

**Report to Her Majesty's principal Secretary of State for the Home Department on the conditions of labour in chemical works, the dangers to life and health of the workpeople employed therein, and the proposed remedies / by the Chemical Works Committee of Inquiry.**

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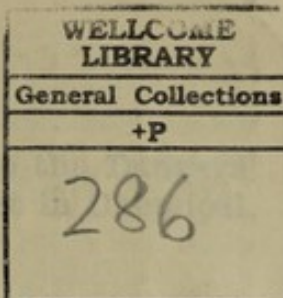
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CHEMICAL WORKS.



# REPORT

TO

HER MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE  
HOME DEPARTMENT

ON THE

CONDITIONS OF LABOUR IN CHEMICAL WORKS,  
THE DANGERS TO LIFE AND HEALTH OF THE  
WORKPEOPLE EMPLOYED THEREIN,  
AND THE PROPOSED REMEDIES,

BY THE

CHEMICAL WORKS COMMITTEE OF INQUIRY.

Presented to both Houses of Parliament by Command of Her Majesty.



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## Report of the Committee appointed to inquire into the Dangers to Life, Limb, and Health attending Employment in Chemical Works.

TO THE RIGHT HONOURABLE HERBERT HENRY ASQUITH, Q.C., M.P., HER MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE HOME DEPARTMENT.

SIR,

October 1893.

THE undersigned, forming the Committee appointed to make inquiry into the conditions of labour in chemical works, with a view to discover—

- (1.) "How far the manufactures, as at present carried on therein, injuriously affect  
"the health of the workpeople; and how far the injurious effects depend  
"upon the age and sex of the operatives;"
- (2.) "What means can be adopted to abate the injurious effects of the manu-  
"facture;"
- (3.) "What special regulations should be adopted to protect vats and other  
"dangerous places and utensils used in the manufacture;"

have the honour to report as follows :

The Committee held sittings at Liverpool (for St. Helens and Widnes), at Glasgow, at Newcastle, at Chester (for Flint and Northwich), and in London. They also personally visited a number of works at and in the neighbourhood of these places.

At a meeting held at Liverpool the Committee had the advantage of a conference with the chairman and three district managers of the United Alkali Co., with whom they carefully went into the subject of the proposed special rules, with the result that practically a unanimous agreement was arrived at as far as they concern that company. It will be seen that some additions and some alterations were made.

The Committee had a number of workmen before them, at a meeting at Liverpool, to give evidence, and also examined many others at the different works visited by them.

The Committee desire to record their thanks for the ready assistance granted to them in the course of their inquiries by employers, more especially by those connected with the United Alkali Co., Messrs. Brunner, Mond, and Co., the Oldbury Alkali Co., and the London Chamber of Commerce; also to the numerous operatives, from whom they obtained much valuable information.

In accordance with your instructions, the Committee have directed their inquiries both generally as regards all classes of chemical works, and also with special reference to alkali works and the manufacture of bichromate and chromium compounds.

### ALKALI WORKS.

The Committee visited a large number of works, and made most careful inquiry into the chief departments, viz. :—

#### (1.) *Bleaching Powder Department.*

This department is undoubtedly by far the most trying of all to those employed in chemical works, owing to the exposure to chlorine gas, under the system which generally prevails at present. In the "Weldon" chambers, which are most commonly used, a thick layer of lime, 4 to 6 inches, is spread on the floor. The chambers are then closed, and strong chlorine gas is turned on, which is absorbed by the lime. At the end of about four days the gas is turned off, the free gas in the chamber is either drawn off by an exhaust or absorbed by a lime distributor, and the doors are opened. The men, about two hours afterwards, enter to pack the powder. As soon as the powder is disturbed by the shovel it gives off chlorine gas, and no man could work in the chamber without some form of respirator. The packers, in order to be able to work in the chambers, wear a respirator, commonly called a "muzzle." This consists of about 30 folds of flannel, damped and tied tightly over the mouth, with the nostrils free and resting on it. The men are obliged to inhale through the muzzle and exhale



by means of the nostrils, otherwise they would be "gassed." The exertion of breathing through the thick folds of flannel shows itself by the red and puffed state of the men's faces, and profuse perspiration on coming out of the chambers, which they are obliged to do at intervals during their work. Some, but by no means all, wear "goggles" to save the eyes from the lime dust. None but strong healthy men could stand the work. Those liable to bronchitis would quickly feel the effects of the gas, which has a tendency to produce bronchial inflammation. In another process of making bleaching powder, the "Deacon" chambers are used. In these chambers the lime is put in thin layers on a series of trays, one above the other; the chambers are closed, and dilute chlorine gas, containing only about 5 per cent. of chlorine, is turned on. When the chambers are opened the packers work from the outside, and the bleaching powder falls through a hopper into barrels below. Though exposed to some gas, the packers at the Deacon chambers can use a very much smaller "muzzle," which is therefore not nearly so trying. In addition to these, mechanical means have been tried for the manufacture of bleaching powder which would obviate all exposure to the gas. The Hasenclever process, by mechanical means, of which a specification is appended, is said to be now successfully used in Germany. Messrs. Brunner, Mond, are erecting a somewhat similar plant of their own for the manufacture of bleaching powder which will shortly be completed, whilst a description is also appended of a patent automatic continuous producing chamber, invented by Messrs. J. M. and A. Milnes. The Committee cannot but express a strong hope that the old process may shortly be abolished for some mechanical process. Meanwhile they have suggested certain special rules to obviate in some degree the escape of gas for the benefit of those working in and around the chambers.

The Committee are bound to add that the packers themselves do not as a rule complain, although some of them have been employed in this occupation for many years, being tempted no doubt by the short hours and high rate of pay. But complaints have reached the Committee from those whose work takes them near the chambers; many of these complain of the effects of the chlorine gas on their health.

#### (2.) *Salt Cake (Sulphate of Soda) Department.*

In this department those employed are more or less exposed to the escape of hydrochloric acid gas. Many of the men have had their teeth entirely destroyed by its effects, but this seems attributable to the use of a rag or "bite" between the teeth. The hours of work in this department are long, consisting of two turns of 11 and 13 hours each. The Committee, from their inquiries, are convinced that with increased care a great deal of the escape of gas here might be prevented.

#### (3.) *Vitriol Department.*

The hours in this department are very long, amounting to an attendance of 84 per week, though the actual work is not continuous. If the plant is bad, either chambers, towers, or pipes, those employed may be exposed to sulphurous gas and nitrous fumes, but with care and due observance of rules laid down under the Alkali Act these should be prevented.

#### (4.) *Caustic Soda Department.*

In this department those employed are not subject to fumes or gas, but danger arises from splashing of the liquor and from the construction of the caustic pots themselves. The Committee have proposed special rules as to the construction of the pots, and the supplying of syringes for treating injuries to the eyes.

#### (5.) *Chlorate Department.*

The danger here is from explosion or from clothing becoming impregnated with chlorate dust and catching fire. The Committee recommend the use of overalls in the grinding rooms, the use of some such lubricant as tallow instead of oil, ventilating cowls in the roof, electric lighting where practicable, and baths kept ready for use.

#### (6.) *Black Ash Department.*

The danger here is from the unfenced gangways across the vats. The Committee recommend that either the vats be covered or the gangways fenced.



## HOURS OF LABOUR.

In the course of their inquiries the Committee have been impressed by the long hours of work which prevail in some departments of alkali works.

In the vitriol department these amount, for burner men, to an actual average attendance at the works of 84 hours per week, whilst in the salt cake departments the men are accustomed to work two shifts of 13 and 11 hours respectively. The Committee would strongly advise the adoption of eight-hour shifts, which have already been successfully tried in some departments at some of the works of the United Alkali Co., whilst at the works of Messrs. Brunner, Mond, and Co. eight-hour shifts prevail throughout. The Committee are indebted to Messrs. Brunner, Mond, and Co. for some very interesting facts as to the improvement of the men's health since the eight-hour shifts were adopted. These figures, connected with their sick club, show that during a summer quarter in 1889, before the introduction of three shifts, the per-centage of those who received sick pay was 7.1, whilst during the same quarter of 1893, after the introduction, the per-centage was only 5.1, or a reduction of 28.32. In 1889 the men attended by the doctor equalled 10.12 per cent., but in 1893 only 5.1 per cent., or a reduction of 49.6. Messrs. Brunner, Mond, and Co. wished to draw particular attention to the great reduction in those who received doctor's attendance, which means stopping away from work one or two days without actually being laid up for a week, as in their club only men absent for a week receive sick pay.

Messrs. Brunner, Mond, and Co., add that the cost of wages paid per ton of alkali produced by them is now no more than it was four years ago, in spite of the fact that the men employed on shift work are paid the same wages for eight hours as they were formerly paid for twelve. This improvement they attribute partly to improvements in the apparatus used, effected at considerable cost, and partly to the increased efficiency of the men due to their better health and spirits.

## BICHROMATE OF POTASH OR SODA.

This manufacture is practically in the hands of three firms at Glasgow, Rutherglen, and Falkirk, all of which works were visited by the Committee.

The Committee found that almost all the men working where dust was prevalent, more especially between the furnaces and the dissolving tanks, had either perforation of the septum of the nose, or had lost the septum altogether.

Many of those employed suffer also from what are technically called "Chrome holes" on hands and arms. These are caused by dust or liquor acting on broken skin, or by the handling of crystals.

The process is as follows :

Chrome ore is ground by machinery. A great deal of dust prevails in the grinding rooms, and the use of some form of respirator is advisable, though this dust is only harmful mechanically.

The ground ore is put into hot furnaces with carbonate of potash, or soda, and lime, and comes out in form of cake. This cake is often placed on the floor and allowed to cool before being put into the tanks. When cool, a great deal of deleterious dust arises from throwing it into the tanks. This harmful dust might to a great extent, in the opinion of the Committee, be obviated by throwing the cake into the tanks at once, instead of leaving it to cool and form dust.

The cake when placed in the tanks is treated with water and the chromate of soda or potash dissolved out. The solution of yellow chromate is then treated with sulphuric acid, and bichromate is thus formed. This solution is evaporated, and the crystals are obtained.

The Committee strongly recommend the use of respirators where any dust arises, and the use of gloves where crystals have to be handled. Sufficient suitable lavatory accommodation and appliances should also be provided.

The Committee are of opinion that the due observance of cleanliness on the part of the operatives would largely conduce to the prevention of the evils referred to.

## CHEMICAL WORKS IN GENERAL.

As regards the question as to how far the injurious effects depend upon the age and sex of the operatives, the Committee find that no females are employed in alkali works, and but few boys under 18 years, except in cooperages, plumbers' shops, box-making, &c. Moreover, their inquiries do not lead them to suppose that exceptional mortality, apart from accidents, exists in them.



On this head, the Committee append certain statistics supplied to them in connexion with the Tyne and Scotch districts, and the Globe Alkali Works at St. Helens. Statistics are also appended with regard to number of men employed, hours of labour, and wages.

The evidence obtained from workmen in the various departments of alkali works is given in the Appendix.

In conclusion, the Committee believe that great good will ensue from the adoption of the proposed rules; and they strongly recommend that these be issued as soon as possible, looking at the unfortunate omission in the Factory Act of 1891, whereby all obligation to fence dangerous pots, pans, &c. was rescinded.

We have the honour to be,

Sir,

Your most obedient Servants,

WM. DAWKINS CRAMP,

H.M. Superintending Inspector of Factories,  
Chairman.

ALFRED E. FLETCHER,

H.M. Chief Inspector under the Alkali, &c.  
Works Regulation Act.

P. A. SIMPSON, M.A. Cantab., M.D.,

Regius Professor of Medical Jurisprudence,  
University of Glasgow.

D. J. O'NEIL, M.B., C.M.,

Certifying Surgeon, Widnes District.

H. S. RICHMOND,

H.M. Inspector of Factories,  
Secretary.

## MEDICAL REPORT.

### BLEACHING POWDER WORKS.

The men employed in the manufacture of bleaching powder are exposed to the following evils; viz:—

The inhalation of—

(1.) Chlorine gas.

(2.) Chloride of lime in the form of dust (bleaching powder).

The effects may be the following—

(1.) Irritation of the lining membrane of the windpipe and bronchial tubes, leading to bronchitis or asthma (or both combined), accompanied by severe cough and profuse expectoration.

(2.) The prolonged irritation may give rise to disease of the lung substance, running on in some cases to a form of consumption.

(3.) Inflammation of the superficial membrane of the eyes (conjunctivitis).

With a view of lessening the foregoing ill effects we would suggest—

(1.) Free and thorough ventilation in and about the bleach chambers.

(2.) Oiling or greasing of the exposed parts of the body before commencing work, the wearing of "goggles," and the introduction at intervals of a few drops of castor oil into the eyes, for their protection.

(3.) Having made various experiments with different chemicals in the hope of increasing the efficiency of the so-called "muzzles," or respirators now in use, we would suggest the following method:—

Let the respirators be moistened from time to time with a solution of sulphite of soda. The chlorine gas coming in contact with the sulphite of soda, the latter is converted into sulphate of soda, while the chlorine now appears as hydrochloric acid. The latter, being readily absorbed by water, is held in the moist respirator, whereas chlorine gas, which is only sparingly soluble in water, passes to a considerable extent through the respirators as at present used.

Were this suggestion carried out, the respirator or "muzzle" might be made much thinner than at present. In this way the heat would be lessened, and the men would be able to breathe with greater freedom and safety.



## WORKERS IN CHROME COMPOUNDS.

The evil effects upon these workers are due to chromic acid combined either with potash, soda, or lime. The lining membrane of the nostrils almost invariably suffers. Irritation of the membrane is followed by ulceration, leading ultimately to perforation or complete destruction of the nasal septum.

These results cause in many cases partial or complete loss of the sense of smell. Similar irritation and ulceration take place in the throat, windpipe, and bronchial tubes.

The foregoing conditions are due to the inhalation of the corrosive dust which is freely given off in various stages of the manufacture of chrome compounds.

Another effect is the production of ulcers, termed "chrome holes," in various exposed parts of the body, due to the deposit of chrome dust. These ulcers are remarkable for their depth, and for their slowness in healing.

After experimenting with various chemicals, with the view of lessening the evils caused by the inhalation of chrome dust, we would suggest the adoption of the following method. Let the sponge or other absorbent material of the respirator be moistened with a solution of bismuth (such as the liquor bismuthi of the British Pharmacopœia). The chrome dust coming in contact with this is decomposed, an insoluble compound of bismuth and chromic acid being formed.

The same result might be obtained, so far as the nose is concerned, by plugging the nostrils with cotton wool, previously soaked in the bismuth solution.

It may here be mentioned that solutions of bismuth, so far from being irritating, have a decidedly soothing effect.

The cleansing of the exposed parts of the body by frequent ablution, and the protection of the hands by waterproof gloves in those who manipulate the chrome products, afford, in our opinion, the best means of preventing the evil effects which we have described. Lavatories should be freely accessible to the operatives in all such works.

## SULPHURETTED HYDROGEN GAS.

As workers are occasionally suddenly overpowered by breathing this gas, a speedy rescue is imperative. For this purpose a fellow workman, attempting the rescue, should use a respirator charged with moist oxide of iron. In order to restore consciousness, a supply of oxygen gas in a compressed form should be at hand.

P. A. SIMPSON, M.B., Cantab., M.B.

Regius Professor of Medical Jurisprudence,  
University of Glasgow.

D. J. O'NEIL, M.B., C.M.,

Certifying Surgeon, Widnes District.

## SPECIAL RULES.

I. In future every uncovered pot, pan, or other structure, containing liquid of a dangerous character, shall be so constructed as to be at least 3 feet in height above the ground or platform. Those already in existence which are less than 3 feet in height, or in cases where it is proved to the satisfaction of an inspector that a height of 3 feet is impracticable, shall be securely fenced.

II. There shall be a clear space round such pots, pans, or other structures, or where any junction exists a barrier shall be so placed as to prevent passage.

III. Caustic pots shall be of such construction that there shall be no footing on the top or sides of the brickwork, and dome-shaped lids shall be used where possible.

IV. No unfenced planks or gangways shall be placed across pots, pans, or other structures containing liquid of a dangerous character. This rule shall not apply to black ash vats where the vats themselves are otherwise securely fenced.

V. Suitable respirators shall be provided for the use of the workers in places where poisonous gases or injurious dust may be inhaled.

VI. The lighting of all dangerous places shall be made thoroughly efficient.

VII. Every place where caustic soda or caustic potash is manufactured shall be supplied with syringes or wash bottles, which shall be enclosed in covered boxes fixed in convenient places, in the proportion of one to every four caustic pots. They shall



be of suitable form and size, and be kept full of clean water. Similar appliances shall be provided wherever, in the opinion of an inspector, they may be desirable.

VIII. Overalls, kept in a cleanly state, shall be provided for all workers in any room where chlorate of potash or other chlorate is ground. In every such room a bath shall be kept ready for immediate use.

In every chlorate mill, tallow or other solid lubricant shall be used instead of oil.

IX. Respirators charged with moist oxide of iron or other suitable substance, shall be kept in accessible places, ready for use in cases of emergency arising from sulphuretted hydrogen or other poisonous gases.

X. In salt cake departments suitable measures shall be adopted by maintaining a proper draught, and by other means, to obviate the escape of low-level gases.

XI. Bleaching powder chambers, after the free gas has, as far as may be practicable, been drawn off or absorbed by fresh lime, shall, before being opened, be tested by the standard recognised under the Alkali Act. Such tests shall be duly entered in a register kept for the purpose, which shall be produced to an inspector whenever called for.

All chambers shall be ventilated, as far as possible, when packing is being carried on, by means of open doors on opposite sides and openings in the roof so as to allow of a free current of air.

XII. In cases where the co-operation of the workers is required for carrying out the foregoing rules, and where such co-operation is not given, the workers shall be held liable in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows :—"If any person who is bound to observe any special rules established for any factory or workshop under this Act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds."

## SPECIAL RULES.

### BICHROMATE WORKS.

I. In future every uncovered pot, pan, or other structure containing liquid of a dangerous character, shall be so constructed as to be at least 3 feet in height above the ground or platform. Those already in existence, which are less than 3 feet in height, or in cases where it is proved to the satisfaction of an inspector that a height of 3 feet is impracticable, shall be securely fenced.

II. There shall be a clear space round such pots, pans, or other structures, or where any junction exists a barrier shall be so placed as to prevent passage.

III. No unfenced planks or gangways shall be placed across pots, pans, or other structures containing liquid of a dangerous character.

IV. Respirators suitable for protection of nostrils and mouth shall be provided where injurious dust or noxious fumes may be inhaled.

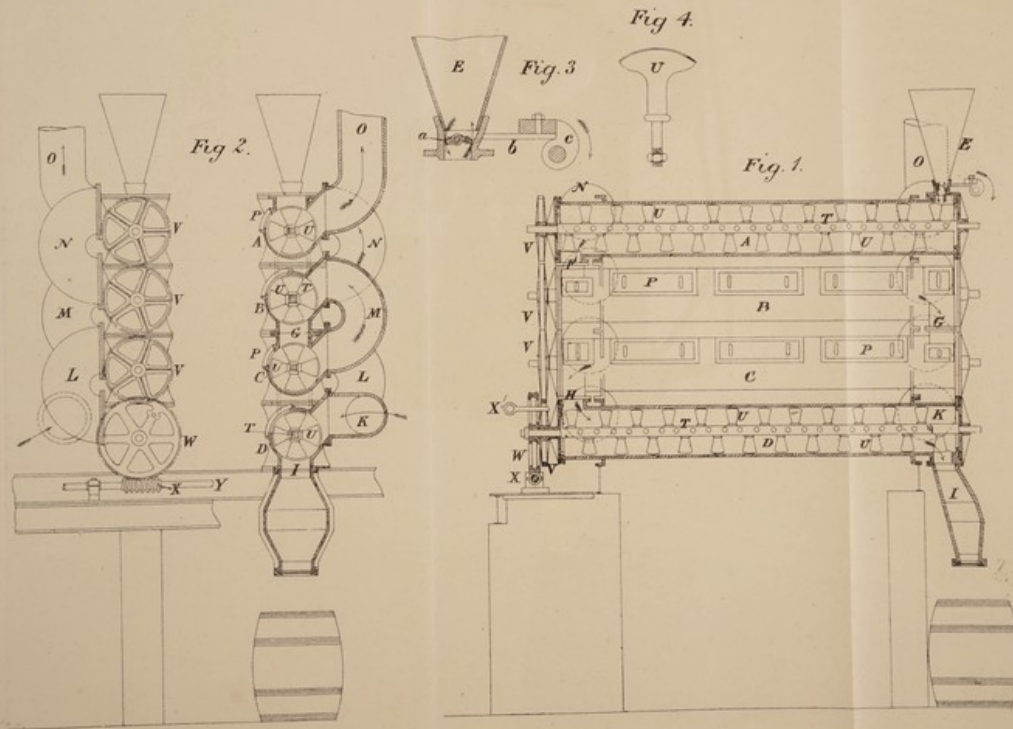
V. The lighting of all dangerous places shall be made thoroughly efficient.

VI. Inasmuch as dust is the principal cause of the various evil results to workers in chromium compounds, all due means shall be taken to limit in every way the formation of dust.

