace and the steam-jet as a means of ventilation, *Elliott's Ev. (First Rep.)*, p. 3-6—Greater consumption of coals, and less ventilation obtained, under the steam-jet than the furnace, *ib.* 4-6—The furnace produced 45,740 cubic feet of air per minute, as against 36,267 by the steam-jet, *ib.* 5—Diameters of the upcast and downcast shafts in this case, *Elliott* 36-38—Further particulars as to these experiments; similarity of the circumstances under which applied, *ib.* 263-279—The result shows unquestionably the greater power, and the less expense of the furnace, *ib.* 266.

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**Plans.** Importance of carefully registered plans of collieries, and means of access to them, *Mather* 1660-1664—The inspector should see that proper plans were deposited, *Woodhouse* 2325—It should be incumbent on the owner, under penalty of a fine, to see that the plans were kept in good order, *ib.* 2326-2328—Examination of the plans by the inspectors adverted to, *Dunn* 3482-3485.

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*Print Works Act.* Education to the extent of 150 hours in six months provided under this Act for boys between the ages of eight and thirteen employed in print works; satisfactory working of the same; proposed application of this principle to boys employed in mines, *Tremenheere* 1253, 1304, 1305.

*Prize System of Education.* Explanation of the prize scheme of education, first adopted in South Staffordshire; its success and great advantages, *Tremenheere* 1346-1350—Extensive adoption of this system at the present time, *ib.* 1346, 1347—Statements in support of the principle of giving prizes and of exciting emulation among the boys, *ib.* 1347—Mention of different persons who are associated with Mr. Norris in carrying out the prize system of education in North Staffordshire, *ib.* 1897, 1898—List of the vice-presidents and of the committee, &c., of the association therein, *ib.* 1898—Adoption of the system by other than the mining interests, *ib.*—Introduction of the system into South Staffordshire by witness in connexion with Mr. Norris, *ib.*—Satisfactory results as regards subscriptions and the working of the scheme since its establishment, *ib.*

Manner in which witness connects the working of the prize system with that of his proposed Bill, *Tremenheere* 1899—Anticipated advancement of boys who may distinguish themselves at school and receive certificates, *ib.*—Much attention is paid to the prize system in Staffordshire, *Wynne* 3178.

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*Props.* Approval of the system of employing deputies to stand the props for the workmen, as better than allowing the workmen to attend to the matter, *Elliott* 337-340, 838-840; *Mather* 1539-1542; *Atkinson* 2473-2479—Importance of there being experienced men to set the props, and of having an abundance of timber at hand, *Darlington* 546-548—Difficulty in procuring a sufficiency of wooden props; employment by witness of cast-metal props, *Elliott* 841-859—Responsibility to be thrown on the prop-setters, *ib.* 860, 861—Superior class of workmen from whom they should be selected, *ib.* 862, 863.

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*Provident Societies.* Good resulting from the contributions of the miners to clubs, &c. for the relief of widows and orphans, *Darlington* 718—The owners have no authority under the Truck Act to stop part of the wages towards a provident fund; expediency of such authority being given, *ib.* 719-721, 725-728—Anticipated objection, on the part of the men, to a rate being levied for this purpose, *ib.* 719—Reference to provident societies established by witness at the Ince Hall Works and elsewhere; how constituted, *ib.* 722, 723—Importance of the workmen having a voice in the management of such societies, *ib.* 724, 725—Application of the subscriptions adverted to, *ib.* 729—The miner himself, whilst able to work, should contribute something weekly towards a fund to support him in sickness, *ib.* 731.

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Resolution of deputations of coalowners and mining engineers approving of benevolent funds generally, but suggesting that the Act should not interfere with the miners or owners in regard thereto, *Third Rep.*, p. 69—No further legislative powers on this subject considered necessary by the Committee, *Fourth Rep.*, p. 9.

*Pumps, &c.* Advantage of the steam-jet, in some cases, for the preservation of the pumps and tubbing, *Elliott* 17-19.

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**Reading Rooms.** Particulars as to the reading-rooms established at the Marquis of Londonderry's mines, *Elliott* 947-951.

