T H E S I S

o n

The PREVALENCE of TUBERCULOSIS in CERTAIN AYRSHIRE VILLAGES with SPECIAL REFERENCE to HOUSING and LIVING CONDITIONS and PROPHYLAXIS

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T H E S I S

Presented by

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The PREVALENCE of TUBERCULOSIS in CERTAIN AYRSHIRE VILLAGES with SPECIAL REFERENCE to HOUSING and LIVING CONDITIONS and PROPHYLAXIS.

" ---- Medicine will make but halting progress, while whole fields essential to the progress of medicine will remain unexplored, until the general practitioner takes his place as an investigator."

Sir James Mackenzie.[1]

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P R E F A C E.

While performing the daily routine work of a colliery and rural practitioner in this parish,(Tarbolton) within the last few years, I was surprised to find that the diagnosis and treatment of Tuberculosis constituted one of my commonest duties.

Being born and bred in the large city of Glasgow, I not unnaturally thought that in rural areas good health would be the rule, and that the ravages of tubercle would be felt in rural areas much less than in large cities.

Great was my surprise to find that the tuberculosis death-rate of this parish approaches that of Glasgow.

This paper is the result of my investigations as to why tuberculosis should be so common in this parish, constituting as it does, a rural area.
As my labours proceeded they became more and more interesting.

It was not long until I had evidence to show that practically all the deaths from tuberculosis were occurring in the miners' rows and houses.

I have, therefore, confined my investigations to three villages, namely, DRUMLEY, MOSSBLOWN, and TARBOLTON - all mining villages.

I have quoted extensively from the evidence led before the Royal Commission on Housing (Scotland) 1914, in giving the descriptions of Mossblown and Drumley.

As I visit these villages every other day, I can testify to the accuracy of the descriptive parts of such quotations.

In/

In other instances I have also quoted from writings of certain authorities and investigators. All such quotations are acknowledged in the list of references.

The notes of my cases were all taken while performing my usual visitations of the villages. In some cases they are unfortunately scanty.

The cases described have all been discovered during the daily round of work. No attempt has been made to manufacture cases.

Regarding diagnosis, this has in practically every instance been confirmed by the Tuberculosis Medical Officer for the district.

I have to thank the late John Dunlop, Esq., Registrar for the Parish of Tarbolton, for readiness and willingness to allow me access to his records, &c.

The photographs were taken by myself and although the prints are not up to professional standard they will, I hope, serve to illustrate the villages and the living conditions.

While venturing to present this essay as a suitable Thesis to the University of Glasgow, I am also hopeful that by its means I may help to give some information regarding the prevalence and causes of tuberculosis in rural areas, and thus show the great need for housing reform in those areas, in much the same manner as Chalmers and Williamson have done for the cities of Glasgow and Edinburgh.

J. Lindsay Boyd,

February, 1917. Tarbolton.

I N T R O D U C T O R Y.

Our country at the present time is passing through, and let us hope successfully, a period of great stress and trial. The drain upon her financial resources has been enormous. More important however than any form of financial expenditure, is the expenditure of human life. It behoves all therefore, who look towards the future to consider what action should be taken in order that the recovery of the country to a normal and if possible, a more progressive condition, may be speedy and complete.

The duties of the medical practitioner towards his patients are twofold.

(1) He should endeavour in the event of serious illness, to guide his patient (as the late Dr Samson Gemmell used to say) into the "haven of convalescence".

(2) He should also endeavour so far as he is able to obtain for his patient a complete recovery in order that his patient may take his place in the State as a useful and constructive citizen.

There are, however, many diseases in which recovery is apt to be incomplete, so that while the patient may remain alive and in medium health, he is not fit for active work.

To this class of disease, Tuberculosis belongs.

It is not enough merely to preserve life. The State requires at this time more than ever, healthy citizens.

A recent publication gives us food for reflection. Norman MacLean in his volume 'STAND UP, YE DEAD'[2] considers the/

the evil of the falling birth rate. In Hampstead, London[3] the birth rate has fallen from 30. per thousand to 17.55 and in the city itself to 17.4. In Edinburgh it has fallen in some districts to 10. He states, also, that in the year 1871[4] there were 34 children born in Edinburgh for every thousand of the population, while in the year 1915, the number of births per thousand of population had fallen to 17. Not only so but in those very cities where a great deal of money has been expended in order to try to reduce the infantile mortality, the results have not been so satisfactory as one might have expected.

The part played by Tuberculosis in shortening the lives of many of the population is well known. During the years 1891-1900, it was the cause of death in 11% of the deaths from all causes in England and Wales.[5] It is a very common cause of death in Russia.[6]

In Manchester the death rate from Tuberculosis has risen somewhat within the last three years.[7] In Glasgow during the year 1912, Tuberculosis was responsible for nearly one out of every eight deaths.[8] In the parish of Tarbolton, Ayrshire, between the years 1906 - 1915, inclusive, Tuberculosis was the cause of death to the extent of nearly one in every nine deaths. Tarbolton is a rural parish and thus the question immediately arises, "Why should the death rate from Tuberculosis in a rural parish approach so closely that of a great industrial centre?" This is the question which I shall endeavour to answer, and I hope to show that in both instances the agencies at work as predisposing causes of Tuberculosis are practically identical.

Before the various bodies, whose duty it is to look after the public health, can hope to eradicate Tuberculosis, it is necessary that the exact prevalence of the disease be known, and that the causes of such prevalence should be elucidated. In one district occupation may play an extremely important part. In another, poverty, usually acting in conjunction with alcoholism and defective housing conditions. It is interesting, but saddening to learn of the great increase in the prevalence of Tuberculosis in Belgium during the present German occupation.[9] In this instance, poverty, defective nutrition, lack of segregation of the infected, lack of treatment and efficient hospital accommodation, and last but not least the general unhappy condition of the people, are all no doubt acting in conjunction as predisposing causes.

LIST of DEATHS from SOME FORM of TUBERCULOSIS in the PARISH of TARBOLTON, AYRSHIRE, from 1906 to 1915 (inclusive) taken from the REGISTRAR'S ENTRY of DEATHS.

1906	Sex.	Age.	Disease	Where died.
1	Male	37 yrs.	Phthisis	Annbank Village.
2	Female	2 "	Tuberculous Meningitis	Failford "
3	Female	49 "	Phthisis	Tarbolton "
4	Male	27 "	Phthisis	Annbank "
5	Female	16 "	Phthisis	Mossblown "
6	Male	31 "	Phthisis	Annbank "
7	Male	1½ "	Tuberculous Meningitis	Annbank "
8	Male	1½ "	Tuberculosis of Bowels	Annbank "
9	Male	62 "	Phthisis	Annbank "

Total number of Deaths for year from all causes 67

Total " " " due to Tuberculosis 9

Made up as follows:-

Phthisis	6)	
Tuberculous Meningitis . . .	2)	9
Abdominal Tubercle.	1)	

1907	Sex.	Age.	Disease.	Where died.
1	Male	52 yrs.	Phthisis	Annbank Village.
2	Female	35 "	Phthisis	Annbank "
3	Male	42 "	Phthisis	Annbank Station
4	Female	25 "	Phthisis	Failford Village.
5	Female	15 "	Phthisis	Mossblown "
6	Female	36 "	Phthisis	Tarbolton "
7	Female	38 "	Phthisis	Tarbolton "
8	Male	17 "	Acute Miliary Tuberculosis	Annbank Station.

Total number of Deaths for year from all causes 55

Total " " " due to Tuberculosis 8

Made up as follows:-

Phthisis	7)	
Acute Miliary Tuberculosis . .	1)	8

N.B.

Cases 3 and 8 occurred next door to one another.

1908	Sex.	Age.	Disease.	Where died.
1	Male	70 yrs.	Lupus. Senile Decay.	Tarbolton Village.
2	Male	7 "	Tuberculous Peritonitis (Epilepsy)	Drumley "
3	Female	29 "	Tuberculous Disease of Hip Joint	Burnbrae "
4	Male	29 "	Phthisis & Tuberculous Laryngitis	Tarbolton "
5	Female	1 10/12 "	Tuberculous Meningitis	Annbank "
6	Male	23 "	Phthisis	Burnbrae "
7	Female	11 "	General Tuberculosis	Tarbolton "
8	Male	26	Phthisis	Annbank "
9	Female	4 "	Tuberculous Meningitis	Annbank "

Total number of Deaths for year from all causes 60

Total " " " due to Tuberculosis 9

Made up as follows:-

Phthisis.	3)	
Tuberculous Meningitis . . .	2)	9
Abdominal Tuberculosis . . .	1)	
Other Forms.	3)	

1909	Sex.	Age.	Disease.	Where died.
1	Male	16 yrs.	Phthisis & Intestinal Tubercle	Drumley Village
2	Male	16 "	Phthisis	Drumley "
3	Male	7½ mths.	Tuberculous Meningitis	Mossblown "
4	Male	26 yrs.	Phthisis	Annbank "

Total number of Deaths for year from all causes 59

Total " " " due to Tuberculosis 4

Made up as follows:-

Phthisis.	3)	4
Tuberculous Meningitis . . .	1)	

1910	Sex.	Age.	Disease.	Where died.
1	Male	8 yrs.	Tuberculous Peritonitis	Drumley Village.
2	Female	21 "	Phthisis	Fail Toll
3	Male	6 "	Tuberculous Meningitis	Annbank Village.
4	Male	73 "	Tuberculous Bone Disease of Foot & leg	Annbank Village.

Total number of Deaths for year from all causes 41

Total " " " due to Tuberculosis 4

Made up as follows:-

Phthisis	1)	
Abdominal Tubercle	1)	4
Tuberculous Meningitis	1)	
Other Forms.	1)	

1911	Sex.	Age.	Disease	Where died.
1	Female	10 yrs.	Tuberculous Meningitis	Tarbolton Village.
2	Female	$1\frac{3}{12}$ "	Tuberculous Meningitis	Mossblown "
3	Male	$1\frac{4}{12}$ "	Abdominal Tuberculosis	Annbank "
4	Female	17 "	Phthisis	Annbank "

Total number of Deaths for year from all causes 46

Total " " " due to Tuberculosis 4

Made up as follows:-

Phthisis	1)	
Tuberculous Meningitis	2)	4
Abdominal Tuberculosis	1)	

1912	Sex.	Age.	Disease.	Where died.
1	Female	$\frac{9}{12}$ yrs.	Whooping-Cough & General Tuberculosis	Annbank Village.
2	Female	13 "	Phthisis	Mossblown "
3	Male	2 "	Tuberculous Meningitis	Annbank "
4	Male	$\frac{2}{12}$ "	Inanition with Tuberculosis	Tarbolton "
5	Male	12 "	Phthisis	Annbank "
6	Male	29 "	Phthisis	Failford Village.

Total number of Deaths for year from all causes 49

Total " " " due to Tuberculosis 6

Made up as follows:-

Phthisis	3)	
Tuberculous Meningitis . . .	1)	6
Other Forms	2)	

1913	Sex.	Age.	Disease.	Where died.
1	Female	$1\frac{1}{2}$ yrs.	Phthisis	Mossblown Village.
2	Female	18 "	Phthisis	Drumley "
3	Male	3 "	Tuberculous Meningitis	Mossblown "
4	Male	16 "	Phthisis	Mossblown "
5	Female	11 mths.	Abdominal Tubercle	Annbank "
6	Male	8 "	Tuberculous Meningitis	Mossblown "
7	Male	3 "	Tuberculosis	Mossblown "
8	Female	8 yrs.	Phthisis General Tuberculosis	Tarbolton "
9	Male	32 "	Injury to Hip followed by Hip Joint Disease, Tuberculosis of Glands, & Phthisis ultimately	Drumley "

Total number of Deaths for year from all causes 62

Total " " " due to Tuberculosis 9

Made up as follows:-

Phthisis	5)	
Tuberculous Meningitis . . .	2)	9
Abdominal Tubercle.	1)	
Other Forms	1)	

N.B.

Cases 3 and 6 occurred next door to each other.

1914	Sex.	Age.	Disease.	Where died.
1	Male	2 yrs.	Tuberculous Meningitis secondary to Abdominal Tubercle	Tarbolton Village.
2	Female	6 "	Phthisis Tuberculous Meningitis	Annbank Station.
3	Female	32 "	Phthisis	Mossblown Village.

Total number of Deaths for year from all causes 67

Total " " " due to Tuberculosis 3

Made up as follows:-

Phthisis	2)	
Abdominal Tuberculosis . . .	1)	3

N.B.
Tuberculous Meningitis occurred as a Terminal Infection in two of the above cases.

1915	Sex.	Age.	Disease.	Where died.
1	Male	56 yrs.	Tuberculosis of Hip and Tuberculous Pneumonia	Failford Village.
2	Male	$1\frac{2}{12}$ "	Whooping-Cough and Tuberculous Meningitis	Tarbolton "
3	Male	17 "	Phthisis	Tarbolton "
4	Male	7 "	Phthisis and General Tuberculosis	Mossblown "
5	Male	56 "	Phthisis	Tarbolton "
6	Female	81 "	Phthisis	Failford "

Total number of Deaths for year from all causes 58

Total " " " due to Tuberculosis 6

Made up as follows:-

Phthisis	4)	
Tuberculous Meningitis . . .	1)	6
Other Forms	1)	

Taking the total of the above tables the following figures are obtained.

Total number of Deaths in Tarbolton Parish for 10 years. (1906 - 1915). 564

Total number of Deaths due to some form of Tuberculosis in Tarbolton Parish for the same period . . 62

The ratio of the Tuberculosis Death Rate to the Death Rate from all causes is therefore approximately 1 in 9. Out of every nine deaths, one death is directly due to some form of tuberculosis.

It is of course, possible that in certain cases in the foregoing list of deaths due to tuberculosis, the certified cause of death may not be accurate, due to mistakes in diagnosis. This is to a certain extent counterbalanced by the fact that in several instances deaths from tuberculosis, which would ordinarily have occurred within the parish, took place in institutions outside the parish, whither the patients had been sent for treatment.

Of the 62 deaths due to tuberculosis, the nature of the tuberculous disease was as follows:-

	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	Total	Per cent.
Phthisis . .	6	7	3	3	1	1	3	5	2[x]	4	35	56.45
Tuberculous Meningitis .	2	0	2	1	1	2	1	2	0	1	12	19.35
Abdominal Tubercle. .	1	0	1	0	1	1	0	1	1[x]	0	6	9.7
Other Forms. . . .	0	1	3	0	1	0	2	1	0	1	9	14.5
	9	8	9	4	4	4	6	9	3	6	62	100.

[x] See note to table for year 1914.

The relatively high percentage of deaths due to tuberculous meningitis should be noted.

The Supplement to the Sixty-fifth Annual Report of the Registrar General of Births, Deaths and Marriages in England 1891 - 1900, gives the following percentages of frequency:- [10]

Phthisis	69%
Tuberculous Meningitis	11%
Tuberculous Peritonitis	11%
Other forms of Tuberculosis. . . .	9%

It is interesting also to note that during the period of 10 years (1906 - 1915) not a single death from any form of tuberculosis occurred among the farming population. The mining population furnished practically all the deaths. Also, the majority of the deaths occurred in the miners' rows.

Age Incidence of Death from Phthisis in above series.

Age.	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	Total
0 - 5 yrs.								1			1
5 - 10 "								1	1	1	3
10 - 20 "	1	1		2		1	2	2		1	10
20 - 30 "	1	1	3	1	1		1				8
30 - 40 "	2	3							1		6
40 - 50 "	1	1						1			3
50 - 60 "		1								1	2
60 - 70 "	1										1
70 - 80 "											
80 & over										1	1
	6	7	3	3	1	1	3	5	2	4	35

The largest number of deaths from phthisis occurred in adolescents, 10 to 20 years of age. Next comes the series of deaths in early manhood or womanhood, 20 to 30 years of age. Thirdly those deaths which occurred in middle life, 30 to 40 years of age. The deaths in the above three series taken together constitute 71.14% of the total number of deaths from phthisis.

Of the 35 Deaths due to Phthisis
19 occurred in males
16 " " females.

Ages at Death from Tuberculous Meningitis in above series of 62 deaths.

	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	Total
0 - 5 yrs.	2		2	1	1	1	1	2	1[x]	1	12
5 - 10 "						1			1[x]		2
	2		2	1	1	2	1	2	2	1	14

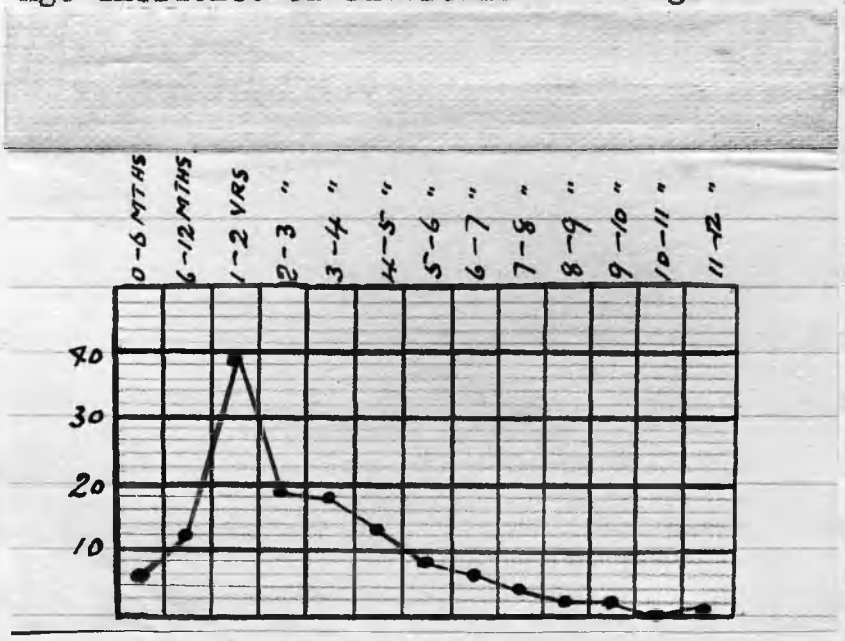
[x] See note to table for year 1914.

Of the above 14 deaths:-

2 occurred during first 12 months.
4 " " 1st - 2nd year.
3 " " 2nd - 3rd "
1 " " 3rd - 4th "
1 " " 4th - 5th "
2 " " 6th - 7th "
1 " " 10th -11th "

This series is a small one and should not be over analysed, nevertheless it agrees with the adjoining table drawn up by S T I L L.[11]

Age Incidence of Tuberculous Meningitis.