VII. Gloves of some waterproof material shall be provided for the use of workers who handle the crystals.

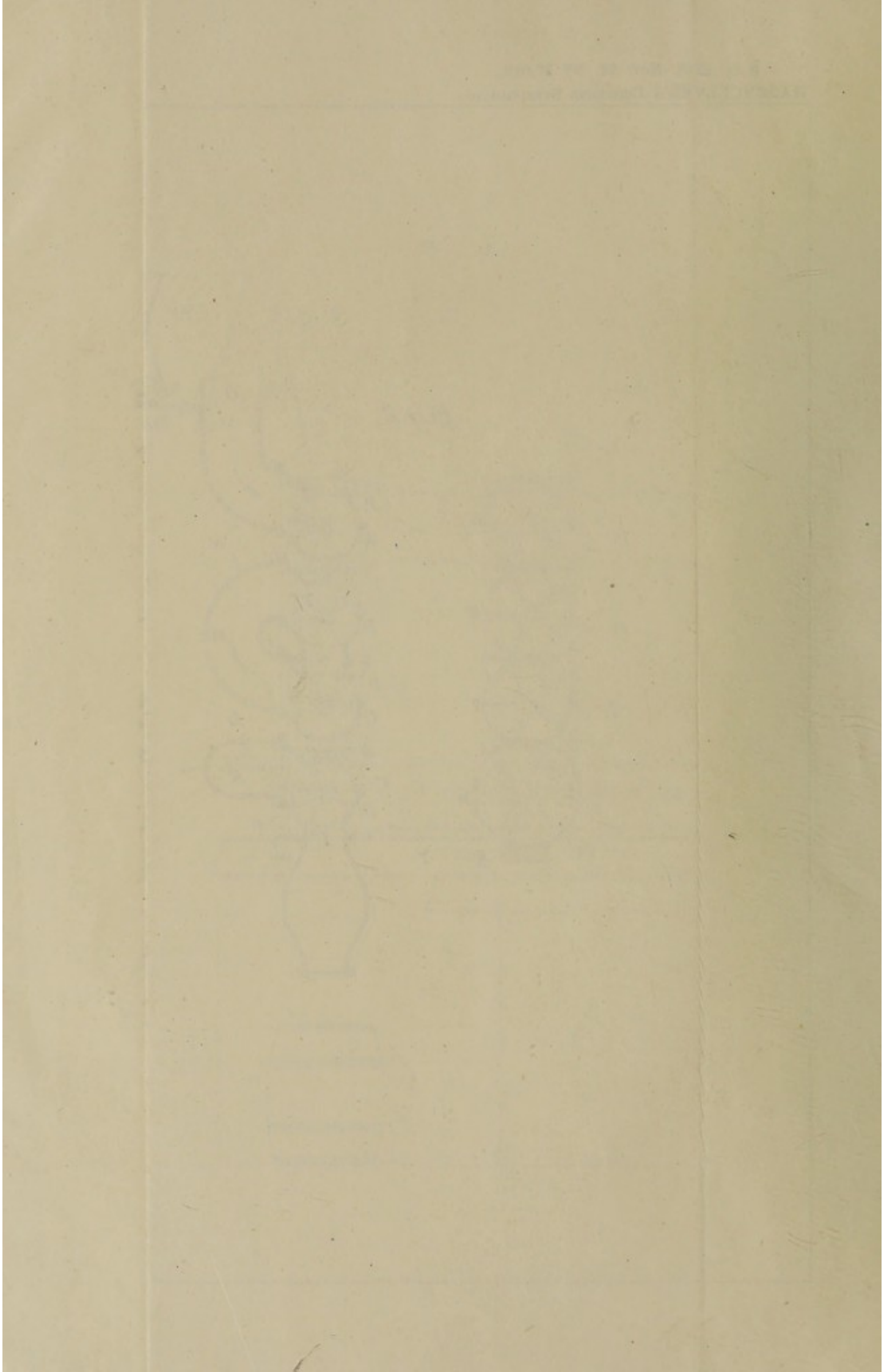
VIII. Sufficient lavatory accommodation, with hot and cold water, soap, nail brushes, and towels, shall be provided.

IX. In cases where the co-operation of the workers is required for carrying out the foregoing rules, and where such co-operation is not given, the workers shall be held liable in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows :—"If any person, who is bound to observe any special rules established for any factory or workshop under this Act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds."



[This drawing is a reproduction of the Original on a reduced scale.]





## APPENDIX.

### THE CHEMICAL COMMITTEE

SITTING FOR THE

### EXAMINATION OF WITNESSES

HELD AT THE

NORTH-WESTERN HOTEL, LIVERPOOL.

Friday, July 28th, 1893.

PRESENT:

W. DAWKINS CRAMP, Esq., in the Chair.

Professor SIMPSON.

A. E. FLETCHER, Esq., Alkali Inspector.

Dr. O'NEIL, of Widnes.

H. S. RICHMOND, Esq., H.M. Inspector of Factories (*Secretary*).

JOHN BEETLE examined by Mr. RICHMOND.

1. Where do you work?—At the Globe Alkali Works, St. Helens.

2. What department do you work in?—In the bleaching powder.

3. How long have you worked there?—In the yard or in the bleach?

4. In the chemical works altogether?—I have worked about 12 years in the Globe Alkali.

5. All that time in the bleaching powder?—No, sir; about five years in the bleaching powder and about two years in the lime-house.

6. (*Mr. Fletcher.*) You have spoken of bleaching powder and lime dressing; which of those occupations do you find most distressing and troublesome and difficult for you?—Well, I used to discharge waggons at first when I went to the Globe.

7. That is not what I mean; which do you like least, working in the bleach chamber or in the lime shed?—I like the bleach the best.

8. And which the worst?—Well just the bare spade job. I had to work for 4s. a day emptying waggons.

9. What I want to come at is this, is lime dressing very distressing?—No, sir.

10. Does not it hurt your face at all—the lime dust?—If you let the lime dust stop on your face when you are sweating it will burn, but if you are not sweating very much, it will not affect you. If the sweat lies on your face it will burn you.

11. What do you do to prevent it hurting your face?—The lime? Sometimes I rub a little bit of tallow on it.

12. Did you ever find putting a cloth or respirator over the mouth to be of use?—Oh, yes, sir; they put a muzzle over the mouth to keep the dust out.

13. The same muzzle that you wear in the bleaching powder?—They do not need as much as us, only to keep the dust out.

14. You wear bigger muzzles in the bleach?—Yes, sir.

15. It is simply to keep the dust out in the lime house.

16. (*Dr. O'Neil.*) If this tallow which you put on afterwards were put on before would it prevent it?—Yes, you put a little on before you go into the chamber, because when you sweat and the dust gets on you it will stick there, and either lime or bleach will burn if it sticks on your skin.

17. (*Mr. Fletcher.*) Then you think if you have grease on your skin and a cloth over your mouth, you are sufficiently protected?—There is no great hardship.

18. You cannot propose anything which could be better?—No, flannel is the best; I have never tried anything else myself.

19. You would not care about a respirator made of metal or india-rubber?—No, sir; I think the flannel is very good for us. I am better since I went to the bleach, increasing in health myself. I am fatter now than ever I was since I went to the bleaching powder. It does not do me any harm. Certainly you must get a little bit of gas sometimes. Your flannel may be a little dry sometimes or a little wet, and you have a little gas to contend with, but you can keep it out, not to do you any bodily harm. I am a lot healthier than I was before I went to it.

20. (*Mr. Richmond.*) Of course in the bleach-house you wear a muzzle to keep out the fumes?—Yes, sir.

21. And in the lime to keep out the dust?—The lime dust, yes.

22. You have worked at bleach and at lime and at the ordinary labour work of the yard, and you would rather work at the bleach, considering the pay and all its conditions, than any other branch.

23. In spite of the chlorine gas?—Oh, yes, sir.

24. You do not count that much?—Oh, no. What little we get does not do us any harm. Your flannel gets a little dry sometimes, or a little wet, and you cannot get your breath through it, and you have to come out and change it.

25. Do you wash that flannel often?—Yes, sir; once a day.

26. Is the same flannel used against the fumes and against the lime?—Yes, you can use the same flannel. Some people use a bit of spun yarn in the mouth, but that causes them to have bad teeth.

27. You are speaking now of the lime, not the bleach?—Oh, you could not do it with the bleach; you have to draw your breath through your flannel, and blow it out through your nose; that is how we get our breath.

28. (*Mr. Richmond.*) You have your bleach muzzle here I believe, and can show it?—Yes, sir; shall I put it on.

*J. Beetle.*

28 July 1893.



*J. Beetle.*  
28 July 1893.

29. Yes, you had better show us how it does go on?—This (*illustrating*) is the way we use them.

30. So that you draw your breath through the flannel, and exhale through your nostrils?—Yes, you never cover your nose.

31. What sort of muzzle do you put on for the lime dressing?—Some people do not use one, they get a bit of spun yarn in the mouth, but I would have a muzzle about half as big as this, just to keep the dust out.

32. But you might in the lime-house have a very much less unwieldy respirator than that; a piece of sponge tied with a string over your mouth would be better than that?—Some people, as I said, have a piece of spun yarn.

33. I said a piece of damp sponge the size of your hand, to put over your nostrils like that?—But you must not have anything over your nostrils.

34. (*Mr. Fletcher.*) How many folds of flannel have you there?—Somewhere about 30 odd.

35. And you wash it every day?—Yes, sir; wash it in soap and water.

36. (*Mr. Richmond.*) And you buy that yourself?—Yes, sir.

37. And you take it home and wash it?—Yes, sir. They find us the bags or covers, and strings.

38. They are found you by the company?—Yes, sir; the strings and bags. We find the flannel ourselves. Sometimes these may be a little too spongy, or a little too dry. If so all you have to do is to come out, take it off, and damp it a little, and then you are all right. In working bleach there must be a little gas. You cannot help getting a little sometimes, but not to do you any bodily harm.

39. Not sufficient to affect you, you think?—No, I have had better health since I went to it than I had before. I can eat well, and everything.

40. (*Chairman.*) How many hours a day do you work in the bleach?—It varies. Sometimes we have only one chamber a day to do, and sometimes two. Just when the foreman can get the bleach ready we have to pack. Some days we have nothing to do. Such days as we have two, that is 33 tons to each of us, and that runs us 22s. apiece. It is a two chamber day to-day.

41. How long does that take you?—To-day it would be about five hours wearing the muzzle. We would be there longer, but all our work is when we have to put the muzzle on and go into the chamber. We have nothing to do besides, and we can sit down as we want.

42. (*Dr. O'Neil.*) How long can you wear that muzzle at a time?—About an hour. We do half a chamber, have a rest, and then go back and finish the other half. We have 2½ hours only with one chamber, and 5 hours with two, but as I said, some days we get none.

43. Do you mean that you would wear that muzzle as long as 2½ hours at a stretch?—In winter I could do it; but in summer it takes an hour and, say, ten minutes to get half a chamber out, and then we go out and have a sit down, and then go and get the other half out. It takes 2½ hours for one chamber and 5 hours when we have two. We do not work more than about 5 hours a day, and that is a big day.

44. (*Chairman.*) Have you ever suffered from being gassed?—No, sir.

45. Not at all?—I have had a little gas, but not to do me any harm. You must get a little sometimes if you work amongst it.

46. What is the effect, as far as you have experienced it?—It makes you cough a little, but soon goes away.

47. It has never rendered you insensible?—Oh no, sir; nothing to prevent me going through my work with it.

48. (*Mr. Richmond.*) Is not the tendency to cause inflammation of the lungs?—I do not know. I never had inflammation of the lungs.

49. (*Dr. O'Neil.*) Bronchial irritation?—I have never had it; I have only been ill two or three days.

50. (*Professor Simpson.*) Do the men ever suffer from cough?—Oh, no. If you get a little gas you would cough, certainly; but it would soon leave you.

51. (*Dr. O'Neil.*) Is bronchitis, for instance, prevalent amongst the men?—No, there is none amongst us. I

find it a very fair job, myself, speaking from my own experience, that is all.

52. (*Chairman.*) Can you suggest any means of getting rid of the gas, without affecting the work; any means of ventilation?—You know you cannot help a little gas rising out of the stuff when you are working amongst it. There is scarcely any gas when we go in, but when we stir the stuff up there must be some come out of it, and you may possibly get a little of that.

53. I do not know much about it myself, but supposing there was a hood over that place where you are packing, supposing there was a ventilator in the roof?—Yes, we have ventilators in the roof, in the middle, sir.

54. What sort?—Take the lid off, and there is a great round hole left.

55. No fan working there; nothing mechanical?—No, sir; we do not need any fan. Very fair chambers, ours are. We pack more than any other yard in St. Helens.

56. (*Mr. Richmond.*) Are the ventilators open only when you are packing?—Yes, they are open before we go in, sir.

57. Because the chamber has to be closed?—When they are making it; oh, yes.

58. Then there is some means of absorbing the gas that remains, is there not; they do have some means of absorbing the gas before you go in, do they not?—The stuff takes the gas up, sir.

(*Mr. Fletcher.*) That is not the gas that affects the worker; the chlorine is the lighter; the stuff is saturated with chlorine, and when they move the bleach powder it begins to come out.

59. (*Mr. Richmond.*) But do they not use a lime distributor for absorbing the gas. There would be more gas in the chamber if it was not absorbed before you went in?—They allow into the chamber so much gas, to make the stuff so strong, and then the stuff takes the gas up before you go in.

60. Is not the process this: lime is put on the floor first of all, and then the gas is turned in?—Yes, sir, it is turned in on the top.

61. And when the lime has absorbed all it can, there is a certain amount of free gas left above, in the chamber, is not there?—I do not understand that.

(*Mr. Fletcher.*) They do not use the lime distributor at the Globe?

(*Witness.*) No, sir, our chambers are clear when we go in.

62. (*Mr. Richmond.*) What means are taken to get rid of the superfluous gas. As far as I have seen these chambers, if you open a chamber and go in, there will be much more gas in there than there would be where they use these lime distributors?

(*Mr. Fletcher.*) It is the gas that comes out of the bleaching powder, after all is finished.

(*Mr. Richmond.*) But there must be a good deal of free gas in there.

(*Mr. Fletcher.*) That is all blown away before he goes in. It is open two or three hours.

(*Mr. Richmond.*) That is exactly what I want to get a knowledge of.

63. As to the gas that remains after the absorption by the lime, the remaining free gas, how do they, at the Globe, get rid of it before the men go into the chambers?—The stuff is supposed to take the gas up, and they draw the spare gas from one chamber on to the other one.

64. They draw the gas off from one chamber to another before you go in?—They are supposed to do so. There is nothing in when we go in, except what we stir up.

65. (*Professor Simpson.*) Are the doors thrown open after the gas meets the lime?—The doors are closed up, sir.

66. How long?—It takes a week to make a chamber.

67. Before you go in how long are the doors left open?—We can please ourselves. We can go in any time we like, we are not tied to time. We go in at 9 o'clock in the morning, or any time we choose, if we do our work through the day. If there was any gas in the chamber we would not go in.



68. (*Chairman.*) How would you know if there was any gas there?—We could see the gas, I suppose, and could smell it.

69. (*Mr. Fletcher.*) The chambers are open several hours before you go in?—It is a while before we go in.

70. (*Professor Simpson.*) How long?—An hour or two sometimes. It depends on the weather. In cold weather it is not as bad as in hot weather.

71. The doors are opened to get rid of the gas some hours before you go in in summer?—It is to cool the chambers, sir. I do not know about the gas. The stuff is supposed to take the gas up before they open the chambers.

72. Do you not think you would feel more gas if you went in two hours before, just as they opened the doors?—The chamber would be much hotter. You see, after the hot gas being on it for a week, they have to be opened to cool the chambers before you can go in. It would be much hotter if you went in as soon as they are opened, certainly. The chambers are very hot after they have been working on them a week, in summer time, especially. They are much cooler when they have been opened an hour two.

73. (*Mr. Fletcher.*) You protect your clothes when you go in by putting a paper round?—We wrap paper round to keep the bleach off our clothes.

74. Have they never used any over-all clothes instead of paper? Do you think paper is the best thing?—The paper is just to keep the bleach out of our clogs. If it got into your clogs it would burn you.

75. You keep your clogs free with paper?—You wrap the paper round your legs close with string so that the bleach cannot get into your clogs. That is all that the paper is for.

76. Is that better than any kind of leather or india-rubber?—I should think it is as good as anything, because you can get it very close, so that no dust can get into your clogs.

77. (*Chairman.*) Do you wear anything for your eyes?—Yes sir, just to keep the dust out.

78. What do you wear?—A pair of glasses. I have a pair here if you would like to see them.

79. I should, please?—They are not very clean. They are just as I wear them, just to keep the dust out of my eyes. (*Produced.*)

80. (*Mr. Fletcher.*) Do the men generally wear these?—No, but some people sweat a lot, and the sweat gets into their eyes, and that keeps the sweat and the dirt out of your eyes. That is what I wear them for—they prevent anything getting into your eyes. They want cleaning now.

81. (*Mr. Richmond.*) Are they made for the purpose in St. Helens?—Oh! yes, sir, you can get them made by leather cutters. There are none for sale in the town, that I know of, but if you order them, and tell the man how you want them made, he will make you a pair. They save the eyes.

82. You say all the packers do not wear them?—All our packers wear them, all where I work. They used not to wear them at one time, but we all wear them now at our works.

83. (*Dr. O'Neil.*) What name do you apply to them?—We call them goggles.

84. (*Mr. Richmond.*) You think that, as long as you wear a muzzle, and these goggles or glasses, you get no ill effects from your work at all?—No, not at all. You must get a little gas sometimes, same as I say, when your flannel gets a little wrong, and you have to come out and repair it. You cannot help getting a little the way it is made. When you stir the stuff up, there is a little comes out of it.

85. And the effect of that little that you do get is to make you cough, is it?—Yes sir, it will make you cough if you get a little.

86. Does it affect you afterwards, for some time, in the throat?—No, it goes away, and leaves you.

87. (*Mr. Fletcher.*) You yourself have been working there five years, but some of the men have been working at packing a number of years; do you know how long?—The yard has only been there 13 or 14 years. The man who works with me has been packing, I suppose, over 20 years.

88. And his health is good?—Yes, he is never ailing; he has very good health.

89. Is packing always done in the daytime, or at night?—We never work at night, sir; we always do ours in the daytime. We go in about 8.30 or 9 o'clock. If we have only one chamber we finish by dinner-time.

90. Then you have easy times of it, plenty of time for everything?—Yes, sir; if we choose we are not pressed for time at all. We just go in and do our day's work; we know what we have to do, and our manager does not press us to come in early. We generally go in after we have had our breakfast.

91. (*Professor Simpson.*) Are many of the men engaged in your work abstainers, or not?—We have one in the lime-house that does not take any drink at all.

92. (*Dr. O'Neil.*) But the majority do?—It is their pleasure.

93. Are they temperate as a rule?—Some people drink, but it is not for the sake of their work. If I took drink at my work, I could not do it.

94. Does your work require it?—No, sir. I can do my work twice as well without it. If I get drink over night I cannot do my work half as well afterwards. You get in company sometimes, and get drink, but you do not need anything to do your work. I always find I am better without myself.

95. (*Chairman.*) Have you known any man get gassed seriously at your work, since you became a packer?—No, sir, not seriously gassed. I have seen men get a little, but not enough to stop them from their work.

96. (*Dr. O'Neil.*) Have you appliances on the works themselves to restore any man who might be gassed?—No, sir, we had my father-in-law hurt a few weeks since, and we had to send to the "public" for a glass of brandy for him.

97. (*Professor Simpson.*) What was the worst effect you ever saw of gassing?—I never saw any serious effect.

98. What was the worst effect?—Only just a man coughing.

99. A single cough or more?—Oh a little more. It would make him cough regular for a while.

100. Five minutes?—Oh yes, sir, above five minutes. They cough longer than five minutes.

101. That is the worst you ever saw?—I never saw any one seriously gassed.

102. What was the case of your father-in-law?—He is old, and he got a wheel over his foot, and we sent for the brandy.

103. (*Professor Simpson.*) The man who was coughing four or five minutes, had he a muzzle on?—No, he had taken it off. If he got a little gas, he would take it off.

104. (*Mr. Richmond.*) Have you ever worked at the Deacon Chambers?—No, sir, I have never packed any, only in the Globe Chambers, but I have a friend working with me that has.

105. You have never seen the new Deacon Chambers put up at some works?—No, sir, I never have.

106. The Deacon Chambers you do not have to enter at all?—No, sir. I have a friend who works at them.

107. Are there any of the Deacon Chambers at St. Helen's?—No, I do not suppose so.

108. They are only at Widnes?—I do not know where they are myself. I have never seen them.

109. As you have no knowledge of them, it is no use asking which you think the best?—No.

110. (*Professor Simpson.*) The gas can never produce coughing so long as the muzzle is worn?—Yes, you might slightly get gas with the muzzle on, if, as I say, it sometimes gets a little too dry or wet, and you must go and pull it off and regulate it.

111. (*Mr. Richmond.*) If you inhale through your nostrils you get gas quickly?—Yes, if you find you are getting gas you must go out and regulate your muzzle. It might be a little too dry or too wet, and sometimes you might not be able to breathe through it properly, but all you have to do is to go and regulate it.

*J. Beattie.*

28 July 1893.



*J. Betney.*

28 July 1893.

I work in the salt cake department at Gaskell Deacon's works of the United Alkali Company. I have worked about 51 years in alkali works, and about 36 years in the salt cake department. I am 64 years of age. My health has been very good. I never found anything detrimental to health in my work. The gas at the salt cake furnaces only injures the teeth, and there is not so much injury in that way now owing to the introduction of the boxes attached to the salt cake furnaces for the charge to be drawn into. I think the injury to the teeth was in great measure due to the rag held between the teeth and tied round the face.

I think the hours of work are too long and eight-hour shifts would be preferable, but the men are against them.

*R. Hankinson.*

JOHN BETNEY, examined, stated:—

The work at salt cake pots and furnaces is not extra hard. The men have this summer been supplied with meal and water, but not previously for some time. Men earn about 7s. 6d. per day for 12 days per fortnight. Five tons of salt cake per day of 12 hours to be delivered, each man receiving 1s. 6d. per ton. The burner men at our works are on eight-hour shifts.

I was about eight years working at the pots and furnaces. The chief accidents that occur in the salt cake department arise from back draught from the furnaces, through re-lighting after they have been out. I think they generally occur through the men not pulling out the dampers, and that their own carelessness is at fault. I think we are short of closets, which are open dry troughs, and often too far from where the men are working.

ROBERT HANKINSON examined by—

112. (*Mr. Richmond.*) You work at Baxters, St. Helens, I think?—Yes.

113. That is one of the works of the United Alkali Company?—Yes, sir.

114. Are you employed in the caustic department?—Yes, sir.

115. How long have you worked in it?—At Baxters altogether in the caustic department between 15 and 16 years.

116. In chemical works how many years altogether?—Between 15 and 16 years. I was in service before that, sir.

117. You work at the caustic pots?—Yes, sir, I am a caustic finisher.

118. You know what this inquiry is for, to find out what dangers attend people working in chemical works. As far as you are concerned that applies to the caustic shed, and to try and find means of making the pots safer to those employed. Have you worked at any other pots besides the ones at Baxters?—Yes, sir, I have worked at the Widnes Alkali Works, a matter of 18 years ago.

119. Were they of the same construction, the pots?—No, sir.

120. Which in your opinion are of the best construction?—Well, sir, there is a different system of working between the two sorts of pots. There is not much difference in the pots but a different system of working. In the case of the Widnes Alkali Company's pots the liquor is worked up to a certain degree where the potman has nothing to do but to run a set of pots, and to run the strong liquor into the pots. They have not to contend with back pans or anything. We at Baxters have back pans and we get our weak liquor into the pots for finishing and have to work more round the pots than they have. I think they had only, at the time I was there, about five pots in a row, and you know that we have 15. Of course, it is a long way round to go round all the pots. I do not suppose they had any more room, but they were not as high as we have.

121. They are quite of a different structure, are they?—Yes, sir.

122. It is very much easier to get near the tops of your pots than it is of their's?—No, I do not think it is, sir. I do not think it is any easier to get near the top than what it was then, because there of course the pots were not so high as what ours are at present; the only obstacle is that we have to go a little more between the pots than they did.

123. You have to go between your pots?—We have sometimes.

124. Is it not the case that between your pots there is a great deal of waste which has collected from time to time till the pots are almost connected at the top?—Well, it is so, sir, they might be kept a little cleaner than what they are. They are not kept as clean on our system of working. It is a different system of working. I was trying to point out to you what the difference is. They work the clear liquor, having no rubbish to work up, whilst of course we work everything in. Their's is a system which gets liquor up to a certain strength. They take all the salts and everything from the liquor and send the pure liquor down, so you see they do not get as much salts and things of that kind in the liquor as we do, and it does not cause the liquor to form as you saw it that day you were round.

125. And with the present structure of your pots it is possible to work all round on the edge of the pots. There is practically that breadth all round your pots which you could work round?—In most cases there is.

