In some cases during the first few days an erythematous rash occurs. The following are notes of such cases, so far as this rash is concerned:

Female, aged 12. On about the tenth day of illness there was a blotchy erythema on the face, forehead, and arms; patches of a scarlet colour, not raised, and not fading altogether on pressure. It lasted two to three days. The patient stated it itched very much.

Female, aged 18. A general eruption of which the appearance differed in different regions. It was present on almost the whole of the face, on the abdomen and chest, on the whole of upper and lower extremities. On the legs, hands, and feet it appeared as bright, red, slightly raised spots of small size, and slightly coalescent. On the forearms there was a confluent bright scarlet rash, slightly raised, fading on pressure. On the face and part of the abdomen it was confluent, of a dusky purple, and fading on pressure; but there was one large brownish patch, which did not fade. There was no marked rash on the back, only a faint mottling. This was about the eleventh day of illness. Next day the eruption had the appearance of erythema marginatum. The rash lasted six days; it itched very much.

In these two cases the proper spots of typhoid came out after the other rash had disappeared.

In a third case—a girl of 5—on the eighth day a papular and macular rash came out on the thighs and extensor surfaces of the knees and elbows; next day the rash was more extensive, though still confined to the extremities. The rash lasted four days altogether.

In the case of a man aged 45, a Russian Jew on his way to America, there was a rash consisting of faint pink macules, with a few petechiae, probably flea bites. The rash disappeared on pressure, and was most abundant on the back, being scanty on the limbs. There was none on the face. Rose spots were not seen. The patient died about the fourteenth day of his illness. From the account given he had evidently been infected before he left Russia. I strongly suspected typhus, in spite of a positive serum reaction (1 in 60), and especially because at the autopsy only slight swelling of one or two Peyer's patches were found. But shortly after his death his daughter and niece were admitted suffering from typhoid fever with all the common symptoms.

In none of these cases was the rash due to an enema or drugs.

ON BOTTLE-MAKERS' CATARACT.*

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IN THE BRITISH MEDICAL JOURNAL of January 24th, 1903, appeared a paper written by me on Bottle-finishers' Cataract, in which I described in some detail the process of making ordinary heavy-metal (but not flint) bottles (for example, wine, whisky, and beer bottles) and showed that cataract was very frequent in ordinary bottle finishers, was posterior cortical in its early stages, was due to the excessive heat to which the eyes of the bottle finisher were exposed whilst at work, and could be prevented by the men wearing goggles.

In December last I gave evidence on this subject in the House of Commons before a Departmental Committee of the Home Office entrusted to draw up a schedule of diseases due to certain occupations, in connexion with the Workmen's Compensation Act, 1906.

The statistics I drew up for this purpose I was about to publish, when, on January 5th of this year, a paper appeared in the JOURNAL by Professor S. Snell, of Sheffield, in which he stated, as the result of some inquiries he made from certain flint and ordinary glass bottle-making firms, and of a visit to certain ordinary glass bottle works and flint bottle works, that "there is not sufficient evidence to show that they (that is, bottle makers) are liable to the affection (cataract) to such an extent as has been asserted."

I therefore extended the field of my inquiries, the results of which are given below and fully confirm my first statements. Here it is necessary to point out that, unlike Professor Snell, my investigations were restricted to ordinary bottle makers only—that is, those who made bottles of heavy metal, such as whisky and wine bottles—for an inquiry I made four years ago led me to believe that cataract is not specially frequent among flint bottle makers (who make medicine and other lighter and better-class bottles). Ordinary bottles are made at huge tanks which are heated with coal gas and are excessively hot (2,500° F.), and into the fierce heat of these tanks the

"founder," the "gatherer," and the "finisher" (otherwise called the bottle maker) must look.

The "founder" feeds the tanks with metal and looks into them at infrequent intervals, and he is provided with a square of glass to look through; I have seen only one cataract in a founder, whom I operated upon, and he came from an ordinary glass works where sugar basins and tumblers were made.

The "gatherer" looks into the tank each time he "gathers" the metal for every bottle, and were it not that nearly all gatherers are apprentices or young men who are generally promoted to be "blowers" after a few years, they would undoubtedly develop cataract to the same extent as the finishers. Some of those who are not fortunate or skilful enough to be promoted do develop cataract (vide infra).