The following table shows the number of Deaths from Tuberculosis in the different Villages in the Parish of Tarbolton during the years 1906 - 1915 inclusive.

	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	Total
Annbank. .	6	2	3	1	2	2	3	1	1		21
TARBOLTON .	1	2	3			1	1	1	1	3	13
MOSSBLOWN .	1	1		1		1	1	5	1	1	12
DRUMLEY. .			1	2	1			2			6
Failford .	1	1					1			2	5
Burnbrae .			2								2
Others . .		2			1						3
Total. .	9	8	9	4	4	4	6	9	3	6	62

Nature of villages indicated above.

Annbank. . .	236 Houses	Mining (wholly).
Tarbolton . .	240 " (approx.) . .	Mixed (Mining & others).
Mossblown . .	97 Houses increased about 6 years ago to 179	Mining (wholly).
Drumley. . .	42 Houses	Mining (with one exception).

Having made a general survey of the mortality in the parish from tuberculosis - I shall now submit evidence to show the prevalence of the disease. The villages will be described in detail. The cases described have with few exceptions come under my personal observation between January 1st 1914 and January 1st 1917. In some instances deaths are inserted which occurred before January 1st 1914 in order to show the steady nature of the prevalence of the disease, and its predilection for certain localities.

Firstly: DRUMLEY VILLAGE.

"Drumley is a small village of 36 two apartment houses standing near the side of the Ayr and Mauchline road, about a quarter of a mile from Annbank Station.

It was built by the Ayr Colliery Co., from twelve to sixteen years ago.

The first row is of two storeys - the kitchen below the room above, and consists of two dwellings ten on each side, standing back to back. The kitchen measures 15 feet by 12 feet and the rooms about the same.

The rent is 1/8d. per week.

There is a dry closet for every family, and a washing house for every five families, with coalhouses and open ashpits; these are 30 feet from the front doors and some of the ashpits when we saw them on 6th December, 1913, were very full and dirty.

There is a water supply from Loch Bradan.

The pathways are unpaved and in wet weather very muddy. The open gutter syvor was sluggish and rather dirty.

The second row has sixteen two apartment houses. This row is only one storey. The kitchen measures 17 feet by 12 feet, the room 12 feet by 12 feet. There is the same accommodation as to washing houses, closets, etc., all under one roof and only 27 feet from the front.

These places give the rows a dirty appearance and must be against the health of the inhabitants. The ashpits here were also very full and dirty, and the open syvor was dirty too.

The houses are built of brick, and the rent is 1/8d. per week". [12]

This description is fairly correct. To it I would add the following. (1) There is a third row somewhat irregularly built, consisting of 6 houses and called Southside. It lies on the main road and in front of the back-to-back row. (2) The drains from some of the wash houses are defective and the contents of the washing tubs &c. are simply emptied on to the ground in the vicinity. (3) The beds of all the houses are of the "inset" type. There are two beds in the kitchen of the back-to-back row. In the room above there is no inset bed. In the second row there are two inset beds in the kitchen and one inset bed in the room. One of the inset beds in the kitchens of the back-to-back row is of an extremely bad type. Owing to the flight of stairs ascending to the room above, the available air space of the bed is halved. All these beds are situated at least 3 feet from the floor. (4) In the back-to-back row the heights of the kitchens and rooms are respectively 9½feet and 8½feet. In the single one-storey row the height of the apartments is 9 feet.

(5) Some of the walls of the ashpits are beginning to give way, with the result that the contents are littered around. Not only so, the dejecta of children is commonly seen in the neighbourhood of the ashpits, thus giving evidence of the carelessness of at least some of the mothers.

(6) The village lies 200 feet above sea-level and is built on a red soil of a clayey and somewhat damp character. Below the subsoil there is a very thick stratum of clay.

Its situation on the gradual ascent of land from the flat surface around Ayr to the village of Mauchline, which/

which is several hundred feet above sea-level - renders Drumley an exposed village. The prevailing rainy wind is from the south west. Geologically the prevailing strata of this part of the parish belong to the Carboniferous series.

As a village, Drumley faces the north west; the living apartments (kitchens) of the majority of the houses never receive the direct rays of the sun.

Drumley. North side of back-to-back Row.

Exposure 3 Sec.
Feb. 1917

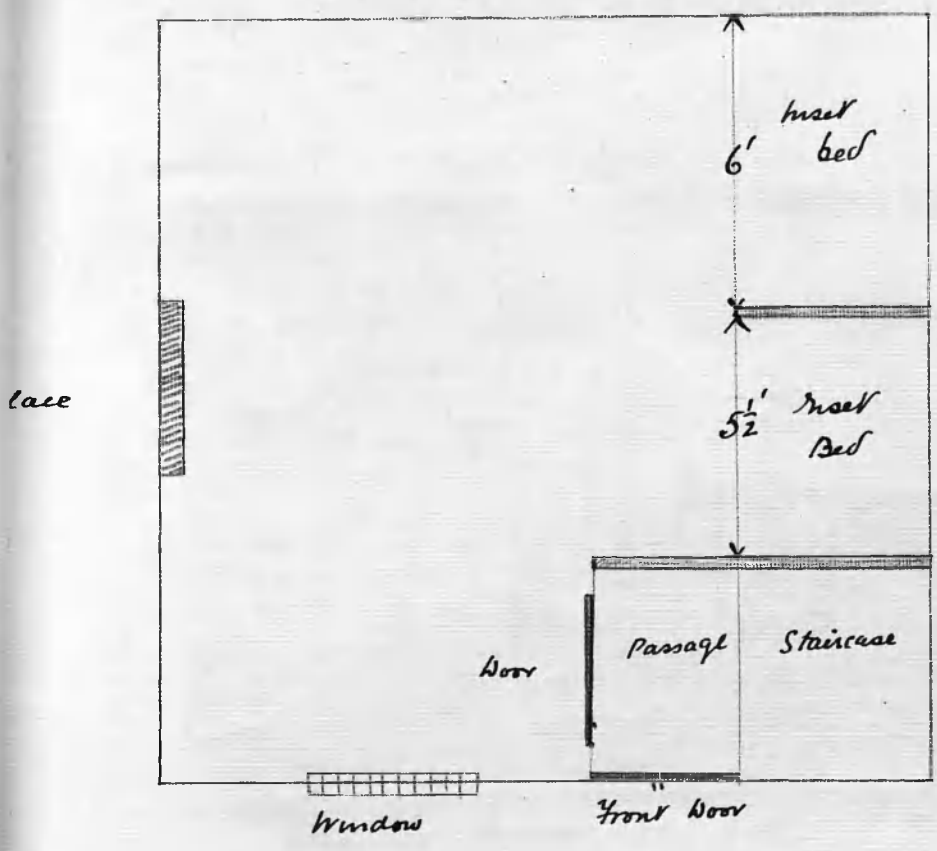
Drumley. South side of back-to-back Row.

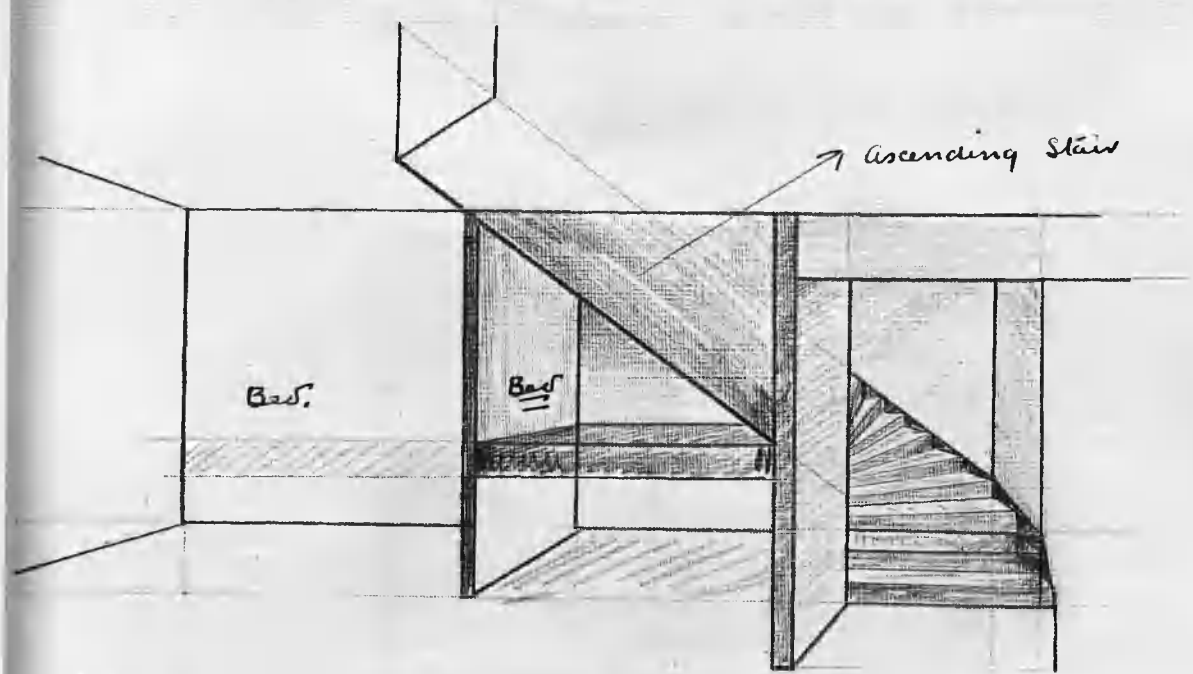
Snap. 1/25 Sec
Feb. 1917

Drumley Village.

Plan of kitchen of back-to-back Row.

Scale $\frac{1}{4}$" = 1'





Elevation showing how the ascending stair reduces the air space of one inset bed by one half.

Washing Houses &c of Drumley

(1) Entrance to washing house

(2) Passage leading to 5 dry W.Cs

(3) Ashpit

(4) Broken down wall of ashpit

(5) Single row of dwelling houses.

Snap 1/25 sec

South side - Drumley.

Tuberculosis infected house. (2 cases)

Note the wooden hut for one of the patients. See page 31

The following is the Sanitary Inspector's Report:-

"Drumley Rows are situated near Annbank Station, and consist of 36 two apartment houses. Twenty of the houses are two storeys, the kitchen being on the ground floor and the room on the upper floor. The walls are plastered inside on the hard, the windows are sashed, and the ground floors are cement. The other 16 houses are one-storey, the plans of which were approved by the Committee. The houses are strapped, lathed and plastered, and the windows are sashed and hung, the floors are of cement and the roofs are rhoned. There is a dry closet and coal house for each family, and a wash house for every five families, with an ashpit placed behind the dry closets. The water supply is by gravitation, and the drainage is by open channels. The houses are all in a good sanitary condition." [13]

Finally we have the third report.

"DRUMLEY ROWS."

"There are 36 houses here, 20 of which are two storeys and although plastered on the hard, were found to be dry and comfortable. The remaining 16 houses were built under the Building Bye-laws and the whole are in a good sanitary condition." [14]

In my opinion the first report is the most accurate and gives the best description of the village.

I shall now give details of the cases I have observed in this village.

A. Back-to-Back Row,

No. 1. There are 6 inmates. A female child died from tuberculosis in 1905.

No. 5. There are 9 inmates. M.McL., adolescent female. She turned ill in August 1901 with an attack of pleurisy. Later definite signs of pulmonary tuberculosis appeared, with tubercle bacilli in the sputum. She was sent to Glenafton Sanatorium. Later she was discharged somewhat improved. Eventually she became chronic and died in 1913.

No. 7. There are six inmates. M.K., aged 22 years, adolescent female. During the summer of 1913 when 19 years of age she turned ill with gastro-intestinal symptoms. My predecessor (the late Dr. McCallum) sent her into Heathfield Hospital, Ayr, as a probable case of typhoid fever. I have since learned that Widal's Reaction was not positive at any time during her illness. She was discharged apparently well. Early in 1914 she consulted me. She then complained of weakness, loss of appetite, &c. She appeared to have lost some flesh but was not wasted. She had some slight cough and had a tendency to sweat at night. These symptoms were associated with anaemia and slight puffiness of the eyelids and face generally.

Examination of her chest revealed the following:-

There was no decided flattening of any part, nor were the supraclavicular regions sunken. There was dulness over the right apex in front and behind, with weakened breath sounds. The right lower apex was also involved, the note being heightened. Crackling râles could be detected at both upper and lower apices posteriorly. She complained of severe pains during her periods.

This patient was sent to Glenafton and improved greatly, gaining over a stone in weight.

She turned ill again in the winter of 1914 - 15. I was called to see her one evening and found her in bed very ill and complaining of severe abdominal pain. In a day or so this pain gradually became localised in the right iliac fossa, and as her pulse was somewhat rapid I sent her into Ayr County Hospital. A definite swelling could be detected in the right iliac fossa and she had tenderness per rectum. She was not operated upon and returned home at the end of 4 weeks. By this time the swelling had diminished somewhat in size and was not so tender. After being kept in bed for a considerable period/

period the swelling almost entirely disappeared and she was able to go about. Gradually she gained strength and began to look fairly well. She still suffered from intermittent abdominal pain.

Late in September 1916 she told me her morning temperature (taken per rectum before getting up) was beginning to rise somewhat. It had never since her first period in sanatorium settled properly to 36.5°C. On examination of the chest the right apex was found to be dull in front and behind. V. R. was increased, and bronchial breathing was distinct in front. The left apex behind now showed signs of infiltration being dull to percussion. Bronchial breathing could be detected at its upper part. A few moist rales were heard lower down.

She was readmitted into Glenafton late in October, 1916. She is being treated with I.K. and I learned lately her temperature was gradually falling.

C.K., female aged 8 years and niece to above M.K. She has been ill since early childhood. This child had tuberculous abdominal glands and tuberculous peritonitis. She was profoundly anaemic and wasted. Treatment was carried out at home and comprised rest, fresh air, inunction with cod liver oil, and the administration internally of iodoform.

(formula recommended by Still). She gradually but slowly improved and is developing into a healthy child.

No. 8. 7 inmates in house, F.F., aged 14 years. She turned ill when 9 years of age. Loss of flesh, anaemia, slight cough and a tendency to sweat at nights were her chief symptoms. Physical examination revealed enlarged mediastinal glands with deficient resonance at the right apex. She was kept from school for a long time and given cod liver oil internally. She is well at present but somewhat pale.

No. 10. 7 inmates in house. The father of this family is in the final stage of emphysema and anthracosis. His sputum has been examined frequently for tubercle bacilli but they have not been found. At present he is confined to bed, very dyspnoeic and shows signs of cardiac dilatation.

H. K., aged 18 years, eldest daughter. She turned ill in her 15th year. In February, 1913, she had an attack of tonsillitis and sub-acute rheumatism. In March a gland appeared in the right cervical region. This gland which proved to be tuberculous was removed in Ayr County Hospital in July. In August she had an attack of dry pleurisy. Later, physical examination of her chest showed the following:-

Right/

Right apex. Dulness in front, R.M. distant, tubular breathing with vocal resonance increased. Loud coarse rhonchi could be heard on inspiration.

At the left apex in front. Dulness was present with coarse rhonchi of the same character as detected in the right apex.

Right apex behind showed distinct dulness with inspiratory rhonchi. The respiratory murmur was distant and the whole right lung exhibited diminished resonance to percussion.
Left apex behind was also dull on percussion and rhonchi were also present. At the left base vocal resonance was decreased. There was no fluid in the chest.
Tubercle bacilli were present in the sputum.

She was sent to Glenafton in September 1913 and discharged somewhat improved in February, 1914. When she came home there was a fluctuating swelling over the left front of the chest. This burst and a large amount of pus was evacuated.

She was sent to Glenafton again in August, 1915 and came home in April, 1916 greatly improved.

When I examined her last she showed the following at the right base:-
Vocal resonance was greatly increased with amphoric breathing/

breathing. The note to percussion was not hyper-resonant but somewhat dull. The sinus was not discharging and she looked well. Breath sounds were feeble over the left chest.

She may have had a partial pneumothorax but the signs are not typical at present.

On December, 1916 I was asked to see a younger sister. She had a slight cough in the morning and sweated somewhat at night. She was not wasted. A tuberculous gland was removed from the right side of her neck over a year ago.

Physical signs were most distinct posteriorly. Percussion showed impaired resonance at both apices, with a few moist rales at the left apex. R.M. showed prolongation of the expiratory portion and was slightly bronchical in character. V.R. and the whispered voice were increased.

The percussion note was impaired along the whole vertebral border of the right scapula. She is under careful observation and will in all probability go to Glenafton soon.

The rest of the family are apparently healthy. Owing to the father's prolonged illness/

illness, they are in poor circumstances and are receiving parish relief.

No. 11. 5 inmates in house; This case is extremely interesting as it is one of those cases where an injury determined the site of the tuberculous infection. [15]

J.S. aged 32 years at death (May 14th, 1913). In the summer of 1909, I removed a tuberculous gland from his neck. Later the whole deep cervical glands became involved and he was treated in hospital.

In the summer of 1912 he received an injury to his right hip while working in the mine. After a long period in bed, his hip joint improved a little and then gradually became worse. His movements were greatly limited and he had considerable pain. Later the typical signs of tuberculous disease of the hip joint asserted themselves and an abscess formed which was evacuated by means of an incision. He was sent to hospital. When he came home he showed distinct signs of pulmonary infection. After a long, weary and exhausting illness he succumbed on May 14th, 1913.

His children received compensation - his wife having died during child-birth a few years before his decease.

No. 14. 7 inmates in house; A.P., 15 years of age. He became ill in 1913. He had slight cough and some wasting. There were no T.B. in the sputum. Physical examination of the chest was as follows:-

Right apex was dull to percussion in front and behind. At both these sites bronchial breathing was present with increased V. R. At the right base, breath sounds were distant and feeble.
The note to percussion over the whole left lung posteriorly was somewhat heightened.
He was sent to Glenafton in September, 1913 and returned home in January, 1914, greatly improved. Since that date he has remained well.

Bombardier P., aged 25 years, brother to the above A.P., consulted me in November, 1916 during his furlough. He stated that he felt absolutely done up after his day's work and drill, and that he had some slight cough in the morning. Upon examination of his chest, dulness was found at the left apex in front with V.R. increased. Behind at the right apex, resonance was impaired, while at the right base the R.M. was very feeble. I gave him a note to his commanding officer. He is now doing very light duty.