**Refuge Stalls.** Conclusion of the Committee adverse to their adoption, *Fourth Rep.*, p. 5.

**Registration of Mines.** Suggestion of the inspectors for a registration of mines, *Dickinson* 3693.

**Regulators.** Advantage of using regulators as much as possible instead of doors, *Darlington* 196-199.

**Reports to Parliament.** See *Inspection*, 3.

**Responsibility.** Extreme importance of attaching responsibility both to the inspectors and all parties concerned in working the mine, *Sir H. De la Beche* 1374-1376. 1428. 1430. 1436—Importance of the responsibility of viewers and owners still continuing, *Smyth* 1815; *Woodhouse* 2263. 2264; *Atkinson* 2510-2513; *Wynne* 3266; *Dunn* 3409-3413—Feeling of the deputations of coalowners, &c. in favour of increasing the responsibility of owners and managers, *Wood* 3560—Approval by the Committee of a continuance of the responsibility of owners, *Fourth Rep.*, p. 6.

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**Return Air.** Advantage in some cases of the steam-jet as a means of preventing the return air from coming in contact with the furnace, *Elliott* 20-23. 26—Paucity of accidents from the return air passing over the furnace, though as a rule the foul air should be worked off by means of a dumb-drift, *ib.* 812-815.—See also *Furnace*.

**Revision of the Law.** The Committee strongly urge that no time may be lost in revising the law now in force, and in applying such further remedies as may appear practicable and effective, *Fourth Rep.*, p. 10.

**Roofs.** See *Falls of Roofs*, &c. *Props*.

**Rules.** Difficulty, in framing a set of rules for collieries, of drawing a line of guidance, the circumstance of no two pits being precisely similar, *Darlington* 671—Inapplicability of the rules generally in the north of England to the Scotch mines, *Landale* 2737-2739.

Explanation as to several rules, drawn up by six inspectors and signed by four, which have just been communicated to the deputation of coalowners and workmen now sitting in London, and are recommended for enactment, *Wynne* 3227-3235; *Dickinson* 3679, 3680—A copy of these suggested rules delivered in, *Wynne* 3235; *Second Rep.*, p. 43—Copy of rules suggested by Mr. Dunn, *Third Rep.*, p. 73, 74—Concurrence generally of witness and Mr. Marton in the rules laid before the Committee by Mr. Wynne, *Dunn* 3509, 3510. 3518-3521—How far the workmen approve of the recommendation that printed rules be posted up in each colliery, *Swallow* 3734—Resolution of deputations of coalowners and mining engineers in favour of a code of rules for every colliery, *Third Rep.*, *Ev.* p. 68—Disapproval on the part of the workmen of this resolution, *Swallow* 3727.

All parties agree that every colliery should have a set of rules, *Wood's Ev. (Third Rep.)*, p. 86—The rules proposed for the safety of the workmen should be kept apart from those for the working of the mine, *Wood* 3530—It should be left to the option of the coalowner, under the advice or suggestions of the inspector and workmen, to frame any rules he may think best fitted to the circumstances of each colliery, *ib.* 3530-3540. 3623-3627—Some of the rules might be embodied in an Act of Parliament, and made compulsory in all collieries, *ib.* 3531, 3532. 3536. 3540—Anticipated adoption by each coalowner of the rules most requisite for his colliery; his responsibility in the matter adverted to, *ib.* 3534-3537. 3620, 3621. 3627—Great care and discrimination required in specifying any rules to be embodied in an Act of Parliament, and made applicable to all mines, *ib.* 3537, 3538. 3618-3622.

Sufficiency of the rules to be enacted by each coalowner to provide against the unsafe working of any mine, *Wood* 3568-3570. 3579—Mode of enforcing the necessary rules considered, *ib.* 3571-3575—Further reference to the character of the rules and regulations which may be embodied in the Act, *ib.* 3675-3677—Expediency of enacting rules which shall embrace and define certain essential points set forth by witness as applicable to every mine, *Swallow* 3727, 3728.

Recommendation of the Committee that the owners or occupiers of every colliery should frame a set of rules applicable to its particular state and circumstances, which rules should be agreed to and certified by the Government inspector of the district, *Fourth Rep.*, p. 8—And that a clause be inserted in any Act to be passed for the purpose of punishing all persons employed in or about mines for breach of colliery rules, *ib.*

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## S.