126. So that you would be above the pots?—Oh, no.

127. But I mean practically that you must be a great deal above the pots?—Yes, it may be so.

128. That is, if you are standing near your pot there is not three feet from your foot to the top of the pot, or anything like that?—No.

129. It is a matter of inches more than feet?—I dare say it is in some cases.

130. I mean when you stand at the pots, practically, you are above them?—I should be below the pot.

131. But your feet would be very little below?—Yes.

132. In the case of pots as they make them now when you stand on the ground it is 3 feet from your feet to the top of the pot, you can have three feet everywhere. But with the ones I am speaking of at your works they are practically on the same level, and the men who are working here on the platform (*indicating*) can work from pot to pot and practically all round the pot?—Yes, sir, that is the construction of those pots.

133. So that there is nothing like 3 feet from the top of the pot to your feet?—Nothing like it.

134-5. And as I said, it is more a matter of inches than feet?—In front of the pot it would be, as near as I can say, 20 inches, sir. That is the average, taking one and the other.

136. Some are not even that?—In some places it is not that and sometimes it is more. As a rule it is 20 inches.

137. Now, I believe that you have had experience of the dangers there yourself?—Yes, sir, I have had a little.

138. You lost an eye there?—Yes, sir, I did.

139. At those works?—Yes.

140. That was from splashing of the caustic?—Yes, sir.

141. Was there any water at hand on that occasion?—Well, there was water down in the fire hole.

142. But no means of getting to use it?—No, no appliances close at hand.

143. But there was a water tap?—Yes, down in the fire hole.

144. (*Mr. Fletcher.*) You could have drawn water there?—Yes, but it was underneath the stage upon which I was working, sir.

145. But you could have filled your water can if you wanted there?—Of course you could have filled your water can there.

146. But although it was so near it was not near enough to save your eye?—No, sir.

147. (*Professor Simpson.*) How long would it take to where you got that splashing to get to the water?—If the road was clear it would not take a minute, it was simply jumping from this platform, and then into the fire hole.

148. You say if the road was clear or ready?—The road is not ready at all times, because sometimes the fire hole is filled up with coal and you have to jump on the coals to get down into the fire hole.



149. But there is a water main tap on the stage there close by that cupboard?—Yes, sir, but it would be handier to get down there.

150. Now, as a matter of fact, when you got the caustic into your eye did you get at the water?—I got it through someone else as soon as I could.

151. You would not be able to see your way?—I did see my way because there was not anyone about me at the time, but I could not depend upon myself jumping down the hole. I groped my way.

152. Then how long from the time you got the caustic in your eye did you get the water applied to it?—It was not very long sir, I could not justly say what length of time.

153. (*Dr. O'Neil.*) But it was too long for you?—It was too long if I had had it immediately.

154. Was it while you could count 100?—Till I could get to the end of the stage and drop down between the two stages I should say it was a matter of 30 yards.

155. I think the method you have there is getting a man to fill his mouth with water and squirt it into the eye?—Yes, sir, of course, but if there is not too much in you get him to put his tongue in your eye and lick it out.

156. If there is not much in, but if more?—They wash it then and lick it afterwards.

157. Is that the usual plan?—The plan we use.

158. Have you any such thing there as syringes?—No, sir.

159. Do not you think that syringes close at hand would be better?—They would be better if we could keep them clean.

160. That is to say if they were kept in boxes?—Yes, sir, but they would want to be in a very close box.

161. So as to keep the water in them clean. If they were kept charged with clean water and put in boxes, you think they would be effectual then?—Yes, sir. The great secret is, with caustic in a man's eye, washing it out clean.

162. So that a syringe or spray bottle would be the best appliances you could get for it?—Of course, anyone who understands, you know, they get it under a good force of water and wash it out thoroughly. It is rather a tender place is the eye, and anyone who gets the caustic in does not like you to meddle with it. They keep the eye shut and you have almost to force it open.

163. Are these splashings very frequent?—No, sir, mine was quite an accident. It might not happen in a hundred years.

164. Was it because the pot was uneasy?—No, sir, it was not uneasy, I took a little out at the cooling, and there was a thorough hurricane blowing that night. The wind was blowing south-west at the top corner of the shed, and it was raining a little at the time, and my spade must have been damp, and when I dropped the caustic on my spade it recoiled back into my eye.

165. It flew?—Yes, sir, it was from my sample spade.

166. But you do get splashes from the pots themselves?—It is very seldom we get splashes from the pots.

167. When did you see a man get splashed last?—About two days ago.

168. How often will it occur?—It just depends how neglectful they are.

169. Once or twice a week?—Oh no, sir, it was a matter of neglect that the man got it the other day. He said he would not do it any more, but it was too late then, he had got the splash.

170. You do not use goggles?—No, they interfere, with your work too much; the steam would get on to the glasses, and you would not see where you were going.

171. (*Mr. Fletcher.*) You know the Green Bank works. They keep syringes there?—Yes, sir.

172. Mr. Balmain used to keep syringes always ready, and saved many an eye by having it always ready to squirt into the eye?—Yes, I have heard that.

173. (*Mr. Richmond.*) You think that syringes would be a good thing to require?—It would be a benefit to the men, but I do not think Mr. Balmain ever saved many eyes if the caustic got into them. If it gets on to the sight it burns it, and you cannot wash it out.

174. It may be so bad that even a syringe will not prevent it doing permanent injury, but there are many cases where it would be of advantage?—Yes, if it

dropped into the corner of the eye and you washed it out thoroughly it stops it from striking across, and it naturally strikes across.

175. Well, now, in regard to these pots, you have had further experience. I believe your father met with his death at these pots did he not?—Yes, sir.

176. Can you tell us how that happened?—Yes, sir, I can tell you from his own lips.

177. His ordinary work was on the platform, was it not?—Yes, sir.

178. Tell us what he was doing, and why he was near the pots?—There is a lid that hangs over the pots and there is a chain attached to it by which it is hoisted up. The lid was lowered, but it was not parallel with the top of the pot, not quite over the pot, and he had his pot full and he was filling the adjoining pot, then he was pulling the lid of the pot down. There is a long hook for that purpose, but he had not got hold of the hook, and thought he would not require it as it was not so far. He was pulling it over with the help of another man, when he happened to say "That will do," when the other man let go of the thing and it caused a slack on the chain. The result was that he was thrown over, and he fell over on to the pot and his arm went into the pot up to the elbow. The result was that mortification set in and he died through it. I dare say he was standing 3 feet from the pot at the time.

179. (*Professor Simpson.*) Was his arm burnt?—Yes, sir, right up to the elbow.

180. (*Mr. Richmond.*) Now, what height above his foot was the pot?—About 20 inches, sir.

181. As he fell he must of necessity fall into the pot more or less?—Yes, sir. He got into it, but of course he would not have met with the accident if he had not had his pot so full as he had it.

182. (*Dr. O'Neil.*) You speak from report as to the state of the pot?—Yes, sir. I did not see the pot. I have only my father's words for it.

183. (*Mr. Richmond.*) How long ago did this happen?—Two years ago last April, sir. He was working with me at the time.

184. Had he worked at the pots long?—He had worked at the pots, I should think, for 30 years.

185. (*Professor Simpson.*) Did you ever know any other fatal accident there?—I knew of one where a man fell into the operating pan or agitator. It is like a big boiler with the top of the boiler cut off, where the liquor is run into it and mixed with lime and water, and it is what they call causticised there. He was putting a leg or syphon there, by which they syphon the liquor off. He had a hook or appliances for shifting it down, and was shifting it down when he overbalanced himself and dropped into the lime.

186. (*Mr. Richmond.*) Was that an instance again where the top of the agitator was less than 20 inches from his foot?—No, he had climbed on to the top of the agitator and stood up.

187. Then he had not got 3 feet?—There is above 3 feet, but he got on to the top of the agitator. Since that accident happened there has been more protection put on the agitators; there have been bars put across so that you cannot actually fall in now.

188. (*Professor Simpson.*) How long ago was that?—About three years since.

(*Mr. Richmond.*) I was at the inquest, and got the bars put across afterwards.

189. (*Mr. Richmond.*) Have you seen any of the pots as they are being constructed at Widnes?—I have not seen any of them.

190. They are being constructed so that you can walk all round the pot like this (*indicating*). The height from the floor to the top of the pot is 3 feet and the brickwork of the pot is being made perfectly smooth, and the top is constructed so that there is no footing on the top of the pot at all. Do you not think that that is a very much safer construction of pot than what you have at present, that is with regard to falling into the pot?—I understand perfectly well what you mean; you will have a road through between the pots, but what width?

191. The distance would not be more than 9 inches, perhaps, which is enough for a man to go sideways through, and with 3 feet from the ground to the top of the pot and the brickwork with no room on the top of the pot upon which he could stand, do you

*R. Hankinson.*

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not think that then it would be much more difficult for a man to fall into a pot of that construction than it is in your works at present?—Yes, if he has not to climb up to fix the racks, as we call them.

192. No, they have not to climb up at all. They are being made at Widnes now so that you can go all round them?—Yes, sir, but I do not think there is any firm at Widnes that works on the same principle as we do.

193. Well, that is how they are making them now, and you understand that by that construction a man cannot stand close to a pot and be above it, so that if he falls he falls into it. I do not know whether you said you knew the Green Bank shed?—I know the old shed, sir.

194. Do you know that lately, last year, I think it was, there was a man killed there?—Yes, I should be hearing something about it.

195. Well, this man was killed by walking there from one pot to another. He went up a ladder to one pot, and then instead of coming down that ladder and going up the next ladder to the other pot, he walked from one pot to the other on the brickwork, and so fell in. Now you see there is that danger to these pots. Do you think that that could have happened if there had been this clear space round the pots, and the pots 3 feet above the floor. It would stop accidents of that kind; a man could not walk then from one pot to the other?—No, he could not if they were all safeguarded in the same way, or unless he used a plank in some way.

196. But that is also to be illegal; planks are not to be put across, so that the construction of the pot would of itself obviate any chance of an accident of that kind, would not it?—Of course, if the thing could be kept clean and all that.

197. You mean kept clean between the pots; that is absolutely necessary, of course. There would be danger if accumulations were allowed, but that is obviated by making it absolutely necessary to keep all clean?—Of course, but my idea is not to have them quite as high as what you have said, because we have to work between our pots a good deal. I know your idea is safer as regards where they can work it, but we have a great deal more to do between the pots than any one else has.

198. But if the pots are made to work satisfactorily at Widnes at the present moment?—They will have to be worked somewhere else, I suppose.

199. I mean if it is possible to work them at Widnes it is possible to work them at St. Helen's if made on the same construction?—Yes, sir, but it would be a reconstruction altogether at our works, right from beginning to end.

200. But an alternative which has been accepted, I believe, is to guard them if they are not 3 feet from the ground to the top of the pot, to have guards round them?—What kind of guards, sir?

201. They are in existence now at Flint, and they have been at Widnes in some of the works. They put a circular guard round the pots?—Yes, sir, iron railings?

202. Yes, iron railings made of piping?—How are they fixed on the pot?

203. They stand back a bit; there are four or more uprights, and a circular rail running round?—Are they permanent?

204. No, they can be moved?—Well, they have to be moved to do any of their work.

205. I do not know, not with your ordinary work I should say. I should think they would be taken down when the pot is re-constructed, but not otherwise?—For instance, if we had them guards and wanted to put a lid down, could we put the lid down with those guards there?

206. Oh, yes, the manager said that could be done by setting the uprights back?—Could we fix shoots in them to take the liquor from one pot to another?

207. Yes, the manager made no objection to that. He said it could be done?—You have eight pots on a level with guards all of the same height, and I want, say, to send liquor from pot number four to pot number eight, and I want a little fall for my liquor to go; how am I to get that fall?

208. You mean whether the rails will interfere with that shoot?—Yes, sir.

209. The manager has said he can do it. Of course, if you see it constructed, and the shoot doing its duty,

you will be satisfied?—I have seen guards round them at Kurtz's.

210. Well, what did they do with their shoots then?—As I said, they worked there on a different principle.

211. You mean that with your pots, there would be some difficulty in the working of those special pots you were working at?—Yes, sir.

212. But if the construction of your pots is condemned?—Well, then of course they would have to be re-constructed.

213. What I want to get from you is where it is possible to construct pots so that you may use the shoots it is desirable to have the guard?—Yes, sir, that is as you say.

214. All these things are possible?—Yes, sir, probable.

215. It would necessitate the re-construction of your pots entirely?—Yes, sir.

216. But as many people think your pots are the most dangerous in the kingdom?—I do not think they are.

217. But you have worked with them and not with others?—Oh yes, sir, I have worked at the Widnes Alkali Company's Works and the British Alkali, Mr. Brock's place.

218. (Chairman.) Taking your own pots into consideration, can you suggest anything to make them safer for the men working at them to prevent accidents?—Well, as regards the working of the pots, the only thing that I could recommend is to drive a little lower down to give you about 6 inches lower down, and to keep a level footing round you. I believe that some of them are 2 feet 6 inches down, and if you had 2 feet 6 inches of room between the pots, and a clear sound footing all round, I believe it would be just as safe as it would be otherwise. I am speaking of the passage between the pots as being 2 feet 6 inches broad.

219. And how broad are they now?—It runs from 2 feet 6 inches to 2 feet in some places.

220. From the top where the rubbish begins it is 2 feet 6 inches but it gets narrower?—Yes, sir, but if the narrowness were taken out, and you had a flat service, with a firm footing, I think that would be better.

221. Mr. Richmond suggests that you have at least 9 in. of flat surface at the bottom; is not that sufficient?—I am speaking of the whole 2 feet 6 inches of flat surface. I mean between the pots here, at the top.

(Mr. Richmond.) This 2 feet 6 inches is all filled up with rubbish at present, and in order to get over they walk across there. I suggest that it should be carried down to the bottom; all cleared away to the bottom, and if there was 9 inches space, to go sideways between the pots, and have a smooth passage there 2 feet 6 inches broad, that would do. The objection, I think, is, that if you are standing there the top of the pot is not 3 feet from your feet—merely about 2 feet.

(Chairman.) What is the obstacle to lowering it now, if it is only rubbish that fills up the space.

(Witness.) It is not rubbish that fills that space altogether. There is 2 feet 6 inches here (indicating), but on the side of this pot is 9 inches of brickwork, and this flue should be 5 or 6 inches at the very least. You have to work it up so that the flue comes out about 20 inches from the top of the pot, so as to allow your gases to develop round the pot, and get all the heat that you can give them.

222. (Mr. Richmond.) But if the rubbish were taken off it would be part of the way?—Yes, sir, and if a couple of 4½ bricks were taken off, and made level with the pots, you would have firmer footing.

223. You agree with me that the passage through between the pots being on the level of the pots, practically, is much more dangerous than if the rubbish was cleared away, and a part of the brickwork?—Yes, sir, but not quite so low as you say.

224. That is a matter of opinion as to what the depth of it should be made but a passage between lower than what it is at present would be of great benefit?—Yes, sir.

225. (Professor Simpson.) Every passage between the pots you speak of would be 2 feet 6 inches in width?—Yes, sir.



226. And as you are on that passage, walking between the pots, 2 feet 6 inches being the breadth between the pots, how much below the top of the pot would your foot be?—About 20 in. if this brickwork was taken off, sir.

227. (Mr. Richmond.) As it is at present?—At present it is not. I suggest that it should be taken down to 20 inches. On the principle we work on, I think that would be best.

228. (Professor Simpson.) How many inches at present is the foot space, where your feet would be, from the top of the pot?—If the pot is clean between now, I dare say it is 15 inches.

(Mr. Richmond.) Many of them are not that. They are not kept clean.

(Witness.) Yes, but if the thing is cut square, you would have them kept cleaner than now.

229. (Professor Simpson.) Even less than 15 inches—how much less?

230. (Mr. Richmond.) Some are nearly on the level; is not that so?—Yes, sir.

(Dr. O'Neil.) In fact there is no interval.

(Witness.) The interval is there, sir.

231. But it is filled up?—Yes, sir.

232. (Mr. Richmond.) So that you walk between the pots on the level?—Yes, sir.

233. And you do not think that walking between two pots on the level is a safe thing, do you?—No, sir. I do not.

234. You know that on many occasions, pay days especially, the workmen get more drink than is good for them?—It is not a matter of the drink question, but if it is on a level with the top of the pot it is liable to give way under your feet.

235. Yes, but this man who was killed, it was said he had been out a good deal of the afternoon drinking with some friends, and then returned to his work?—That may be so, sir.

236. And a passage on the level of the pots for a man not steady on his legs must be a very dangerous thing, must not it?—Yes sir, it must. There is sometimes rather a false spirit in a man when he gets too much drink.

237. And you agree that if the work can be done equally well with a clear space of three feet all round, from the ground to the top of the pot, with a smooth surface to walk round on, that would be a much safer construction of pot than you have at present, leaving out the question, mind you, as to whether in your opinion you could work your pots as well, because if can be proved that they are already in operation, that would not much matter?—I certainly cannot do otherwise than agree with you that it would be safer.

238. If they can be constructed to do your work as well?—It would be equally as safe.

239. A man cannot fall into a pot if he stands 3 feet below it?—But the question is whether, when the men want to get to certain work—

240. We are leaving out the question whether they can work equally well. I can show you pots so constructed in actual operation, and all I ask you now is whether in your opinion it would be very much safer to have pots of that construction, provided you can do your work equally well?—Well, if I had seen the pots and the men working them, I might have given a better explanation. You have seen them passing through only.

241. I have seen them in full operation.

242. (Professor Simpson.) Would it be more likely for you to fall accidentally into a pot 3 feet from the ground, or into one 2 feet 6 inches from the ground?—I would be more likely to fall into one 2 feet 6 inches, I should say.

(Professor Simpson.) Therefore the 3 feet one must be safer.

(Mr. Fletcher.) The hesitation in his mind is whether they can work it as well.

243. (Chairman.) One other question. About the hours of work: what hours do you work?—We work on an average 12 hours a day.

244. Including meal times?—That is including meal times, altogether 12 hours a day.

245. You work by day?—By day and night, sir.

246. You have two turns of 12 hours each?—Yes, R. Hankinson, sir.

247. It seems your turns are not one long and one short?—Yes, our turns are one long and one short. Our time is supposed to be 12 hours, but we arrange it with one another that we do not come quite so early in the morning and get away a little earlier at night on the day turns; but our proper time is 6 to 6 o'clock.

248. (Chairman.) What time is the long turn?—On the Saturday afternoon from 1 o'clock to 6 o'clock on the Sunday morning.

249. That is 17 hours?—Yes.

250. (Mr. Fletcher.) But part of the time on the Sunday morning is stoking and so on?—We generally knock off on the Sunday morning, except stoking the fires, &c., for the Sunday night men to come in.

251. (Chairman.) Do not you think that long turn is the cause of accident through the men getting tired and done up?—No sir, I do not think so.

252. (Mr. Fletcher.) You are not 12 hours continuously at hard work. You work an hour, say, and then rest, as the work admits it?—Yes sir, we may have an hour, or an hour-and-a-half with nothing to do scarcely, and sometimes three hours with nothing to do, and then four or five hours hard work, and then again three hours with scarcely anything to do, except to keep our eyes about us.

253. (Dr. O'Neil.) Is that long shift necessary for changing the shifts?—For changing the shifts. If we did not do the long turn, you would have one set of men staying on till 6 at night, and the others relieving them then, and a man scarcely has any pleasure if he has not a Saturday afternoon off sometimes. It is the men's fault that it is done.

254. (Mr. Richmond.) As far as the company is concerned, you may work from 6 to 6 only?—Yes.

255. Have you any Sunday work?—We go in at 6 o'clock—6 to 7, on Sunday nights.

256. The chief Sunday work is keeping the fires going?—The dampers are all in, and there is one man there to keep a little fire on, and then he goes home at night.

257. (Chairman.) Are there any boys under 18 employed in your works?—No, sir, not in our department.

258. (Professor Simpson.) Would eight hours a day be possible in your work?—It would be a great reduction of wages.

259. Yes, you are not in favour of it?—No, sir, I am not. If I worked eight hours I could not expect to get as much for it as I could for 12 hours.

260. (Mr. Fletcher.) And you could not get more work out of the pots with three eight hour shifts than with two of 12 hours?—No, sir, I do not suppose we could get any more.

261. (Mr. Richmond.) I do not see how you could; the pots are always in operation?—Always in operation.

262. Are your sheds well lighted for night work?—Yes, sir.

263. By what?—By gas.

264. So, I mean, that you can see where you are going?—In the front of the pots there is a gas jet at every 20 feet, and behind the pots it is about the same, sir. At some places it may be less, at the end of the shed, or anything like that.

265. Can you tell me what is your loss of wages by coming here?—I get 54s. to 55s. a week for 6½ days.

266. Then how much do you lose by coming here to-day?—From 8s. to 9s.

267. (Mr. Fletcher.) Can you tell me whether there are any other tanks or vessels of any kind in your department, besides caustic pots which are particularly dangerous?—No, sir there is not, with the exception of the revolving pans, and you simply go up a ladder to them, and have a look to see if they are full, or anything like that.

268. When the causticising pans are fenced, there is no danger?—No, sir, there are no other pans, only the caustic pans.

Mr. Richmond stated that Mr. King was in attendance with 23 men, but he had arranged with him to select six for examination.

Mr. King and the six men then entered the room.



*J. Ryan.*

28 July 1893.

JAMES RYAN examined.

269. (*Mr. Richmond.*) Where do you work?—Kurtz's works.

270. In what department?—In the Weldons department.

271. Making muriatic acid?—Yes, making muriatic acid. It belongs to the weldons department.

272. But what you are actually working at is the manufacture of muriatic acid?—Yes, sir.

273. (*Mr. Fletcher.*) You work at the muriatic acid pots?—No, sir, the towers. I attend the condensing towers.

274. You do not work in the salt cake furnace?—No, sir.

275. (*Mr. Richmond.*) How long have you worked at it?—A little over 12 years.

276. All at the same process?—Very nearly.

277. What have you got to tell us about your experience?—Well, I have got gas during that time so that I was not very well able to come, not in the mornings.

278. How often were you gassed?—I could not tell you exactly, but a good many times, sometimes worse than others.

279. With muriatic acid?—No, chlorine gas.

280. I thought you said you attended the towers?—Yes, sir.

281. Do you work at the chlorine stills?—No, sir, but still I am working amongst both. I have to look after things in the chlorine department. I work on both sides, salt cake and that as well. I look after the pipes.

282. Then were you gassed by chlorine or muriatic gas?—By both.

283. What are you by trade, a plumber?—No, I am a labourer or acid maker.

284. Now, what effects had the gas on you?—It left me very short in the breath. Occasionally I have not been able to get over it for an hour in the morning, first thing after I get up. Up to the top of those towers is 40 feet, and sometimes I would have to rest two or three times before I got to the top.

285. Was the gas that you were affected by in the open or in the shed, or how?—In the shed.

286. You mean that it affected your throat, was it?—It affected my inside, and left me short of wind.

287. (*Professor Simpson.*) Anything else?—I lost a finger.

288. But any other effect of the gas except shortness of breath?—I do not know that there was anything else.

289. (*Mr. Richmond.*) You mean temporarily?—Yes, sir.