The "finishers," or bottle makers, are the men who suffer most, because they are the older men, having worked their way up through the grades of "taker-in," "wetter-off," "gatherer," and "blower," and because they look into the furnace each time they gather sufficient metal to form the neck of the bottle, which necessitates exposure of their eyes to the fierce heat for at least sixty-six minutes a day, or five and a half hours a week (see my previous paper).

The "blower" turns his back to the "hole" of the "tank" whilst at work, but as his eyes were exposed to the heat whilst he was a "gatherer," he, too, occasionally develops cataract.

In flint bottle works the mode of working is quite different, and the heat is not nearly so great, being generated by coal fires. "The flint bottle finisher sits, in many cases, ten yards away from the furnace, and works at a small 'glory hole,' into which he need never look." The bottle makers in flint bottle works, therefore, are not prone to cataract. In January last I operated upon a cataract in a finisher from an ordinary glass works, where he finished "sugars" (that is, sugar basins), as many as 800 a day; his was probably an ordinary senile cataract, as the men are not required to look into a hot furnace. In these works the metal is "gathered" from "pots"—little troughs by the side of the furnace—which is also the case in flint bottle works.

In my investigation I applied to the local secretaries of the men's societies to which the bottle makers belong, these officials having a more intimate knowledge of the men than the members of the various firms. There are three ordinary bottle works in this district, and I wished in the first instance to make a personal examination of all the men employed at the factory which I visited and described in my previous paper, and those who had been previously employed there and were now disabled, but a difficulty presented itself at the outset, for the men's officials could not induce the workmen to submit themselves for examination, because (1) they dreaded they might be told they were beginning to have cataract; and (2) if their sight was at all defective they did not wish their condition to become known, fearing loss of work.

It is the duty of the "finisher" to see that the bottle handed to him is without flaws and properly made, and when his sight begins to fail he has been known to trust to another man (a "gatherer") to tell him of defects. Should he overlook many defects he is liable to dismissal. Hence an inquiry among the men now working would be valueless unless it included them all, as those with defective vision were those most likely to avoid examination. This feeling on the men's part may partly explain Professor Snell's failure.

With the exception of the men now employed, some of whom I examined, I made a full examination of those men who are now disabled from working through cataract at this factory, with the help of Mr. F. Heptinstall, who has been Secretary of the North of England Glass Bottle Makers' Society for fifteen years, and who recently left the trade as a bottle finisher for fear he should develop cataract, as his uncle and father had done (see First Factory).

In addition to the factory referred to above, I made inquiries of the two local secretaries of the men's societies at the two other works which are situated in this district, and their figures are given below.

The result of my inquiries of the Yorkshire Bottle Makers' Society is also stated.

* A paper read in the University of Oxford at the Congress of Eye Surgeons, July 26th, 1907.

TABLE I.—*List of Men Superannuated—they all had Cataract and all were Bottle Finishers.*

No.	Age when Sight began to Fail.	Age when Disabled.	Number of Years a Finisher.	Condition of Lenses.		Examined by
				Right.	Left.	
1	53	53	27	Lens removed for cataract	Clear	The writer.
2	64	64	30	Cataract	Cataract	Dr. Brears.
3	55	55	21	Removed for cataract	One sector of senile cataract	The writer.
4	49	52	24	Cataract	A few radii of senile cataract	The writer.
5	62	62	32	Posterior cortical cataract	Posterior cortical cataract	Dr. Brears, Dr. D. Blair.
6	R. 50 L. 52	55	30	Mature cataract	Posterior cortical cataract and two radial sectors	Dr. D. Blair.
7	?	54	?	Removed for cataract	Removed for cataract	{ Dr. Call Weddell, and Dr. Cunningham.
8	52	53	30	Posterior cortical cataract	Cataract	The writer.