## SAFETY-LAMPS:

1. *Their Advantages generally.*
2. *Difficulty in exploding them.*
3. *Negligence in their use considered.*
4. *Other Particulars.*

1. *Their Advantages generally:*

Necessity for the safety-lamp in mines subject to sudden outbursts of gas, *Darlington* 215, 216, 218, 229-240; *Smyth* 1696; *Woodhouse* 2170-2172, 2181; *Dunn* 3421-3424—Estimated cost of lighting a mine exclusively with safety-lamps, as compared with the cost of using candles; slight difference in favour of the former, *Taylor* 1084-1087, and *Second Rep., Ev. p. 35, 36*—Circumstances under which the lamp should always be employed, *Sir H. De la Beche* 1424; *Mather* 1557, 1558, 1582; *Smyth* 1763-1769, 1773-1776; *Wynne* 3148-3155—Expediency of safety lamps under proper regulations, *Landale* 2744, 2745—Consideration of the Report of the Committee of 1852, as to the safety-lamp "being rather a lure to danger than a security," *Elliott* 821-832; *Taylor* 1065-1069, 1079-1081, 1091; *Woodhouse* 2149-2160.

Opinion of the Committee that in fiery mines, especially those that are liable to sudden outbursts of gas, safety-lamps add largely to the security from explosion, and can be used without much, if any, extra cost over the naked light, *Fourth Rep., p. 5*—Still safety-lamps, however valuable, should not be relied upon for the prevention of explosions, *ib.*

2. *Difficulty in exploding them:*

Impression as to the velocity of current in which the Davy or ordinary lamp will explode, *Darlington* 206-212, 219-228—Witness has never been able to explode a lamp so long as the gauze has been under red heat, *ib.* 220, 221—A slight movement will explode one at red heat, *ib.* 222, 223—Confidence of witness in Mr. Wood's experiments with safety-lamps, *ib.* 582, 583.

Except under extraordinary circumstances, the lamp is perfectly safe, *Elliott* 824-831—Great velocity required to cause explosion, *ib.* 828-830—Witness never heard of an explosion in North of England through the safety-lamp; his experiments on the subject alluded to, *Taylor* 1068, 1069—Reference to the safety-lamp produced by Mr. Wood before the Committee of 1853, *Mather* 1679-1682—When the gauze becomes red hot the work in the mine should be stopped, *Smyth* 1765, 1766—Satisfactory character of the experiments conducted by Messrs Wood and Elliott, *Fourth Rep., p. 5*.

3. *Negligence in their use considered:*

Occasions of workmen taking off the tops of the lamps; difficulty generally experienced, from the state of the law, in getting magistrates to punish properly for this offence, *Darlington* 590-598—Difficulty of applying the law adverted to, *Elliott* 936, 937—Frequent occurrence of accidents through the carelessness or want of intelligence of workmen with their lamps, &c.; such carelessness should be punishable, *Sir H. De la Beche* 1379-1381, 1390—The lamps should always be kept locked, *Smyth* 1765.

4. *Other Particulars:*

Parties by whom the use of the lamp should be determined, *Darlington* 241, 242; *Woodhouse* 2183-2188; *Wynne* 3156-3159—Respective merits of different lamps, *Elliott* 832-837—Compulsory use of safety-lamps recommended by witness in 1845, *Sir H. De la Beche* 1356—Difficulty in regard thereto, *ib.* 1377, 1382-1389—Danger of safety-lamps near some goaves, *Smyth* 1725—Degree of light given by the safety-lamp adverted to, *ib.* 1774, 1775—Instances of mines being worked exclusively with safety-lamps, *Taylor* 1083.

Objection to the safety-lamp being used in every mine, *Woodhouse* 2182—There is scarcely ever any necessity for the use of the safety-lamp in Scotch mines, *Landale* 2684—Dangerous characters of the lamps used in Scotland, and countenanced by the inspectors, *ib.* 2746-2751—Use of safety-lamps by witness as a precaution in dangerous mines, *Dobson* 2962-2967—Slight use of the safety-lamp in the Midland district, *Wynne* 3137, 3138—Care taken of the lamps in Northumberland and Durham, *Dunn* 3427, 3428—Danger of many lamps now in use, which are not constructed on the safe principles of the Davy lamp, *ib.* 3431-3434—Strict regulations advisable in using the lamp, *ib.* 3435, 3436—Rules and regulations as to the use of the lamp in fiery and non-fiery mines, *Third Rep., Ev. p. 78-80*—Paper showing the results of experiments at Wallsend Colliery in October 1849, and August 1853, for the purpose of testing the lighting powers of several safety-lamps, *Taylor* 1220 and *Second Rep., Ev. p. 55*.