290. Have you had your health damaged permanently?—I have not got my health the same that I had when I went there first, not by a long way.

291. What did you lose your finger by?—I got poisoned by red lead, the stuff I used.

292. You had some wound on your finger?—No, it worked under the nail itself, the stuff I used for that job.

293. (*Professor Simpson.*) What took place, did your finger swell up, or what?—Yes, mortified.

294. How soon after the red lead got under your nail did it mortify?—It might be three or four days afterwards, or it may have been there longer than what I knew.

295. Did the inflammation spread at all?—No, when it started it broke out under my arm and down in the groin.

296. (*Mr. Fletcher.*) The cases you speak of where the gas affected you, did it come from leaky pipes, or from the salt cake shed?—It might, perhaps, sometimes come from a chamber or still when they were running off. I have been working amongst it, and had to go in amongst it, when they were running a still off, or the like, or if there was a chamber down I would have, perhaps, to do some little job round about while it was clearing away.

297. (*Mr. Richmond.*) That was in the open; you have never been inside?—The stills are in the inside under the shed. The chambers are in the open.

298. Then any gas that you got from the chambers was passing the chambers outside?—Yes, I might have had a job close to them.

299. (*Mr. Fletcher.*) You were doing labouring work?—Yes, sir, about the pipes, and connected with the stills.

300. (*Chairman.*) When you are doing work of that kind do you wear any respirators?—Sometimes I would have a piece of flannel in my mouth to keep it from getting inside if I could.

301. How long ago is it since you were last affected by gas?—Well, I was affected last week.

302. In which works was that?—At Kurtz's.

303. By which gas, chlorine or hydrochloric gas?—I think it was chlorine gas.

304. Did it come from the stills, the chambers, or the pipes?—A little of it from both.

305. Can you not tell us where the gas came from?—It came from both stills and chambers.

306. You would not receive it from both at the same time. They are not near together?—They are very close. I have often received it from both together.

307. They are 50 yards apart I should think?—No, they are not 10 yards apart, the stills and the chamber; the chamber is very close to one or two of them.

308. And you happened to be just between. Perhaps you could tell us where it came from a little more accurately?

309. (*Chairman.*) What were you doing last week when you suffered from the gas?—I have to go on to the top of these towers to regulate the water, and while I would be going up to those places the wind would blow it on to me. It just depends how the wind is.

310. (*Professor Simpson.*) When you are gassed do you suffer from want of breath?—Yes.

311. (*Mr. Richmond.*) You talk about gas floating about in the open, but you are not gassed in the same way as a worker in a bleach-house?—No, I do not go into the chambers like that.

312. What you get is gas in the open chiefly?—Yes, sir; sometimes I don't get much, but sometimes a great deal. It would depend which way the wind would be.

313. (*Chairman.*) Knowing your liability to this, why do not you wear a respirator?—I had got flannel for that purpose, but I might think I would not need it and not bring it with me, and just be caught in it. Besides, it is not very nice. You do not want to wear flannel in your mouth, the teeth tells that.

(*Mr. Richmond.*) Is that state of your teeth from wearing flannel between your teeth?—Yes, sir.

314. That is not a good kind of respirator clearly?—No.

315. What do you propose to prevent you suffering in the way you have stated, what do you think ought to be done?—I could not say exactly what should be done to prevent that.

316. But that is what we are here for, to endeavour to find some remedy for this kind of thing if possible; if you, a practical man, can suggest anything we will take a note of it?—I dare say there could be a good deal of improvements made in that respect.

317. In what respect?—In preventing that.

(*Mr. Richmond.*) That is preventing the gas, but there is an Act of Parliament already which deals with that.

318. (*Chairman.*) Then you are not able to suggest anything as being a practical remedy to prevent your getting this gas in the future?—I would not like to suggest anything of that sort. It might place me in a very awkward position perhaps.

319. I do not think it would at all. You are a practical man and I am not, and I want you to advise with me.

320. (*Mr. Fletcher.*) Could any kind of respirator be advised for you to work with and for you to wear?—Well, there will be always a portion of gas escaping, no matter what remedy they try, so long as there is weldon



plant working. That will always affect a man who works round it.

321. Even if he wears a respirator?—Yes, sir.

322. (*Professor Simpson.*) Then you think there is no remedy at all?—They may be able to bring out one that will improve it a good deal, but it will never prevent the injuring of a man's health.

323. Did you ever have any other symptoms except want of breath?—I spit a good deal first thing in the morning. It will be fast on the chest.

324. Anything else?—I have a kind of giddiness in my head since I came to the job.

325. Anything else?—Nothing else, sir.

326. (*Mr. Richmond.*) You are what is called a labourer in the works?—I am not a tradesman, sir.

327. You cannot call yourself attached to the caustic acid, a burner, or anything of that kind; nothing distinctive. Yours is more labouring work in the open?—Yes, sir.

328. (*Mr. Fletcher.*) You have been all the time you named working at Kurtz's works?—Yes, sir.

329. Were you working anywhere before?—Yes, sir.

330. Where?—At Mr. Tinker's soap works.

331. (*Professor Simpson.*) Do you state that the symptoms, including shortness of breath, pass off very soon?—It tightens me in the chest.

332. An hour or two?—It might last a day or two.

333. And then pass away?—Yes, sir, only I get a little more, and then it tightens me in the chest again.

334. How do you feel your general health affected?—I am rather inclined to be sick and cannot eat the same that I did. It is very little that I eat for breakfast or tea. It is mostly dinner. I cannot eat at breakfast time.

#### WILLIAM DOOLEY examined.

349. (*Mr. Richmond.*) Where do you work, Dooley?—At Kurtz's works.

350. As a burner?—Yes, sir.

351. In the vitriol department?—Yes, sir.

352. Are you subjected to gas of any kind?—Yes, sir, two or three sorts.

353. Where is your special work?—In the burner shed.

354. What is the gas you are subject to?—Sulphur gas; it catches you on the chest and gives you a heavy feeling on the chest. Then you have nitre gas when potting the nitre, and when you have a rag in your mouth it rots your teeth—I have not a tooth in my head.

355. Knowing that, why did you wear a rag in your mouth?—A man could not do it without.

356. But a different sort of respirator should be used. I do not see much use of a rag in your mouth?—But where would you put it? If you tie it across your mouth it will slip down unless you tie it tight, and then you cannot breathe at all.

*Mr. Richmond:* It seems to me that you all condemn a rag in the mouth.

357. (*Mr. Fletcher.*) Do you think it would be of great assistance if you had a better respirator?—I don't know that it would.

358. Would you wear them if you had them?—Yes, sir, but you have to get your own, and I cannot afford it.

359. (*Professor Simpson.*) You would wear one if it was given to you?—Yes, sir.

360. How does the gas affect you; you say it is tightness in the chest?—Yes, sir, and you cannot eat anything, and are always dry, and always want some sort of drink to stimulate you and give you wind to last your time out, or else you could not work.

361. Do you mean that you must have drink, and that it must be alcohol?—Yes, sir, to put a false spirit in you.

362. What do you feel wrong with you when you have got this gas?—Sickly, you cannot eat anything.

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335. (*Chairman.*) Now I am told that you had an accident recently; what was that?—A plank broke from under me when at work.

336. Was that at one of the towers?—No, I was putting in some pipes in a kind of platform.

337. And you were standing on the plank?—Yes, sir, and it broke from under me.

338. Was anything wrong with the plank?—It was rotten, of course, or else it would not have broken.

339. Did you select the plank or what?—No, I did not select it, the plank was there before I started on the job.

340. Where did you fall?—I slipped straight through and alighted on a cross bar that was keeping one of the uprights in its place and caught me on the chest. I also hurt my head.

341. Was that at Kurtz's?—Yes, sir.

342. And was the plank rotten through the action of the acids?—I suppose it has been there a long time.

343. (*Professor Simpson.*) Were you long laid up with that?—Going on for eight weeks.

344. Had you headaches before that accident?—I had a kind of giddiness this last seven years in my head and I am subject to headaches now a bit since the accident.

345. (*Mr. Richmond.*) But that accident might have happened anywhere, not especially in chemical works?—Oh, yes, a plank might break with anybody in any place.

346. With a builders man, for instance?—Oh, yes, I would much sooner that had not been mentioned. Bringing it forward again would not do for me very well.

347. (*Mr. Richmond.*) It is not an accident incidental to chemical works. It might have happened to builders building a house or anything?—Quite so.

348. What are your wages per week?—30s. 4d., sir.

*J. Ryan.*

28 July 1893.

*W. Dooley.*

363. And is that what makes you take whisky?—Yes, sir.

364. How does whisky make you feel better?—It puts a false spirit in you, and gives you a bit of wind, whisky does. It cuts the gas.

365. (*Dr. O'Neil.*) Do all the men in the place drink whisky?—Yes, when they can get it.

366. What do you mean by "cuts the gas"?—It cuts the gas which tightens you.

367. How often are you affected with the gas in this way?—Oh, every shift we are working.

368. And how long do you work a day?—Twelve hours.

369. Including meals?—Yes, sir. We have no set meal times on our job.

370. But do you take your meals in that time?—Yes.

371. (*Mr. Richmond.*) You start at 6 and stop at 6?—We work 13 hours one day.

372. But that is an arrangement between yourselves?—Yes, sir.

373. Do you know the rules with regard to burner men?—Yes, sir.

374. You have them posted up there at Kurtz's?—Yes, they were put up last week, because they knew the inspector was coming.

375. They are new rules, so it could not be because of the inspector. How long have you worked there?—Nearly three years at Kurtz's.

376. Did you work at chemical works before going there?—With the Widnes Alkali Company.

377. How long?—Four years.

378. At the burners?—No, about 12 months. I was blowing vitriol to the towers the rest of the time.

379. How old are you?—Twenty-three next November.

380. You began as a boy then?—Yes, sir.

381. Are there any boys under 18 working now in your department?—No, not working in our department.

382. Are any of the men working, as far as you know, your fellow workers, in the vitriol department, testotallers?—No, none of our lot.

B



W. Dooley.  
28 July 1893.

383. Now, is there any suggestion you can give to this committee to improve matters. What can the employers do more than they do now to make the working healthier?—They could give us more draught, and keep the chambers in better repair.

384. By draught do you mean ventilation?—No, a better draught from the kilns to the tower, not ventilation.

385. To carry off the gas, you mean?—To carry off the gas, and not have so much coming out.

386. Well, they could do that, and what else?—To keep the chambers in proper repair. When the wind blows downwards it brings the gas on to you from the vitriol chambers. They want patching regularly, and looking after.

387. (Mr. Fletcher.) How are Kurtz's works in that respect compared with others?—They are putting up new ones lately. They are making them better than what they were; they were bad.

388. (Mr. Richmond.) What are your wages?—36s. a week, but we have terrible long hours to work for it, 84 hours a week.

389. Do you work on Sundays?—Yes, sir.

390. That is general with the burners, is it not?—Yes, sir.

391. It is practically the only department where the work does go on on Sundays?—Burners, yes sir. That would be a great remedy if we dropped to 56 hours a week.

392. (Chairman.) But the work must be continuous?—Yes, sir.

393. So that you would want three sets of men?—Yes, sir.

394. (Mr. Richmond.) How would that affect your wages; do you want piece-work or weekly wages; which are you at now?—We are on weekly wages now.

395. And do you expect to get the same wages for eight hours as for 12 hours?—Well, they might allow a bit.

396. The question is, whether the manufacture would pay. You cannot make an article without profit of some sort?—No.

397. (Mr. Fletcher.) You see the chambers would not produce any more in the three shifts; that is, when you have got the eight hours shift, the chambers will produce exactly the same with the three eight hours shifts as with the two 12 hours shifts?—Yes, sir, they just do the same work in the 24 hours, that is all.

398. Then would you be content to work eight hours a day and receive diminished wages in proportion?—We would have to agree to that. I would be willing to work eight hours.

399. And be paid the corresponding lower wage?—Aye! if they did not put us too low.

G. Burns.

GEORGE BURNS examined.

414. (Mr. Richmond.) Where do you work?—The Globe works at present, sir.

415. St. Helen's?—Yes, sir.

416. What department?—Salt cake.

417. Now, what gases are you subject to?—Mostly from the salt cake.

417A. Hydro-chloric acid?—I have suffered from gases elsewhere more, not much from the Globe at present.

418. But what gas do you suffer from?—From the still gas I have done.

419. But at present you are working at the salt cake?—Yes, sir.

420. And that is hydro-chloric acid gas?—Yes, sir.

421. How does it affect you?—It affects me on the chest very much, with a touch of bronchitis, and such as that.

422. And what are you working at, the pots or the furnaces?—At the furnaces at present.

423. Then you get the gas when you are drawing the charge, is that it?—Yes, sir.

424. You draw it in those boxes beneath the furnace?—Yes, sir.

400. But, exactly in proportion, it would be 24s. a week. That would bring it down for eight hours. Would you be content to take 24s. a week for eight hours?—24s. would not be enough.

(Chairman.) That is a matter we cannot deal with, of course.

401. (Mr. Richmond.) Do you have these new rules before you as to what burner men are to do?—Yes, sir.

402. And are they complied with properly?—Yes, sir, as well as we can.

403. Is a damper always drawn as directed?—Yes, sir.

404. These rules, you think, are carried out?—Yes, sir, as far as possible.

405. I suppose it is possible for them to be carried out. Is there any rule that the men could not follow?—That about the drawing of the dampers, they do not always do that.

406. Whose fault is that?—They do not allow us to touch the dampers, not the burner men.

407. But the rule says that the burner men are to do it?—The foreman does all the damper drawing and regulating of the dampers.

408. Then these rules say that every burner man who violates the rules shall be fined half-a-crown for each offence, and it says that you are to draw the dampers?—Yes, but they do not let us touch the dampers, and the foreman does not tell us when he does so. The dampers are not in our sight.

(Mr. Fletcher.) Dooley could not tell whether the damper is drawn or not.

(Mr. King.) Would you ask the witness if there are not special instructions given to the men about these dampers and other matters, when the inspector is visiting the yards.

409. (Mr. Fletcher.) Have you reason to suppose that there is any difference of behaviour on the part of the men when any of the inspectors are there?—Well, I know that they send over from one yard to another when the inspector is about, and when he does come into the works they send a lad out of the office to tell them that the inspector is about. He always goes in through the office.

410. (Mr. Richmond.) You are speaking about gas and so on under the Alkali Act?—Yes, sir.

411. (Mr. Fletcher.) You mean to say that a messenger comes down and says, "Don't charge the burners"?—We dare not charge them without orders then.

412. Have you been told not to charge the burners because the inspector was coming?—Yes, sir.

412A. By a man or messenger from the office?—Yes.

413. (Dr. O'Neil.) Don't you take your orders from your foreman?—Yes sir, but if they send a man out of the office we are to comply with that too.

425. Does that help much?—Yes sir, it does.

426. You get less gas with these boxes than you used to do?—Oh yes, sir, there is a great deal of improvements on it.

427. (Mr. Fletcher.) When do you feel the gas most, when wheeling away the charge?—No, sir, when I am working a furnace. I do not feel it much when wheeling away at all.

428. (Mr. Richmond.) That is when you are receiving the charge from the pots?—Yes, sir. I get the most punishment from it then.

429. (Mr. Fletcher.) Can you not reduce that by not having the doors open so wide?—No, sir. We must have the doors open.

430. (Professor Simpson.) What effect has the gas on you?—A touch of bronchitis and so on.

431. It makes you cough?—Yes, sir.

432. Did you always have bronchitis?—No, sir, except the last four years.

433. Did you have it continuously that time?—Yes, sir.

434. And did you have good health before that?—Yes, sir.



435. (*Chairman.*) And you think that bronchitis was caused by the gas?—Yes, sir, the doctor told me so, what it was.

436. Do you know anything to prevent the inhalation of the gas?—I wear a big shawl across my mouth.

437. Flannel?—Yes, sir, flannel.

438. Between your teeth?—No, sir, I do not put it between my teeth at all.

439. How are your teeth?—I have scarcely any, they are all out now. I had to get some of them drawn, from the gas that I have got.

440. (*Mr. Richmond.*) How could you prevent that gas?—Oh, it could be prevented by giving more draught.

441. You mean by giving less gas?—Yes, sir, we should get less gas by more draught.

442. (*Professor Simpson.*) Where do you mean more draught?—In the condensers, sir.

443. Do you use a regular respirator?—No, sir.

444. Would you use one if you had it?—Yes, sir, I would.

445. You use a shawl?—That is all, sir.

446. Now, some of your men seem to get on very well, and tell us that they have good health who have worked at it for 20 years and so on. How is it that you feel it more than they do?—I have mostly got chlorine gas, but I am working at the salt cake at present, and I do not feel the effects of the gas as I did.

447. It is not so much from the present work as from past work then?—No, sir.

448. (*Mr. Richmond.*) When did you get the chlorine gas?—When making chlorate of potash.

449. You mean at the pans where they make it?—Yes, sir. I worked inside.

450. You mean in the crystallization?—No, sir, before that. Chlorate of soda was one department, but I worked at the chlorate of potash and finished the liquor for it.

451. That is before it gets to the crystallizing then, you mean the actual manufacture?—Yes, sir, that is what injured my health.

452. (*Chairman.*) I suppose some of the men in the salt cake department are healthy enough, are they not?—Yes, sir, some of them.

453. Are there any boys under 18 working in your department?—No, sir.

454. What hours do you work?—I work 12.

455. Including meals?—Yes, sir. I have 13 on the night turn and 11 when I am on the day.

456. Do you work on Sundays?—Yes, sir, Sunday nights. We go in at 4.30 or 5 o'clock.

EDWARD SMEE examined by—

473. (*Mr. Richmond.*) Where do you work?—A Kurtz's, sir.

474. What do you do?—Bleaching powder packing.

475. And how long have you worked at powder packing?—I have been four years at powder packing.

476. And are still engaged at it?—Yes, sir.

477. (*Chairman.*) How old are you?—About 32.

478. (*Mr. Richmond.*) You go into the chambers, of course?—Yes, sir.

479. Are you much affected by the gas?—Yes, sir.

480. You wear muzzles, do not you?—Yes, sir, we have to wear muzzles, about five yards of flannel, but we get some chambers that no muzzle can keep the gas out, sir.

481. Is it gas which is in the chamber, or that which escapes as you disturb the lime, that you are affected by?—The gas which is in the chamber.

482. Is it extra gas, or gas which comes off?—Just what is stationary; it will not shift.

483. (*Professor Simpson.*) Do you wear the muzzle dry or wet?—You must have it damp. It must not be too wet, or too dry.

484. A happy medium?—Yes, you have it washed at night.

457. Not during the day up till 6?—No, sir, not during the day.

458. How many hours a week do you work?—Eighty now, or something like that. Sometimes we work a great deal more.

459. (*Mr. Fletcher.*) Eighty hours a week?—Yes, sir, and sometimes we work Sunday morning, cleaning fires and so on.

460. But those who come on the Sunday are off on the Saturday afternoon?—Yes, sir, at 2 or 3 o'clock.

461. (*Mr. Richmond.*) Now, what wages do you get per week?—I get 6s. a day. It is by tonnage I am paid.

462. (*Professor Simpson.*) Now, is there anything else that the salt cake workers complain of, except what you have told us of—tightness of the chest?—No.

463. Do you suffer from diarrhoea or constipation?—Yes, sir.

464. Which most, diarrhoea or constipation?—Diarrhoea is the most.

465. You know what I mean by constipation, when the bowels are not moved for days or weeks?—No, sir, nothing like that that I have known of.

466. They suffer from diarrhoea then?—Yes, sir.

467. (*Chairman.*) Now, Mr. Burns, beyond the fact that if there could be a better draught from the kilns to the towers to carry off the gas, you think that the vitriol chambers should be kept in better order. Have you any other suggestion to offer as to improving the conditions of work?—No, sir, not at present; it would be no use my saying anything to them.

468. But we are here to see if anything can be devised practically, to make the work healthier, and anything that you can suggest we will take a note of. The masters will know nothing about your evidence now. You may speak quite freely?—There is nothing more at this present time.

(*Mr. King.*) Would you ask each of them if every chemical worker does not suffer from bronchitis and tightness of the chest, after working a time?

469. (*Chairman.*) Is it a fact that every chemical worker suffers more or less from tightness in the chest?—Yes, sir, they do.

470. You mean the men in your work?—I mean all the men in our work; we get it from the gas, which should be kept down, and is not kept down.

471. (*Mr. Fletcher.*) Did you ever think to tell the inspector when he came that there was a lot of gas floating about, and that it should be reduced?—I was told he was about, and I was told to keep the gas down as well as I could.

472. But did you ever complain to the inspector that there was a lot of gas which was injuring you, and which ought to be controlled?—No, sir, I never did.

485. What do you wash it in?—Soap and water, and scalded in hot water.

486. And then it is sufficiently moist. Will gas come through it still?—Yes, in some chambers you could not keep it out. You would have to have that much flannel that you could not breathe through it, and it would be no use at all to you.

487. The chambers are opened before you go into them?—Yes, for two or three hours sometimes.

488. And is not that long enough?—Yes, sir, it would be if there was any ventilation in them, but there are some of them where they are not able to clear them.

489. And that compels you to go into the chamber when there is dangerous gas in it?—We have to go in ours to get the work done.

490. Could you not leave it until it was clear?—It would not clear itself in a day. Sometimes we have had to leave it until the next morning, or it would eat the face off you, you would be so burnt you could not stop in.

491. Do you grease your face before going in?—Yes, sir.

492. Always?—There are some who do not need to do it, but it is generally the case that you should do it every morning.

G. Burns.

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E. Smee.

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493. How long would you be at work at any one time in a chamber?—Sometimes you might stop in a quarter of an hour.

494. Not longer?—No, sir, but others you could be in for half-an-hour or an hour, some are not as bad as others.

495. Have you worked any others besides Kurtz's?—I have packed an odd chamber in other places, but I never worked regularly anywhere else. I have packed a chamber at Sutton Lodge.

496. Do you feel the gas before you stir the powder?—Just the same, it is just as bad.

497. Before you touch the powder?—Yes, sir.

498. Is there not some means of carrying off the superfluous gas before you enter the chamber, is it not drawn off into another chamber?—No, sir, not that I know of, I have not seen any.

499. Have you any lime distributors?—Yes, we do put lime in.

500. That is distributed?—Yes, sir.

501. Then they do put in lime to absorb the superfluous gas?—Yes, sir.

502. (Professor Simpson.) Then they do use a distributor?—Yes, sir.

503. Do you mean that it is not effectual?—No, it does not clear all the gas, sir. As long as that chamber has been left open it is throwing off the gas all the time.

504. From the lime itself?—Yes, sir, from the time you start packing until you have finished. It is as bad when you have only one tub in the chamber.

505. And it is as bad before you begin, you say?—Yes, sir, and the same right up to the last tub.

506. Were the Sutton Lodge chambers as bad, or what?—I could not say, but the one I was in was not so bad as what I have got to do myself.

507. (Chairman.) What kind of better ventilation would you suggest?—Well, there should be a door at the other end of the chamber, to let the draught come right through, and the side doors should be left wide open. They can scarcely be opened, some of them.