No. 15. 4 inmates in house. N.P. female child, aged 4 years. When 2 years of age she was treated in hospital for abdominal tuberculosis and tuberculous glands in her neck. She was under my care last summer (1916) and still had some evidence of abdominal tubercle. She is fairly well at present.

No. 16. 6 inmates in house. S.B. aged 15, adolescent female. She is not under my care and I have not had an opportunity of examining her chest. She has been in Glenafton Sanatorium twice.

No. 17. 7 inmates in house. Baby B., female, aged 3 years, died early in 1916. This child had measles several months before she showed signs of tubercle. She never fully recovered from her attack of measles and went progressively downhill. The abdominal and mediastinal glands were affected when I saw her.

No. 18. 11 inmates in house. M.R., aged 24 years,,female. She was sent to sanatorium in February, 1916. She had no sputum.

Her chest condition was as follows:- The right apex was dull to percussion before and behind; Bronchial breathing and increased V.R. were present posteriorly. Sonorous rhonchi could be heard over the left base. Breath sounds over the whole thorax were feeble. She came home in April much improved.

B. Single Row.

No. 27. 8 inmates in house, Baby S., died in 1916 from tuberculous meningitis.

No. 29. 6 inmates in house. K.O'H., young married woman, aged 27 years. This woman lived here several months. As, however, she first came under my notice while living in Tarbolton Village, I shall defer the description of her case until I consider the series of cases occurring in Tarbolton. She died late in 1916. Before her death she removed back into Tarbolton Village.

No. 32. 11 inmates in house. Miss P. Adolescent female. She came under my notice several years ago with haemoptysis, which recurred several times. She had physical signs of phthisis at the right apex. Upon no account would she go to sanatorium. She did not work for a long time. I saw her in December, 1916, on which date she appeared to be fairly well.

No. 33. 7 inmates in house. J.S. adolescent male, aged 16 years, died in 1909 from phthisis and abdominal tuberculosis.

No. 36. 12 inmates in house. Boy McG., aged 6 years. He died in 1910 from tuberculous peritonitis. The excreta from this lad's sick room, I have learned, were emptied into the open ashpit.

C. Southside: Drumley.

No. 2. 7 inmates in house. A.W., aged 13 years. She became ill early in 1911. Her chief symptoms were cough, sputum and decided wasting. Her sputum contained numerous tubercle bacilli. Even at this stage the physical signs in her chest were indefinite. Later they became localised as follows:

Left apex was dull anteriorly and posteriorly with bronchial breathing. Crepitant rales could be detected in front.

Right apex, in front exhibited some prolongation of expiration.

She was sent to sanatorium in June, 1911, and came home in November, 1911. In March 1913, she began to lose flesh again and was sent to sanatorium for the second time in April, 1913. Signs of cavitation and fibrosis could be detected at her left apex. At the present time (January, 1917) she is very well and at school. She has had an open air shelter erected just beside her home. In this she sleeps at night.

J.W., male, aged 7 years, and brother of the above A.W. He has tuberculosis of the tarsal bones of the left foot.

No. 4. 8 inmates in house. A.C., aged 7 years, died in 1908 from tuberculous peritonitis. This child took epiliptic fits.

No. 6. 3 inmates in house. Adolescent male, aged 16½, died in 1909 from phthisis pulmonalis.

In Drumley therefore, since 1905 onwards, tuberculosis has figured largely as a cause of death and ill health. Unfortunately I am unable to give the clinical histories of cases which occurred before 1910 as it was then I first became acquainted with the village.

The population of the Village at the time of my enquiry was about 267. Since 1905 19 at least of the 42 houses or 45% have been infected with tuberculosis. It should be understood that the occupants of these houses have in nearly every instance been resident in the village for a good number of years.

Since there are 267 inhabitants in the village and 42 houses, the average number of inmates to each house is nearly 6.5. As a rule both kitchen beds are occupied at night. In some cases the room is not used as a sleeping apartment.

The next village to be considered is that of MOSSBLOWN.

The following are the descriptions given in the evidence to the Royal Commission:-

"Mossblown is a village, wholly mining, of 179 dwellings of two apartments, except twelve cottages, which have three apartments.

It is in the Parish of Tarbolton and within two or three hundred yards of Annbank Station. The larger half of the village was built about sixteen years ago - the other half about four. The houses are of a fairly good type.

One commendable feature is that all the pathways are of concrete. This is good both for the tenant and for the house. The whole village is built of brick. The older and larger half of the village consists of two rows on the north side of the G. & S. W. Railway. One of them has 28 houses of two apartments. (This row is divided into two blocks of 14 houses apiece. J.L.B.)

The kitchen measures 15 feet by 13½ feet - the room 13½ feet by 10½ feet.

There is a washing house for every six tenants, and a dry closet for every three, with covered ashpits. These last leave much to be desired, some of them being very dirty. There are coal-houses for all.

All these conveniences are placed behind the row. There is a fair supply of gravitation water from Loch Bradan. The rent of these houses is 2/6 per week.

The other row of this half of the village has 69 two apartment houses, in every point the same as the first row. (They are built in blocks of 12 houses.)

I should have said that all the houses have wooden floors. There are small gardens in front of the second row, all nicely cultivated. The drying green is at the back.

The newer half of the village is on the South side of the G. & S. W. Railway and consists of two rows of 32 and 38 two apartment houses and a third row of twelve 3 apartment houses called "The Cottages".

The apartments of the double houses are slightly smaller than those in the older rows, the kitchen measuring 15 feet by 12 feet and the room 12 feet by $10\frac{1}{2}$ feet.

There is a water-closet for every three tenants and a washing house for every six. There are ashpits and coal-houses. All these conveniences are under one roof and are placed in front of the doors only twenty feet away.

This is to be regretted in houses so lately built. It is not only unsightly to have them there, but it is conceivably dangerous to health, as we were informed when we visited the village (6th December, 1913) that well into the autumn of this year there was what might be termed a plague of flies.

There are water taps in the washing houses of these rows. The rent is 3/- per week.

The cottage row has 12 dwellings of 3 apartments each with a front and back entrance, a nice lobby and a good

sized scullery fitted with a kitchen sink and water tap.

There are nice flower plots at the front, inside wooden railings.

The kitchen measures 13½ feet by 12 feet, the large room 13½ feet by 12 feet and the bedroom 12 feet by 11 feet.

There are water closets, washing houses, etc., in the same proportion as in the other rows. The rent is 5/- per week.

These cottages could be called first-class if there were baths attached. The rent too for the average working man is almost prohibitive; but with rents which could be paid by the average worker, and a bathroom to each of the tenants, these cottages are what we could commend as suitable for our people.

Mossblown is a decided improvement on many of the villages in the county." [16]

Finally the third report is as follows:-

MOSSBLOWN ROWS.

"These rows are the best visited in relation to the present inquiry. Of the newer houses, built about 3 years ago, it may be said that they are first-rate, in fact, model miners' dwellings, and were gravitation water laid into the houses in the lower row from the pump wells, they would be in the same category. All the houses are comfortable and in excellent order." [18]

A few points however could be added to the above reports:-

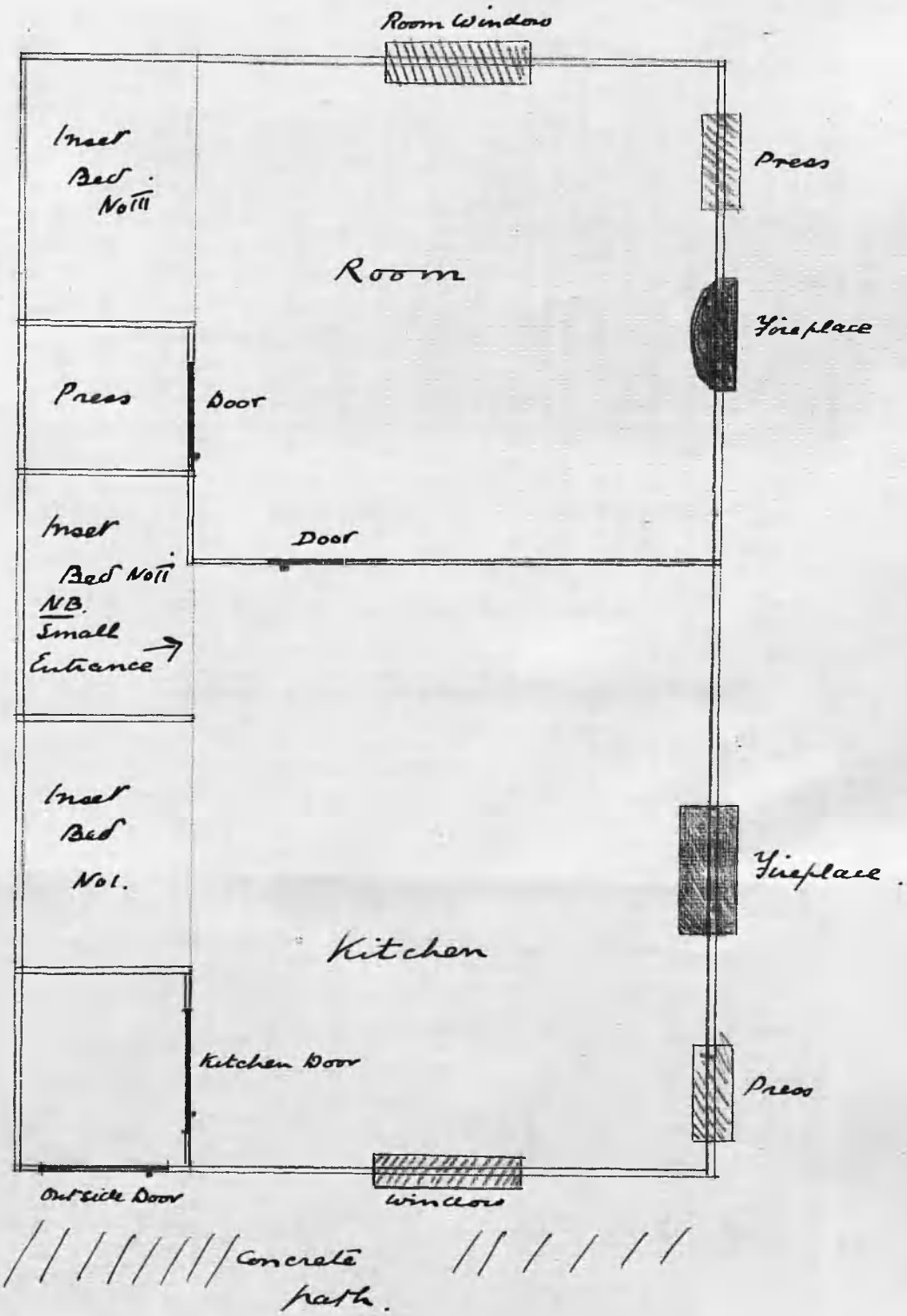
(a) The beds are of the inset type - two in the kitchen and one in the room. The open side of the rear kitchen bed is encroached upon by the wall of the room.

(b) The Village as a whole looks towards the south-west. One row looks north-west. Mossblown is situated about 160 feet above sea level. Geologically the village lies on the coal measures. The subsoil is reddish and clayey in character. Deeper still there is a thick stratum of pure clay.

Plan of House found in Mossblown Village.

Old Row.

Scale $\frac{1}{4}$" = 1'



Particular notice should be taken of Inset bed No II in the kitchen In this bed it is common to find 2 – 4 – 6 children sleeping.

Part of the Old Row, Mossbloom

① Two cases of Tuberculosis

② Two cases of Tuberculosis

Exposure 1½ Sec.

Back view of the same houses, showing also the sanitary conveniences.

Notice the delapidated state of the roof

Exposure 2 Sec.

Side view of part of the 'old row,'
Mossbloxon. Tuberculosis
is common in this row.

Exposure 1/25 Sec.

Feb. 1917

'The Cottages'. Mossbloxon

Snap. 1/25 Sec.
Feb. 1917.

Nos. 135 – 132 New Rows. Mossbloom.

Exposure $\frac{1}{25}$ Sec.

W.C.'s ←

→ Coal cellars & ashpits

Part of New Rows, Mossbloom

Exposure 1 Sec.

→ No II

Sleeping accommodation in the kitchen of a tuberculosis infected house in Mossbloown.

NB. 1. Inset bed No 2 (see plan)

2. The poor lighting of the bed-space

3. The 'hangings'.

Exposure 10 sec.

Feb. 1917.

The next report is that of the Sanitary Inspector.

"MOSSBLOWN ROWS are situated near Annbank Station and consist of 167 two-apartment houses and 12 three-apartment houses. Ninety seven of the two-apartment houses are on the north side of the railway and were built about 14 years ago to plans approved by the Committee.

They are built of brick in blocks of 12 houses in each row; the inside of the walls are strapped, lathed and plastered, with wood floors; the windows are sashed and hung, and the roofs are rhoned. There is a wash-house with water and underground drainage for every six families, and a coal house for every family. These conveniences are built in blocks at the back of the houses.

The other 82 houses are built on the south side of the railway, and consist of 70 two apartment houses and 12 three apartment houses. The houses are constructed similar to the other rows just described, except for the fact that water closets for every two families are substituted for dry closets.[x] The water supply is by gravitation and the drainage is by open channels and underground drains.

The houses are all in a good sanitary condition." [17]

[x] This is wrong. The correct proportion is one for every 3 families. J.L.B.

Interior of a house in Mossbloom,
in which a tuberculous patient lived.
The photograph shows the 'inset'
bed in the room (NB. the hangings)
This house was very clean and
tidy.

Exposure 15 seconds
(Feb 1917)

The following is a list of the cases of Tuberculosis I have observed in Mossblown between 1st January, 1914, and January 1st, 1917.

As in Drumley, a few cases which occurred before January 1st, 1914 have been noted to show the progress of the disease.

OLD ROWS.

No. 95. There are 6 inmates. The house is in a clean condition. J.McG., male 25, discharged soldier. He was wounded early in the Battle of the Marne, 15th September, 1914. In November, 1916 I had occasion to visit him to examine his wounded shoulder. I noticed he had a cough and upon examination of his chest found typical signs of phthisis. The disease was most advanced in the left lung. Dulness started at the left apex and extended downwards along the vertebral border of the scapula to the base. Crepitations and moist rales were easily heard. Dulness was also present over the right lower apex posteriorly. His sputum contained tubercle bacilli and also small ovoid bodies probably of a fungoid nature. He is at present in Glenafton.

No. 94. There are 4 inmates in this house which is scrupulously clean. J.M. aged 9 years, school girl. She was treated by me in 1915 for tuberculous glands on the right side of her neck and broncho-pulmonary tuberculosis. The cervical glands were removed in hospital. She received a long series of doses of T.R.

and improved greatly both in health and appearance. At present she is under treatment again as several slightly enlarged glands can be felt in the region of the scar. The four inmates sleep in the kitchen.

No. 87. There are 8 inmates in this house, including the father, mother (the patient) and six children.

Mrs. A., aged 37 years.

They all sleep in the kitchen. The house is clean. This woman had a tuberculous gland on the right side of her neck. I advised her to go to hospital but she declined as she was pregnant. The gland softened and was evacuated. At present she is well.

No. 80. M.C.A. Female, 16 years, died in this house from phthisis in 1906. The family have since left the district.

No. 80. M.H., aged 5 years, female. This house has 7 inmates, father, mother and 5 children.

They all sleep in the kitchen. The house is clean but poorly furnished. The mother is thin and anaemic but has no signs of tubercle. There is evidently some poverty here probably due to the habits of the father. He is now on active service.

The patient had tuberculous peritonitis with localised ascites. She was kept in bed.

bed lying at an open window for several months. This, combined with improved feeding gradually led to great improvement. She is now well and able to run about.

No. 69. Baby A, aged 1 year, male. There are 4 inmates, namely the father and mother and one child (the patient) and a lodger who occupies the room.

The mother was treated in sanatorium before she married and is a case of arrested phthisis. She is well at present.

The child however had general glandular tuberculosis, the cervical glands being chiefly affected. Tuberculous dactylitis was also present in one hand and one foot. This child was treated in Kilmarnock Hospital and at home. For a long time no improvement resulted, but latterly the child began to gain weight. They have now left the district and I have learned that the improvement in the child's condition is still maintained.

These people were of a superior type.

No. 61. M.F., school girl, aged 8 years. There are 7 inmates, all of whom sleep in the kitchen. The father suffers from asthmatic bronchitis and is often off work.

His sputum has been examined for T.B. but they are absent. The patient had a tuberculous gland removed from her neck in April/

April, 1916. Since then she has developed a bony thickening of one of the metacarpal bones of the right hand. She is at present fairly well in health. This house is fairly clean but owing to the father being an irregular worker, the children are under-fed. They have also an infant which is not thriving. This child has an enlarged gland on the right side of its neck possibly tuberculous.

No. 58. J.S., Aged 9 years. This lad was treated in 1914. He began to lose flesh again late in 1916. The condition of his chest was as follows:-

The right apex was dull in front with some moist rales. At the left apex similar rales were detected. The left apex posteriorly was dull to percussion and the breathing was bronchial in type with V.R. increased.

In addition he was pale and anaemic and had lost flesh considerably. There are 8 inmates in the house, the father, mother and 6 children. They all sleep in the kitchen. The house is in a somewhat questionable condition as regards cleanliness.

No. 54. J.L., female, aged 5 years. This is a tuberculous family who are of a somewhat nomadic type, never remaining long in the same house. Reference is made to them again in the list of cases of tuberculosis occurring/

occurring in Tarbolton Village. At present there are 8 inmates in the house and they all sleep in the kitchen. Only with great difficulty did I get the patient put into a crib situated near the room window. She has tuberculous ascites. No glands can be felt, the probability being that the tubercles are confined to the peritoneum. Her limbs and body generally are wasted and the picture of the child it typical of the condition. She was brought up, her mother tells me, on unboiled cow's milk. The children in this home are poorly fed and the atmosphere of the house suggests poverty. The eldest girl of the family suffers from glandular tuberculosis.

No. 53. Mrs. H., young married woman, aged 28 years, with early phthisis. She became ill in 1914 with loss of flesh, weakness, slight sweating at night and cough. She was treated in Glenafton and shortly after she returned home, she had her first child. She did well after her confinement and has since remained well.