See also *Blasting. Davy Lamp. Glover's Lamp. Hall's Lamp. Stephenson's Lamp.*

*Sanchie Pit (Scotland).* Unsuccessful application of the steam-jet to the Sanchie Pit, near Alloa, where the fires were never extinguished, and are still burning; the fault not attributed to the jet, *Landale* 2588-2595, 2840-2849.

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*School of Mines.* Inexpediency of referring questions of importance as to the conduct of collieries to the School of Mines, *Darlington* 672, 673.

*Schoolmasters.* See *Education*, 5.

*Schools.* See *Education.* *Mining Schools.*

## SCOTLAND:

1. *Ventilation and Working of the Mines.*
2. *Nature of the Law in cases of Accidents, &c.*

1. *Ventilation and Working of the Mines:*

Different circumstances of the pits in Scotland and in the north of England, as regards ventilation, *Landale* 2663-2665—Greater danger in Scotland of pillar-and-stall work than of long-wall work, *ib.* 2699-2705—General rules handed in as applicable to Scotch mines, and embracing machinery, shafts, ventilation, mode of working, and proceedings on accidents, *Landale's Ev. (Third Rep.)*, p. 21, 22—Power of the procurator fiscal rather than of the inspector under these rules; sufficiency of remonstrances by the latter, *Landale* 2787-2791. 2813-2815—Use of the furnace in Scotland where fire-damp exists, *ib.* 2568—Particulars as to the upcast and downcast shafts in Scotland, *ib.* 2581-2584—The furnace or fire-lamp is used in Scotland where artificial ventilation is required, *ib.* 2587—Occurrence of fires in Scotch mines adverted to, *ib.* 2611.

2. *Nature of the Law in cases of Accidents, &c:*

Information given by the men to the procurator fiscal in cases of grievance, *Lundale* 2780-2783—Reference to the common law of Scotland as sufficient, in connexion with proper rules, without increased Government inspection, *ib.* 2775-2780—Evils of the law for assessing damages in cases of accidents, *ib.* 2816 *et seq.*—Course of the law in such cases, *ib.* 2817. 2819-2829—Occasional ignorance displayed by the judge and jury in the course of the trials, *ib.* 2818. 2838—Inexpediency of introducing the English law into Scotland, *ib.* 2835-2837—Inexpediency of adopting in England the Scotch law in regard to accidents, *Elliott* 930-934.

See also *Education*, 2. *Winding up and down.*

*Seaton Delaval Colliery.* Reference to the experiments of Mr. Forster with the steam-jet at this mine, *Taylor* 1132-1135—Result of these experiments adverted to, as showing the great power of the jet in large mines, *Mather* 1474-1478—Explanation of an allusion made by witness in his work on "Coal Mines, &c." to the mode of application of the steam-jet at Seaton Delaval, and to the want of knowledge of the Committee on the subject, *ib.* 1674.

## SHAFTS:

1. *Size and Expense.*
2. *Proposed Precautions for the prevention of Accidents.*

1. *Size and Expense:*

Opinion that the smaller shaft should be the upcast and the larger the downcast, *Elliott* 308—Great expense of the shafts, *Darlington* 512-516; *Dunn* 3452, 3453—Impracticability, frequently, of sinking additional shafts; cases in point, *Taylor* 1179-1182—Means by which the proper size for the shafts might be decided, *Woodhouse* 2087-2093—Extent of area which may be safely worked with two pits of a certain diameter, *Landale* 2625, 2626. 2636-2638—Rule proposed for Scotland as to the size, &c., *Third Rep.*, p. 21—Explanation of this rule, *Landale* 2805, 2806.

2. *Proposed Precautions for the prevention of Accidents:*

It should be compulsory to arch over or fence round the mouths of the pit, *Darlington* 564, 565; *Mather* 1543; *Wynne* 3209, 3210—Necessity for abandoned pits being walled round or filled up, *Elliott* 865, 866—Expediency of fencing or walling round the mouths of the shafts considered; objection to fences, *Woodhouse* 2118-2123—Rules suggested for the proper condition of the shafts in Scotland, *Landale* 2786—Custom in Scotland of walling round disused pits, *ib.* 2804—Occurrence of accidents through the bad condition of the shafts, *Wynne* 3198-3202—Necessity of walling round abandoned pits in Staffordshire, &c.; penalty proposed, *ib.* 3203-3207.