508. Do you mean that there is a door at Kurtz's at one end only?—There is no door at one end, the doors are only at the sides, and you have not the draught coming through.

509. But there are three doors in the chamber?—Yes, five, indeed, in some of the bigger chambers.

510. And how many of those doors are opened before you go in?—They are all opened before you start packing, sir.

511. And the addition you propose is to make this other end door?—One more, so as to let more air in.

512. Have you suggested that to the manager or the master?—I have suggested it over 12 months since, when we had a bother there over a drop which was given us, and it has never been altered since.

513. How do you suffer from this gas?—Tightness on the chest, a feeling that you can hardly get your breath, and you have no wind to follow your work up.

514. How often do you feel this?—There is hardly a day goes over but I get a little or much of it, sometimes worse than others.

515. Anything besides tightness of the chest?—No, I feel nothing else.

516. Any bronchitis?—I feel that in the morning, sir, I cannot breathe in the morning.

517. That is no necessary proof of bronchitis?—It must be something of the sort, sir.

518. How do you know that you have bronchitis?—I do not know that I have it at all, but it is what I thought I have. I have been to a doctor with it, and have been getting medicine from a doctor.

519. Did he tell you what you were suffering from?—Bronchitis.

520. (Mr. Fletcher.) Now do you think that any better class of respirator could be found than what you use?—It might be a better pattern, but I do not know of any?

521. (Professor Simpson.) Do you always wear yours in the Chamber?—You could not go in without them; you would drop, sir.

522. (Mr. Richmond.) Have you worked in the Deacons Chamber?—No, sir, never. I have seen them, but not worked in them.

523. Have you any idea which is preferable?—No, sir, I do not know.

524. As far as gas is concerned?—No, sir, when I saw them I did not understand the work at all.

525. In the Deacon chamber you stand outside and do not go into the chamber at all?—No, sir, but I have never seen them work.

526. What hours do you work?—Well, sometimes there are two Chambers, and at other times only one. When there is only one chamber we could get that done in about eight hours, but if you have two, it may last over 12 hours.

527. (Chairman.) Does it take you as long as that to empty a chamber?—Not to empty them, but we have to start the lime again, and so on.

528. Is that the case in all chambers?—No, there are some places where they just finish the packing, and then go home. They do not lime in the Globe, or break down.

529. Now, as far as you know, do any of your fellow workers in the same department suffer in the same way?—There is not one but complains the same road, they are all touched.

530. (Mr. Richmond.) Do you know the Globe chambers? Have you ever been to the Globe chambers?—I have seen them from the outside.

531. Have they doors at each end as you are suggesting?—Yes, sir.

532. The extra door which you suggest?—I do not know whether it is there, but they are not situated the same as ours. They run one by one along the straight, whilst ours are side by side, so that air can get into them from both sides, you see, in their chambers.

533. (Mr. Fletcher.) Is there some reason at Kurtz's for not putting in the end door?—Not that I know of.

534. (Mr. Richmond.) You cannot get the draught at both sides as at the Globe Chambers?—No, sir.

535. (Professor Simpson.) Do the men suffer at the Globe at all?—I do not know them, sir.

536. The position of the chambers you mean is better at the Globe than it is at Kurtz's?—Yes, sir, it is.

537. (Mr. Richmond.) Now what wages do you earn?—Well, it is tonnage with us, sir.

538. What do you earn a week?—Sometimes we get 2*l.* and sometimes not 25*s.*

539. Well, what is your average?—About 36*s.* on an average. Our place is a slack place for working.

540. That is for six days' work?—Yes, sir.

J. Plant.

JOHN PLANT examined.

541. (Mr. Richmond.) Where do you work?—I am only cleaning schools now, sir.

542. You are not working at chemical works then?—I have not been working at chemicals for the last two years, I have not been able.

543. Where did you work?—At Kurtz's.

544. What department?—I was working the black ash till the last few weeks, and then I was labouring.

545. Then are you a caretaker now?—No, but me and my missus clean the schools, and get ready for the scholars.

546. What did you do in the black ash department?

—I left the salt cake and went to the black ash to get rid of the gas, as I thought.

547. (Mr. Fletcher.) Were you working with revolver or hand furnaces?—I have worked both.

548. You used to work the salt cake?—Yes, sir, but by the doctor's advice I left it, thinking I could get rid of the gas, but I did not.

549. (Mr. Richmond.) What sort of gas did you get with the black ash?—All sorts: salt cake, burner gas, and others.

550. How has it left you?—It has left me so that I cannot breathe at all except it was a very light job.



They found me a light job, but then that department stopped. The last day I worked there I was set picking up old iron round some stills, and I got a touch of the still gas and it laid me up for three weeks, and I never worked there since. When I went back they could not find me this same job again, and that department has never started since.

551. Is there anything in that black ash department, except the gas, that you object to?—I cannot say that there is anything in the black ash; it was the gas from the other departments.

552. (*Professor Simpson.*) How were you affected?—Tightness on the chest, and a very hard cough causing me to spit blood. Sometimes when going home I would take a fit of coughing in the street and drop as if I was dead, powerless and senseless.

553. In consequence of the cough?—Yes, sir, from the gas. On one occasion a policeman thought I was drunk, but I had not tasted.

554. And you were obliged to give up your work?—Yes, sir. Very likely if I had had a drop of whisky it would not have had that effect on me, but I had nothing to get it with.

555. (*Chairman.*) Is there anything dangerous in the black ash department, as to wheeling barrows

over the tanks, or anything of that sort?—I have seen dangerous places a good while since, but I have not seen any lately, that I can say.

556. Have you wheeled barrows over the vats?—Yes, sir.

557. Did you ever know of an accident through any one falling in?—No, but I have often been near having an accident myself. I have let the barrow go in order to save myself.

558. What would you go into?—Into liquor; it is liquid and black ash.

559. It is not liquid?—Not until the water is put on. The liquid is on the top.

560. That is, it is covered with liquid, and would you come in contact with liquid before the black ash?—Yes.

561. How broad was the gangway that you wheeled barrows on?—From 1 foot 9 inches to 2 feet.

562. Not broader than 2 feet?—No, say two full planks.

563. Have you seen any as broad as this table?—No, sir, I have not.

564. Do you not know that there is a tramway running across them?—I am speaking of the time I worked. There may be waggon roads across now.

JOHN MULLEN examined.

*J. Plant.*

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565. (*Mr. Richmond.*) Where do you work?—I am working nowhere at present, sir. I have worked at the chemical works.

566. How long?—Till about a month ago.

567. Were you working at chemical works a month ago?—Yes, sir; and for the last 18 years.

568. Where at?—At Gerard Bridge Works, Mr Gamble's.

569. And you left about a month ago?—Yes, sir, a month I have been out of work.

570. What department were you employed in?—At both departments, both at the weldon process and the salt cake.

571. (*Chairman.*) Which of the two do you think the most healthy?—Well, I think the weldon is, but you have not the same amount of work to do in the weldon as in the salt cake process.

572. Salt cake is the hardest?—Yes, sir.

573. What do you work at in the weldon process?—Looking after the stills, sir; but if I was getting a portion of the gas there I could save myself from it, and go some other way. The only remedy I see if you are getting chlorine gas, is for you to knock off work and take a rest and sleep it out of your bones. I have taken drink for it, but it never did me any good. It will ease you a little until you have a rest, and have had some sleep. Some nights coughing will come on, according to the chlorine you get.

574. (*Professor Simpson.*) Then the only cure, you think, for chlorine gas is sleep?—The only remedy I can see for it.

575. (*Mr. Fletcher.*) It comes from leaks?—There will be a blow sometimes, and you cannot avoid it. It is the still man's fault. Sometimes that gas has come out when the manager has been standing close to.

576. You were the still man?—No, sir; not myself—I was at the salt cake. Mr. Wiles sent word down that he could not come, owing to his having caught chlorine gas by a blow from the stills.

577. You mean that it was due to something under the control of the men?—He did not say anything to the men. He was going through the shed himself, and I saw him getting the gas; I saw him putting his handkerchief in his mouth.

578. Was that the fault of the man at the works, the stillman?—It would be the stillman, sir.

579. He did not get his joints right?—Or he had no room to work it.

580. Did you wear a muzzel?—I have worn a shawl at salt cake, but a man cannot wear it regularly. To do salt cake work he has to work hard, and can keep nothing round his mouth, at salt cake.

581. Did you used to wear the shawl?—Yes, sir.

582. Did you find much effect from the salt cake gas?—Yes, sir; I found effects from it. The men put things into their mouths, they call them bites, a sort of handkerchief. Some of them wear a bite, but I could not bear it, and wore a shawl tied round my mouth, but not holding it in my mouth.

583. Your teeth are gone are they?—Yes, sir, it would go through a shawl.

584. Your teeth are gone and you attribute that to the gas?—Yes, sir.

585.—That is, you attribute it to the gas you got in the salt cake?—Yes, sir, I have lost many a tooth through getting chlorine gas in the salt cake, and when you got some of the gas it would throw you off your work for perhaps 10 minutes, and after that you could not fill this time up. When you are on piece-work, the master will expect you to do so much in the time, and if you do not do it he wants to know whose fault it is. The furnace does its work, and you have to move the cake away. It is bound to affect your breath all the time. I have worked nights and nights, and never touched my meat, I could not eat it.

586. You think chlorine gas is the worst?—Yes, sir, it is much the worst. Any man who is not eating his food is not doing justice to himself.

587. What wages do you earn?—It varies. I have earned 2*l.* a week at salt cake, and I have worked on it for 25*s.* It depends on the furnaces I am at. They are going out of repair and do not work as well, I suppose.

588. What do you place as your average?—I should say about 30*s.* a week. There are plenty that I know of in the same works not getting 25*s.*

589. You think your average would be 30*s.* a week?—Yes, sir, but I have known many a week when men have been off three or four days through getting the gas.

590. (*Mr. Fletcher.*) The object of this committee is to find out some remedy which can be adopted to prevent this injury. It is a defect that we deplore very much. It arises from small leakages in the pipes and stills, as we think?—No, sir, I can tell you one reason for it. A certain portion of it comes from that, but at different times I have seen it since they came on this stilling system, the way they are working the stills now. The stillman is trying to get through his work when he gets a blow from one of the stills, which you could not get to quieten down for two or three minutes, and the force blows the lute out of the pipes.

591. If it blows the lute out of the pipes is it not because there is not water enough in it?—Yes, sir, I daresay that was so, but I have seen it blow what there was in it, and I have seen them put clay, stiff yellow clay, to keep the water in.



J. Mullen.  
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592. Would not the manager soon have that repaired and made deeper?—He could not if he would, as that would be a matter of stopping the works. The process might have to be stopped 24 hours.

593. But you do not want an Act of Parliament to make the lutes deep enough, if the lutes are not already sufficiently deep to keep the chlorine in. I believe that what you suffer from must be the small leakages which are likely to occur?—Yes, sir.

594. And they are stopped with this black cement which is in the hands of the still man?—Then the kilns are close to the salt cake place, and they eat away holes in their covers. It may be two or three months before the men put patches on to them.

595. Why do not you complain to the still man if he does not keep his still tight?—If the still man did not do his work and keep the acid down he would be in fault and they would get another man. This is not the still man's fault. He may be doing another job, and if he puts the cement on it may blow off, and there will be another little hole on this top. I have seen them like a riddle. It is suffering from chlorine gas that all these men are complaining of. I have known it myself.

596. (Professor Simpson.) Can you suggest any remedy for the chlorine in the bleach powder places?—No remedy, only to put you off your work and let you sleep. You may take a glass of whisky or of rum for it, and it will ease you for the time.

597. But is there any remedy for stopping it?—Yes, sir, but all the remedy I can see is their repairing these leakages, where it comes from.

598. I am speaking of the bleach chamber?—I never worked about the bleaching powder, not but about the salt cake and stills.

(Mr. King.) I should like to give evidence, sir.

(Chairman.) We have your evidence before us, the evidence taken before the Labour Commission, but if you wish to give any further evidence we shall be happy to hear it.

(Mr. King.) Yes, sir, I do, about preventable accidents and the unreliability of the statistics relative to the health of the men. The reason I brought this man Plant to-day was, that he is one of hundreds who have lost their health in chemical yards. They have then been driven out of the chemical yards and sent about their business, and after they have left and turned to something else, and in a year or two have died, and instead of their deaths being attributable to any diseases caused by the chemical works, they are put down as general labourers, and you cannot come to any conclusion with regard to chemical workers in consequence. I could illustrate that in the case of Dick Shone, who gave evidence before the Commission, and looked quite as healthy as these men. At the time he gave evidence I told them privately, and the secretary in particular, that the man would not live two years and he has since died. Immediately after he came out from the Commission they banished him out of the works altogether, and he died a bricklayer's labourer. Then I have known men who have lost both arms and legs by accidents which could be very easily prevented.

(Chairman.) We will hear any evidence you have to give as to preventable accidents, but all you have said so far will apply to any trade. A man going out of any trade is not registered as belonging to that trade, and we know the value to place on statistics. On the question of preventable accidents, if you tell us of any which might have been prevented, and give us the means whereby they can be prevented, we shall be glad to hear you.

(Mr. King.) There is a man who lost both legs, and is at present in the Prescott Workhouse. He was walking across a yard one night, when he fell into a well containing some machinery, and which was not fenced in, and lost both his legs. That was at Sullivan's. Now, immediately it became known that this accident had happened there they fenced in the machinery, and it is quite impossible for an accident of that description to happen there again.

(Chairman.) What kind of a machine was it?

(Mr. King.) It was an outside crank pit. It was not fenced in or covered over.

(Mr. Richmond.) But that is required absolutely by Act of Parliament, without our legislating for it.

(Mr. King.) If there was a man, what we might call a practical working man, to act under the inspector as

sub-inspector to look after these things, especially such as the breaking of the plank which has been referred to, and things in connexion with these particular places, and I think the powder chambers should be more in the open, like the Globe, it would be better, so that the air should have access from every quarter, so as to take away the gas. I could not understand at first why they are worse in Kurtz's than at the Globe, and the work harder, but it is because the Globe yard is more in the open; the men said "Look at the open" a long time before I understood it. I think there should be some plan devised for giving more space. Land ought to be taken from the landlords by the employers compulsorily. At present it is too dear, and they are inclined, I think, to put their plant a little closer than they otherwise would if able to obtain land cheaper. I say for manufacturing purposes manufacturers should not be handicapped by all paying excessive prices for the land on which to build industrial works.

(Chairman.) I think the manufacturers will agree with you.

599. (Dr. O'Neil.) Had that man any business there who had his legs taken off?—He was going to the W.C., I think.

600. There was no water-closet there, and as a matter of fact he had no business there?—He declared to me that he was going out to attend to a call of nature when he tumbled into this crank pit. Then, during his illness while he was laying in bed (I tell the tale as it was told to me) the fireman came to him making all sorts of promises that they would see he did not want in future, and eventually got him to sign a paper practically contracting himself out of the Employers' Liability Act, and agreeing to take a certain sum. This may or may not be true, but I think the time ought to be extended to prevent men contracting themselves out of the Act in this fashion.

(Chairman.) Then now is your time for impressing that opinion on the Home Secretary, while the Employers' Liability Amendment Bill is before the House of Commons. You might take steps to make your views known, but we could not do that.

(Mr. King.) These men, too, will tell you that they are more susceptible to the gas when they are working a long time, the last two or three hours of the 12, than the whole 10 previously. I believe that if the hours of labour were shortened in connexion with chemical and copper works, the health of the men would be very considerably preserved. When they are bodily fatigued they are more susceptible to getting gassed.

(Mr. Richmond.) This is in favour of having eight hours?

(Mr. King.) Yes.

(Mr. Richmond.) Then what do you say about the reduction of wages in consequence.

(Mr. King.) Well, I do not think that the reduction ought to be corresponding, because I believe that if the men only worked eight hours they would be able to give more heart to their work, and more ready minds to it, and by that means do much more than they would be able to perform in the same space of time where they worked 12 hours.

(Mr. Richmond.) But take the case of a still, or anything like that in constant work, it cannot do more than a certain amount of work possibly, can it?

(Mr. King.) No.

(Mr. Richmond.) And it produces exactly the same amount whether it is worked by two sets of men at 12 hours each set, or by three sets at eight hours each?

(Mr. King.) Well, I would not like to say that it would not produce more with three sets. Mr. Brunner told me he was better satisfied with the men having eight hours instead of 12, and the loss did not much effect the men, who had 4s. 1d. a day, and I think he took off the odd penny.

(Mr. Richmond.) But you must bear in mind that Brunner, Mond, & Co. are a very successful company, and pay large dividends, but you have to deal with the case of works which are not making very large profits also, and you cannot expect masters to run their works at a loss, can you?

(Mr. King.) No, certainly not.

(Mr. Richmond.) And you have got to meet that fact that stills can only produce a certain amount, and the cost of production must be met.



(Mr. King.) Yes, but I think that could very easily be met by a board of conciliation and arbitration on a sliding scale, which could be very well adopted.

(Chairman.) Do not you think that members of unions could bring that about? They have brought it about in some trades.

(Mr. King.) I am a member of the Liverpool Board, and the other day there were two cases where the men were willing to submit to arbitration, but the masters would not, and I do not think they will submit to arbitration until they are compelled to do so.

(Professor Simpson.) Supposing that you were manufacturing an article against the competition of France and Germany, do you think you would be willing to concede eight hours, and give the men the same wages?

(Mr. King.) Certainly not. If I was convinced that such was the case, certainly not. I certainly would say the first thing in the minds of the working men should be to look and see that they were not interfering with the trade of the country, or unduly hampering it, and giving a preference to the foreigner.

(Professor Simpson.) That is sometimes forgotten, I think.

(Mr. King.) It may be, for at the times when there is conflict between masters and men it is practically war, and they do not take these matters into consideration. But I think if the more thoughtful men met together, and the masters said we will arbitrate, or in any way showed a willingness to give and take, the men would listen to it, and we should not have the strikes taking place that we have had.

The proceedings then closed.

Mr. King then stated that he had three witnesses present from Widnes.

The Chairman thought that if the witnesses worked in the same departments as the witnesses already examined it would be unnecessary, and one of them, Mr. Healey, had already given evidence very fully before the Commission. This Committee also intended to visit Glasgow in a week or two, to see both masters and workmen, and to visit the works for themselves.

(Mr. Fletcher.) The question is whether certain rules can be adopted which would benefit the men in preventing accidents. Anything personal to the men we leave them to deal with themselves. The general question of the condition of the chemical trade is a very large one. We know that the chemical works are not drawing-rooms or bowling greens, but the question is, can we adopt some regulations which shall benefit and help the men in the work which they carry on.

(Mr. Richmond.) You see this is an inquiry solely on account of the Factory Act Department. Mr. Fletcher, who has charge of the question of alkali gases, and so on, is attached to quite a different department altogether. In fact it is not a Home Office matter at all. There have been rules adopted with regard to keeping down gases.

(Mr. Fletcher.) Yes, that is what the inspectors are all busy about.

The Chairman asked whether, after what had been stated, Mr. King still wished these men to be examined?

(Mr. King.) Oh, certainly not, if you do not think it necessary.

(The Chairman.) I do not think any good would come of it, or we would do it with pleasure.

J. Mullen.

28 July 1893.

Date of Application, 22nd Nov. 1888.

Specification accepted, 15 Jan. 1889.

A.D. 1888, 22nd November. No. 17,012.

### COMPLETE SPECIFICATION.

IMPROVED APPARATUS for subjecting PULVERULENT OR GRANULAR MATERIALS to the ACTION OF GASES.

I, ROBERT HASENCLEVER, of The Chemische Fabrik Rhenania, Aachen, Germany, General Director, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

My invention relates to an improved construction of apparatus for subjecting pulverulent or granular materials to the action of gases, such for instance as for the absorption of chlorine by lime in the manufacture of chloride of lime, which apparatus consists mainly of a series of horizontal or slightly inclined closed channels or tubes arranged either one above each other or side by side, and each provided with stirring and propelling apparatus, the said tubes being made to communicate with each other and with a gas supply, in such a manner that the pulverulent or granular material fed into one end of the first tube is caused by the stirring and propelling apparatus to pass consecutively through all the tubes, while at the same time the gas with which the material is to be treated is made to enter the last tube and to pass consecutively through all the tubes in the contrary direction to that in which the material travels, this being brought into intimate contact with the gas during its transit by means of the stirring apparatus.

On the accompanying drawing is shown a construction of the above-described apparatus more particularly suitable for the absorption of chlorine gas by lime. Fig. 1 shows a sectional side view, Fig. 2 shows in end view and cross section, and Figs. 3 and 4 show enlarged details. A, B, C and D are a series of superposed pipes of which a greater or less number can be used, according as the quantity of gas to be absorbed is great or small.

Each tube contains a stirring and propelling apparatus consisting of a shaft T carrying a number of oblique radial blades U which are by preference widened out at the end, as shown at Fig. 4 so as to afford considerable surface for raising and propelling the lime. The ends of the shafts T are carried in bearings in the end covers

of the tubes, as shown, and they are each provided at one end with a spur wheel V, such wheels being all made to gear with each other as shown. On the lowest shaft is a worm wheel W gearing with a worm X. The worm wheel W is loose on the shaft T, but is connected thereto by a pin X', passed through holes in both V and W when it is desired to work the apparatus, the rotary motion thus imparted to the bottom stirring apparatus being connected to the upper ones by the gearing V.

When it is desired to stop the motion of the apparatus, the pin X' is withdrawn.

The lime is charged into the one end of the top tube A through the hopper E, and is caused by the blades U to travel slowly to the other end, where it falls through a branch pipe F, connecting A with B, into the latter. Here it is conveyed back to the other end of the tube, where it falls through a connecting branch G into C, and so on, the lime being made to pass from C into D through the branch H and being eventually discharged through a shoot I into a suitable receptacle, or a transporting worm, that collects the lime discharged from a number of such apparatus.

The chlorine gas is made to enter the lowest tube D at the discharge end through a lateral inlet K, and in flowing through the same is brought into intimate contact with the lime as it is raised up by the stirrers. From the other end of D the gas rises through the connecting branch L into C, and in like manner through the branches M and N successively into B and A, the unabsorbed portion of gas, if any, passing off from the inlet end of A through the branch O. The gas might also be made to enter the several tubes through the same branches F, G, H through which the lime descends, but in order to prevent the gas from carrying too much of the lime dust with it, it is preferred to admit it as described.

The hopper B has, as shown at Fig. 3, a description of throttle valve a which receives a reciprocating motion as indicated by the arrows by means of a weighted arm b and revolving cam c so as to alternately open and close the hopper-opening, and thus produce a regular discharge of material from the hopper.

For observing the action of the stirrers, the tubes A, B, C, D are formed on one side with openings which are closed tightly by covers P, which can however be readily removed when it is desired to inspect the interior of the tube, or for cleaning the same.



Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Apparatus for treating pulverulent or granular materials with gases, consisting of a series of closed tubes communicating with each other alternately at opposite ends and containing revolving, stirring, and propelling apparatus so arranged that the said material fed into the one end of the first tube is caused to pass consecutively through all the tubes, and is at the same time stirred up so as to be brought into intimate contact with the gases flowing through in the contrary direction, substantially as herein described.