TABLE II.—*List of Workmen—all Bottle Finishers—who had become Disabled by Cataract, and who are Employed at Other Work, and all of whom have been Treated or Examined by the Writer.*

No.	Age when Sight began to Fail.	Age when Disabled.	No. of Years a Bottle Finisher.	Now Employed as	Condition of Lenses.	
					Right.	Left.
1	50	55	32	Hawker	Posterior cortical cataract	Removed for cataract (aged 55) by writer.
2	49	49	17	Labourer at light work	Posterior cortical cataract and one radial sector	Removed for cataract by writer.
3	36	46	23	Manager of factory	Removed for cataract (aged 41)	Posterior cortical cataract; some ringlike peripheral opacity.
4	47	53	18	Night manager of factory	Slight posterior cortical opacity	Slight posterior cortical opacity.
5	55	57	33	Labourer (four years)	Early cataract, radial sectors	Early cataract, radial sectors.
6	63	65	35	Lodgeman at factory	Removed for cataract	Removed for cataract by writer.

THE FREQUENCY OF CATARACT IN BOTTLE MAKERS.

First Factory.

This factory, described in my previous paper, employs at present about 130 hands (54 boys and 76 men)—namely, 24 takers-in (boys), 24 wetters-off (boys), 24 gatherers (6 boys and 18 adults), 24 blowers, 24 finishers, and 10 foundries.

One gatherer was working with a cataract in one eye; he was 24 years of age, and had been "gathering" six and a half years. A year and a half ago he noticed the sight in the left eye beginning to fail. His left cheek (this being more exposed to the fire than the right) is inflamed and scorched, and he has a ripe cataract in the left eye. The media of the right eye are perfectly clear and the fundus is normal. There is no history of any injury. He was examined under homatropine.

A member of a bottle-makers' society who has reached the age of 50 and is permanently disabled from working is entitled to superannuation. On inquiry I found that at this factory at the end of 1906 there were 8 members on the superannuation list, every one of whom was disabled through cataract, and they had all been bottle finishers. (See Table I.) From this and Table II it will be seen that there were 24 bottle finishers at work in this factory, and that no fewer than 14 were disabled from working as bottle finishers because of cataract—an enormous proportion.

All the above cases except 2 or 3 were examined by oblique illumination and the ophthalmoscope, and under a mydriatic when necessary. Cataract was not observed nor heard of amongst any other class of workmen except in the case of the one "gatherer" mentioned above.

The number of cases of incipient cataract among the men still working I could not ascertain.

Second Factory.

At present about 274 hands are employed at this factory, of whom 157 are men and the rest boys. There are 52 finishers, 52 blowers, etc. With Mr. Heptinstall's help I have been able to discover 17 men—16 finishers and 1 gatherer—who have cataract and who are or have been connected with these works, namely:

8 are superannuated members—namely, 7 finishers and 1 gatherer. The total number of superannuated members is 14.

5 are working at other work than finishing.
2 are still working as finishers (Nos. 7 and 8).
2 are disabled from working as finishers, but are not included in the above.

Of the above 17 cases, 7 cases are reported by Mr. Heptinstall, all of whom have been certified as suffering from cataract by various medical men, and I have personally examined the 10 cases recorded in Table III. Nos. 3, 4, and 5 in the list were operated upon by me, and No. 7 is the only man who is still working as a finisher and has had an operation for cataract.

Third Factory.

This factory employs at present about 296 hands, of whom about 168 are men and 128 boys. The number of finishers is 54, the blowers, gatherers, etc., having about the same number for each class of workman.

Six men (bottle finishers) are reported by the men's secretary to be totally incapacitated from working by cataract, and he adds—

It is very difficult to get to know all the cases of cataract, as men don't care to give publicity to the same; if I had time, say a few months, I might get to know a great many cases by private inquiry. There are many young men who don't care to let it be known they have cataract.

Dr. Douglas Blair attended a meeting for me on March 2nd of the men at present working at this factory, and which had been called for another purpose, and examined the eyes of 32 men. The majority of the men were young or middle-aged, there being only three or four old men present.

He examined the men under difficulties and without a mydriatic, namely:

Twenty-one finishers, 1 of whom had cataract in the left eye only. He was 44 years of age and the sight had been failing for a year.

Seven gatherers, one of whom had cataract in both eyes. He was 45 years of age and his sight had been failing for two years. The left eye had advanced and the right eye early cataract. He had been a gatherer for twenty-eight years.

Four blowers, none of whom had cataract.