Suggestions by the inspectors as to the condition and care of the shafts, *Third Rep.*, p. 43—Resolutions of coalowners and mining engineers on this subject, *ib.* 69—Reference to the propositions of the inspectors for the better prevention of accidents in the shafts, *Wood* 3608-3611—Views of the coalowners in regard to the propositions of the inspectors, *ib.* 3656-3662—Suggested enactment of the inspectors' proposal for the fencing and lining, &c., of the pits, *Dickinson* 3681-3683. 3687-3690—How far the workmen approve of this proposition, *Swallow* 3729, 3730.

Recommendation of the Committee that every shaft or pit which is out of use, or used only as an air pit, should be securely fenced by its owner, *Fourth Rep.*, p. 8—

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## SHAFTS—continued.

## 2. Proposed Precautions for the prevention of Accidents—continued.

Also that every working and pumping pit or shaft be properly fenced when not at work, *Fourth Rep.*, p. 8—Also that every working and pumping pit or shaft where the natural strata are not safe shall be securely cased and lined, *ib.*

See also *Winding up and down.*

*Shallow Mines.* See *Steam-jet*, 2.

*Sick Clubs.* See *Provident Societies.*

*Silesia.* Reference to a mining school in Silesia, where science has been introduced with great advantage, *Smyth* 1856, 1857. 1859.

*Smart Money.* Particulars as to the payment of "smart money" to men and boys injured by accidents in the Northumberland and Durham mines *Taylor* 1027-1033.

*Smyth, Warrington.* (Analysis of his Evidence.)—Inquiries by witness, in conjunction with Sir H. De la Beche and Dr. Lyon Playfair, into the causes of accidents in coal mines; the result was published in 1845; 1694, 1695—Government inspection was recommended by witness, 1696—Also the imperative use of the safety-lamp in fiery mines, *ib.*—Attention paid by witness since that period to the subject of accidents in collieries; official inquiries made by him thereon, 1697. 1707—Improvements of late years in the ventilation of coal pits, 1698, 1699—Fairness with which Mr. Wood conducted his experiments with the steam-jet and furnace at the Killingworth Colliery, 1699-1703—Correct account of the experiments given in his book on the subject, 1704-1706.

Several sources to which witness attributes the occurrence of accidents, 1707-1711—He does not agree with Mr. Taylor that most of the accidents in Northumberland are attributable to sudden irruptions of gas, 1709-1711—Necessity of guarding against accumulations of gas in the goaves, 1711—Different modes in the Northern and in the Midland districts of distributing the air through the mine, 1712, 1713—Efficiency of the system of coursing the air where long-wall work is adopted; it is in such cases the only possible system, 1713, 1714—Necessity of splitting the air where the pillar-and-stall mode of working is employed, as in Northumberland; effect thereof upon the condition of the pit and the health of the colliers, 1715-1719—More ventilation required where carbonic acid gas exists than where there is carburetted hydrogen, 1720, 1721.

Best mode of ventilating the goaves, 1723-1724—Danger of safety-lamps near some goaves, 1725—Restrictions in Mr. Wood's pits at Hepburn as to the use of lights, adverted to, 1725-1728—Adoption of long-wall work in certain districts with much advantage; its extension desirable, 1729-1738—Modes of working the coal in Northumberland and in South Wales; advantages of the Northumberland practice, 1739-1744—Better condition generally of the mines in the North, attributed to the greater intelligence of the viewers, &c., in those districts than in the Midland Counties, 1745-1750—Great importance of highly educated managers as affecting the character of the ventilation, &c., 1751. 1760-1762. 1812-1814. 1843.

Expediency of leaving the peculiar mode of ventilation to the discretion of the managers and owners, 1752—Great importance of stoppings or regulators of solid coal in lieu of doors; their adoption generally considered, 1753-1760—Security and expediency of using safety-lamps under certain circumstances, 1763-1769. 1773-1776—They should always be kept locked, 1765—When the gauze becomes red hot the work should be stopped, 1765, 1766—Reference to a sudden outburst of gas which took place in sinking a shaft in South Wales, 1770-1772—Liability of mines occasionally to such outbursts, 1773—Degree of light given by the safety-lamp adverted to, 1774, 1775.