No. 51. School boy, T., aged 8 years. In this house there are 8 inmates, father, mother and 6 children. The eldest is 8 years. The youngest was 4 weeks old at the time of my first visit to the patient. He is a fairly well nourished lad but troubled with asthmatic attacks. The attacks appeared first when he was 5 years of age. His chest was somewhat barrel shaped/

shaped with impaired resonance to percussion at the right apex. He was sent to Glenafton and came back somewhat improved after several months treatment.

No. 50. School girl, aged 9 years. This house contains 7 inmates five of whom sleep in the kitchen. The patient is a sister to the case mentioned in Number 53.

Her chief symptoms were debility, listlessness, loss of appetite and anaemia associated with a slight cough. She had no sputum. The physical signs were confined to her right apex posteriorly. In this situation the note was high to percussion, with prolonged expiration. The whispered voice was better heard than normally. A few rhonchi could also be detected. These disappeared later. She had in all probability tuberculous enlargement of the broncho-pulmonary glands. At present she is not attending school, being simply allowed to run about in the fresh air. Cod liver oil is being given internally. Under this simple regime she is improving.

No. 46. There are 8 inmates in this house the two parents and 6 children. The youngest child aged 8 months died from tuberculous meningitis in 1913.

No. 45. Male, aged 3 years. There are 6 inmates, the two parents and four children. This child, the youngest of the family died from tuberculous meningitis in 1913.

These people left this house in 1915 and it was occupied by another family as follows:-

No. 45 J. McA., aged 3½ years, infant female. There are 4 inmates, the parents and two children.

In May 1916, this child had pertussis. She was somewhat ill at this time and had slight capillary bronchitis. I was called in to see her again in November, 1916. She is of a typical phthinoid build. Her mother stated that she was getting much thinner and had still some cough associated with loss of appetite. Her chest condition was as follows:-

At the right apex and left apex posteriorly the note was heightened to percussion. Some crepitant rales could be heard. Along the vertebral border of the right scapula the note was also impaired. Expiration was prolonged and the whispered voice was easily heard. At the left apex in front, the note was somewhat dull with prolongation of expiration. Moist rales were also present. She is at present under observation and is somewhat improved.

No. 43. Female child, aged 2½ years. There are 4 inmates, the two parents and two children. The house is clean. This child had tuberculous abdominal glands. She was kept lying in a small cot near an open window for 3 months. This, combined with a nutritious diet and the application to the abdomen of cod liver oil as recommended by Whitla led to gradual improvement. At present she is well.

No. 32. School boy, M.C., aged 11 years. This lad has been in poor health for some years but is moderately well meantime. His chest condition when I last examined him was as follows. Dulness was present at the right apex, with bronchial breathing and V. R. + . His chest development was very poor.

He had hypermetropic astigmatism which could only be partially relieved by glasses. There are 8 inmates in the house all of whom with one exception sleep in the kitchen.

No. 2. O. G., aged 10 years, school boy. There are seven inmates, five of whom (including this patient) sleep in the room. Both parents have a tuberculous family history.

The patient first came under my notice during the summer of 1914. His chest condition at that date was as follows:-

The right apex in front was dull to percussion. Breath sounds were of the bronchial type with expiration prolonged. Posteriorly at both the upper and lower apices, dulness to percussion and occasional rhonchi could be detected. He was treated in sanatorium for 5 months and has remained well since.

R. G., aged 13 years, and sister of the above O.G. She suffers from glandular tuberculosis. She had a cervical gland excised in Ayr County Hospital during 1915.

No. 3. School girl, aged 15 years. At the time of my investigation into this case and the following one, there were 9 inmates in the house, the two parents and seven children. They all slept in the kitchen. The mother has since died and I understand this child of 15 years looks after the rest of the family and does the general housekeeping/

housekeeping. The father needless to say has been warned. The girl suffers from tuberculous hip-joint disease and is a partial cripple.

School girl, aged 12 years, and sister to the above. This child had tuberculous periostitis of the ribs for which she was treated in Kilmarnock Infirmary in 1915.

No. 6. School girl, aged 14 years. The family to which this child belonged has suffered heavily from tuberculosis, there having been 4 deaths in all from the disease. I saw this child early in 1914 and found her in advanced phthisis. With some difficulty I got her removed to Kaimshill Hospital near Kilmarnock where she died.

School boy, aged 7 years. He died from phthisis pulmonalis in Kaimshill 3 months after his sister. The other two deaths in the family were due to phthisis pulmonalis in the one case and abdominal tuberculosis in the other.

M.D., aged 7 years. This is the youngest child of the family. He is not ill at present but is apt at times to be somewhat run down. He has as yet shown no distinct clinical evidence of progressive phthisis. On the last occasion I examined him, there was some heightening of the percussion note at the right apex both behind and in front. Expiration was prolonged anteriorly. At present he is not attending school.

He is out in the fresh air the whole day and seems fairly well.

He has probably some involvement of his broncho-pulmonary glands.

No. 7. A. N., female, aged 15 years, died here from phthisis in the year 1907.

No. 14. Mrs. A., aged 32 years. In this house there were 8 inmates including the two parents and six children. The mother who was the patient died late in 1914 from phthisis. She pursued a rapid course and could not be removed to sanatorium. I tried to get her taken away but as she was unsuitable for Glenafton, and as Kaimshill was full up at the time, she had to remain at home. The patient's mother died from tuberculosis. The children meantime are well.

No. 16. Mrs. E. B., aged 51 years. She suffers from chronic phthisis and has a small cavity at her right apex. Her sputum in nummular in character and contains tubercle bacilli. She had a slight relapse lately but is now fairly well. When young she had pleurisy. Her mother died from phthisis.

It will be interesting here to note the fact that in this part of the village (Nos. 1 - 28) there are quite a large number of Lithuanians. Personally I have not met with a case of tuberculosis in either parents or children. This is interesting in view of the high death-rate from tuberculosis in Russia.

NEW ROWS. MOSSBLOWN.

No. 98. H.K., adolescent male, aged 16 years, died here from phthisis pulmonalis in 1913.

J.K., adolescent female, and sister to the above. She first consulted me in 1914. Her chief symptoms were anaemia, languor, and some slight loss of flesh. There were no definite signs of phthisis but I thought I could detect some heightening of the percussion note at the right apex. A few months ago she had her appendix removed. Lately she consulted me again. The note at the right apex both anteriorly and posteriorly was slightly dull. Expiration was prolonged and the whispered voice could be heard better than normal. She has some slight cough but no sputum. She is well nourished, does not sweat at night and feels well in her general health. She has been warned to live as simply as possible and to be out in the open air every day as long as she can.

No. 109. M.G., aged 9 years,,school girl. There were seven inmates, the parents and five children. Both kitchen and room were used as sleeping apartments. This child was first seen by me early in 1915. She had distinct signs of pulmonary tuberculosis and was sent to Glenafton/

Glenafton where she remained 5 months. Since her return home she has remained well.

No. 113. Baby. F., female infant, aged 3 years. There are eight inmates, the two parents and six children. They all sleep in the kitchen. The child has enlarged abdominal glands associated with wasting &c. The house is dirty and the mother is very careless with her children.

No. 118. S.M., school boy, aged 12 years. This is a large family, consisting in all of 13 persons. In the kitchen at night sleep the father and mother with seven children of their own and two other children. The grandfather and an uncle occupy the room. Before coming to Mossblown 5 years ago, they lived in Lanarkshire.

At the age of 5 the patient received a very severe burn of the anterior abdominal wall, which was rapidly complicated by an attack of pneumonia. After recovery the mother states that the medical attendant remarked that one of the boy's lungs was weak, but that as he grew stronger it would also improve. About 6 months ago, his mother brought him to see me. She stated he was losing flesh; that he did not play about as he used to do, and that he had a slight cough.

There was a little dulness to percussion at the left apex posteriorly but otherwise no positive signs could be detected. I examined him several times later and he seemed greatly improved while the physical signs had not increased.

Lately however his father brought him to me again to see if he was fit for school. He also added however this remark, namely, that lately the lad seemed to have contracted a cold and complained of some pain in his side. Examination of the patient revealed the following:-

"The boy is not thin or wasted. He is however somewhat anaemic.
The chest condition is as follows:-

There is distinct flattening of the left supraclavicular region with some dystrophy of the upper part of the left trapezius muscle posteriorly.
There is distinct dulness to percussion at the left apex in front, above and below the clavicle. Vocal fremitus is increased. The breathing is bronchial in character and the spoken and whispered voices are distinctly better heard than normally. Posteriorly the left apex is also dull to percussion with + V.F. and + V.R. and bronchial/

bronchial breathing. This dulness extends downwards between the vertebral border of the scapula and thoracic spines to and including the base. At the base the dulness becomes absolute and V.F. and V.R. are both lost, while the R.M. also disappears. This dulness runs forward towards the mid-axillary line where it is replaced by "Skodaic resonance." There is evidently some effusion present.

The right apex behind is also dull with + V.F. and + V.R. and bronchial breathing. The dulness at the right apex behind is more limited in extent than that at the left apex. Percussion along the vertebral border of right scapula shows a long narrow dull strip about ¾" - 1" in breadth and separated from the thoracic spines by a clear area. The right base is not as yet implicated.

The disease has therefore progressed and the lad has evidently had a pleurisy with effusion. He will require to go to sanatorium at once.

No. 122. H.W., school boy, aged 7 years. In this house there are six inmates including the parents and children. They all sleep in the kitchen. The patient died in 1915 from general tuberculosis.

Lately/

Lately the mother gave birth to another child. Shortly before her confinement she had an attack of pleurisy. Examination of her chest was difficult as she was of a very stout build. There was present however some slight dulness to percussion along the vertebral border of her right scapula. The R.M. was very weak and air entry was diminished.

In front below the left clavicle there was one small spot of slight dulness. Here expiration was also prolonged. She had a tendency to sweat at night. Her sputum was examined but no T.B. were found. She had a normal labour and since then has been fairly well.

Another child of this family died from tuberculosis at the age of 5 years.

No. 123. J. H., school boy, aged 10 years. There are seven inmates, two parents and the five children. They all sleep in the kitchen. The patient had deficient resonance at the right apex with V.R. + &c. These symptoms were associated with loss of flesh, cough and weakness. His broncho-pulmonary glands were no doubt affected. His grandfather and one uncle and one aunt on his mother's side died from tuberculosis.

No. 125. A.F., school girl, aged 11 years. This child came under my notice first in 1912. At that date she was living in Annbank Village.

Wasting, cough and a sputum containing diplococcci were the salient clinical features of her case. The condition of her chest was as follows:-
Both apices in front were dull to percussion. There was some flattening of the left supraclavicular region and some rhonchi (sonorous) could be heard on auscultation. The breath sounds were weak all over the right lung posteriorly. She was sent to sanatorium. After that I lost sight of her until she came to Mossblown in 1916. She has been twice in sanatorium since she first became ill. She suffers also from atrophic rhinitis. Her lung condition at present is as follows:-

Right apex in front, dull with V.R. +

Left apex, dull with bronchial breathing and V.R. +. Left apex posteriorly also dull with bronchial breathing and V.R. +. Some rhonchi could be detected at the left base. The cardiac apex is slightly outside the nipple line. In general health she is fair but her nasal condition is a constant source of trouble and annoyance. Her lung condition is probably now of a chronic nature with some fibrosis.

There are nine inmates in the house two of whom (boys) sleep in the room.

No. 126. R. F., male, aged 5 years. This child had adenoids and tonsils removed in the summer of 1916. He is still somewhat thin and is not so lively as a boy should be at his age. Physical signs are most distinct posteriorly over the left lung. There is diminished resonance to percussion over both the left apices, and extending towards the base. V.R. and whispered voice are more distinct than normal and at one spot along the vertebral border there is bronchial breathing. Some rhonchi can be detected at the left base. There are eight inmates, seven of whom sleep in the kitchen.

No. 127. Boy, F., about 5 years. My notes on this case are very scanty being simply confined to the fact that this child had localised tuberculous ascites which disappeared under treatment. The family have left the district.

No. 128. F.F., school girl, aged 10 years. She is a cousin to the cases occurring in No. 127 and in No. 113. There are 11 inmates (lately increased to 12) consisting of the husband, wife, and nine children. Some of the children sleep in the room. The patient had slight dulness at one apex associated with wasting, loss of strength, anorexia &c. She no doubt had broncho-pulmonary tuberculosis. She was kept off school for several months and improved greatly.

No. 136. There were seven inmates in this house, the father and mother, with 5 children.

Both room and kitchen are used at night as sleeping apartments.

Three cases in all occurred in this family.

E.C.M., aged 12 years, school girl. Physical signs were most distinct at the right apex which was dull to percussion both anteriorly and posteriorly. Bronchial breathing was also present.

Van Pirquet's reaction was positive.

Her mother stated that she had been in failing health for some time and on several occasions, had fainted in school. She was sent to sanatorium in February, 1914 and returned home in July, 1914.

C.M., aged 12 years, school boy. His chest condition was as follows:-

The right apex was dull to percussion anteriorly, with bronchial breathing and + V.R. At the left apex anteriorly resonance was impaired, and rhonchi could be detected on auscultation. The R.M. was very feeble at the left base. He had slight night sweats, associated with the expectoration of muco-purulent sputum. No T.B. were found. He was sent to sanatorium in July, 1914 and was discharged in December, 1914, having gained 9½ lbs. in weight.

S.M., adolescent female, aged 17 years. The mother stated that this girl had had a winter cough since she was 4 years old. She exhibited on examination of her chest, lesions more widely spread than the other two children, so that she was in all probability the first to be infected. The right apex in front was dull to percussion with + V.F. and + V.R. The breathing was bronchial in character. Similar signs were detected posteriorly at both upper and lower right apices with the addition however, of occasional rhonchi. There was impaired resonance posteriorly at the left apex.

She had night sweats associated with some irregularity of temperature, which however was never high. She was sent to sanatorium in Nov. 1914, and returned home in April, 1915. She gained a stone in weight during her residence in sanatorium. A fourth child of this family is an epileptic.

No. 137. E. G., school boy, aged 7 years. There are seven inmates in this house, including the parents and five children. The room is occupied at night.

In December, 1915, the patient had measles and since then has had a tendency to slight attacks of bronchitis. Late in 1916 his mother kept him off school as he was losing flesh and looking somewhat/

somewhat pale. After some weeks at home he returned to school. He rapidly lost flesh and I was called in to see him. My notes on his condition are as follows:-

"The patient is of the typical phthinoid type with a very pure skin, long eyelashes and dilated venules on his chest. He is very thin so that his ribs and scapulae stand out prominently. His chest is narrow with the ribs sloping very obliquely. He is never hungry and often goes to school without his breakfast. He often brings home his lunch in his pocket. After school hours he creeps close beside the fire and refuses to go out and play as was his wont. He sleeps badly at night. He is listless, peevish and cannot be bothered with anything." Examination of his chest was as follows:-

"At no part of his chest is there distinct dulness but the note is somewhat heightened anteriorly below the middle point of the right clavicle. Expiration here is prolonged. Posteriorly there is impaired resonance at both the right apices (upper and lower) with distinct prolongation of expiration. Crepitations are present at the right base. The left lower apex is slightly dull to percussion while the note at the left base is almost skodaic/

skodaic in character. Smith's murmur is present." I have quoted this case at some length as it is almost a typical case of enlarged and tuberculous broncho-pulmonary glands.

A younger child of this family lately had enlarged abdominal glands associated with gastro-intestinal symptoms, tympanites and wasting.

No. 141. A. W., servant, aged 26 years. This case while the diagnosis of tuberculosis, has not yet been confirmed is somewhat interesting. I was called to see her one morning in the winter of 1915 - 1916. I found her in bed, looking ill and with typical signs of right sided pleurisy. Her sputum contained some blood but was not rusty in character. She had no signs of pneumonic consolidation. A few days later she complained of pain in the right iliac fossa. She had some rigidity of the right rectus. I had her removed to hospital where she had her appendix and a right sided pyosalpinx removed. Before her operation, she had night sweats; afterwards, these became less but did not entirely disappear. After she came home, her abdominal pain returned. Later she went to hospital for the second time where she had the greater part of her left owary removed, it being in a state of cystic degeneration. I examined her sputum several times but did not succeed in/

in finding tubercle bacilli. She had deficient resonance at her right apex and some rales could be detected. She suffered from anaemia for a long time and even after her operation her recovery was extremely slow.

She did not work for a long time. From her own and family history, I am strongly of opinion that she had a pulmonary tuberculous lesion. She has been married lately and appears to be well. I hope to be able to follow her history however.

No. 142. Infant boy, aged 3 years. He suffers from enlarged abdominal glands associated with wasting, anorexia &c. This child was of an extremely neurotic type and would eat soil, worms, coal, &c. The inmates of this house are five in number, the father, mother and three children. They all sleep in the kitchen.

No. 148. W. B., male infant, aged 2¼ years. There are four inmates, the parents and two children. The patient suffered from typical tuberculous ascites, associated with intermittent diarrhoea. He was kept in bed for several months during the summer of 1916. The fluid has gradually disappeared and he is gaining flesh.

No. 154. B. K., school boy, aged 8 years. There are six inmates in this house and the kitchen alone was occupied at night. Later however the room was reserved for the patient.

He/

He first came under my notice late in October, 1916, with a sharp attack of right sided pleurisy. Fluid, if present, was very slight and required no interference. After his pleuritic pain had passed away, careful examination of his chest revealed the following, (pneumonia excluded.)

At the right apex there is a small area of comparative dulness which extends downwards towards the space between the right scapula and the thoracic spines. In this space, crepitations could be heard. At the right base, the percussion note was dull and associated at the upper margin of dulness with oegophony. Crepitations could also be detected at this point. At the left base there was a small dull patch to percussion. Respiratory movement was markedly diminished on the right side.

This lad was of the phthinoid type with long eyelashes, fine soft skin and clear complexion. He has not gone to school since his pleurisy. He is beginning to put on flesh and look a great deal better.

No. 156. Two cases of tuberculosis in this house came under my care almost simultaneously. I shall give the two cases as they developed. There are seven inmates five of whom until lately slept in the kitchen. The two affected lads now occupy the room.