2. In apparatus for treating pulverulent or granular materials with gases, the combination of closed tubes such as A B C and D having closed sight holes such as P and connected together by branches such as F G H, stirring and propelling apparatus consisting of a shaft T with stirring blades U, an inlet E for the pulverulent material and an outlet for the gases at one end of the first tube and an outlet I for the pulverulent material and an inlet K for gas at one end of the last tube, substantially as herein described with reference to the accompanying drawing.

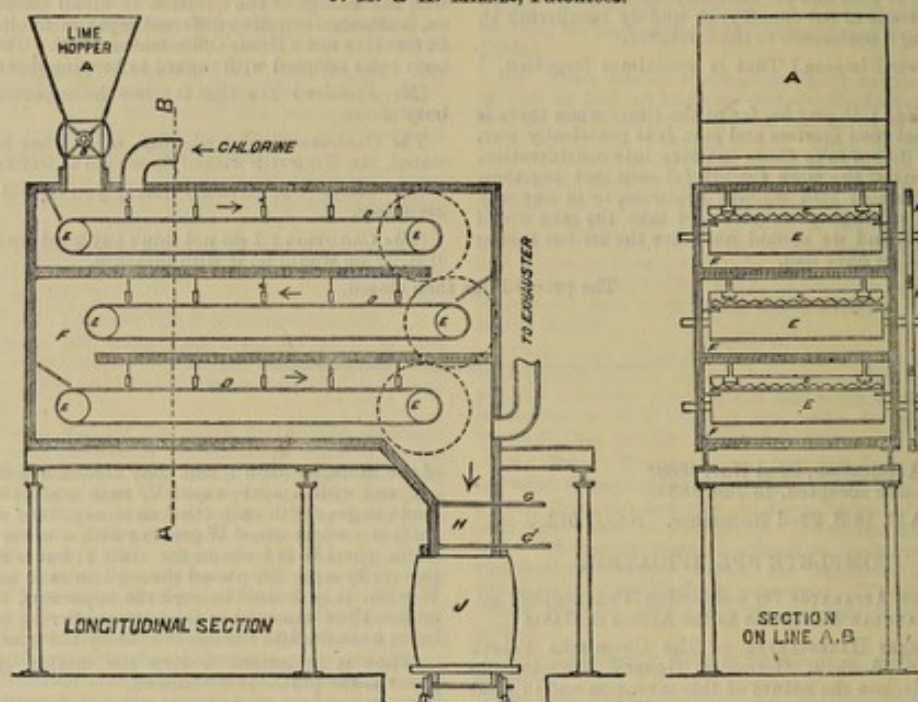
Dated this 22nd day of November 1888.

ABEL & IMRAY,  
Agents for the Applicant.

### IMPROVEMENTS IN THE MANUFACTURE OF BLEACHING POWDER.

PATENT AUTOMATIC CONTINUOUS PRODUCING CHAMBER, A.D. 1891, No. 15,833.

J. M. & A. MILNES, Patentees.



*Description of Drawing.*

"A" is a hopper receiving the ground slaked lime intended for chlorine saturation. "B" is an automatic admission valve, so arranged that the quantity of lime admitted into the chamber can be increased or diminished at will. "C C C" are combs suspended from the chamber divisions over each belt for the purpose of regulating the thickness of the layer of lime, and also to turn over the lime as it is being carried along by the travelling belt, thus presenting continual changes of faces in the lime layer exposed to the action of the saturating gas. "D D D" are the endless travelling belts of asbestos cloth running over the cylinders "E," placed one at each end of the travelling belts. "F" is the chamber, built preferably of slate slabs, and divided into three or more compartments or divisions. "G" "G" are dampers for respectively admitting the saturated lime (bleaching powder) into the receiving chamber "H," and from it into the packing cask "J." "K K K" are spur gear wheels for driving the travelling belts "D D D."

#### *Method of Working.*

The machine is so simple in construction and manipulation that the drawing pretty well explains itself. The lime intended for saturation is elevated into the hopper "A," from whence it is admitted on to the first travelling belt by means of the valve "B." The first belt carries the lime from the left to the right end, where it falls upon the second belt, and is carried from the right to the left end; here it falls upon the third belt, and is carried again from the left to the right end, where it falls upon the first damper "G," from whence it is admitted into the receiving chamber

"H," the speed of the travelling belts being so regulated that the material shall be saturated with the gas up to the required commercial strength. The upper damper "G" is then closed, and the lower damper "G" is opened, admitting the saturated lime, which is now chloride of lime (bleaching powder), into the packing cask, which is then headed up and passed for shipment.

#### *The present Method of Manufacture.*

The method of manufacturing bleaching powder as at present conducted is as follows:—

A chamber of lead sheets, supported and strengthened by timber supports, is erected as a rule on a level with the ground, usually from 30 to 50 feet long by 20 to 30 feet wide, and about 5 to 6 feet high. This chamber has doors at each side, through which the lime is wheeled in barrows, and is then spread by means of rakes over the surface of the floor. When the floor of the chamber is covered all over, the doors are closed and the chlorine gas is admitted through a pipe on the roof of the chamber. When the lime is partly saturated the doors are opened and men enter the chamber, and with rakes proceed to turn over the lime, in order to present fresh surfaces to be acted upon by the gas. This operation being completed, the doors are again closed and the gas is again admitted. The chamber is left closed until such time as the lime becomes saturated with the gas up to the required commercial test strength. When this has taken place the doors are once more removed, packing casks are rolled into the chamber, and men enter and with shovels pack the bleaching powder into the casks. It will be easily seen that these three operations of (firstly) spreading the lime on the floor of the chamber, (secondly) the raking over



when the lime is partly saturated, and (thirdly) the packing of the finished bleaching powder into the casks, entail a considerable amount of hand labour. Moreover, the two last-named operations are highly prejudicial to the health of the operatives (as shown by the evidence given before the Labour Commission), and also a considerable cause of nuisance to the communities in the immediate vicinity of the factories where the manufacture is carried on.

#### Objections to the present Method.

The objections to the present primitive method of making bleaching powder are many. That the workmen suffer very considerably there cannot be any doubt, and to illustrate this we give a few extracts taken from the evidence given before the Royal Commission on Labour.

(The figures indicate the number of the question, and the extracts are from the authorised report of the "Minutes of Evidence.")

Mr. George Mitchell, Secretary to the Labour Literature Society of Glasgow, replying to Mr. Mundella, says as follows:—

21,227. You think a vitriol burner ought not to work more than six hours a day?—Yes.

21,228. Any other workers who should be restricted to six hours a day?—Those who work in the bleaching powder department ought to be restricted to that.

21,229. They ought to be restricted to the six hours a day?—Yes.

21,230. Are there any that ought to be less than six hours a day?—Of course I am not prepared to say that any ought to be less. *If by some means of compulsion the employers had to use every method, every invention which is adopted, which has the object in view of making the work as sanitary as possible, then probably six hours a day would not tax them quite so much as even three under the conditions under which men have to work placed as they are at the present time.*

21,273. Now as to the sanitary conditions, what do you say to them?—(After describing the unsatisfactory state of the ventilation in the works, the witness goes on)—it is no uncommon occurrence round about the district of a chemical works that for probably, say a quarter of a mile, you will find the smell of the gases so strong that at times those not accustomed to it will find their eyes watering.

21,277. Do you think that the average death-rate is worse amongst the chemical workmen than amongst the ordinary workmen?—Taking the per-centage of the men who keep working at the chemical industry, it is much higher—terribly higher, in fact.

#### Examined by Mr. LIVESEY.

21,312. Then the work of the bleaching powder makers; is that continuous?—No, it is not quite continuous. The time they are at it, though, *their work is physically very hard, and they are in a very stifling atmosphere of chlorine.*

#### Examined by Mr. TOM MANN.

21,454. Are you familiar with the bleaching powder department?—Yes, fairly well familiar with it from my being always in it, more or less.

21,455. What about the conditions that obtain there, are they fairly healthy?—No, not healthy.

21,456. Are they very unhealthy?—Very unhealthy, from the fact that *one not accustomed to it at certain times may pass the bleaching chambers, and if the gas has not time to get away, it will so catch him that he may drop down.*

21,463. Is that the department where the muzzle is worn?—Yes, the muzzle is worn in that department.

Mr. THOMAS STEEL, representative of the Tyneside and National Labourers' Union.

#### Examined by Mr. MUNDELLA.—

With reference to the use of the "muzzle" alluded to by the last witness. (*This "muzzle" is composed of layer upon layer of flannel to the thickness of six or more inches.*)

21,610. What proportion of your men use these muzzles?—Every man in the bleach works has to use one, he could not work without it. . . . They make a filter very often by putting a large piece of flannel folded up several times into their mouths and biting it

and drawing every breath through that, or when they are going to be continuously at work they get a large pad. I believe you have seen the muzzle—and they put it over their mouths, and they have to draw the whole of their breath through that, which is, of course, a great strain on the chest.

21,611. That applies to the bleaching powder chiefly, does it not?—Yes, chiefly.

#### Examined by Mr. TOM MANN.

Mr. Steel, in answer to a question as to whether he would advise the use of certain mechanical means, says (21,684) *Certainly, and if anything better can be got afterwards have that too, anything that would remove any of the superfluous gas. In the first instance it should not be allowed to get into the exterior atmosphere at all, that is against the Alkali Act, I believe; and secondly it is a loss; and thirdly it is injurious to health.*

#### Mr. P. HEALEY, Mr. R. SHIEL, and Mr. J. CASEY.

#### Examined by Mr. MUNDELLA.

22,496. (To Mr. John Casey.) What departments have you been in?—Only the bleaching powder.

22,497. How many hours a day do you work?—Between six and seven.

22,502. Do all the men engaged in powder packing work only six or seven hours a day?—Some work under.

22,503. You say that is as much as you can perform?—Yes.

22,504. Will you explain why it is that you cannot work longer?—I can just show you how I have got to work (*producing muzzle*).

22,505. That is your muzzle through which you inhale when you are packing?—Yes.

22,506. And do you wear that all the time?—Not all the time. Sometimes we cannot keep it on five minutes. Sometimes we keep it on for twenty minutes.

22,507. When you are in the act of packing you are obliged to keep it on?—*Certainly. I should be suffocated altogether if I did not keep this on.*

22,508. And have you ever suffered from your work?—Yes. I have been cut and burnt with the bleaching powder on my chest.

22,509. And you work in a muzzle? I suppose you wear goggles also, do you not?—Yes.

22,510. To preserve your eyes?—Yes.

22,513. How does it affect you, in the chest?—Yes.

22,514. Your work is spade work, is it not, chiefly?—*Yes, it is all spade work.*

22,515. What you suffer from is the escape of chlorine gas, I suppose?—Yes, that is what we suffer from. *When we go into the chamber, sometimes we are not able to stop in the chamber five minutes, sometimes a quarter of an hour, sometimes half an hour. Sometimes you cannot stop two minutes.*

22,515a. On account of the amount of gas?—Yes, it is inside the chamber.

22,554. (To Mr. Carey.) You heard the evidence of the previous witnesses?—Yes.

22,555. Do you generally agree with what they have said to us?—Yes.

22,556. Have you anything further you would like to state to the Commission?—I have got the muzzle with me. (*Witness put on the muzzle.*)

22,557. Whenever you are packing in a hot chamber you are obliged to use that?—Yes.

22,558. And no man could enter the chamber without it?—*No, they could not put their noses inside.*

22,559. It is nothing but ordinary flannel?—Yes.

22,560. Several folds of ordinary flannel?

(Mr. Shiel.) Yes. It has to be the best flannel—it has to be renewed—it gets eaten away with the gas.

22,561. And six or seven hours a day is as much as a man can work at that sort of work?—Yes.

22,562. When you enter the chamber you work for a few minutes at a time as long as you can and then come out?—Yes, sometimes we stop ten minutes, sometimes twenty minutes.

22,564. Then about twenty minutes is the longest time you can stay in the chamber, is it?—Yes.

Though much more evidence is given, the foregoing will be sufficient to indicate that the present method of manufacture is highly objectionable on the grounds stated, viz., of being needlessly expensive and very dangerous to the health of the operatives, and also the cause of serious nuisance to the surrounding neighbourhood of the bleach factories.



Some little time ago a trade journal sent a special commissioner to St. Helens, in Lancashire, to report upon the nature of the work of chemical operatives, and in an article under the head of "British Slaughter-Houses," speaks as follows with regard to the workers in the bleach departments:—

"The duties of the powder packer consist of filling casks with bleaching powder. To do that he has to enter the chamber, which for several days past has been charged with the chlorine gas. Though the worst of the gas has been allowed to pass out of the chamber before the packer enters it, the atmosphere is still charged with the deadly fumes. The heat is something tremendous, especially as the poor wretch who has to endure it is swathed about the head in a way that would protect him from arctic cold. How does the packer protect himself? Ten years ago he simply wound a few folds of flannel round his mouth, which sufficed to filter the air through. The strength of the gas then was nothing like what it is now. As the eyes were unprotected, and they are very sensitive to contact with the chlorine, the packers in former times, however, stayed for a shorter time in the torture chamber than they do now. Besides this the chambers were smaller, so that the work per man was less than now. . . . Before he approaches his work now the man gets himself up in the fashion depicted in the photo. He wears a round paper cap; his eyes are covered with a pair of enormous goggles. Then comes the muzzle. This formidable respirator is composed of twenty-six folds of flannel, wide enough to cover the space from the upper lip to the neck. This is lashed tightly under the chin and round the neck with cords. No space on any account must be left through which the horrible chlorine may find its way to the mouth. The ruts in the flesh which are cut by cords not infrequently afford an inlet for the gas; if the muzzle is replaced after an interval for breath over the ruts instead of exactly as it was before, with the cords fitting into the grooves in the flesh, the man will be 'gassed.' When the muzzle is on, the effort of breathing appears to be most painful even in the open air. The chest heaves like that of a man struggling for breath in the violent stages of lung disease.

"The appearance of the face of the muzzled man gives you an impression, which you cannot shake off; that he is being suffocated; the eyes seem distended as they stare out through the goggles; the veins of the forehead are swollen and the flesh is puffed up in a scarlet ridge round the top of the muzzle.

"I ought to have mentioned an additional precaution which is taken before the muzzle is put on. The men grease themselves thoroughly all over their face and neck, and wherever the skin is exposed. Round their legs they tie paper closely, and in these gaiters, with their feet encased in thick wooden clogs, they step into the powder. It is like stepping into the flames; for although they shovel a clear place to stand in, the feet and legs are exposed to tremendous heat.

"Their arms, in spite of the grease, frequently bleed. 'Let me see,' I said to one of the packers, who in a quiet matter-of-fact way was giving me his version, 'pull up your sleeve.' He hadn't been working for a week, he said, so that the arms were nearly well. They were covered with little half-healed scars, where the corrosive stuff seemed to have burnt in. The packers' arms are in a chronic state of inflammation. To use their own expression, 'they are on fire.' At night they cannot keep them under the bedclothes.

"What is it like, being gassed?' I asked the man. 'Like having a hot poker shoved down your throat,' was the answer. 'You feel done for. Whether you lie by for a day or longer, it takes you fully a week to get over it. Sometimes your mate will help you out with your share, and you stay about and make a show of helping, but it is no good. When the stuff has got down your throat, you can't eat anything. If you manage to swallow a bit, you vomit it up again directly. All you can take is drink—whisky is the best thing.'

"But you old hands don't get gassed, do you?' I queried. But I was mistaken. Every man is liable to a visit of the gas right through the muzzle. Gassing is such a common matter, that the men describe its symptoms as they would tell you what their Sunday's dinner was like.

"Is it ever fatal?'—'Yes, sometimes.'

"The length of time which has to be passed in the torture chamber cannot be stated exactly. There is so much work that has to be done in the time, and each man sticks at it as long as he can hold out. The amount of work, as I said above, has been increased of

recent years by the devilish application of the piece-work system. Then whilst he goes out to recover himself, his mate takes a turn. Perhaps a 100 yards may have to be traversed to the hut where the grease and water are kept, and really fresh reviving air is not to be had anywhere inside the works. Usually the spell of rest is no longer than will allow the packers to fetch their wind again, get a blow through their noses, or unloose the muzzles and repeat the greasing process. Frequently the men are on duty 12 hours; in some places they are allowed to escape after eight or nine hours of it.

"The man who lent me his muzzle was in his working togs, wooden clogs, paper leggings over his trousers. I got him to give me his clothes bill for a fortnight. The items are as follows. They were checked by a number of other men, and are under rather than over the mark:—

	s.	d.
5 cotton shirts at 1s. 2d. . . . .	5	10
1 pair of clogs in three weeks at 3s. 6d. . . . .	2	4
1 singlet at 3s. . . . .	3	0
1 pair trousers, with patchings, at 3s. . . . .	3	0
Flannel for renewing muzzle . . . . .	1	0
	15	2

"These particulars were somewhat staggering, but the packer asked me to look at his clothes. His shirt was torn, I noticed, and in several parts hung in strips. It was hardened by the acid or powder, and tore freely wherever one laid hold of it. This shirt had seen two days' work, and was now good for nothing. Through the rents the chlorine gets at the flannel singlet and attacks that. His trousers were held together by some rough patches. Patching clothes is, however, out of the question as a rule. I tried to get a pin through the shirt but the stuff was so caked and stiffened with the sweat and powder that it was like pushing it through plaster. 'Besides,' said the men, 'we can't ask our wives to patch our clothes. The acid gets at the ends of their fingers and burns them. There is nothing for it but to be continually buying fresh things as the old ones give out.'

"As I said last week no definite period of work is assigned to the packers. They must work when they are wanted, that is when the chlorine chambers require to be emptied. I believe that on the Tyne the packers do not exceed four hours a day. The St. Helens men would be delighted indeed if they could have the limit drawn there.

"There is probably no calling in the whole sphere of industry so terribly trying as the powder packers. No one denies this, but hitherto no one has taken the trouble to make things as easy as humanity demands for these sorely tried men. Does any one mean to say that mechanical ingenuity is baffled at this time of day in devising a means whereby work may be done even in the suffocating chlorine chambers with a sufficiency of air? If a premium of 100l. were to be offered by the alkali magnates, there would be chlorine diving suits put together in no time, with proper air pumps and an anti-corrosive coating which would resist the rasping and tearing of the dust and gas. The directors might do worse than keep the photo of the powder packer's head, which appeared last week, on their breakfast tables and in their board-room, just as a reminder."

#### Press Extracts.

"Paper Making," the recognised organ of the paper trade, says (February 1st, 1892), in an article describing Messrs. Milnes' patent chamber, "We give below an outline of an improved chamber constructed for the impregnation of lime by chlorine gas. In the usual chambers the lime is spread upon the floor, and the chlorine gas is allowed to fill the chamber and to remain therein until absorbed by the lime. Then the side doors of the chamber are opened, and the lime is turned by hand by men who are naturally more or less choked by this very disagreeable job. Then, after again being submitted to saturation by fresh chlorine, the operation is concluded, and the men have again to enter the chamber and fill casks with the bleaching powder. Our readers will not be surprised to know that this is a very hard task for the workmen concerned. By Messrs. Milnes' patent chamber all the hand labour is done away with." After describing the working of the chamber, the writer concludes by saying, "The whole affair is



"extremely simple and not expensive to erect. The relief afforded to the operatives is our great matter for consideration, as well as the saving in cost of production of bleaching powder packed in casks and ready for heading."

"The Chemical Trade Journal" (September 3rd, 1892) says:—"One of the chief points upon which the arguments in favour of shorter hours in the chemical trade are hung, is the arduous and trying occupation of those engaged in the production and packing of bleaching powder. Any improvements which will enable manual labour in this particular department to be reduced to a minimum will, therefore, in the majority of cases be eagerly sought for by managers for innumerable reasons. We take this opportunity of calling the attention of those whom it may interest to the recent patent of Messrs. J. M. and A. Milnes. This patent consists virtually of an automatic bleach chamber. Although the apparatus is designed to affect the saturation of any solid material with gases or vapours, we shall confine our attention to the application of this apparatus to the absorption of chlorine gas by lime for the production of bleaching powder." After describing the machine, the article goes on: "The apparatus, as will be seen from the drawing, is so simple that it is quite unnecessary to give any explanation of the method of working."

#### Advantages claimed.

The advantages we claim for our machine over the present method of producing bleaching powder are briefly as follows:—

- The lime being introduced into the chamber automatically, we save the cost of the hand labour incurred by men having to enter the chamber to spread the lime upon the floor.
- That the lime requiring no further attention from the time of entering the saturating chamber until it arrives at the receiving chamber ready for admission into the casks (the turning over being accomplished by the combs) the expense of intermediate handling is avoided.
- The expense of hand packing is saved as the bleaching powder is simply admitted from the receiving chamber into the casks, and requires no further handling beyond the heading of the casks.
- The compensation to the operatives for destroyed and extra clothing is likewise avoided, as also allowances for illness.
- The saturating chamber being practically sealed there is no escape of chlorine into the surrounding atmosphere.
- The production of bleaching powder by our method becomes continuous instead of intermittent, as at present.

NOTE.—Upwards of 150,000 tons of bleaching powder are made annually in Great Britain alone.

J. M. MILNES,  
Mechanical and Chemical Engineer,  
110, Cannon Street,  
London, E.C. }  
A. MILNES, M.A., F.S.S., } Patentees.  
Her Majesty's Civil Service,  
22A, Goldhurst Terrace,  
South Hampstead,  
London, N.W. }

#### THE UNITED ALKALI COMPANY, LIMITED (ST. HELEN'S DISTRICT).

STATEMENT showing the HOURS of ATTENDANCE of the WORKPEOPLE in the different DEPARTMENTS, and TIME SPENT in actual WORK, and REMARKS on the NATURE of the WORK, &c. SICK AND ACCIDENT CLUB (GLOBE WORKS), and DEATH-RATE, &c.

##### VITRIOL DEPARTMENT.

###### Burnermen:

Average hours of attendance - 84 per week.  
" " spent in actual labour - 28½ "  
wages paid - 32s. 6d. "  
(Muzzles not used in this department.)

##### SALT CAKE DEPARTMENT.

###### Potmen and furnacemen:—

Average hours of attendance - 68½ per week.  
" " spent in actual labour - 51 "  
wages paid - 32s. 6d. "  
(Muzzles not used in this department.)

The boilermen referred to Mr. King's evidence in connexion with this department have no existence.

##### BLEACHING POWDER DEPARTMENT.

The processes under this Department are:

- Chlorine still working.
- Neutralizing.
- Blowing or manganese recovery.
- Lime dressing.
- Bleach packing.
- Knocking down.
- Heading up casks by coopers.

###### (a.) Chlorine stillmen:

Average hours of attendance - 71 per week.  
Work extremely light—viz., opening and shutting taps.  
Average wages, 1891 - 35s. per week.  
(Muzzles not used here.)

###### (b.) Neutralizers:

Average hours of attendance - 71½ per week.  
Work very light.  
Average wages, 1891 - 25s. 6d. per week.  
(Muzzles not used here.)