Good effects of the Government inspection, 1777—The visits of the inspectors should be unexpected by the managers, 1777, 1778—There should be seven or eight chief inspectors with smaller districts than at present, 1779. 1786, 1787—The chief inspectors should have assistants under them, who should be men of junior experience but of equal capabilities otherwise; how this suggestion might be carried out, 1780-1782. 1802-1811—Expediency of the inspectors being better paid, 1783, 1784—Their efficiency at present, 1785—How their visits to the pits should be regulated, 1788, 1789—Opportunities of the workmen to communicate their grievances to the inspectors, 1790-1801.

Importance of the responsibility of viewers and owners still continuing, 1815—Expediency of some central Board or authority to decide disputed points between the viewers and inspectors, 1816-1819—Quantity of coal now raised annually in England, 1820, 1821—Necessity of the inspector's reports being made to some authority who could proceed against owners for neglect of precautions pointed out to them, 1822-1825—Alterations requisite in the constitution and working of coroner's juries, 1825-1829

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*Smyth, Warrington.* (Analysis of his Evidence)—continued.

—Ventilation of some mines by natural means only; sufficiency thereof in many instances, 1830-1839—Cases in which natural ventilation should not be trusted, 1838, 1839.

Feelings of managers on the subject of education, 1841, 1842—Expediency of the workmen as well as the viewers being better educated, 1843, 1847, 1848—Approval of Mr. Wood's suggestions for the establishment of local mining schools of different classes, 1844-1846—Means proposed for enabling boys from the inferior schools to follow up their education at the higher schools, 1849—Difficulty in preventing boys from working till they are twelve years old, 1850, 1851—Advantages of the suggestion for continuing to educate boys after they have entered the pit, 1852, 1853.

Practical and scientific character of the education essential for colliers' children, 1853-1856—Reference to a mining school in Silesia, where science has been introduced with great advantage, 1856, 1857, 1859—Means contemplated for the support of the proposed schools, 1858, 1859, 1874, 1875—Difficulty which might be felt in procuring properly qualified schoolmasters, 1860—Objection to a system of lectures only, 1861—Feasibility of affording scientific education to boys between twelve and eighteen, in conjunction with the practical experience they are obtaining underground, 1862-1870—How far the mines in Belgium, &c., may be more safely and economically worked than those in this country, 1871-1873.

Expediency of a large class of managers being better educated, as they might be, through the proposed schools, 1876, 1877—Belief, that with two or three dozen exceptions, there is a great deficiency among the present managers of collieries, 1878-1880, 1888-1892, 1896—Expediency of every manager understanding not only the circumstances of ventilation, &c., in his own pit, but the principles and circumstances of ventilation under all contingencies, 1881-1887—Slight acquaintance of owners with mining operations, 1893-1895.

*Sources of Accidents.* Several sources to which witness attributes the occurrence of accidents, *Smyth* 1707-1711.

*South Shields Committee.* Witness was the originator of the South Shields Committee; acted as secretary, and prepared the report, *Mather* 1446-1449.

*South Staffordshire.* See *Staffordshire, &c., District.*

*South Wales.* See *Wales.*

*Splitting the Air.* Importance of paying especial attention to the "splitting" and dissemination of the air when in the pit, *Darlington* 191, 192; *Elliott* 309-312; *Taylor* 1150, 1151; *Mather* 1515-1521; *Dunn* 3438, 3439—Improvements of late years on this point, *Darlington* 192—Explanation of the present mode of splitting and circulating the air; diagrams referred to, *Taylor* 1152-1162—Necessity of splitting the air where the pillar-and-stall mode of working is employed, as in Northumberland; effect thereof upon the condition of the pit and the health of the colliers, *Smyth* 1715-1719—Mode of splitting the air in the Midland Counties; defects of the system, *Woodhouse* 1925, 1998-2006, 2010, 2011—Advantage of the system, as adopted in Northumberland and Durham, adverted to by the Committee, *Fourth Rep.*, p. 4.

See also *Bensham Wallsend Pit.* *Buddle, Mr.*

*Staffordshire, Shropshire, and Worcestershire District.* Demand for the labour of boys in South Staffordshire adverted to, *Tremenheere* 1270-1273—Inconvenience of limiting the employment of boys underground in South Staffordshire to the age of twelve instead of ten years, *ib.* 1271-1273—Anxious and unsuccessful endeavours of the South Staffordshire iron-masters to promote education in their districts, 1274-1276.