S. H., school boy aged 7 years. He was seen first in the autumn of 1916. The following is/

is the report from my notebook. "He is thin and very pale. His mother states that he has lost strength and does not play about as was his wont. In the summer of 1916, he had adenoids and tonsils removed. Examination of the chest. Left scapula lower than right. Movements of the left scapula greatly restricted during respiration. Resonance to percussion diminished at both upper apices and also at right lower apex. Breathing at right and left apices approaching the bronchial type with V.R. +.

There were no rales or rhonchi to be heard.

I told his mother that he had probably some disease of his mediastinal glands extending into the lung and that he would require a long holiday from school. She told me his elder brother had a cough due to the 'cold'. In a few days however I was called in to see the brother.

J. H., aged 14 years, had just recently started to work in the mine. The following is the note of his case. "Apparently well developed lad, but evidently a mouth breather. He has right sided pleurisy. Right apex behind is dull to percussion. Expiration is prolonged and V.R. +. Rhonchi can be detected at the right base. He has some sputum." This sputum was obtained and examined. Tubercle bacilli were present though scanty.

He has not worked since. He is gaining weight, his cough has disappeared

and he is anxious to return to work. The mother of these lads is a very sensible woman and has followed out my instructions faithfully. The lads now sleep in the bedroom, the window of which is down night and day. After consultation with the tuberculosis officer, it was decided to keep them at home for several months under observation. The eldest boy was kept in bed until his temperature became normal.(i.e. 36.5°C. per rectum in the morning). Later he was allowed up a little every day and told to take small walks, stopping short of tiring himself.

These two cases are interesting in so far as the presence of tubercle bacilli in the sputum of the older lad helped to confirm the symptoms and diagnosis of the younger brother's condition.

No. 160. H.F., school girl, aged 7 years. There are five inmates, father, mother and three children. They all sleep in the kitchen. The patient at the age of one year had acute broncho-pneumonia. During this illness she wasted a great deal and I somewhat hurriedly gave an unfavourable prognosis as I thought it was a case of tuberculous broncho-pneumonia. An Ayr physician who was consulted by the mother diagnosed whooping cough. This diagnosis was shown to be wrong as at the age of 2 years/

years the child took typical whooping cough. Up to this period and until 1916 they lived in Annbank. On coming to Mossblown, the child was brought to me again with a swelling in front of her left ear. This swelling was incised and pus escaped. The pus was not typically tuberculous looking in character but the keloid nature of the scar certainly was very suggestive of tuberculous mischief. This gland enlarged again and when excised was shown to be of a tuberculous nature. She had lost flesh considerably and had some cough associated with pain in the thoracic region. Her chest was examined with the following result.

"The chest is decidedly flattened in front and the shoulders are rounded. The veins stand out prominently over the whole thorax in front. Numerous vennles are present over the posterior cervical and upper thoracic spines. The muscular development of the chest is extremely poor. Beneath both clavicles in front there is a small area whose note on percussion is heightened. Expiration here is prolonged and V.R. +. Posteriorly the note of both upper and lower apices is heightened on both sides but chiefly on the right. Expiration is prolonged at the upper and lower right apices. Smith's mummur is present/

present anteriorly. She has granular eyelids. She has in all probability tuberculosis of the broncho-pulmonary glands.

There is a history of tuberculosis on her mother's side.

This child has been kept off school and is rapidly improving. The diagnosis was confirmed later by the tuberculosis officer.

No. 166. M.F., school girl, aged 12 years. There are six inmates as follows, the father and mother with this (their own) child, and other three children belonging to a sister of the mother.

The mother has tuberculous scars on her neck.

The patient at the time of my examination (November, 1916) had very much enlarged tonsils which have since been excised preparatory to her admission into Glenafton.

This child has been in variable health for some years and does not agree with school.

At the time of my examination, she was extremely thin; her chest development was very poor, the thorax being very flat anteriorly and somewhat alar in shape. Occasionally she had night sweats. The veins of the chest wall were very distinct. There was dulness at the right apex posteriorly with/

with very deficient air entry. At a slightly lower level the whispered and spoken voice were better heard than normally. The left side of the chest is contracted and the movement is seen to be diminished posteriorly. Over her left lung there are no distinct abnormal signs on percussion or auscultation.

She is to go to Glenafton soon.

MOSSBLOWN COTTAGES.

No. 169. Mrs. C., aged 40 years. There are four inmates; the two parents and a son of 16 years of age, and one daughter about 2 years of age. The mother is the patient and the following is her history.

About 8 years ago before the birth of her second child (which has since died) she states she took bad bronchitis and had sweating turns. She was very ill before and at the birth of the child but later regained her usual health.

She requested me to attend her in her third confinement about March, 1915. About six weeks before her confinement she again took what appeared to be bronchitis. She had however night sweats and her sputum was purulent. Just about this time she had an attack of dry pleurisy. Her sputum was examined and contained numerous tubercle bacilli. She lost some flesh but never really got thin. After her confinement, which was normal, I explained to her that she had some disease of her chest and that she must not suckle her child; also, that she should go to a sanatorium. She however would not consent to go away. She regained strength rapidly and has now neither cough nor spit. She is able to do all her housework and washing &c. and certainly/

certainly looks the picture of health and strength. There is no history of tubercle in her family.

No. 173. M.N., school girl, aged 11 years. This girl was brought to me first in the summer of 1914. She was very thin and complained of a bad cough. Sweating at night was frequent. Her sputum contained tubercle bacilli. The chest condition was as follows:-

Both apices dull anteriorly with distinct bronchial breathing at the right apex. Posteriorly both upper apices were dull to percussion.

The right base exhibited signs of infiltration being dull to percussion with fine crepitations on auscultation.

The left base, at its upper part exhibited bronchial breathing, while numerous rhonchi could be detected lower down.

She went to sanatorium in August, 1914 and came home in January, 1916, somewhat improved. Since then she has left the district. I have learned since that her father who never could reconcile himself to the idea that she had phthisis, placed her under the treatment of an herbalist.

So far as I can remember there were six inmates in this house.

No. 179. M. G., miner, aged 17 years. There are five inmates. The eldest son (the patient) had tuberculosis of his cervical glands. This lad was pale and did not look well. I opened one of the glands. He shortly afterwards left the district.

The above list is a long one and while all the cases did not actually develop in Mossblown rows, the majority of them did. It will serve at least to show that tuberculosis has occurred with frequency in a type of house which has been recommended by the Miners' Federation Authorities as suitable for miners. We are therefore forced to the following conclusion regarding these houses.

(1) They must be defective in some way.

or

(2) They are not being used properly by the inhabitants.

I hope to show later that both these factors are present and playing an important part in the production of the disease.

TARBOLTON VILLAGE.

Tarbolton is the chief village of the Parish. In by-gone times the industry was hand loom weaving but with the advent of the steam mills and looms the industry has disappeared until now, there is only one weaver left. In conversation with an old residenter I learned that 'consumption' was common in the village long ago and that certain families suffered greatly from the scourge. In those days the people were thrifty, hard-working, and managed to struggle through life in comparative comfort. They cultivated their gardens in their spare time. The looms went merrily from morn till night, while the men at least, were each and all enthusiastic politicians, and during the meal hour, many a problem was discussed. Their sons, however, who remained in the village had to find new employment. The rapid development of the coal industry at the lower end of the Parish supplied that need, so that now the majority of the villagers are miners. The greater number of them have been born and bred in the village and adjacent part of the Parish.

Regarding the housing conditions it is difficult to give an accurate description, for the types of houses are many and varied. Formerly the chief type of house consisted of two apartments. These apartments led from a passage, which ran from the front door to the back door, one room being to the right and the other to the left. One of these rooms provided accommodation for the loom while the other housed the family. With the disappearance of the weaving industry, the room formerly used for weaving was/

was converted into another single apartment house. So that in these old houses there are as a rule at the present time two tenants. The beds are all of the inset type, there being two in each single apartment. Some of these beds are very short (5 feet). The roofs are low and in several cases can be touched by raising the arm above the head. The windows are small and in many cases cannot be opened and are neither sashed nor hung. Thatched roofs are still present in certain cases, also stone or cement floors. Needless to say all the older houses are devoid of damp-proof courses in their walls, while ventilation beneath the floors is non-existent. Many of the houses are damp; others are situated in such a position that the sun can never shine into the apartments. Inset beds have been made in the odd corners simply as it were to take up the space. Some attempts at renovation have been made. In a few instances this has been properly done while in others, enough only has been done to make the houses habitable.

In one short street in the village, the housing conditions are deplorable and I question if worse slums could be found in any large city. There is no sewage scheme for the village, the closets being all of the ashpit type (with five exceptions). In a few cases no ashpits are provided at all, and the refuse is simply dumped down in a part of the garden. Quite a large number have no wash houses. Drainage is by open syvors and underground channels.

The/

The village boasts a public library and has a coal-gas supply, which however is very poor in quality.

While the majority of the inhabitants are miners, there are also in the village, joiners, blacksmiths, clerks, shop-keepers, tailors, &c, and these have as a rule houses of a newer and more modern type. They have however no bath rooms or flush water closets.

In all there are about 240 inhabited houses and apartments in the village. In normal times the population is about 1,100. There are five public houses (including hotels) and two licensed grocers in the village. Geographically the village is situated on the Permian lava and stands about 300 feet above sea level. It is somewhat sheltered from the prevalent S.W. rainy wind by Torcross Hill, an eminence easily seen from the Firth. The subsoil is locally known as 'till'. It is reddish in colour, clayey and contains gritty material. It is only moderately porous so that the subsoil is probably damp.

Tuberculosis infected houses in Farbolton

① one case (acute phthisis, died)

② one case.

③ one case.

Snap ¼ sec.
Aug. 1916

Tuberculosis infected house in Farbolton

2 cases occurred in this house which is situated only a few yards from those in the top photograph.

Exposure. Snap. ¼ sec:
Aug. 1916

Tuberculosis infected house
in Yarbolton.

Exposure Snap: 1/25 Sec.
Aug 1916

Tuberculosis infected houses in
Yarbolton
(1) one case
(2) one case
Old houses somewhat renovated

Exposure Snap. 5.30 p.m.
1/25 Sec. Aug. 1916

W.C. & ashpit of a house in Tarbolton

① W.C. (dry)

② Ashpit made by nailing a few boards to some small wooden stakes.

Exposure. 3 sec.
Feb. 1917

Back windows of the same house

① Kitchen. - front window somewhat larger

② Room - front window also larger but cannot be opened.

Exp. 3 Sec
Feb. 1917

The following are the cases of Tuberculosis observed in the village:-

R. F., school boy, aged 11 years. There are five inmates, including the two parents and three children, in the house. The house is of an old type and consists of two rooms and a kitchen. One of the rooms is very small. This lad came under my notice first early in 1916. He was very thin, his chest development especially being very poor and somewhat pigeon shaped. Loss of appetite, slight sweating at night, and cough were the other chief symptoms. He had no sputum. Examination of his chest was as follows:-

"Slight flattening of the left supra- and infraclavicular regions is evident. There is a very prominent vein at the upper part of the right side of the thorax in front. The note is dull to percussion at the left apex both anteriorly and posteriorly. The dulness extends downwards posteriorly between the vertebral border of the scapula and the thoracic spines, thus showing involvement of the left lower apex. Bronchial breathing is present over the dull areas with V.R. increased.

There are no rales."

The lesion was evidently of a somewhat chronic nature and fibrosis was probably present/

present. He was sent to Glenafton and returned home greatly improved. This lad continued well until recently, (December, 1916.) His mother stated that he had contracted a bad cold and that the cough was persisting. Examination of his chest gave the following result:-
"Left apex; dull in front and behind with bronchial breathing and moist rales. In front in the mammary region moist rales are heard. These rales are also present at the left base.
Right apex in front; dull to percussion both above and below the clavicle. Tubular breathing is present. Rales(moist) are heard over the mammary region.
Right apex behind; dull to percussion but the dulness is not so extensive as that at the left apex. There is also a decided dull area opposite the right scapular spine, with tubular breathing. Rales are present at the right base."

He has lost flesh and has sweated several times at night. He will require to be readmitted to sanatorium.

D. F., school boy, aged 8 years. This child died in the summer of 1915. His history is as follows:- According to his parents he has been very healthy especially of late. He turned ill somewhat/

somewhat suddenly, complaining of diffuse abdominal pain associated with vomiting. When I saw him he had tenderness over McBurney's point, with little or no rigidity of his right rectus. His pulse was not rapid and his temperature was normal. His bowels were opened with enemata and he was put on starvation diet with complete rest in bed. His symptoms abated somewhat and in a few days he was apparently a great deal better. On the 6th day his pain returned and on the 7th day for the first time his temperature was raised and his pulse quickened. He was sent into Ayr Hospital, where he underwent an appendicectomy. A small appendicular abscess was found. The operation however did not save his life, as he succumbed a few days later. Dr. Geikie who operated wrote me concerning the child and in his letter made the following statement, namely that on opening the abdominal cavity the peritoneum was discovered to be covered with miliary tubercles.

I questioned his parents about him and they both maintained that until the onset of his appendicitis he appeared to be in the best/

best of health and had never complained of any abdominal discomfort or pain. Reference to this case will be made again.

J.H., father & J.H., son — aged 50 and 17 years respectively. These two cases need little description. The son was the first to consult me, regarding a chronic cough. He was thin and wasted, had night sweats and in fact all the signs of advanced phthisis. He ran a rapid course and died in April, 1915. His father, J.H., was found to be similarly affected. He told me he had had his cough for years and that he thought he had chronic bronchitis. He died a few months after his son. The sputum of both contained tubercle bacilli. Both received about 10 weeks treatment in Kaimshill which had no effect but to prolong the agony of their gradual dissolution.

In the house there were at least six inmates. The house is of the old type and consists of two apartments. It has been somewhat renovated. The room is very dull and dark. It is, owing to its bad situation almost entirely excluded from sunlight, while the free circulation of air around it is also impeded. The landlord at my suggestion has made an extra window in the kitchen.

R. I., message boy, 14 years of age. He became ill in August, 1914. His chief symptom was a continued pyrexia. Pulmonary signs at first were indefinite. His temperature was suggestive of a typhoid infection. On two occasions his blood was taken but Widal's test was negative. He had no rose spots, or any splenic enlargement. Later pulmonary signs asserted themselves, consisting chiefly of scattered small areas of impaired resonance associated with moist sticky rales. Dr. Prest of Glenafton saw him in consultation with me and agreed with the diagnosis of acute phthisis. The pyrexia was of an irregularly remittent type and continued for 2 months. Thereafter his temperature slowly returned to normal. His pulse rate during the pyrexial period was persistently rapid (100 - 120 per minute). Only slowly, after his pyrexia had ceased, did it fall to normal.

As his pulse fell, his condition began to improve. After about 4 months in bed he was allowed up.

At present he is well and able to do a little work.

H.McB., school boy, aged 14 years. When he was 11 years of age he had tuberculosis of the bones of both legs (tibiae &c.). There is a history of tuberculosis and insanity on the father's side.

The house is not a very old house and consists of one room and kitchen. The kitchen has two windows, a large one to the front and a small window to the back. The room has one large window.

There are 8 inmates, three of whom sleep in the kitchen, the remaining five sleep in the room. The house is over stocked with furniture.

Mrs. A.A., aged 35 years, died early in 1916 from acute phthisis. She had a child early in 1915. In August, 1915, I was called to see her. Her chief symptoms were pallor and a slight evening rise of temperature. She had at that time neither cough nor sputum. There were no definite pulmonary signs beyond a fleeting attack of dry pleurisy. Her blood was taken on two occasions and sent to Dr. Macdonald the Medical Officer of Health, but Widal's reaction was negative on both occasions. I did not see her during the last 14 days of September as I was off duty. When I returned early in October, definite pulmonary signs were present. She had moist rales over practically all her thorax, but chiefly over the apices. There were areas of impaired resonance and increased V.R. Cough was persistent and troublesome. She had night sweats. Her temperature chart showed an irregularly/

irregularly remittent pyrexia, the temperature at times reaching 104°F. in the evening. She lost flesh rapidly. Dr. Muir who was then acting as Tuberculosis Officer for the county confirmed the diagnosis of acute phthisis and stated that sanatorium treatment was out of the question as she was far too ill to be removed. She sank rapidly and died early in 1916.

This woman with her husband and five young children occupied a single apartment. The windows were small and totally unfit for either lighting or ventilation. A middle-sized person could easily touch the roof. There were two beds in the house, both of the inset type.

There was no family history of tubercle on the side of either parent.

S.W., aged 11 years. This girl was seen by me first in December, 1913. She had previously been treated for rheumatism. When I saw her first she had erythema nodosum. She had some slight cough with which were associated a considerable amount of malnutrition and vaso-motor disturbance. Examination of her chest was as follows:- The left apex in front was dull to percussion. The R.M. was bronchial in character at the lower margin of the dull area.

Moist rales could be detected over the right apex posteriorly. At the left base rhonchi could be heard, while over the right base the R.M. was uniformly feeble. She had some sputum but T.B. were absent.

She was admitted into Glenafton on 6th January, 1914, and returned home the following June greatly improved having gained over a stone in weight. Since then she remained well. There were 7 inmates in the house which was of an old type and contained two apartments, one of which was used as a barber's shop. The sleeping accommodation was thus limited and the beds were of the usual inset type. On the mother's side there was a history of tuberculosis.

E.B., school girl, aged 8 years. When 6 years of age she had a prolonged attack of whooping cough complicated by broncho-pneumonia and pleurisy. Her chest is slightly barrel shaped.

In November, 1916 her chest was examined and the following data obtained. "At the right apex in front there is a small dull area, over which can be heard on auscultation a few moist rales. Expiration was definitely prolonged. At the left apex posteriorly a similar area can be detected.

Resonance/

Resonance to percussion is impaired along the vertebral border of the right scapula. Moist sounds are present at the right base."

She was considerably wasted and had an irritating cough. In general configuration she was of the phthinoid type. At present she is being treated in Glenafton.

The house is a single apartment and contains one inset bed in which sleep the four inmates comprising the mother and three children.

The height of the roof was seven feet and the window measured 2' by 4'.

A.M., school boy, aged 13 years. Late in 1914 he had a definite haemoptysis. He was greatly troubled with asthmatic attacks. His shoulders were rounded and the anterior surface of the thorax considerably flattened. His chest condition was as follows:-

Over the right side of the thorax anteriorly and at its upper part there was a very distinctly marked vein. Resonance was impaired at the right apex. Here, expiration was prolonged and moist rales could be detected on auscultation. His parents sent him away to reside with a relative who lived among the hills near New Cumnock, close to the sanatorium.