That the proportion of cataracts reported amongst the men in the second and third factories is less than in the first factory is due simply to the circumstances that the

TABLE III.—List of Men (all Finishers) who have Cataract and who have been Examined by the Writer.

No.	Age when Sight began to Fail.	Age when Disabled.	Conditions of Lenses.		Remarks.
			Right.	Left.	
1	47	53	Posterior cortical cataract	Posterior cortical cataract	Was a finisher for 18 years, and is now a packer at the first factory; brother (a finisher) has cataract.
2	57	59	Posterior cortical cataract	Posterior cortical cataract	Was a finisher for 35 years; he left off work 4 years ago, when the eye condition was the same as now. Incapacitated from working.
3	R. 51 L. 48	—	Removed for cataract (aged 53)	Removed for cataract (aged 51)	Superannuated.
4	R. 46 L. 49	—	Removed for cataract (aged 59)	Removed for cataract (aged 59)	Not able to work as a finisher.
5	R. 55 L. 55	—	Removed for cataract (aged 58)	Removed for cataract (aged 58)	Not able to work as a finisher.
6	R. 51 L. 50	55 55	Posterior cortical cataract and a central congenital dot	Posterior cortical cataract and a central congenital dot	Superannuated.
7	R. 31 L. ?	At work	Removed for cataract (aged 36)	Slight posterior cortical cataract	Working as a finisher; with a + lens for right eye V. = 2.
8	R. 38 L. 38	At work	Posterior cortical cataract	Posterior cortical cataract	The notes of this case were taken four years ago.
9	R. 50 L. 55	56	Early cataract, posterior cortical (?)	Clear	Father had cataract; finisher for 31 years; superannuated; has also opacities in vitreous and disturbance of retinal pigment in both eyes.
10	R. 69 L. 43	43	Early posterior cortical cataract	Mature cataract	Doing light work for last 29 years; was a finisher for 23 years.

inquiry at the second and third factories is so much less complete. Still the numbers are sufficient to show how extremely common cataract is amongst bottle finishers.

SUMMARIES OF CASES OF CATARACT OBSERVED IN THE THREE FACTORIES IN THE SUNDERLAND DISTRICT.

At these three factories 400 men are employed, among whom there are 130 finishers, 130 blowers, etc. The gatherers also number about 130, but one-fourth of them are boys.

Number of Men known to have Cataract = 40.

	Founders.	Blowers.	Gatherers.	Finishers.
Men at work (report very incomplete) ...	0	0	2	3
Of 23 superannuated men (who must be over 50 years of age) ...	0	0	1	15
Doing other work owing to cataract ...	0	0	0	11
Others disabled by cataract ...	0	0	0	8
Totals ...	0	0	3	37

These figures prove the great frequency of cataract in bottle makers, especially in bottle finishers, and are, I imagine, unparalleled in any other trade.

In 25 of the cases of cataract the age at which the sight began to fail is stated, and it will be observed that—

The sight began to fail in 1 case between the ages of 21–30 years.

"	"	"	3 cases	"	"	31–40	"
"	"	"	13	"	"	41–50	"
"	"	"	6	"	"	51–60	"
"	"	"	2	"	"	61–65	"

In other words, in two-thirds of these cases the eyes began to suffer from cataract by the age of 50 years.

As the cataract nearly always begins close to the posterior pole of the lens which is near the nodal point, that is, the point through which all rays must pass which enter the eye without undergoing refraction (principal rays), the disturbance of vision is very great, though improvement in the sight may be effected by the use of atropine.

In 21 cases the age at which disablement from work occurred is known, namely:

1 man	was disabled	between the ages of	41 to 45 years.
3 men	were	"	46 to 50 "
0	"	"	51 to 55 "
4	"	"	56 to 60 "
3	"	"	61 to 65 "

In 14 out of 20 cases, therefore, disablement through cataract was brought about by the age of 55.

In 17 cases the number of years the workman was a finisher before disablement occurred is known, namely:

Three men were finishers for from 15 to 20 years before being disabled.

Three men were finishers for from 21 to 25 years before being disabled.

Five men were finishers for from 26 to 30 years before being disabled.

Six men were finishers for from 31 to 35 years before being disabled.

The number of years varied between 17 and 35 years, the average being 27 years.