The ventilation of collieries in the Midland Districts has much improved since 1849 through the more general adoption of artificial means, *Woodhouse* 1944-1947—Respects in which the condition of these mines has improved of late or still needs improvement, *ib.* 1989-1992—Deficiency of the discipline, *ib.* 1991, 1992—Dangerous character of some of the mines, *ib.* 1993, 1994—Large number of collieries in the Midland District, *ib.* 2216, 2221, 2222.

Witness is Government inspector of coal mines in Staffordshire, Worcestershire, and Shropshire; resides at Longton, *Wynne* 2977-2980—Has been inspector two years and a half, *ib.* 2982, 3194, 3195—Experience of witness before his appointment, *ib.* 2984-2986—Inferior manner in which the collieries in his district are ventilated and conducted; special reference to South Staffordshire, *ib.* 2987-2990, 2993 *et seq.*—Great improvement being effected in North Staffordshire, *ib.* 2989, 2991-2993, 3006, 3040, 3049-3051, 3224—Non-attention paid by owners to witness's complaints, *ib.* 3007, 3008.

Insufficient size of the air-ways in the district, chiefly in South Staffordshire; reasons given for not enlarging them, *Wynne* 3023-3052—Attention paid to the air-ways in North

*Staffordshire, Shropshire, and Worcestershire District—continued.*

North Staffordshire, *Wynne* 3040. 3049-3051—Working of the South Staffordshire collieries on the pillar-and-stall system, except in three instances, where the long-wall system is employed, *ib.* 3053, 3054—There are about 400 collieries under the inspection of witness, *ib.* 3196—The loss of life is greater than in any other district, *ib.* 3197—Accidents in the shafts and in the winding up occur chiefly in South Staffordshire, *ib.* 3223—Non-attention paid to witness's suggestions on these points, *ib.* 3225, 3226—Exception to be made in the case of South Staffordshire as regards enactments for winding up and down the shafts, *Dickinson* 3686, 3687.

See also *Butties. Education, 2. Prize System of Education.*

*Steam Boilers.* How far more desirable to provide by Act of Parliament, as suggested in the 13th proposition of the inspectors, than by rules, that every steam-boiler should be provided with a proper steam-gauge, water-gauge, and two safety-valves, *Wood* 3613-3617—Recommendation of the Committee that every steam-boiler shall be provided with a proper steam-gauge, water-gauge, and safety-valve, *Fourth Rep. p. 8.*

*Steam Engines.* There should not be a steam-engine in any pit without a downcast and upcast shaft, *Wynne* 3276.—See also *Spurbridge.*

**STEAM-JET :**

1. *Its proper mode of Application considered.*
2. *Its Advantages or otherwise, as compared with the Furnace.*

1. *Its proper mode of Application considered :*

Advantage, in trying the power of the steam-jet, of placing the boilers at the bottom rather than the top of the pit, *Elliott* 43, 44; *Darlington* 141-143. 146-154. 167; *Mather* 1490, 1491—The success of the jet depends upon the precision of its arrangements, *Darlington* 100—Necessity of the cylinders being of the same size, and also the jets, *ib.* 116. 124—Greater efficiency of the jets in the shaft than in the dumb-drift, *ib.* 132—Necessity of the same area of fire space in any comparison between the steam-jet and the furnace; gain in the ventilation by the jet under such a comparison, *ib.* 138-140.

Necessity of the application of the jet being properly understood, *Mather* 1473. 1497. 1499—Reference to the application of the jet to certain manufactories on the Tyne, as proving its action by propulsion against the law of expansion, *ib.* 1479, 1480—Propelling power of the jet illustrated by these applications, *ib.* 1536-1538—Necessity of not extending the jet beyond one foot sectional area, or thereabouts, *ib.* 1497—Large area adopted nevertheless in Mr. Wood's experiments, *ib.*

2. *Its Advantages or otherwise, as compared with the Furnace :*

There are certain exceptional situations in which the steam-jet may be used with advantage; definition of these, *Elliott* 17-23. 26. 59. 291; *Woodhouse* 1986-1988; *Dobson* 2893-2904. 2919-2922—In these exceptional cases it would only be useful as an auxiliary to the furnace, *Elliott* 24—Greatest quantity of air, in cubic feet, which may be passed through a shaft by means of the steam-jet, *ib.* 25. 27. 28. 34—Reason for Mr. Forster having obtained a larger result than witness with the steam-jet, *ib.* 39-42—Conclusion that the same amount of ventilation cannot be produced by the steam-jet as by the furnace, from the same means and with the same economy, *ib.* 55-58.