He came back greatly improved after having been away several months.

Since his return home he has not had a single asthmatic attack. He is now an apprentice gardener.

J.M., aged 10 years, and sister to the above A.M.

She had enlarged mediastinal glands associated with impaired resonance at both apices.

When 4 years of age her mother stated that she spat blood and matter. When I examined her she appeared to have lost a considerable amount of flesh and had an irritating cough. She had a peculiar way of craning her neck and taking a deep inspiration. This was probably caused by the pressure of the enlarged glands on the trachea.

The house is old but of a moderately good type and consists of two apartments. The tenement was in former years a hotel.

There are 6 inmates, and the room is used as well as the kitchen as a sleeping apartment.

K.C., school girl, aged 8 years, and a near relation to Case occurring in Drumley.

She suffered from enlarged mediastinal glands. Her chief symptoms were loss of flesh and cough. Physical signs were represented by a slight but definite heightening of the percussion note over the right apex, and right interscapular area. With this were associated increased V.R., and deficient respiratory movement of/

of the right apex.

There are 7 inmates, four of whom sleep in the kitchen and three in the room.

The house is better that the most of the miner's houses in the village but the beds are of the usual inset type.

R. H., hamcurer, aged 17 years. In November, 1916, I was asked to see this lad. His mother stated that he was losing flesh and that he came home from his work (which entailed a lot of cycling) every evening, thoroughly exhausted. These symptoms were ascribed by her to his rapid growth.

When I examined him I made the following notes:-

"He is a tall lad but thin and anaemic.
He suffers from acne.
The chest is of the alar type and careful percussion of Kronigs areas shows a marked diminution of the right area. This is associated with a very faint R.M.
The right lower apex is dull to percussion and distant bronchial breathing can be heard on auscultation.
There is a small area of impaired resonance at the left apex posteriorly.
He sweats at night and wakens in the morning feeling tired.

His sputum was examined but no T.B. were/

were found. I put him to bed and requested the district nurse to take his temperature per rectum every morning. For 3 weeks it kept persistently between 37°C. and 37.5°C. thus giving evidence of the tissue saturation with toxin.

I advised him to consult Dr. Prest of Glenafton and later he was admitted into the sanatorium.

R.H., senior, aged 50 years, and father of the above. He has a chronic lesion at the left apex. About 1½ years ago he had a slight attack of haemoptysis. His sputum has been examined repeatedly for tubercle bacilli but they have not been found. His sputum largely consists of a diplococcal culture associated with staphylococci and strepto bacilli.

The house is a modern cottage of 4 apartments. There are seven inmates four of whom at least sleep in the kitchen. The mother admitted to me that the windows were always kept closed as she was very apt to catch cold.

School boy, A., aged 10 years. Two years ago he had an acute pleuro-pneumonia. A year ago he was brought to me on account of a chronic cough. He was very thin and gave evidence of enlargement of the mediastinal glands.

The house is old but has been renovated. It consists of two apartments. There are six/

The following four cases all gave evidence of enlarged glands in the mediastinum:-

School girl, S., aged 10 years. (She had a sister died from a meningitic condition. The course was rather rapid for a tuberculous meningitis). There are six inmates in a single apartment. This child had erythema nodosum.

A.D., school boy, aged 7 years. There were eight inmates in the house which consisted of two small rooms and kitchen.

N.B., school girl, aged 12 years. She was very pale and bloodless. Dulness was present at the right apex and here expiration was prolonged. She had a tendency to sweat at night. She was kept from school several months and improved greatly. Her mother suffers from melancholia.

At the of my examination, there were six inmates in the house, which consisted of two small bedrooms, one sitting room and the kitchen.

D.S., school boy, aged 12 years. Enlarged mediastinal glands..

There were five inmates in the house, which consisted of two apartments.

six inmates, all of whom sleep in the kitchen.

W.F., chauffeur, aged 20 years. This young man was seen by me first in March, 1915. His mother thought he had a 'stomach' cough and had on several occasions got elixirs to try to help him.

Fortunately for him he developed an attack of pleurisy which was severe enough to require the attention of a physician. Pulmonary signs were quite definite, when I saw him. His right apex was somewhat flattened and movement was diminished. There was dulness anteriorly, and, on auscultation, bronchial breathing could be heard. V.R. was increased. Just above the upper hepatic margin, pleural friction could be heard.

Right apex was dull posteriorly along the vertebral border of the scapula towards the right base.

His sputum contained numerous tubercle bacilli.

He was sent to Glenafton on 22nd May, 1915, and came home in September, 1915. At present he is well. There were six inmates in the house which consisted of two apartments.

K.O'H., young married woman, aged 27 years. She turned ill in the winter of 1914 - 1915. The first sign of pulmonary trouble was a sharp attack of pleurisy rapidly followed by haemoptysis. Her sputum was examined and tubercle bacilli in large numbers were found. She refused to go away from her home as she had several little children to look after. Ultimately she went to Kaimshill where she remained about 3 months. The conditions under which she lived were pitiable in the extreme. Her husband's time at work was very broken and the weekly wage was small. The house in which she lived was as bad as could be found in any city slum, being damp, low roofed, ill ventilated and with no sanitary conveniences. She went to Drumley, and there she lived several months. Shortly before her death she came back into Tarbolton and took a house above her original home. This apartment had fortunately windows that would open. Her bed was placed near one of the two windows and she got help as regards food, clothing, &c. Death brought her relief late in 1916. She was seven months with child at the time of her death. Altogether during her illness she inhabited four different houses.

The house in which she lived when she turned ill was one of the worst it has been my lot to see.

There were 6 inmates in the house, the two parents and four children.

I examined lately all the children of Mrs. K.O'H. They all appeared perfectly well but my notes contain the following remarks.

J.O'H., male, aged 14 years. Impaired resonance in front below the sternal ends of both clavicles. Expiration is prolonged and slightly bronchial in character. Posteriorly there is an area of impaired resonance at both right upper and lower apices. At the lower apex there is distant tubular breathing. He suffers from nocturnal enuresis.

K.O'H., female, aged 7 years. Percussion note is heightened at the right apex posteriorly. Expiration is considerably prolonged with increased V.R. The note is also heightened at the left apex posteriorly with cog-wheel inspiration.

Annie O'H., aged 5 years. Percussion note heightened at right apex both in front and behind.

E.O'H., female, aged 3 years. No definite pulmonary signs.

The probability is that they all have been infected owing to the living conditions. These children were all examined later by the tuberculosis officer who decided to accept the notifications. At present the children are apparently well but I hope to examine them periodically.

Mrs. M.L., aged 35 years, and sister to the above K.O'H. She has chronic phthisis. Her sputum contains a large number of tubercle bacilli. She is at present in Kaimshill. The house consists of a single apartment with three small windows none of which could be opened. The only means of ventilation was a small window pane which was hinged. It measured 10¼" by 7¼". In this single apartment with two inset beds there slept at night 10 persons. Sanitary conveniences are sadly lacking. The tenement was originally a box-work. There are no wash houses for the inhabitants and the closets are of the ashpit type. The whole place is in a broken down condition and should be condemned by the Local Authority.

One child in this family is an epileptic.

J. McG., married woman, aged 36 years. She and her husband with five children live in a single apartment house of a very poor type. The windows will not open up or down. One of the children suffers from chronic asthma. I examined him lately but could not detect any definite signs of pulmonary or broncho-pulmonary tuberculosis.

She consulted me late in 1916. She stated that she had been ailing for four weeks/

weeks previously, suffering from a bad cough and loss of strength. She was very thin and anaemic.

The condition of her chest was as follows:- The right apex was dull in front; bronchial breathing could be detected, with increased V.R.

The left apex showed a similar but smaller dull area with prolonged expiration.

The right apex behind gave a heightened note to percussion with prolonged expiration. Moist rales were present practically over the whole thorax. She had some sputum but it did not contain tubercle bacilli.

R. D., young married woman, aged 26 years. She consulted me before her first child was born (1916). Physical signs were definite and tubercle bacilli were present in the sputum. After her child was born she was admitted into Glenafton. Lately (February, 1917.) she returned home greatly improved.

L.A., male, aged 34 years. He suffers from tuberculosis of the cervical and axillary glands.

The family consists of four inmates living in an old house of two apartments - a kitchen and an extremely small room. The ceiling is low and the windows very small

Miss L., aged 15 years. She had glandular tuberculosis. She is a sister to case at 54 Mossblown - where the family now live.

J. D., female, aged 57 years. This patient died in Ayr County Hospital in 1915, from psoas abscess and phthisis.

G. M., male, aged 41 years: miner. He suffers from tuberculosis of the bones of the left fore-arm.

Baby D., male. This child died early in 1914 from tuberculous meningitis occurring as a terminal event in the course of chronic tuberculous peritonitis. There were four inmates in a single apartment which was old, damp and badly lighted &c.

D. R., adolescent male, aged 20 years.

In November 1913, he had an attack of tonsillitis. In a few days this was followed by a distinct haemoptysis. Tubercle bacilli appeared in the sputum and he had an evening rise of temperature. He was sent to Kaimshill Hospital where he remained until August, 1914. After his return home he had a bad attack of measles which caused a recrudescence of his pulmonary lesion. He went back to Kaimshill Hospital and returned in February, 1915. Later he started work and continued well. He enlisted in June, 1915 and has since served with His Majesty's Forces both in France and in the Balkans. [19]

Baby W., aged 1 year, female. The mother of this child died in Annbank in April, 1916, about 2 months after this child was born. The infant only lived 14 days with her mother and then was removed to the house of a relative living in Tarbolton. The child suffers from tuberculous disease of the left tarsus and tuberculous dactylitis of the right hand. In the house in which she lives there are six inmates. One of the beds is practically 'concealed' and is used for the children.

In all I have therefore notes on 111 cases tuberculosis

It will readily be admitted that the disease is common in the villages described. This is all the more to be regretted as they have occurred in a rural area where one would expect good health among the population.

As I hope to show later - the chief cause of the prevalence of the disease is the deficiency of housing accommodation and in certain instances the existence in the parish of housing conditions, comparable to that of any city slum. No doubt other factors are at work as co-operating predisposing causes. These factors I shall endeavour to elucidate.

Before proceeding to discuss this matter - it will be necessary to review to a certain extent our knowledge of the characteristics of the tubercle bacillus, also, the channels of infection with the bacillus in man.

CHARACTERS OF THE TUBERCLE BACILLUS.

The tubercle bacillus is a small non-mobile organism 2.5 to 3.5 in length and .3 in thickness. It is straight or slightly curved and when stained, often shows beading, this beading being due either to vacuoles or spore formation. In old cultures it may appear as long filaments. These filaments occasionally show a branching formation. Certain observers hold that this is a degenerative change, while others maintain that it demonstrates the affinity and close relationship between the bacillus and the streptothrices. The bacillus stains slowly and is difficult to decolorise. It is the most important of the 'acid-fast' group of organisms. In culture the growth of the organism ceases below 28°C. and above 42°C.

There are three main types of the tubercle bacillus, namely:-

(1) Human (2) Bovine

(3) Avian.

From the standpoint of preventive medicine the human and bovine are the most important. It may be taken as proven that these two types although undoubtedly related to one another, are yet distinct entities in so far as they have acquired well defined characteristics.

With reference to the bacillus of bovine tuberculosis, the following is a summary of the results published by the Royal Commission on Human and Animal Tuberculosis.[20]

(a) It can be arranged into three groups according to its growth on artificial media. The bovine growth is as a rule not so luxuriant as that of the human type, and hence is termed 'dysgonic.'

(b) When inoculated into bovines, rabbits, guinea-pigs, &c., it produces death by generalised tuberculosis.

(c) It shows stability as regards its cultural characters, both when sub-cultured and when passed through animals.

(d) It shows great stability in virulence both after long sub-cultivation and after passing through animals.

Morphologically the bovine type is shorter, thicker and more regular than the human type.

Regarding the bacilli of human tuberculosis it was demonstrated by the Royal Commission that there were three main types.

(1) Bacilli identical with the bacillus of bovine tuberculosis. These bacilli were obtained from three cases of cervical glandular tuberculosis and eleven cases of abdominal tuberculosis.

(2)(a)Grow more luxuriantly in culture than the bovine type and hence they are termed 'eugonic.'

(b)When inoculated into rabbits and calves they do not produce (or only occasionally) a generalised and fatal tuberculosis.

(3) Bacilli were obtained which could not be assigned definitely to either the bovine group or the human group - being possibly of bovine origin and altered by residence in the human body.

It is quite clear then that we must regard both the human and bovine types as causing the disease in man.

Phthisis pulmonalis is almost exclusively caused by the bacillus humanus. Griffith[21] who has made a summary of the investigation carried out both in this country and abroad as to the nature of the tubercle bacilli found in phthisical sputum, gives the following table.

Out of 938 cases investigated the classification of the cultures obtained was as follows:-

Bacilli of the human type	932
" " bovine "	3
" a mixed "	3

He extended his investigations to Edinburgh where bovine bacillary infections among children are very common. Out of 42 cases the bovine bacillus was demonstrated in one.

In 159 cases investigated in London, the bovine bacillus was demonstrated in two.

While tuberculous lesions in the human body are mainly due to the human type of bacillus - the part played by the bovine type as a cause of human tuberculosis is no small one, especially amongst the young.

The Royal Commission found the bovine type in 50% of the cases of primary abdominal tuberculosis in children investigated by them.

Park,[22] who investigated the subject - gives the following figures as a result of his own and other collected observations.

Total number of cases examined (all forms of Tuberculosis included) 1065

Adults 16 years & over	Human type	700	Bovine type	9
Children 5 - 15 years	" "	99	" "	33
" under 5 years	" "	161	" "	59
		960		101

Mixed infections 4 Total 1065.

Other investigations point to the fact that before bovine infection can occur - the doze ingested must be very large or else other conditions must be present which either increase the liability to infection or lower the resisting powers so that the infective process becomes easily established.

Still, who has investigated this part of the subject gives the following figures as a result of 216 post-mortem examinations made on children who had died from tuberculosis before the age of 12 years, and where it was possible to determine the channel of infection.[23]

138 or 63.8% were infected through the respiratory tract.
63 or 29.1% were infected through the intestinal tract.
15 were infected through the ear.

In 100 infants below 2 years of age,

65 were infected through the respiratory tract.
22 were infected through the intestinal tract.

In infants under one year, out of 39 cases,

27 were infected through the respiratory tract.
5 were infected through the intestinal tract.
7 were infected through the ear.

Still quotes similar results obtained by Carr, Shennan and Northrup.

Mitchell of Edinburgh in an extremely interesting paper on the "Infection of Children with the Bovine Tubercle Bacillus," gives the following table:-[24]

The bacilli were cultivated from tuberculous cervical glands.

Children 5 - 12 years of age.			
	Human Type.	4)	34 cases
	Bovine Type	30)	
Children under 5 years of age.			
	Human Type.	3)	
	Bovine Type.	35)	38 cases
		72	

This infection of young children with the bovine type of bacillus, he attributes to the drinking of milk from tuberculous cows.

Fraser,[25] also of Edinburgh made a similar investigation into the types of bacilli causing tuberculous bone and joint disease. The cases all occurred in children under 12 years of age.

Out of the 70 cases investigated in 41 instances he isolated the bovine bacillus; in 26 cases the bacillus humanus was found; while in 3 cases both types occurred. His results differ markedly from those obtained by other observers.

To sum up however, it may be taken as demonstrated that in investigating the prevalence of the tuberculosis in any district one must elucidate all the conditions which will favour the infection of the inhabitants with both types of the bacillus.

CHARACTERISTICS of the TUBERCLE BACILLUS in its RELATION to PUBLIC HEALTH.

The bacillus is very resistant to cold and can tolerate very low temperatures for many days (Swithinbank)[26]

It is said to be destroyed after

4 - 6 hours exposure to a temperature of 55°C.
15 minutes " " " " 65°C.
5 " " " " 80°C.
2 " " " " 90°C.

and very quickly by boiling water.

As the tubercle bacillus grows best at a temperature between 29°C. and 42°C. it finds a suitable temperature for growth within the human body.

When the bacillus is in a dry condition, its resistance is increased.

Sunlight kills the tubercle bacillus rapidly (Koch and Straus).[27]

Ransome, who made some investigations into the effect of fresh air and light on the virulence of the bacillus concludes his article as follows:-[28]

"These experiments are too few in number to justify the statment of positive conclusions, but so far as they extend they go to prove that fresh air and light and a dry sandy soil have a distinct influence in arresting the virulence of the tubercle bacillus; that darkness somewhat interferes with the disinfectant action and that the mere exposure to light in otherwise bad sanitary conditions does not destroy the virus."

Findlay/

Findlay and Martin,[29] using pure cultures of both types of the bacillus (human and bovine - and originally derived from lesions in the human subject), exposed them to the desiccating action of room temperature(50° - 60°F.) and the active effect of diffuse daylight. As a result of their experiments they conclude that daylight and drying reduces the virulence of the bovine type more rapidly than the human type and that this may explain why infection of the respiratory system in the human subject by the bovine type is so uncommon.

Sutherland mentions a case reported to him by Mr. Lang (M.O. of health for Inverness-shire) of great interest in this connection. This family was practically wiped out in a few years by tuberculosis. They lived in a two roomed house which owing to its position did not receive direct sunlight for four months of the year.[30]

Indoors, and in situations where there is a lack of light and ventilation, the bacillus can maintain its vitality for a long period (Koch, Fischer, Toma).[31]

In conversation lately with Sir Thomas Oliver, he mentioned to me the interesting fact that after burying tubercle bacilli for a period of eight weeks, they were found to retain their virulence.

In this connection the further experiments of Ransome and Delepine are of great interest.[32] From an investigation of the statistics relating to tuberculosis and housing conditions, they formed the opinion that the air of insanitary dwellings contained a particular form of impurity which afforded a suitable medium for the growth of the bacillus.

Accordingly they collected condensed vapour from:-

(a) Healthy breath.

(b) Phthisical breath.

(c) Cellar air.

(d) A weaver's shed.

(e) Pure ground air.