In 16 cases in the above lists in which the necessary figures are given it appears that the time between the sight beginning to fail and the occurrence of disablement from cataract varies from some months up to ten years, the average being about three years.

Both eyes are almost always affected, as will be seen by reference to the cases given above; and the disease often begins about the same time in both lenses, though there may be a difference of some years between them in this respect. In the Yorkshire cases given below both eyes were affected in 33 out of the 37 cases.

THE GLASS BOTTLE MAKERS OF THE YORKSHIRE UNITED TRADE PROTECTION SOCIETY.

The total number of members of the above society is 2,623; but of these only 1,341 were employed in December last, made up as follows:

	Men.	Apprentices.
Finishers (or makers) ...	447	—
Blowers ...	430	17
Gatherers ...	245	202
	1,122	219

The large number of hands unemployed (1,282) is due to the fact that the trade is a decaying industry, owing to foreign competition. Among the unemployed, however, are 131 members incapacitated for work.

The area covered by the society includes the whole of Yorkshire, Blaydon-on-Tyne with 85 adult members, Newport in Monmouthshire with 91 members, and London with 29 members. In Yorkshire are included the works at Castleford, Swinton, Hunslet, Thornhill Lees, Knottingley, Wakefield, Barnsley, Conisbro', Masbro', Wombwell, Stairfoot, and Hull.

At my request, Mr. A. Greenwood, the Central Secretary, has prepared me a list of all the members who have been superannuated during the last nine years, numbering 114, and showing their ages and the diseases from which they

were suffering, and which caused their permanent inability to work. All these men were examined by Dr. G. B. Hillman of Castleford, who certified their condition. To be entitled to superannuation, these men must have attained the age of 50 years, and be permanently unable to work at their trade.

So far as my inquiry is concerned, these statistics are very incomplete, because there are no figures available to show:

1. The number of men who are working and who have cataract.
2. The number of men who are disabled by cataract and are under 50 years of age.
3. Men who have left the trade for various reasons (including failing sight) and who have now cataract.

Of the 114 superannuated members (all necessarily over the age of 50 years), 37, or 32.4 per cent., had cataract, and all but one of these were incapacitated for work through the eye condition. There were:

79 finishers, 29 of whom had cataract, or 36.7 per cent.	
28 blowers, 4 " " 15.4 "	
9 gatherers, 4 " " 44.4 "	
Total, 114 men, 37 " " 32.4 "	

I know of no other class of disabled workmen with such an unwonted prevalence of cataract.

Of the 37 cataract cases:

11 were disabled between the ages of 50 and 54 years inclusive.	
12 " " " 55 " 59 "	
12 " " " 60 " 64 "	
2 " " " 65 " 70 "	

The average age of disablement was 57.3 years, but if those with cataract who are under 50 years of age were known and included, this average age would be reduced by some years.

In addition to the 37 with cataract, 11 others had other eye affections, making a total with eye diseases of 48 men, or 42 per cent. of the whole—namely:

- 2 had traumatic cataract (not included in the above).
- 1 had corneal ulcer.
- 3 had optic neuritis.
- 5 had other eye affections (hypermetropia, presbyopia, myopia, "failure of sight," and defective sight).

FORM OF THE CATARACT IN ITS EARLIEST STAGES.

A perusal of the cases detailed in the tables given above shows that in 16 cases the disease was seen in its early stages, and in 13 of these it is definitely stated that it was posterior cortical in form, and in only 3 was it beginning in one of the ordinary senile forms as peripheral radial sectors. It is true that in 2 of the posterior cortical cases there were radial sectors, namely, in one case one sector and in another two. In none of these early cases was a perinuclear development noticed.

When both lenses in a patient were seen in an early stage of the disease the form of the cataract was identical in both.

The posterior form of development is described in detail in my previous paper. Of course, an ordinary senile cataract may begin in the posterior cortex, but it is a rare form, the common forms being equatorial radial sectors and opaque layers forming around the sclerosed nucleus.