###### (c.) Blowers and limepot men:

Average hours of attendance - 70 per week.  
Average wages, 1891 - 34s. "  
(Muzzles not used here.)

###### (d.) Lime dressers:

Average hours of attendance - 63 per week.  
Average hours spent in actual labour - 30 per week.  
Average wages, 1891 - 45s. 2d. "  
(Muzzles not used here.)

###### (e.) Bleaching powder packers:

Average hours of attendance - 30 per week.  
Average hours spent in actual labour - 15 "  
Average wages, 1891 - 68s. 6d. "  
(Muzzles are used by the men in this operation.)

###### (f.) Knocking down:

Average hours of attendance - 48 per week.  
Average hours spent in actual labour - 30 "  
Average wages, 1891 - 30s. "  
(Muzzles are used by these men.)

##### PEARL HARDENING DEPARTMENT.

Average hours of attendance - 56½ per week.  
wages - 23s. "  
Work very clean, and not laborious.  
(Muzzles not used in this process.)

##### COPPER EXTRACTION DEPARTMENT.

Average hours of attendance - 68 per week.  
" " actual labour - 30 "  
wages - 35s. 6d. "  
(Muzzles not used.)

##### ARTIZANS.

Hours of labour - 56½ per week.  
Average wages - 35s. 6d. "

##### LABOURERS.

Hours of labour - 56½ per week.  
Wages range from 17s. to 24s. per week.

The hours of attendance, except in the case of the artisans and labourers, include meal times.

Of the total number of men engaged in manufacturing operations, only about 2½ per cent. wear the muzzles, and the necessity it not imperative, except in the case of the bleach packers.

To explain the conditions under which bleaching powder packing is performed, a description of the bleaching powder chamber may be of assistance. The chambers vary very much in size as regards length and breadth, but the height is nearly in all cases about 6½ feet.

\* In the case of lime dressers, packers, and knockers-down, the Globe Works have been taken, as these are the only works in the district where the duties are distinct and divided.



The chamber is formed of sheet lead attached to a timber frame work. There are one or two doors at the ends of each chamber, which serve the double purpose of charging the chamber with lime and ventilating it before packing. The structure is supported on cast-iron columns or brick pillars at a height about 6½ feet from the ground.

The chamber bottom is supplied with shutes, which are connected with casks placed on the ground floor to receive the bleaching powder. The connexion between the shute and the cask is of calico, to prevent loss of the powder.

The space underneath the chamber is not enclosed, so that there is nothing to impede a free circulation of air.

In the manufacture of bleaching powder, after the lime has been saturated with chlorine, any excess of the latter is drawn off over the freshly-lined chamber. The atmosphere of every chamber about to be packed is tested for the quantity of chlorine present, and the doors are not allowed to be taken down until the quantity of chlorine is reduced to under two grains per cubic foot.

After the doors are taken down, the packers do not enter the chamber until it has been thoroughly ventilated, and the only gas with which they have to contend is the small quantity held interstitially or mechanically by the thin layer of bleach to be packed.

This small quantity of gas is effectively intercepted by the flannel muzzles. The men wearing these muzzles suffer no inconvenience when habituated to their use. The position of bleaching powder packers is always in requisition, and with men of temperate habits is one of the most healthy occupations in connexion with the chemical industry, and will compare well with those in other industries.

Of the other men who wear muzzles, viz., knockers-down and the coopers who head up the casks. The work of the knocker-down is to strike the cask with wooden mallets, so that the powder may settle down in the cask, and the package hold its full quantity. The work is carried out underneath the chamber, where there is a free circulation of air, and the muzzles are worn to intercept the bleaching powder dust.

*Heading up casks by coopers.*—This work is carried out in Lancashire under conditions altogether different to those described by Mr. Girling in his evidence before the Royal Commission on Labour. The heading up is not done in the chamber, but underneath, where there is a free circulation of air.

*Reduction in the Hours of Labour.*—The short time spent in actual labour in some departments as compared with the time the men are required to be in attendance at the works, may have suggested to those unacquainted

with the processes in operation, that a commutation of the hours of attendance to the hours of labour actually required to perform the work would—provided the work were done—meet all the requirements of the case.

This, however, is not so, and as an example take the burnermen (vitrol department) whose hours of attendance are 84 per week, but whose actual work, as has been shown, extends to only 28½ hours per week. Each of the burnermen employed in this department has to charge a certain number of pyrites burners during the 12 hours' shift, and it is indispensable that the charging should be spread uniformly over the 12 hours, otherwise the success of the process would be impossible.

Take another case of an entirely different character, untrammelled by any regulations as to times of charging, and in which it is greatly to the employers' advantage that the work should be done as expeditiously as possible, viz., the copper workers, whose hours of actual labour during the 12 hours' shift are on an average 4 hours 55 minutes, or say 30 hours per week. It must not, however, be understood that the hours of actual labour given in this case are defined by operations requiring only that length of time; were they extended the charge of ore would be calcined in less time with a corresponding saving of fuel, less wear and tear to the plant per ton of ore calcined, and an increase of workmen's wages.

In this process, the furnace having been charged with ore, and the ore levelled, no further work on the part of the workmen is required until the charge has reached a sufficiently high temperature. The process really consists in exposing fresh surfaces of the ore mixture at a sufficiently high temperature to the action of atmospheric air, and the oftener fresh surfaces are exposed the sooner will the operation be finished. The men, however, trust in a very great degree to heat and the action of air as supplementary to their work.

#### SICK AND ACCIDENT CLUB, IN CONNEXION WITH THE GLOBE WORKS.

All the persons employed (average 273) are members of the club, and besides receiving sick pay have also medical attendance.

The following are the ailments to which the men have been subject during the six months ending 31st March 1892, and embracing the most crucial period of the year. Comparisons ought therefore to be confined to this period.

It is to be regretted that data are not to hand by which a comparison could be made with this and other districts as to the proportion of the various forms of disease.

Ailments, and Number of Men affected. Six Months ending 31st March 1892.

Total Number of Men affected.	Influenza.	Bronchitis.	Congestion of Lungs.	Diarrhoea.	Epithelial Cancer.	Febriola.	Gastric Catarrh.	Gastritis.	Inflamed Legs.	Lumbago.	Neuralgia.	Rheumatism.	Tonsillitis.
14	15	6	1	4	1	6	1	1	2	1	1	1	1

Mortality and Nature of Disease for Four Years ending 31st March 1892.

Fourteen men died during this period. Of this number one man was killed by a crane accident, and in the case of three others no record exists as to the cause of death.

Diseases, and Number of Deaths from each. Four Years ending March 1892.

Total Number of Deaths.	Death Rate per 1,000 per Annum.	Bronchitis.	Bright's Disease.	Carline Disease.	Apoplexy.	Consumption.	Cancer of the Stomach.	Pneumonia.	Typhoid Fever.	Killed by Crane.	Disease not known.
14	12.82	2	2	1	1	1	1	1	1	1	3
Rate per 1,000 per annum -		1.832	1.832	.916	.916	.916	.916	.916	.916	—	—

Hardshaw Street, St. Helens, Lancashire, 17th May 1892.

We certify that the foregoing list of deaths, occurring in connexion with the Globe Alkali Works during the last four years is correct.

(Signed) H. and F. KNOWLES,  
Surgeons.



In the return of "Diseases not known, 3," there were two deaths from "unknown causes," as certified by coroner, and one death of which there is no record of cause of.

The death rate—12·82 per 1,000 per annum—compares very favourably with that of the members of the Manchester Unity of Oddfellows, which for the five years ending 1891 is given as 13·9. The Order of Oddfellows may reasonably be said to include all the trades and occupations of British workmen, and it may therefore be concluded that the conditions of health which affect the chemical operative are not more unfavourable than those which obtain generally throughout the different trades of the country.

J. R. WYLDE,  
District Manager.

St. Helens,  
26th May 1892.

#### HOURS of ATTENDANCE and TIME SPENT in ACTUAL WORK at GLOBE WORKS.

##### VITRIOL PROCESS.

Average hours of attendance of the two shifts of men - 84 per week.  
Hours spent in actual labour - (say) 30 "  
The latter is arrived at in the following way, viz.:—  
Dropping one burner or kiln - 2 minutes.  
Barring and charging one burner - 4 "  
30 burners are charged per 12 hours, or at the rate of 2½ per hour.  
 $6 \times 2\frac{1}{2} = 15$  minutes per hour.  
Time spent in potting 6 " "  
21 " "  $\times 12$   
= 4·2 hours per shift, or 29·4 per week.

##### SALT CAKE DEPARTMENT.

Average hours of attendance - 70 per week.  
Potmen.—Time spent in actual labour - 52½ "

##### Arrived at as follows:—

Gathering-up charge	-	-	6½ minutes.
Shoving	-	-	23½ "
Spreading	-	-	10 "
Charging pot	-	-	7½ "
Wheeling out salt cake	-	-	19 "
Wheeling salt	-	-	19½ "
Working pot	-	-	14 "
Watching acid-heater filling	-	-	16 "
Clinkering fire	-	-	3½ "
Firing	-	-	8 "
Throwing up cinders	-	-	2½ "
			<u>129½</u> "

Or 2 hours 9½ minutes per charge  $\times 3 = 8$  hours 32 minutes per shift, or 51 hours 48 minutes per week.

Furnacemen.—Time spent in actual labour - 55 hours 18 minutes.

##### Arrived at as follows:

Taking in one charge	-	-	23½ minutes.
Spreading	-	-	10 "
Charging pot	-	-	7½ "
Clinkering	-	-	3 "
Slicing	-	-	28½ "
Wheeling out salt cake	-	-	19 "
Slicing, toothraking, and drawing	-	-	36½ "
Firing	-	-	8 "
Throwing up cinders	-	-	2½ "
			<u>138½</u> "

= 2 hours 18½ minutes per charge  $\times 4 = 9$  hours 13 minutes per shift, or 55 hours 18 minutes per week.

##### BLEACHING POWDER DEPARTMENT.

Lime dressers.—Three men employed.  
Average hours of attendance - 63 per week.  
Time spent in actual labour - (say) 30 "

##### Arrived at as follows:

2 men sieving	-	-	-	3½ hours each.
1 man laying down lime	-	-	2½ hours	} = 3½ "
1 man slacking lime	-	-	1 "	
All the men turning lime 1 hour each, $\therefore$ each man works 4½ hours, which $\times 6 = 27$ hours per week—say 30 hours.				

#### HOURS of ATTENDANCE and TIME SPENT in ACTUAL LABOUR at GREENBANK WORKS.

##### VITRIOL PROCESS.

Average hours of attendance of the two shifts of men - 84 per week.  
Average hours spent in actual labour - 50 "

##### The latter is arrived at in the following way:

Dropping one burner or kiln	-	-	2 minutes.
Barring and charging one burner	-	-	6½ "
$\therefore$ Dropping, barring, and charging one burner	-	-	<u>8½ "</u>

17 burners are charged per 12 hours, or at the rate of 1½ per hour.  
 $1\frac{1}{2} \times 8\frac{1}{2} = 12$  minutes per hour.  
Time spent in potting nitre - 4 " "  
Time spent in blowing liquor and firing boiler - 19½ " "  
 $35\frac{1}{2} \times 12$

= 7 hours 9 minutes per shift, or 50 hours 3 minutes per week.

##### SALT CAKE DEPARTMENT.

Potmen.—Hours of attendance - 66½ per week.  
Time spent in actual labour - 47 "

##### Arrived at as follows:

Gathering-up charge	-	-	8 minutes.
Shoving charge	-	-	20 "
Spreading	-	-	11 "
Charging pot	-	-	15 "
Filling up salt cake into waggon	-	-	13 "
Filling salt into trucks	-	-	16 "
Working pot	-	-	17 "
Watching acid-heater filling	-	-	10 "
Clinkering fire	-	-	7 "
Firing	-	-	8 "
Throwing out cinders	-	-	3 "
			<u>128</u>

Or 2 hours 8 minutes per charge  $\times 4 = 8$  hours 32 minutes per shift = 46 hours 56 minutes per week.

Furnacemen.—Hours of attendance - 66½ per week.  
Hours of actual labour - 47 "

##### Arrived at as follows:

Taking in one charge	-	-	20 minutes.
Spreading	-	-	12 "
Slicing	-	-	28 "
Filling up salt cake in trucks	-	-	13 "
Splicing, toothraking, and drawing	-	-	37 "
Clinkering	-	-	7 "
Firing	-	-	8 "
Throwing out cinders	-	-	3 "
			<u>128</u>

Or 2 hours 8 minutes per charge  $\times 4 = 8$  hours 32 minutes per shift = 46 hours 56 minutes per week.

Lime dressers.—Two men employed.  
Hours of attendance - 47 per week.  
Hours of actual labour - 33½ "

##### Arrived at as follows:

2 men sieving	-	-	-	2½ hours each.
2 men laying down lime	-	-	1½ hours	} 1½ "
and slacking	-	-	½ "	
2 men turning lime	-	-	-	1 "
				<u>5½</u> hours each.

$\therefore$  each man 5½ hours per shift  $\times 6$  shifts = 33 hours per week.



## CHEMICAL COMMITTEE OF INQUIRY:

## SUTTON LODGE WORKS.

## HOURS of ATTENDANCE and ACTUAL LABOUR of PACKERS and LIMEMEN.

Week ending	M. Grady.		J. Conway.		J. McCabe.	
	Total Attendance Hours.	Actual Labour Hours.	Total Attendance Hours.	Actual Labour Hours.	Total Attendance Hours.	Actual Labour Hours.
April 27 - - - - -	24½	16	24	16	26	17
May 4 - - - - -	29½	15½	29½	15½	30½	15½
" 11 - - - - -	8½	6	10	6	10½	6
Total for three weeks - - -	62½	37½	63½	37½	66½	38½
Average per week - - - - -	20½	12½	21	12½	22½	12½

Average of last 3 weeks total attendance - 21½ hours per man.  
 " " actual labour - 12½ "

Week ending	Stillmen.		Blowers.		Limepot.	
	Total Hours Attendance.		Total Hours Attendance.		Total Hours Attendance.	
	Day Shift.	Night Shift.	Day Shift.	Night Shift.	Day Shift.	Night Shift.
April 27 - - - - -	55½	81	55½	81	55½	81
May 4 - - - - -	55½	79	55½	81	55½	79
" 11 - - - - -	55½	81	55½	81	55½	81
Total for three weeks - - -	166½	241	166½	243	166½	241
Average for three weeks - - -	55½	80½	55½	81	55½	80½

## ACTUAL LABOUR required at the VITRIOL BURNERS.

Work done by R. Rowland on May 11th, 1892.

Dropping kiln	-	-	-	-	1½ minutes.
Bringing tools from one kiln to another	-	-	-	-	1 "
Barring	-	-	-	-	1 "
Raking	-	-	-	-	0½ "
Charging	-	-	-	-	1½ "
					5½
Kilns done per hour	-	-	-	-	2
					11
Nitroing.—Drawing two and charging three pots and making up doors	-	-	-	-	5 "
					16
Actual labour per hour	-	-	-	-	16

Actual labour per week of 84 hours at 16 minutes per hour = 22½ hours.

The above particulars were taken by Mr. Burdekin. The work was done in anything but a hurried manner.

## ACTUAL LABOUR required in the PRODUCTION of SALT CAKE.

## Pot Man.

Actual Work.			Actual Rest.		
Period.	Time.	How spent.	Period.	Time.	How spent.
9.55 a.m. to 10.10 a.m.	15 min.	Pitching charge.			
10.10 " 10.20 "	10 "	Spreading charge.			
10.20 " 10.40 "	20 "	Charging pot.			
10.40 " 10.50 "	10 "	Firing furnace.			
10.50 " 11.10 "	20 "	Watching liquor (super-vision).			
11.10 " 11.15 "	5 "	Sweeping round furnace.			
11.15 " 11.45 "	30 "	Filling charge from boxes to be wheeled away.			
12.0 noon to 12.5 p.m.	5 "	Firing furnace.	11.45 a.m. to 12.0 noon	15 min.	Sitting down.
12.5 p.m. 12.15 "	10 "	Wheeling salt.			
12.50 " 1.0 "	10 "	Wheeling salt.	12.15 p.m. to 12.50 p.m.	35 "	Having dinner.
Total—3 hrs. 5 min.	135 min.			50 min.	



Roaster Man.					
Actual Work.			Actual Rest.		
Period.	Time.	How spent.	Period.	Time.	How spent.
9.55 a.m. to 10.20 a.m.	25 min.	Carrying and spreading charge.			
10.20 " 10.40 "	20 "	Charging pot.	10.40 a.m. to 11.0 a.m. -	20 min.	Sitting smoking.
10.40 " 11.0 "					
11.0 " 11.15 "	15 "	Slicing charge.	11.48 " 11.55 " -	7 "	Sitting down.
11.15 " 11.48 "	33 "	Wheeling charge from boxes.	12.10 p.m. to 12.30 p.m. -	20 "	Having dinner.
11.55 " 12.10 "	15 "	Slicing charge.			
12.30 p.m. to 12.50 p.m.	20 "	Slicing charge and drawing same into boxes.	12.50 " 1.0 " -	10 "	Sitting down.
	128 min.			57 min.	

During a period of 3 hours 5 min. the average time per man spent in actual labour = 2 hrs. 11½ min.  
 " " " the average time per man spent in rest = 53½ "

Actual time employed in works per week = 69 hrs.  
 " engaged in work " = 49 " 2½ min.  
 " resting " = 19 " 57½ "

**REPORT on the SICKNESS and MORTALITY experienced by the WORKMEN employed at TENNANT'S WORKS, HERBURN.**

The figures given below are based on the official records of the benefit society which formerly existed at the above works. All the members of the society were employed at these works, though not all workmen were members, but principally those who were not in any ordinary friendly society. A number of members, were not eligible for membership in outside societies by reason of age. The ages varied from 18 to 70 years, and no medical examination was required on

joining, the only condition of membership being employment at the above works, and no man was excluded on account of age or any other cause. Most of the members had been employed in chemical works during the whole of their working lives: many of them for 20 years, and from that up to 50 years. The members of the society numbered about two-thirds of all our workmen.

The accounts were—by request of the men—kept in four departments; and the average number of members, number of days sickness, and number of deaths during the seven years' existence of the society are shown below. The society was wound up at the end of 1890.

**SICKNESS and MORTALITY experienced by the MEMBERS of the SICK and FUNERAL BENEFIT SOCIETY at TENNANT'S ALKALI WORKS, HERBURN, for Seven Years, 1884—1890.**

	TOTAL.			Vitriol and Sulphate Department.			Ash and Soda Department.			Bleaching Powder Department.			Mechanical Department (including Coopers).		
	No. of Members.	Days' Sickness.	Deaths.	No. of Members.	Days' Sickness.	Deaths.	No. of Members.	Days' Sickness.	Deaths.	No. of Members.	Days' Sickness.	Deaths.	No. of Members.	Days' Sickness.	Deaths.
1884 - - -	485	2,407	1	61	258	—	173	767	1	66	159	—	185	1,223	—
1885 - - -	422	3,506	1	48	191	—	154	2	—	57	342	—	163	1,601	1
1886 - - -	417	4,306	4	52	632	1	161	2	2	50	200	—	154	1,992	1
1887 - - -	416	4,931	10	57	338	2	153	1,874	1	52	750	—	154	1,969	7
1888 - - -	435	5,720	12	55	363	1	174	2,063	1	54	565	4	152	2,729	6
1889 - - -	256	3,368	1	48	399	—	162	2,455	—	46	514	1	Benefit suspended this year, and statistics incomplete.		
1890 - - -	372	4,835	3	45	623	—	135	1,	2	47	479	—	145	1,780	1
Total for seven years	2,803	29,073	32	366	2,804	4	1,112	11,966	7	372	3,009	5	953	11,294	16
Average sickness days per annum per member.	10.37			7.66			10.76			8.09			11.85		
Average deaths per annum per thousand.	11.42			10.93			6.29			13.44			16.		
				Vitriol, Salt Cake, and Bleaching Powder Departments.											
Average sickness days per annum per member.	—			7.88			—			—			—		
Average deaths per annum per thousand.	—			12.19			—			—			—		

NOTE.—No deduction whatever has been made for sickness due to accidents, nor for old men who might be regarded as "permanently sick."



## AUDITORS' CERTIFICATE.

We hereby certify that we have examined the books of the Sick and Funeral Benefit Society at Tenant's Works, Hebburn, and that the above is a correct statement of sickness and mortality as shown by the books.

(Signed) MONKHOUSE, GODDARD, & Co.,  
Chartered Accountants.

Newcastle-on-Tyne, April 27th, 1892.

It was desired to obtain, for comparison, similar figures for the same period from the local friendly

societies, but effects to this end were unsuccessful. Application was then made to the general secretaries of the two largest orders in England, viz., the Manchester Union of Oddfellows and the Ancient Order of Foresters; but in all cases the societies are unable or unwilling to give the desired information. We were therefore compelled to fall back on the information contained in a publication called the "Foresters' Directory, 1891," from which the following table has been prepared:—

## ANCIENT ORDER OF FORESTERS—SICKNESS AND MORTALITY.

As reported in the "Foresters' Directory, 1891."

	SICKNESS: DAYS PER MEMBER.					Mortality per Thousand 1890.
	1879.	1880.	1889.	1890.	Average for 4 Years.	
England - - - - -	9.57	9.45	10.99	12.11	10.28	11.91
Durham - - - - -	12.65	12.92	15.88	16.32	14.44	15.22
Northumberland - - -	11.36	10.97	13.40	14.00	12.43	12.41

NOTE.—(1) The number of Foresters in 1890 were as follow:—England 562,813, Durham 17,480, Northumberland 13,209

(2) The above four years are the only ones for which figures are given in the above Directory.

It will be observed that the rate of mortality is given for only one year, but that the figure for the whole of England for that year (11.91 per 1,000) is somewhat low as is proved by the statements made in Finlaison's "Report on Sickness and Mortality," where the mortality is given as 12.60 per 1,000, this being the average for five years, 1846-50, of 792,980 members of friendly societies. Further proof is contained in the report of the Manchester Unity of Oddfellows for 1891, where it is stated that the mortality of that society for five years, 1887-1891, was 13.90 per 1,000. The mean of these three numbers (11.91, 12.60, and 13.90) is 12.80 per 1,000.

The average amount of sickness per annum to each person is given by Finlaison at 10.11 days, which corroborates the figures for the Foresters given above.

## CONCLUSIONS.

From the foregoing figures, the following conclusions may be drawn:—

FIRST.—The average number of days sickness per annum per number at the above works was 10.37 days, which is practically the average sickness amongst the working classes of this country, as shown by the returns of friendly societies; whilst the number of

days' sickness amongst the men employed in the vitriol, salt cake and bleaching powder departments was 23 per cent. less than this, or only 7.88 days per annum per member.

SECONDLY.—The annual rate of mortality for the whole society averaged 11.42 per 1,000, and amongst the men in the vitriol, salt cake and bleaching powder departments 12.19 per 1,000, whilst the average rate of mortality experienced by friendly societies is about 12.80 per 1,000.