They sterilised these fluids and by using glycerine agar, potato, pure filter paper, lining wall-paper (which were also sterilised and soaked in the above mentioned fluids, with or without the addition of a small amount of glycerine) as cultivating media they managed to grow the bacillus. The experiments were carried out at a temperature of 35° - 37°C. and later repeated at a temperature of 20°C. At the higher temperature all the fluids were proved to be good culture media.

At a temperature of 20°C. a large proportion of their experiments were successful. Therefore by experiment it has been demonstrated that at ordinary room temperatures, in bad light and insanitary conditions, the bacillus can grow and multiply.

He (Ramsome) also mentions Beevor, Kanthack and Delepine as having succeeded in growing the bacillus on potato at a comparatively low temperature.

The bacillus abounds in the sputum of phthisical patients in whom actual breaking down of lung tissue is taking place. Such patients can expectorate an enormous number of bacilli daily.

As is well known the sputum is most dangerous when it dries and becomes suspended in the air, in which condition it is inspired into the lungs.

The/

The importance of 'spray infection' was investigated by Koch and Heymann,[33] and is a probable method of infection in the intimate associations of family life.

The bacillus occurs also in the faeces in tuberculous ulceration of the bowel - in the urine in tuberculosis of the genito-urinary tract and in the discharges from tuberculous lesions generally.

Finally I wish to draw attention to the experiments conducted by Coats (1902), into the presence of infective material in dwellings occupied by consumptive persons, being a continuation of the investigations initiated by Cornet 11 years previously.[34]

Three classes of houses were investigated.

(1) Houses which were in a dirty condition, in which a consumptive patient was living who took no precaution regarding his sputum.

(2) Houses which were clean but contained a consumptive patient not over careful with the disposal of his sputum.

(3) Very dirty houses in which there had been no tuberculous disease for years.

In group (1) Infective material was obtained in 66.6% of 21 houses.

In group (2) Infective material was obtained in 61% of 31 houses.

In group (3) No infective material was obtained.

Thus the patient is not the only danger to the community. His house can, if proper precautions regarding infective material be not taken, become a greater menace.

These/

These researches also demonstrated that the ordinary form of the tubercle bacillus was not ubiquitous but abounded chiefly in the neighbourhood of infected people and dwellings.

He also showed what I consider to be a most important point that a large amount of cubic space in a dwelling was of little avail in decreasing its infectivity &c., if the ventilation were bad; also that the infective material as would be expected, abounded chiefly on or about the floor level.

The conclusions to be drawn from the above remarks are as follows:-

(1) Insanitary surroundings, deficient ventilation, over-crowding, insufficient lighting of houses and workshops, and lack of care in the disposal of morbid tuberculous material favours the occurrence of infection, and conversely

(2) Healthy surroundings, ample ventilation, reduction of number of inmates especially in sleeping apartments, and a plentiful supply of light together with scrupulous care in the disposal of tuberculous material will greatly diminish the risk of infection.

THE CHANNELS of INFECTION.

The great majority of infections probably take place through the respiratory tract as shown by the statistics of Still and others on a previous page, and by the occurrence of the bovine bacillus in the lesions of pulmonary tuberculosis but rarely.

The infection of the bronchial glands is probably always secondary to a focus situated within the lung. Ghon who made a large number of autopsies in order to elucidate this point states:-[35]

"Experimental injections have shown that generally speaking under normal conditions, certain groups of bfoncho-pulmonary and tracheo-bronchial lymphatic glands are supplied in a centripetal direction from certain regions of the lung, and that in the median line, the lymphatic glands of both sides show certain anastomoses with one another, which are designated as median intersections. Bartels calls these the 'primary or guiding law' and the 'secondary or tributary law.'

These laws are always adhered to in the so called primary lung focus of children and I never remember having seen a departure from the rule. Therefore in consequence of those laws we often see an almost fan-like spreading out of the tuberculous process from the lung focus to the adjoining lymphatic glands towards the median line. I never saw such a fan-shaped spreading out of the process in an opposite direction which would have been observed if the changes in the adjoining lymphatic glands really represented the older process, and the lung focus had been formed from them/

them, secondarily and by retrograde lymphogenous means.

The second reason was that I have seen no case where the alterations in the lung focus showed a more recent stage of development of the tuberculous process, from a morbid anatomical standpoint, than the alterations in the adjoining lymphatic glands. The fact alone that in the greater half of the cases, the focus and adjoining lymphatic glands showed apparently anatomical changes of equal age, could at the most only leave a doubt as to which of the two changes could be regarded as the first; but in conjunction with the fact that the focus never showed a more recent stage of alteration, whilst the adjoining lymphatic glands often did, and in conjunction with the reasons quoted earlier, it would in no way dispel the idea that the focus showed the older process in point of age."

The primary focus is described by Ghon as being frequently subpleural. It has been suggested that such a focus could arise from a tuberculous pleurisy implicating the visceral pleura, this pleurisy having originated from a tuberculous infection of the tracheo-bronchial and bifurcation glands. (Overend, Sutherland).[36]
It is highly probable also that, whether the lung focus be primary or secondary to the infection of the root glands - once these glands do become affected - there is a stasis of the centripetal flow of lymph in the lymphatics and that the infective process may extend in a centrifugal direction towards the alveolar tissue of the lung. Such an extension would be favoured in children by the fact that their lymphatic channels are comparatively wider and more embryonic in character than in the adult. Clinically many cases of phthisis/

phthisis originates as hilus tuberculosis. One writer states that 40% of all cases of phthisis pulmonalis are of the peri-bronchial type and that when phthisis originates thus, it may reach an advanced stage without any signs of its presence being discoverable by the usual methods of physical examination of the chest.[37]

Walsham has shown that the bacilli can gain an entrance into the body through the tonsils and so reach the cervical lymphatic glands.[38] Pigs fed on tuberculous milk are infected through the tonsils (Woodhead).[39] According to Walsham the tuberculous infection may spread from the cervical glands to the bronchial glands, but Wood,[40] has shown that there is no direct connection between the cervical glands and the lungs or pleurae.

Woodhead, has traced the route of infection from the intestine to the bronchial glands by way of the mesenteric, retro-peritoneal, and posterior mediastinal glands.[41]

The bacilli can gain entrance through the tonsils or intestinal tract without causing lesions in those organs (Martin).[42]

INFECTION THROUGH the ALIMENTARY SYSTEM.

The bacillus often gains entry into the body through the intestinal mucosa (chiefly through Peyer's patches in the lower part of the ileum). Children especially are liable to be infected thus, through the drinking of tuberculous milk, by creeping on the floor in houses containing infective dust and in those cases of massive infection/

infection described by Sutherland.[43] Recent investigations tend to prove that the dose required to cause infection through the intestinal tract is much greater than that required for the respiratory tract. Certain continental observers, notably Von Behring and Calmette, regard infection by ingestion as the usual method of infection - such infection occurring chiefly in childhood. Their views have not been accepted generally, and more recent work tends to disprove their assertion.

Symmers and Whitla by injecting carbon particles into the peritoneum of guinea pigs showed that when the animals were killed, carbon particles filled the lungs. They also showed that by feeding animals through a catheter, with a mixture of china ink, olive oil and water, similar results could be obtained.[44] Zenker and Knauff by causing animals to inhale coloured dust found the lungs pigmented when examined post mortem. In their experiments, however, the fallacy of the dust perhaps having been swallowed must be noted.

The researches of Steenberghe lead one to believe that the mesenteric glands in the young are more able to deal with dust infection and localise it than the glands of the adult.

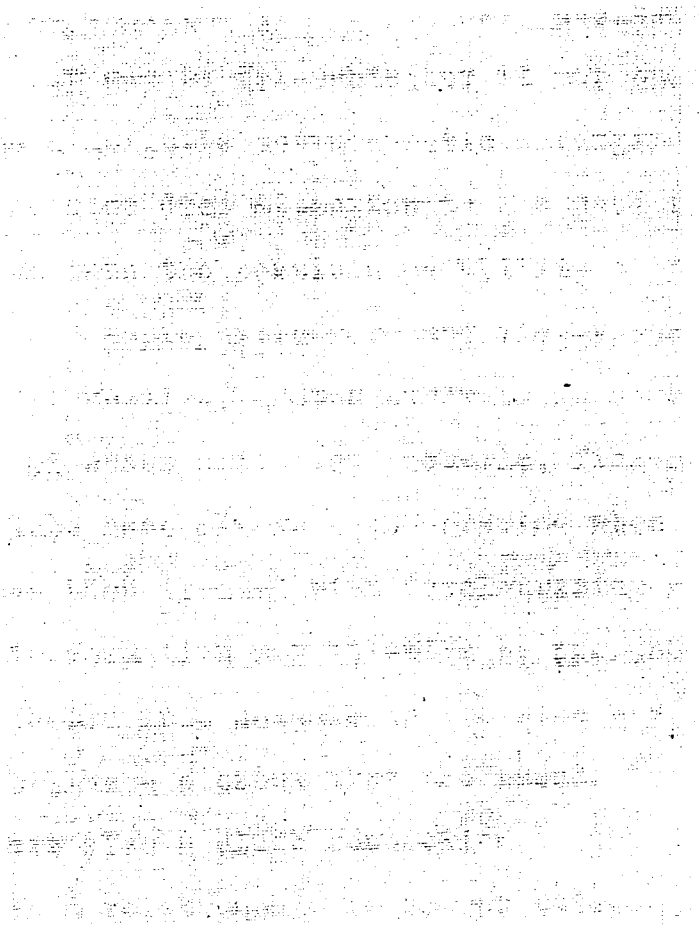
Findlay[45] maintains that in the anthracosis of miners, the coal dust does not reach the lungs by the intestinal tract. From experimental evidence, therefore the exact rôle played by the alimentary system as a portal of infection has not yet been demonstrated.

I do not propose to discuss further whether the respiratory tract or the alimentary tract is the more common route of infection - the important point as regards my enquiry is that both systems can under certain conditions afford/

afford a ready channel for infection, and that before such infection can occur - inhalation or ingestion of tuberculous or tuberculigenous material must occur, and that the lining membranes of these tracts must be devitalised either by local disease or lowered general health or both.

Infection can also occur through the ear (Still) or through a wound (rare).

According to Baumgarten, ante-natal infection is not at all uncommon. It is highly probable, however, that the bulk of tuberculous infections are post-natal in their origin.



The Mutability of the Tubercle bacillus.

Muir and Ritchie in their text-book on Bacteriology make the following statement:-[46]

"If the bacillus can pass into a form not demonstrable by the method usually employed, we have manifestly to do with a fact of the highest importance." Similarly if it be possible that certain bacilli, allied to the tubercle bacillus, can under certain conditions assume the characteristics, both chemically and biologically, of the tubercle bacillus and cause tuberculosis, the importance of such a metamorphosis cannot be over-estimated from the public health standpoint.

Bulloch. (1902) states the following:-[47] "Under certain conditions the bacillus of tuberculosis assumes forms other than rods. It may be filaments, or it may show clubs, and there may be a definite actinomycotic arrangement of the fungus." He also drew attention to the need for investigation into the possible mutability of the tubercle bacillus into a saprophytic form and vice-versa.

Similarly Moeller,[48] quotes Lubarsch as asserting "that in the case of other acid-fast bacteria, fibres, branched forms and clubs have always been observed when pure cultures have been treated with decolourising reagents, and actinomycotic formation may likewise be produced, provided they are injected into animals in the same way as the tubercle bacillus - a proof that the pseudo-tubercle bacillus bears also a close connection to the actinomyces, whereby again a relationship is set up between the pseudo-tubercle bacillus and the tubercle bacillus."

The researches of Levaditi, Metchnikoff, and Babes confirm this statement.

In summarising their investigations into the characters of the tubercle bacillus, the Royal Commission make mention of a group of bacilli which were not definitely bovine or human, and suggested that they were possibly bovine in origin and altered by residence in the tissues of the human body.

Much maintains that the bacillus can exist in three forms:-

(1) Ordinary form as stained by the Ziehl-Neelsen method.

(2) Fine bacillary form not acid-fast, often showing granules in its interior.

(3) Free granules which do not stain with the Ziehl-Neelsen stain.

Nos. 2 and 3 may be stained by a modified Gram's method.

Behring and De Jong, assert that by passing the human type of tubercle bacillus through goats it can be transformed into the bovine type.[49]

Other observers, having passed the human type through goats and cattle, found that after five such passages, the bacilli isolated from the lesions were still of the human type, and hence deny the foregoing assumption.

Nocard, is stated to have produced bacilli strongly resembling the avian type by introducing intraperitoneally in birds, cultures of bovine and human bacilli.

Moeller, was of opinion that by passing the human type through the blind worm for a year, he could produce

a/

a type similar to the bacillus of fish tuberculosis, while Dubard, is stated to have fed carp with human tubercle bacilli, and later obtained from them bacilli of the fish tuberculosis type.

One of the most recent papers on this subject is that written by James.[50] He states as follows:-

"The tubercle bacillus is not an organism especially created and perpetuated by Providence to be a cause of suffering and death to man, but is simply one stage of the virulent transformation which takes place in a harmless and probably useful organism, when by man the principles which Providence has ordained as necessary to the maintenance of healthy and good life are being violated." He makes use of the views of Malm, Kempner, Henri, Much, Ferrar and sums up the situation as follows:-

"In this way, then, we cannot but admit the existence of very important evidence pointing to these acid-fast bacilli as being all variations and probably interchangeable variations of one and the same breed. But still further, we have to remember that opinion is being expressed that this breed will be found to include as well, organisms which are <u>not</u> acid-fast,"

and again

"We believe that we can adduce evidence from the clinical side telling still more against specificity and therefore correspondingly in favour of the mutability of the tubercle bacillus, for we can show results which go to demonstrate that (a) tuberculin can excite reactions with other than acid-fast organisms (tubercle, timothy, smegma or mist,) and that (b) toxins other than tuberculin can intensify the reactions caused by tuberculin inoculations."

He/

He also in association with Wang showed that the smegma and timothy bacilli in certain instances produced local lesions, which resembled very closely those produced by the milder forms of the tubercle bacillus.

In a later paper James[51] designates the acid-fast bacilli found in dung, butter, milk, also the timothy grass and smegma and certain non-acid-fast bacilli as tuberculigenous and states that:-

"Tubercular disease in man, therefore, is in the vast majority of cases due not to the entrance into him of a specially created disease-producing germ - but really to the virulent transformation of germs which are always either in him or about him."

Herein lies the crux of the matter, and if the above assertions are true they only serve to strengthen a conviction which is growing more and more deeply rooted in the minds of all those who are interested in the eradiction of tuberculosis, namely, that while it is all important that everything should be done to prevent infection of the human body with tubercle or tuberculigenous bacilli - the disappearance of tuberculosis as a scourge will depend on a change in the environment of the masses, especially as regards housing and living conditions, and the conduct of life. It may of course be argued that pleomorphism is not a common phenomenon observed among bacteria generally. Still in view of the statements made by James, it would be premature to maintain that the bacillary form of the tubercle bacillus constitutes its whole life history so far as its morphological characters are concerned. Simple infection from one person to another or from one animal

to/

to another or to man does not to my mind explain the whole incidence of tuberculosis. The evolution of the lower forms of life may be still proceeding and it is not possible to draw a hard and fast line between animate and inanimate. (vide Chapter I of the admirable book 'The Meaning of Personal Life' by Newman Smith M.A. Hodder & Stoughton 1916) Again it may be argued that while bacteria may not be highly specialised so far as their morphological characters are concerned, yet so far as their toxins are concerned they are certainly in an advanced state of specialisation and hence less liable to variation or mutability. In this connection however it should be remembered that even in the virulence of their toxins, great variability is shown. Thus the pneumococcus and streptococcus salivarius are commonly found in the mouths of healthy people, while the colon bacillus and streptococcus faecalis are normal inhabitants of the intestine. These organisms may and often do become pathogenic. To say that they become pathogenic because the resistance and vitality of the tissues is reduced may not be the whole reason why they should become pathogenic. Pneumonia and appendicitis often occur in people who are perfectly healthy and who show no evidence at all of reduced vitality. It is just as probable that, due to reasons unknown to us, these organisms at times may overcome the resistance of normal tissues, by an increase of their toxin-producing powers, or a change in the nature of the toxin produced. A more probable explanation may exist in the fact that the growth and virulence of these organisms is often augmented by the abnormal or unhealthy conditions which produce a devitalised condition of the somatic cells.

The mutability of the tubercle bacillus cannot yet be/

be accepted as a proven biological fact. A great deal of work will yet require to be done in this interesting branch of experimental bacteriology before the conclusions of James and others can be accepted.

I now propose to state what I consider to be the causes of the great frequency of Tuberculosis in the three villages described.

(1) SOIL & SITUATION.

They all stand on soils of a clayey nature.

In Tarbolton, as mentioned previously, the subsoil is mixed with gritty material.

The relationship between phthisis and a damp subsoil has been studied chiefly by Buchanan and Bowditch - who showed that the disease diminished in frequency as the subsoil became drier through adequate drainage.

In Drumley the paths in front of the doors in wet weather are very wet and muddy and must render the floors of the houses damp. Similar conditions exist in certain parts of Tarbolton. In Mossblown, the paths in front of the houses are concrete and the roofs are rhoned. Nevertheless some of these houses are damp, due no doubt to faulty material being used in their construction.

Drumley and Mossblown are both exposed villages. Tarbolton is somewhat sheltered. Tuberculosis is, if anything, commoner in the first named villages than it is in Tarbolton. It will be remembered that I mentioned on a previous page that Drumley as a village faced the north-west, with the result that the sun seldom ever shines into the living apartments of the majority of the houses.

This, combined with the fact that one row of 20 houses, is/

is a back-to-back row, helps to explain and account for the prevalence of the disease in this village. Light is inimical to the life of the tubercle bacillus.

Certain houses in Tarbolton are similarly situated as regards outlook while others are built in very close and irregular relation to one another, making a free current of air about them impossible.

The prevailing winds are from the S.W. & W. and are rainy. Hence the claims made by Gordon are substantiated. Gordon maintains that districts exposed to strong prevalent rainy winds have a higher death rate from phthisis than districts sheltered from them. I take the liberty of quoting his paragraph in detail.[52]

"SCOTLAND.

Here again the prevalent rainy winds are south-westerly, westerly, and north-westerly. If the table of death rates from phthisis in the Scotch counties for the ten years from 1881 - 1890 be examined, it will be seen that the two lowest death rates are in Kinross and Nairn, both well sheltered from the rainy winds; that except Elgin, Forfar, and Edinburgh (of which the first is open to the north-west, whilst the other two contain very populous towns), the eastern counties have relatively low death-rates, whilst the western counties as far north as Argyle, have all relatively high death rates.