High opinion entertained by witness of the power of the steam-jet, *Darlington* 71-75—Particular circumstance under which the application of the jet is superior to that of the furnace, *ib.* 75-78. 82. 84—When both are worked with pure air, the jet is greatly superior, *ib.* 76-78—Greater advantage and economy of the jet in proportion as the pit is more shallow, *ib.* 82-84—Greater capabilities of the jet if the combustion of the coal under the boiler be made perfect, *ib.* 96-99. 164—Advantage of the steam-jet at the top of the pit in shallow mines, and in cases of impending accident, *ib.* 166, 167—Inapplicability of the steam-jet to the ventilation of every mine, *ib.* 177—Advantage of using it when the mine is charged with explosive gas, *ib.*—Preference given to the steam-jet and furnace over any other process, *ib.* 184, 185.

Doubts as to the same ventilation being procured from boiler fires at the bottom of the pit as from the furnace, on account of the necessarily different combustion of the coal, *Elliott* 282-290—Similar ventilation from the boiler fires as from the furnace, if possible, to procure combustion of the coals, *ib.* 287—Diminution of the heat imbibed from the boiler in its passage up the shaft, *ib.* 288-290—Doubts as to the advantages of the steam-jet, even in shallow mines, *Taylor* 1136-1138.

Decided preference of the steam-jet to the furnace, *Mather* 1472, 1473—Advantages of the steam-jet in deep as well as in shallow mines, *ib.* 1474—Advantages due to the controversy on the subject of the steam-jet and the furnace, *Mather* 1498; *Fourth Rep. p. 4*—Diagram, showing how Mr. Mather illustrates the greater power of the jet than of the furnace, *Second Rep. p. 90*—Several imperfect trials of the steam-jet have been



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**STEAM-JET**—continued.2. *Its Advantages or otherwise, as compared with the Furnace*—continued.

made in Scotland without success, *Landale* 2588-2596—Greater expense of the steam-jet than of the furnace, or Struvé's machine, *Dobson* 2915.

In concluding that the steam-jet is on the whole inferior to the furnace, the Committee consider that the former may, under some circumstances, especially in shallow mines, be used with advantage, *Fourth Rep.* p. 4.

See also *Alloa Mine (Scotland)*. *Drumpelner Mine*. *Experiments in Ventilation*. *Furnace*. *Pumps, &c.* *Sanchie Pit*.

*Steam-mill*. Witness produces and explains the operation of the steam-mill formerly employed in lighting dangerous mines, *Mather* 1675-1679—The rudeness of this instrument as compared with the safety-lamp shows the advance of science in recent years, *ib.* 1678.

*Stephenson's Lamp*. Principle of security possessed by this lamp, *Elliott* 832, 833—Superiority generally of Stephenson's lamp, *Woodhouse* 2166-2169.

*Stoppings*. Danger sometimes arising from stoppings, *Darlington* 200—Importance of the stoppings being strongly secured, *Darlington* 204, 217; *Taylor* 1166, 1167; *Dunn* 3440, 3441—Strong construction of the stoppings in the north of England; regulations about to be adopted on the subject, *Taylor* 1163-1165—Improvements being made to render stoppings as strong as possible, *Mather* 1522, 1525, 1526—Great importance of stoppings or regulators of solid coal in lieu of doors; their adoption generally considered, *Smyth* 1753-1760—Recommendation of the Committee in favour of very strong stoppings and crossings, *Fourth Rep.*, p. 5.

See also *Hilda, St., Colliery*.

*Stourbridge*. Particulars as to an accident near Stourbridge through the use of a steam-engine where there was only one shaft; resolution of the manager to continue working the mine on the same principle notwithstanding witness's remonstrances, *Wynne* 3268-3278.

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#### WINDING UP AND DOWN:

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the pits or shafts, *Fourth Rep. p. 8*—Also that every working pit or shaft shall be provided with some proper means of signalling from underground to the surface; and *vice versa, ib.*—Also that a proper indicator, to show the position of the load in the pit or shaft, shall be attached to every machine used for raising or lowering persons, *ib.*

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