FINALLY.—Judging from the figures given, it would appear that in these works—and by analogy in all works where the same operations are carried on: (1) The rate of mortality throughout the works, and in the three departments where gaseous escapes are liable to take place, is slightly less than the average experience of friendly societies; and (2) the number of days sickness per annum per member in the whole works is about the same as the average of friendly societies, whilst the sickness in the three departments where gaseous escapes are liable to take place is actually about 23 per cent. less than the average of friendly societies.

THOS. W. STUART,  
District Manager.

Hebburn, 27th April 1892.

TABLE I.—TYNE AND SCOTLAND DISTRICT.

Number of Special Process Men and the per-centage of total Men employed.

Name of Works.	Vitriol Burner Men.	S & Cake, Pot, and Roaster Men.	ALKALI.					BLEACH.				SULPHUR.		Copper Furnace Men.	Total Men employed.	Per- centage of Special Process Men to total Hands.	
			Revolver Men.	Vat Men.	Salterns.	Carbona- tions.	Cautile Pots.	Weldon Packers.	Dugon Packers.	Line Dressers.	Still Men.	Carbonize Men.	Claus Kilns.				
TYNE—																	
Allhusen's	54	51	15	27	—	Firing Finishing	10	24	—	8	6	12	3	—	1,295	16.91	
Hebburn	12	18	16	12	19	14	—	12	—	4	4	—	—	—	570	19.48	
Friar's Goose	12	26	14	6	24	6	—	12	—	5	2	4	2	—	606	20.50	
St. Bede	11	24	8	6	8	19	—	8	—	3	3	—	—	—	446	18.16	
SCOTLAND—																	
St. Rollox	12	22	18	12	12	6	—	11	—	3	4	—	—	—	520	19.25	
Eglinton	4	8	—	—	—	—	—	2	—	1	2	—	—	—	59	19.19	
Irvine	4	8	4	6	—	—	6	2	—	1	2	—	—	—	105	31.40	
Total	109	167	75	69	63	36	25	71	—	25	23	16	5	—	3,025	18.87	



TABLE II.—TYNE and SCOTLAND DISTRICT.  
Average Hours of Labour and Wages per Week.

Name of Works.	Vitriol Burner Men.		Salt Cake, Pot, and Roaster Men.		ALKALI.								BLEACH.								SULPHUR.				Copper Furnace Men.				
					Revolver Men.		Vat Men.		Salting.		Carbonating.		Caustic Pots.		Weldon Packers.		Deacon Packers.		Lime Dressers.		Still Men.		Carbonator Men.		Clash Kilns.				
	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	Hours.	Wages.	
TYNE:		s. d.		s. d.		s. d.		s. d.		s. d.		s. d.	56	s. d.	35 0		s. d.		s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
Allhusen's	56	32 1	56	30 0	56	40 4	84	35 4	—	—	{ s. d. Firing Finishing		84	63 8	42	63 0	—	—	42	59 9	56	35 0	56	32 0	56	31 6	—	—	
Hebburn	56	33 10	70	34 6	71	36 0	54	32 0	70	32 6	70	30 6	—	—	36	63 0	—	—	31	60 0	70	33 0	—	—	—	—	—	—	
Friar's Goose.	53	31 6	71	33 0	70	37 0	58	44 0	70	28 0	70	31 0	—	—	56	55 0	—	—	48	40 0	60	33 0	75	31 0	73	36 0	—	—	
St. Bede	56	31 6	70	32 6	72	41 7	72	27 0	72	24 0	72	31 0	—	—	36	60 0	—	—	36	60 0	70	33 0	—	—	—	—	—	—	
SCOTLAND:																													
St. Rollox	56	35 0	70	28 0	70	32 0	56	26 0	70	27 0	70	25 6	—	—	48	34 0	—	—	54	33 0	75	27 0	—	—	—	—	—	—	
Eglinton	84	34 0	72	38 0	—	—	—	—	—	—	—	—	—	—	36	55 0	—	—	48	52 0	72	46 0	—	—	—	—	—	—	
Irvine	84	32 3	70	35 8	70	40 0	54	37 0	—	—	—	—	72	52 0	36	47 0	—	—	36	47 0	70	47 0	—	—	—	—	—	—	
Averages	64	33 0	68	33 1	69	37 9	63	33 7	70	28 0	70	29 6	71	59 3	39	53 0	—	—	43	59 3	69	37 0	65	31 6	64	28 9	—	—	

N.B.—The hours mentioned are the total hours the men are on duty, without deduction for meal times, &c.

TABLE III.—TYNE and SCOTLAND DISTRICT.  
Average Death-rate per 1,000 per annum.

TYNE:				TOTAL.	
Allhusen's	—	—	—	—	No statistics.
Hebburn	—	—	—	11.42	7 years, 1884-90. See separate report on Sickness and Mortality.
Friar's Goose	—	—	—	10.37	10 years, 1881-1890.
St. Bede	—	—	—	9.93	8 years, 1884-1891.
SCOTLAND:					
St. Rollox	—	—	—	—	
Eglinton	—	—	—	about	5.00
Irvine	—	—	—	—	No statistics.
Average	—	—	—	9.18	

TABLE V.—TYNE and SCOTLAND DISTRICT.  
LIST of DEATHS at ST. ROLLOX CHEMICAL WORKS, GLASGOW. May 1884—May 1892.

Process Departments.									
Date.	Name.	Age.	Date.	Name.	Age.	Date.	Name.	Age.	Date.
1884, May 14	Sam. McGuillan	75	1888, Jan. 16	Dan. Devine	70				
" 19	Robt. Marshall	55	Feb. 23	Peter McLeod	—				
Sept. 24	Murdo. McKenzie	60	Mar. 20	John Coyle	50				
Oct. 22	Rob. Clayton	50	" 22	Harry Purvis	74				
Nov. 5	George Taylor	66	Apr. 5	William McAdam	65				
Dec. 3	William Eadie	70	June 25	John Millmore	55				
1885, Jan. 6	Robert Ward	55	Aug. 27	John Docherty	75				
" 20	Thomas Stay	50	Sept. 4	Robert Wallace	—				
Mar. 17	John Webster	74	" 22	Neil Douglas	60				
" 23	John McKenna	50	Oct. 8	Wm. Malcolm	64				
Apr. 20	Thomas Docherty	50	" 13	Chas. Wm. Fudgen	35				
Oct. 21	Neil McKinnow	80	Dec. 14	John Nicholson	55				
Nov. 30	Sam. Russell	65	" 24	Jos. Wilson	65				
Dec. 31	John McGuere	75	1889, Jan. 18	Mch. McGovern	50				
1886, Apr. 29	Peter Collins	65	" 21	Dan. McLean	75				
May 10	John Glancy	70	Mar. 21	Thomas Haggerty	70				
June 15	Pat McCafferty	50	July 22	Jas. McKenna	72				
" 30	Wm. Clark	48	Dec. 7	Francis Sherlock	35				
Sept. 4	Hugh McKay	55	1890, Jan. 23	Jas. McNab	48				
" 29	Thos. Carter	45	May 19	Jas. Hannoway	56				
" 30	Mungo McLean	20	July 11	Alex. Lees	40				
Dec. 1	Rich. Cooke	70	Sept. 16	Jos. Wyllie	60				
" 6	George Booth	65	" 23	Thos. Mitchell	45				
1887, Jan. 10	Arch. McDonald	75	Nov. 5	Dan. Livingstone	78				
Feb. 5	George Irvine	40	" 28	James Cormack	50				
" 16	Alex. Fitzpatrick	50	1891, Jan. 13	Tom McQuirter	72				
" 25	Pat. O'Brien	70	" 22	Thomas Kennedy	50				
Mar. 18	John Hutcheson	70	Feb. 28	Thomas Woods	36				
Apr. 7	Norman McQueen	55	Mar. 10	James Sullivan	56				
June 2	Pat. O'Brien	32	" 11	John Dean	28				
Aug. 6	Arch. Campbell	76	" 20	William Nisbet	74				
Dec. 28	Thos. Nelson	45	June 24	Thomas Somerville	60				
1888, Jan. 5	Robert Bell	55	Oct. 20	Dan. McNeil	60				
" 12	Hugh Stirling	45	Dec. 1	Pat McMahon	70				
			" 14	Sam Cochran	55				
				Average age 58.					



Table V.—continued.

Trade Departments.									
				Age.					Age.
1884, Sept. 30	-	James Davie	-	40	1888, July 2	-	Wm. Burnett	-	36
Nov. 10	-	Robt. Rodman	-	52	Aug. 11	-	Peter Wright	-	60
1885, Jan. 8	-	Rich. Rogers	-	28	Oct. 15	-	Alex. Cleland	-	75
Feb. 6	-	Ed. Quin	-	40	July 22	-	Ed. Mullen	-	56
Apr. 23	-	Jas. McKay	-	32	Aug. 6	-	John Donnelly	-	65
July 10	-	Hugh McLuskie	-	60	Dec. 14	-	Jas. McDade	-	70
Oct. 30	-	Thos. Billsborough	-	65	1890, Jan. 31	-	John Twigg	-	65
1886, Feb. 22	-	John Easton	-	70	Apr. 23	-	James Gray	-	68
" 27	-	Jos. McLuskie	-	47	July 15	-	John McAnespie	-	32
May 24	-	Alex. McInnes	-	70	1891, Jan. 14	-	Wm. Caldwell	-	65
July 16	-	Robt. Tiernon	-	30	" 22	-	Thos. Kennedy	-	50
Sept. 28	-	Thos. Anderson	-	70	Mar. 21	-	James Boyle	-	66
Oct. 2	-	John Mooney	-	70	Apr. 24	-	Adam Rutherford	-	65
Dec. 18	-	Wm. Docherty	-	70	July 23	-	James Dilke	-	30
1887, Jan. 11	-	Thos. Kelly	-	70	Aug. 5	-	Don. McKenzie	-	70
Mar. 5	-	Pat Struther	-	52	" 5	-	John McGeachie	-	55
Aug. 30	-	Thos. McVey	-	60	Jan. 27	-	Rod. McLean	-	80
Nov. 5	-	Pat Murray	-	62	Average age 56.				
1888, Jan. 9	-	Thos. Kelly	-	50					
" 25	-	John Lafferty	-	65					
July 6	-	Arch. McKenzie	-	25					

TABLE VI.—TYNE AND SCOTLAND DISTRICT.

Actual hours of labour of men who work night and day shifts. (The hours of labour are the total hours on duty without deductions for meal times, &c.)

## ALLHUSEN'S WORKS.

		Vitriol Burner Men, Salt Cake Men, Revolver Men, Caustic Firemen.	Caustic Finishers.		Lime Dressers.	Bleach Packers.
			Day.	Night.		
Sunday	-	All 8 hour-shifts.	12	12	7 hours per day.	7 hours per day.
Monday	-		8	13		
Tuesday	-		8	13		
Wednesday	-		8	13		
Thursday	-		8	13		
Friday	-		8	13		
Saturday	-		7	18		
Total per week	-	56	59	95	—	—

## FRIARS GOOSE WORKS.

		Vitriol Burner Men.	Salt Cake Men and Revolver Men.		Salters and Carbonators.		Bleach Packers.	Lime Dressers.		Still Men.	
			Day.	Night.	Day.	Night.		Day.	Night.	Day.	Night.
Sunday	-	8-hour shifts.	—	12	—	10	6 hours per day.	—	—	—	10
Monday	-		11	13	11	13		8	9	11	13
Tuesday	-		11	13	11	13		8	9	11	13
Wednesday	-		11	13	11	13		8	9	11	13
Thursday	-		11	13	11	13		8	9	11	13
Friday	-		11	13	11	13		8	9	11	13
Saturday	-		9	—	10	—		6	5	8	—
Total per week	-	56	64	77	65	75	—	46	50	63	75

## HEBBURN WORKS.

		Vitriol Burner Men.	Salt Cake Men.		Revolver Men, Salters, and Carbonators.		Bleach Packers and Lime Dressers.	Still Men.	
			Day.	Night.	Day.	Night.		Day.	Night.
Sunday	-	8-hour shifts.	—	13	—	13	6 hours per day.	—	13
Monday	-		11	13	11	13		11	13
Tuesday	-		11	13	11	13		11	13
Wednesday	-		11	13	11	13		11	13
Thursday	-		11	13	11	13		11	13
Friday	-		11	13	11	13		11	13
Saturday	-		7	—	9	—		7	—
Total per week	-	56	62	78	64	78	36	62	78



## ST. BEDE WORKS.

		Vitriol Burner Men.	Salt Cake Men.		Revolver Men, Salters, and Carbonators.		Bleach Packers and Lime Dressers.	Still Men.	
			Day.	Night.	Day.	Night.		Day.	Night.
Sunday	- - -	8-hour shifts.	—	13	—	13	6 hours per day.	—	13
Monday	- - -		11	13	11	13		11	13
Tuesday	- - -		11	13	11	13		11	13
Wednesday	- - -		11	13	11	13		11	13
Thursday	- - -		11	13	11	13		11	13
Friday	- - -		11	13	11	13		11	13
Saturday	- - -		7	—	10	—		8	—
Total per week	-	56	62	78	65	78	36	63	78

## ST. ROLLOX WORKS.

				Vitriol Burner Men.		Salt Cake Men, Revolver Men, Salters, and Carbonators.		Bleach Packers.		Lime Dressers.		Still Men.	
				Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.
				8-hour shift.	—	13	—	—	—	—	—	—	7
Sunday	-	-	-		11	13	8	—	9	—	11	13	
Monday	-	-	-		11	13	8	—	9	—	11	13	
Tuesday	-	-	-		11	13	8	—	9	—	11	13	
Wednesday	-	-	-		11	13	8	—	9	—	11	13	
Thursday	-	-	-		11	13	8	—	9	—	11	13	
Friday	-	-	-		11	13	8	—	9	—	11	13	
Saturday	-	-	-	7	—	8	—	9	—	24	—		
Total per week - -				56	62	78	48	—	54	—	79	72	

## EGLINTON WORKS.

		Vitriol Burner Men.		Salt Cake Men.		Bleach Packers.		Lime Dressers.		Still Men.	
		Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.
Sunday	- - -	12	12	—	13	—	—	—	—	—	12
Monday	- - -	12	12	11	13	6	—	8	—	12	12
Tuesday	- - -	12	12	11	13	6	—	8	—	12	12
Wednesday	- - -	12	12	11	13	6	—	8	—	12	12
Thursday	- - -	12	12	11	13	6	—	8	—	12	12
Friday	- - -	12	12	11	13	6	—	8	—	12	12
Saturday	- - -	12	12	9	—	6	—	8	—	12	—
Total per week	-	84	84	64	78	36	—	48	—	72	72

TABLE VII.—TYNE and SCOTLAND DISTRICT.  
Average Weekly Earnings per Individual.

	No. of Hands employed.	Average Total Weekly Wages, including Office and Staff.	Average Amount per Individual.
TYNE :		£	s. d.
Allhusen's - - - - -	1,295	1,916	29 7
Hebburn - - - - -	570	880	30 8
Friar's Goose - - - - -	599	920	30 8
St. Bede - - - - -	446	620	27 9
SCOTLAND :			
St. Rollox - - - - -	520	656	26 0
Eglinton - - - - -	89	130	29 2
Irvine - - - - -	105	166	31 7
Totals and average - - - - -	3,624	5,288	29 2

N.B.—The above does not include salaried officials.



TABLE VIII.—*Tyne and Scotland District.*

List of Men in St. Rollox Chemical Works 60 years of age and upwards. 3rd March 1892.

	Age.	Years in Works.		Age.	Years in Works.
<b>ALKALI:</b>			<b>ENGINEERS:</b>		
John Cussack - - -	64	35	John Ross - - -	65	22
Jas. McMellan - - -	60	22	Andrew Alexandra - - -	60	20
Pat McCarron - - -	61	32	James Guthrie - - -	65	18
James Duffy - - -	61	30			
Pat Docherty - - -	66	22	<b>BRICKLAYERS:</b>		
James Brown - - -	60	34	Arch. Campbell - - -	64	50
Chas. Collins - - -	60	28	Harry Wright - - -	61	25
Pat Gallacher - - -	62	42			
John Dobbs - - -	74	25	<b>SLATERS:</b>		
Thos. Thirlow - - -	72	43	Robt. Burnet - - -	70	35
Peter Glen - - -	60	48			
John Malone - - -	60	33	<b>CARTERS:</b>		
Matthew Connally - - -	68	18	Pat Carlton - - -	60	36
<b>VITRIOL:</b>					
William Galbraith - - -	75	52	<b>RAILWAY:</b>		
Thomas Thomson - - -	74	50	Anthony Griffin - - -	60	25
Jas. Wilson - - -	70	40			
Geo. Branton - - -	70	40	<b>CASKS:</b>		
<b>MANGANESE:</b>			Andrew Watson - - -	67	44
Alex. Rennie - - -	63	25			
<b>B. POWDER:</b>			<b>LABOURERS:</b>		
Peter McLever - - -	78	48	Wm. Barnett - - -	70	30
<b>M. ACID:</b>			Pat Tollins - - -	60	18
Wm. Donald - - -	64	41	Tom Beggs - - -	61	36
<b>SULPHATE:</b>			Chas. Hill - - -	65	30
Jas. Currie - - -	62	41	Tom Murty - - -	70	47
David Montgomery - - -	75	40	John Ferguson - - -	62	36
Thos. Stance - - -	66	46	Jas. Sturgeon - - -	63	40
John Dickson - - -	61	37	Arch. Colquhoun - - -	79	60
Sam Vance - - -	61	28	Dan McAuley - - -	70	50
Allan McLean - - -	60	40	John Monaghan - - -	68	41
<b>JOINERS:</b>			Don. McDougall - - -	66	33
William Brockley - - -	61	30	Chas. McGaffigan - - -	70	26
Dan McCormack - - -	63	39			
David Johnstone - - -	64	28	Average - - -	65½	35½

## ALKALI, &amp;c. WORKS REGULATION ACT, 1881.

SPECIAL RULES made by the United Alkali Company, Limited, for the guidance of the workmen employed by them as "bleaching powder men."

Every bleaching powder man shall comply with the requirements of such of the following special rules as may apply to any process in which he is employed; that is to say:—

1. Manganese mud must not be run into a chlorine generating still at such a speed as will cause chlorine to escape out of any lute on a main or through any joint of a pipe.

2. A still must not be run or emptied until all the chlorine generated in the still has, so far as may be practicable, been worked off.

3. Every lute in connexion with any pipe which conveys chlorine from a still to a bleaching powder chamber must be examined at least twice in every twenty-four hours, that is to say, at least once between the hours of 6 and 8 a.m., and at least once between hours of 5 and 7 p.m.

4. A bleaching powder chamber must not be opened until all free chlorine therein has, so far as may be practicable, been worked off.

5. When the supply of chlorine to a chamber exceeds what is requisite the main must be immediately disconnected or the making of chlorine in the stills must be slackened.

6. When chlorine begins to pass through the exhaust or draught pipe of any set of chambers, fresh lined chambers must be immediately connected or the draught must be slackened.

The workman in charge of the salt-cake pot, or of the still in connexion with the chambers must be forthwith instructed to diminish or stop the evolution

of hydrochloric acid or chlorine as the case may require.

7. No sample must be taken from the "Deacon" chambers at any time when the salt-cake pot in connexion with the chambers is generating hydrochloric acid gas.

Every bleaching powder man who violates any of the foregoing rules will be liable to a fine of two shillings and sixpence for every such violation.

(L.S.)

Sanctioned by the Local Government Board,  
25th November, 1892.

## ALKALI, &amp;c. WORKS REGULATION ACT, 1881.

SPECIAL RULES made by the United Alkali Company, Limited, for the guidance of the workmen employed by them as "burner men."

Every burner man shall comply with the requirements of such of the following special rules as may apply to any process in which he is employed; that is to say:—

1. To prevent the escape of gas in the process of charging a kiln the damper must, if necessary, be drawn.

2. During the process of breaking-up or levelling a kiln the doors must be kept as nearly closed as possible.

3. A kiln must not be screwed down sooner than 30 minutes before the time for charging, unless the foreman order otherwise.

4. During the process of drawing a kiln, two doors only must be down at any one time.

5. Not more than one kiln in a set must be charged, screwed down, or drawn at any one time, unless the foreman otherwise permits.



6. In the process of potting nitre the liquid must be run on slowly.

Every burner man who violates any of the foregoing rules will be liable to a fine of two shillings and sixpence for every such violation.

(L.S.)

Sanctioned by the Local Government Board,  
25th November 1892.

#### ALKALI, &c. WORKS REGULATION ACT, 1881.

SPECIAL RULES made by the United Alkali Company, Limited, for the guidance of the workmen employed by them as "salt cake men."

Every salt cake man shall comply with the requirements of such of the following special rules as may apply to any process in which he is employed; that is to say:—

1. A pot must not be charged when it is too hot.
2. Liquor must not be run into a pot until the whole charge of salt is in, and the door replaced.
3. If gas begins to escape in the process of running liquor into a pot the running liquor must be immediately slackened, or, if necessary, stopped completely for a time.

4. The damper between the pot and roaster must be kept as tight as possible.

5. In working the roaster all the doors must be kept closed as far as is practicable.

6. The opening from each roaster to a draft stack must be kept clear.

If gas begins to escape from the furnace the damper in the stack must be drawn.

7. All charges which have been properly roasted must be drawn from the furnace into the boxes once in every two hours, that is to say, at 7.30 a.m., 9.30 a.m., 11.30 a.m., 1.30 p.m., 3.30 p.m., 5.30 p.m., 7.30 p.m., 9.30 p.m., 11.30 p.m., 1.30 a.m., 3.30 a.m., 5.30 a.m.

If a charge is not properly roasted at the time fixed by this rule for drawing it from the furnace, the charge must be kept in the furnace until it has been thoroughly roasted or until the foreman permits it to be drawn.

8. If gas escapes from hot salt cake that is being loaded into a barrow, or tipped into a store, cold salt

cake must be thrown upon it to stop the escape as far as possible.

Every salt cake man who violates any of the foregoing rules will be liable to a fine of two shillings and sixpence for every such violation.

(L.S.)

Sanctioned by the Local Government Board,  
25th November 1892.

Northwich,

31st August 1893.

DEAR SIR,

As promised this morning we give you below a few figures relating to our sick club payments, before and after the introduction of the three shifts in our works.

We have taken as comparison a summer quarter in 1889, before the introduction of three shifts, and a summer quarter in 1893, after the introduction.

In 1889 the per-centage of those who received sick pay equal	-	-	-	-	7.1
In 1893	-	-	-	-	5.1

Or a reduction of 28.3 per cent.

In 1889 the men who were attended by the doctor equal	-	-	-	-	10.12
In 1893	-	-	-	-	5.1

Or a reduction of nearly 50 per cent.

We wish you to notice particularly the great reduction in those who received doctor's attendance (which means stopping away one or two days without actually being laid up for a week) has diminished to one half of what it used to be.

In our club only men who are away a week receive sick pay.

I also send you a copy of Hasenclever's patent, which I promised you.

If in any way we can be of service to you in your investigations we shall be very glad to give you our assistance.

Yours truly,

For Brunner, Mond, & Co., Limited,

GUSTAV JARMAY,

Managing Director.

H. S. Richmond, Esq.,  
34, Canning Street,  
Liverpool.