It was to be expected that some of the cases would begin in an ordinary senile form considering the age of the men, but the fact remains that the disease usually begins as a posterior cortical cataract, but it differs from the ordinary posterior cortical cataract as described in the textbooks in the following points:

1. Bottle-finishers' cataract is a primary cataract, there being no posterior mischief except sometimes disturbance of retinal pigment, and when it is successfully removed the sight is good, though the workman is rarely able to resume work as a finisher owing to the loss of the power of accommodation. At its commencement it is like a cobweb in structure (and best seen with a +10 or +12 lens by direct examination) and saucer-shaped, owing to the opacity being immediately within the posterior capsule. The outline is irregular, and not radial nor rosette shaped.

2. Ordinary posterior cortical cataract is one secondary to disease of the vitreous, choroid or retina, and consequently frequently occurs in the young, and after its removal the sight is bad. Moreover the form of this cataract is at first rosette-shaped or stellate, its centre corresponding to the posterior pole of the lens, while its rays are directed radially toward the periphery (Fuchs).

A posterior cortical must not be confounded with a posterior polar cataract, the former is a progressive disease of the lens substance, whilst the latter is a mere dot on the posterior surface of the lens capsule and represents the remains of the hyaloid artery when this vessel does not disappear completely; it is a congenital and stationary affection.

ETIOLOGY AND PREVENTION.

It is interesting to observe that cataracts produced by the administration of naphthalene to animals and by the injection of saline or sugar solutions into their blood show an opacity first in the posterior cortical layers and near the equator of the lens next the capsule; and lenses removed from the eye and artificially dried show signs of opacity in the same regions first. Magnus affirms that 93 per cent. of all senile cataracts begin in the same way as naphthalene cataract. This statement lacks confirmation so far as I am aware, unless my figures corroborate it. Case 3 in Table II showed the opacities both near the posterior pole and the equator.

These statements lend support to the belief that the excessive heat of the gas furnaces is the cause of the disease, an opinion borne out by the fact that the frequency of cataract in bottle makers is in proportion to the extent and length of exposure of the eyes of the different classes of workmen to the fierce glare of the tanks; hence the bottle finisher suffers by far the most, next comes the gatherer, who is succeeded by the blower, who is only seldom attacked, the rest of the workmen being affected not at all (*vide supra*). A shrinkage of the lens substance (drying) caused by the prolonged exposure to great heat may cause a slight separation of the lens fibres from the capsule first near the posterior pole, which would account for the opacity being first seen there and its peculiar saucer-like shape. The equatorial region being sheltered behind the iris, especially as the pupil is contracted by the bright light, escapes from the effect of the heat for a longer time than the cortex near the posterior pole.

Cataract does not appear to be common in iron and steel workers, because the eyes of the men are not exposed to the heat to anything like the extent a bottle finisher is, and in the Siemens-Martin process I am informed the men wear dark-blue protecting glasses. Investigation of the condition of the eyes of these and other workers whose eyes are exposed to great heat is desirable.

In my previous paper I recommended that the men should wear dark coloured spectacles or goggles whilst at work, because glass possesses the property of allowing only 30 per cent. of the heat rays to pass through it, and, if the glass be dark coloured, many of the light rays are intercepted also. This suggestion has been adopted by half the finishers at the first factory referred to, by about one-fourth at the second, but by one man only at the third, and I am informed that there is already a belief amongst the men that the glasses have done much good. At first there was considerable difficulty in wearing the goggles, owing to the condensation of the moisture from the excessive sweating of the men while at work, but by the use of "Lasin" pencils, made of a kind of soap, this drawback has been overcome. At one works the goggles are dark-blue and at the other dark-smoked.

I am told that at some works in Germany a square of framed glass hangs in front of the hole, through which the finisher looks into the furnace. The eyes of the gatherer, too, should also be protected.

Doubtless there are other ways—for example, by slight structural alterations of the holes at which the finishers and gatherers work—by which the men would be able to obtain the metal without their eyes being exposed to the glowing sea of glass.

MEDICO-LEGAL ASPECTS.

Should bottle-finishers' cataract be put on the Schedule of Industrial Diseases appended to the Workmen's Compensation Act (1906), it is evident that preventive measures will be at once put in force by the employers. It will also most probably lead to the systematic examination by an expert of the eyes of all intending apprentices, and possibly to periodic examinations of the workmen. Should any defect be found, will the workman be allowed to continue to work at his trade? It is unfortunate that the Workmen's Compensation Act swells the number of the unemployed and the unemployable.