Average death rates per 1,000 from phthisis in the counties of Scotland for the 10 years 1881 - 1890, arranged in ascending order.

Kinross	1.0	Ross & Cromarty	1.3
Nairn	1.1	Banff	
Inverness	1.2	Kincardine	1.3
		Berwick	

Orkney		Shetland	
			1.8
Caithness		Elgin	
Aberdeen	1.4	Dumbarton	
Haddington		Argyle	
			1.9
Peebles		Edinburgh	
Sutherland		Wigton	
	1.5		
Linlithgow		A Y R	2.0
Fife		Forfar	
Clackmannan	1.6	Dumfries	2.1
Stirling		Kirkcudbright	
Perth		Bute	
	1.7		2.2
Roxburgh		Selkirk	
		Lanark	2.4
		Renfrew	2.5"

The position of Ayrshire in the above table should be noted.

(2) POVERTY.

Poverty cannot in the case of these villages be assigned as a cause. The men as workers are on the whole steady, and the children get their food. Indeed the usual cry of the mother is that the child will not take his food, and that in spite of all the nourishing things she can buy, his appetite remains capricious. In certain cases it may take the parents all their time to make ends meet, particularly in the case of miners, who work on the pit head. Such workers do not receive as/

as good wages as the actual coal-workers, and if it be the case that they have several children, every penny is needed for food and clothing. In the few cases in which poverty does exist - the cause of the poverty is alcohol and betting. Where hardship occurs through ill-health the miners themselves usually make a 'lift' on behalf of the incapacitated worker and he may receive anything from 10 - 20 pounds. Parish relief also plays an important part in the prevention of actual hardship, and I am convinced that the poor in rural areas are in a much better condition than people similarly situated in large towns.

Since acting as Parish Medical Officer, I have only had to give evidence once in three years against parents for neglect of children. It may therefore be taken as certain that in the villages mentioned - poverty does not play a part in the production of tuberculosis. The people as a body are well-clad and have sufficient means to obtain the necessaries and a good number of the luxuries of life.

(3) ALCOHOL.

It is difficult to estimate to what extent alcohol may act as a lowering agent of the vitality of the people in the parish. That a large amount of alcohol is consumed, I have no doubt, since Tarbolton itself has seven licensed places for a population of 1,100. This population does not include the surrounding districts, but there are also licensed places at Stair (3 miles from Tarbolton)/

Tarbolton) and Annbank[x] (3 miles from Tarbolton and 1½-2 miles from Drumley and Mossblown). I believe however, that alcohol does play a part, for, wherever alcoholism prevails, it is usual to find uncleanliness, overcrowding and bad hygienic conditions generally. There can be no doubt of the wisdom of the resolution passed at the International Congress of Tuberculosis in Paris: "That in view of the close connection between alcoholism and tuberculosis, this Congress strongly emphasizes the importance of combining the fight against tuberculosis with the struggle against alcoholism."

The high death-rate from tuberculosis among hotel and inn servants, and unoccupied males has been attributed to alcohol.

Allen, on the other hand stated, at the British Congress on Tuberculosis 1901, in his paper 'On Natural Immunity from Tuberculosis in Natal, South Africa', regarding the Hindu residing there:-[53] "Residence in Natal, causes the Hindu labourer to improve greatly in physique, especially noticeable in the second generation, the result of climate, country and food. They are by no means a temperate people, so far as the consumption of alcohol is concerned. They drink spirits freely, especially rum. They are practically free from tuberculosis in any of its forms."

In spite of this statement however, the two cases are not strictly analogous. Alcohol must be regarded as a tissue poison, lowering the vitality of the individual and tending to a retrogression in the quality of the race; also, as a potent cause of poverty, misery and family deterioration.[54]

[x] This place has now been closed. J.L.B.

(4) DIET.

Improper feeding can of course act as a predisposing cause of tuberculosis especially in young children.
(1) Omission of the sterilization of milk by boiling, and
(2) Improper quantities of food at the proper time, combined with carelessness in keeping feeding bottles &c. clean;
(3) also the giving of young children food which their organs are totally unable to digest, &c. Fortunately in this parish the large majority of mothers suckle their children, and the children as a class are above the normal weight at birth (8-9lbs. is a common weight).

In older children the digestion is often upset by too many sweet stuffs.

There however is prevalent one custom which should certainly be stopped from the stand-point of child welfare.

In the public schools both at Annbank and Tarbolton, it is the custom during the winter months to give the children only half an hour for their mid-day meal instead of an hour, in order that the children coming from a distance may get home earlier.

Now the detrimental effects of this custom are not seen to the same extent in Tarbolton as in the villages of Drumley, Mossblown and Annbank, for the simple reason that the village school in Tarbolton stands in the village and the majority of the children have time to run home for a warm meal. The children who come from a distance are to a great extent the children of farmers, and the parents make arrangements for the children to get something suitable to eat in the village.

Annbank School stands from $\frac{1}{2}$ - $\frac{3}{4}$ of a mile from all three villages, with the result that the majority of the children/

children cannot get home and back in time for school within the half hour. They could easily do so, if they had one hour for lunch. Accordingly they take something with them in their pockets and a flask of cold tea which is heated for them at the school. The flasks of the children often get mixed and thus is provided a possible source of infection in epidemic diseases.

Not only so, but in the case of children who do not feel very well, although they are at school, it is quite common for them to come home with their bread and butter sandwich untouched, having been thus six hours without food.

In certain cases it is possible that while the amount of money coming into the house is ample to provide sufficient food, it may not be expended on proper food stuffs.

Miss Lindsay (Glasgow) made an investigation into the dietaries of families with irregular wages under £1 per week, and showed that in not one case investigated by her did the energy-value of the diet reach the minimum of 3,000 calories. She also adds that the children were nearly all small and light in weight.[55]

In the villages under consideration however, few if any families have a wage as small as £1 per week, and the probability is that in nearly every family there is an ample supply of food, but that in certain cases the food stuffs purchased may not be the best suitable for physiological good health.

(5) OCCUPATION.

Coal miners as a class are not prone to develop phthisis, and in this respect differ greatly from tin, lead and copper miners and from potters and brass workers.

Slight attacks of pleurisy are common however, no doubt/

doubt initiated by chill, especially in cases where the miner has been working among water and has a mile or two to walk to his home.

While practising in the North of England (1909 - 1910) I observed the following case which shows that exposure may determine the actual onset of an acute tuberculous process.

The patient a young lad about 15 years of age had three miles to walk from the pit to his home. During a very severe snow-storm he lost his way and was found in the morning in a very much exhausted condition. He developed an attack of acute pleurisy which was followed rapidly by acute phthisis with death within four months.

(6) TUBERCULOSIS and PREGNANCY.[56]

Pregnancy, undoubtedly acts as a predisposing cause of tuberculosis amongst married women. As James has shown, in such cases the disease is apt to be severe and the mortality high. I have seen a quiescent lesion take on a renewed period of activity during the pregnancy of the patient, and quieten down again with appropriate treatment after delivery. The wives of working men are particularly prone to develop tubercle when pregnant as they have their ordinary duties to perform, the other children to care for, and in many cases they are unable to go out to get the amount of fresh air and exercise necessary for health.

(7) HOUSING and LIVING CONDITIONS.

A. Personally I believe that herein lies the real cause of the evil and I wish to draw particular attention to the following:-

Miners as a class have fairly large families. In Drumley the percentage of inmates to each house was at least six.

By far the greater number of the population in the three villages discussed live in single-and two-apartment houses. Drumley and Mossblown (with a few exceptions) are entirely composed of two apartment houses. In Tarbolton, single apartment houses are common. In these single apartments there are two beds as mentioned before and both are usually occupied at night. The kitchen serves as kitchen, dining room, scullery, bed room, and it is not uncommon to find sleeping in such 'single ends' - anything from six to eight or more people. Not only so, but no provision in many cases has been made for sufficient lighting and ventilation. In some cases the windows are fixed so that they cannot be opened; in others pieces of wood fixed so that the window can only be opened slightly; again, one small pane of glass may be made to open. In one case this small opening was the only possible means of ventilation in a single apartment with two inset beds, in which slept nine people, one of whom was expectorating tubercle bacilli. Many of the windows are ridiculously small and practically useless for sufficient lighting and ventilation. The ceilings of some of the houses are very low and easily touched by raising the hand. I have made s special note in my list of cases occurring in Mossblown of the/

The arrow points to the opening pane of glass. This small opening was the only means of ventilating a single apartment house with 2 inset beds. In this single apartment there slept at night nine people, one of whom was expectorating T.B.

a 'Slum' Row in Yarkollon.

Originally a boxwork.

X marks the window shown above.

Exposure. 1/25 Sec.
April. 1917.

Photograph illustrating method of ventilating a single-apartment House in Yarbolton Village.

Exposure 1/25th Sec.

the number of inmates in each house and the number who slept in the kitchen at night. It is common to find families of six to eight and ten persons occupying the kitchen at night, while the room stands unused as a bed room. This habit is especially common in those cases where its pernicious effects will be most severe, i.e. where there are families of several young children. Thus it happens that in one bed it is common to find the parents and one or two of the children, while the other bed and usually the worse type of the two is occupied by several children (even up to five or six in number). If, in this connection, it is remembered that an oil lamp is kept burning all night, that pit clothes are drying in front of the fire with perhaps the day's washing, and that the windows and the room door are probably tightly shut, it will be conceded that the atmospheric conditions are just such as would favour the development and spread of tuberculous mischief. Whether this custom is due to the fact that many of the parents have been brought up in single apartments, or due to ignorance or habit, it is hard to say. Dr. McVail in his address on "Sanatorium Benefit" at the Fourth Annual Meeting of the Scottish Association of Insurance Committees made the following remarks. "Besides, the Scotsman for all purposes lived in the kitchen - "the room" being more of a furniture store for all the use he made of it. The Scotsman had to be educated into the use of his house - for the housing problem had much to do with the problem of tuberculosis."

I can testify to the truth of the above statement and in many cases it may be truthfully stated that the full benefit/

benefit of improved housing conditions will not be realised until the inhabitants use their houses properly. Certainly it is the case that in Mossblown Village which (although labouring under the disadvantages of being composed almost entirely of two-roomed houses with inset beds) commended itself to the Miners' Federation Authorities as being a great improvement on the general type of miners' rows, tuberculosis is rife. These houses allow of free ventilation. They are well roofed and rhoned, and one part of the village has good sanitary accommodation. Seldom have I seen the tenants take advantage of the facilities for ventilation by keeping both room and kitchen windows open at night, with the room door a little ajar. Instead, they are kept rigidly shut.

The conditions in Drumley as regards housing and sleeping accommodation are much the same as in Mossblown.

In Tarbolton the bulk of my cases occurred in the old houses of the type described in a previous paragraph.

In this connection namely the influence of one apartment and two apartment houses on the tuberculosis incidence of a community, several interesting investigations have been carried out.

Dr. Chalmer M.O. of Health for Glasgow gives some interesting data in his paper.[57]

He demonstrates that there is a definite relationship between the size of house and the death rate.

Death Rate from all causes in Houses of several sizes:-

	Death Rate. 1901	1909 - 12
1 Apartment.	32.7	25.9
2 Apartment.	21.3	16.5
3 Apartment.	13.7	11.5
4 Apartment.	11.2	10.8
Institutions and Harbours	52.3	39.3

He also shows that the sexes taken separately also prove the relationship between the size of house and the death rate.

Females at all ages have a death rate of

25 per thousand in 1 apartment house.

16 " " " 2 " "

11 " " " 3 " "

9 " " " 4 " "

45 " " " Institutions

Males at all ages as follows:-

27 per thousand in 1 apartment houses

17 " " " 2 " "

12 " " " 3 " "

13 " " " 4 " "

37 " " " Institutions.

He gives other corrected tables which still more forcibly demonstrate the relationship.

He also states "It is an old observation in Glasgow that the number of persons per room increases as the number of rooms decrease, and during the period we are considering the average number of inmates in one apartment houses was 3.196; in two apartment houses the occupants average 2.4 per room; in three apartment houses 1.7 and in houses of four apartments 1.3."

In this connection the following table is instructive.

REPORT by MEDICAL OFFICER to [58]
the LONDON COUNTY COUNCIL.

PHTHISIS 1894 - 98.

Proportion of total population living more than two in a room (in tenements of less than five rooms,)	Death rate per 1,000 living				
	1894	1895	1896	1897	1898
Districts with under 10%	1.07	1.18	1.07	1.14	1.10
" " 10 - 15	1.38	1.49	1.46	1.42	1.43
" " 15 - 20	1.57	1.64	1.61	1.63	1.61
" " 20 - 25	1.81	1.83	1.67	1.75	1.80
" " 25 - 30	2.11	2.09	2.06	2.10	2.07
" " 30 - 35	2.25	2.42	2.13	2.32	2.42
" " over 35	2.46	2.66	2.55	2.64	2.63

Dr. Chalmers also investigated the phthisis death rate and its relation to the size of house, as follows:

	1 Apartment	2 Apartments	3 Apartments	4 Apartments
1901	2.4	1.8	1.2	.7
1909-1912	1.76	1.26	.91	.66

A later investigation is that of Dr. Williamson, M.O. of Health for Edinburgh. [59]

He states that:

62% of the Population of Glasgow live in houses of 1 or 2 rooms
37.2% " " " Edinburgh " " " " "
64.9% " " " Paisley " " " " "
58% " " " Greenock " " " " "
63% " " " Dundee " " " " "

also

In Edinburgh.

32% of the Population live more than 2 in one room
12.8% " " " 3 "
4.1% " " " 4 "

In Glasgow.

55.7% of the Population live more than 2 in a room
27.9% " " " 3 "
10.7% " " " 4 "
3.4% " " " 5 "

Now in the villages under discussion the vast majority of the houses are of one and two apartments, and if we take the average of each house as 6 (in Drumley it is more) - it will be admitted that over-crowding is just as prevalent in these villages as in the towns mentioned, if not more so, for the following reason

There are many people occupying one and two-roomed houses who would immediately remove into larger houses if they could get them. In Tarbolton especially, houses are scarce, with the result that many houses are occupied which certainly would remain empty if others and better houses could be had, even if the rents were dearer.

He (Williamson)also maintains that the death rate of a community is in almost exact relationship to the number of one and two-roomed houses in it, thus, in Edinburgh:

Ward.	Death rate.	No. of 1 and 2 rooms.
Merchiston	12.2	811
St.Bernard's	12.5	879
Broughton	13.2	1,240
St. Andrews	17.1	1,278
George Square	18.0	2,108
St. Giles	21.2	2,913

He makes reference to the close connection between density of population and infectious diseases and in the case of phthisis, he writes as follows:-

"I have for some years past devoted considerable attention to the influence of housing in its relation to the spread of this form of disease, and I cannot imagine any doubt remaining as to the connection between these two after a study of the figures to which I now direct your attention.

In the year 1910, 6.1 per thousand of the occupants of one roomed houses were notified to me as suffering from phthisis: 3.4 per thousand in houses of two rooms; 2.1 per thousand in houses of three rooms and only one per thousand in houses of four rooms and over.

Two years afterwards the same striking relationship is found to exist; 6.9 per thousand occurred in houses of one room; 5.6 per thousand of two rooms; 3.5 per thousand of three rooms; while only 1.4 per thousand occurred in houses of four rooms and over.

In 1914 a precisely similar relationship is found to exist, always dependent upon the home conditions thus:- 5.3 per thousand occurred in houses of one room, 2.8 per thousand occurred in houses of two rooms; 2.2 per thousand of three rooms; while only 1.4 per thousand in houses of four rooms and over."

As may be expected the influence of housing is reflected most rapidly on the youngest and weakest members of the population.

I do not think therefore that it can be doubted but that in the villages discussed, one of the most important predisposing causes of tuberculosis, and in all probability the most important cause is the fact that by far the greater number/

number of the inhabitants live in houses of one and two apartments.

B. Another cause which I wish to mention and which is partly included in the above is the defective sleeping accommodation.

(a) The individual room or rooms contain too many inmates to begin with.

(b) Almost without exception the beds are of the 'inset' type as follows:-

(1) One side wholly open.

(2) Open side encroached upon to a greater or less degree.

(3) Short inset beds 5' in length with a recess in the wall to accommodate the sleepers' feet.

(4) Still shorter beds of 3' or 4' in which I have seen children sleep.

(5) 'Trolley' beds. These are very low wooden beds with small wooden wheels. During the day they are pushed out of sight beneath one of the beds. At night time they are drawn out into the middle of the floor. Hence in some parts of the parish it is not unusual to find three beds in a single apartment and all occupied at night.

These beds form cul-de-sacs of stagnant air that cannot be ventilated. They are badly lighted. In some cases the air space of the bed is reduced by a sloping roof, a stair or a very low ceiling. Again the free circulation of air in and out of the bed space is still further obstructed by hangings and curtains. It is little wonder that many of the children wake up in the morning feeling unslept and unrefreshed.

The air in the sleeping apartment becomes foul. The deleterious effects of breathing air charged with respiratory impurity are due as much to the organic matter contained therein as to the CO_2. Not only so but it is probable that respired air differs from fresh air

by/

Sleeping conditions in a tuberculous infected house in Yarbolton (Bed No 1)

NB

(1) the 'inset' bed

(2) the sloping roof

(3) The 'hangings' were removed for photographic purposes

Exposure 10 sec :

Feb. 1917

Sleeping conditions in a tuberculosis infected house in Yarbolton. (Bed No. 2)

NB.

① the 'inset' bed

② the sloping roof

③ The 'hangings' were removed for the purpose of the photograph.

Exposure 15 seconds.

Feb. 1907

Sleeping conditions in Yarbolton
old Type of House (Bed No 1)

NB ① Most bed
② Damp on roof
③ Curtains
④ Poor lighting

See note to next photograph.

Exp: 20 sec.
Feb. 1907

Sleeping conditions in Yarbolton
Old type of house. Bed No 2
a poor photograph but of great
interest.

① NB. 'inset' bed
② curtains
③ the poor lighting.

The plate was exposed for
20 seconds during a bright
day in February. The lens
used was a rapid rectilinear
working at f 8

by having undergone some subtle molecular disturbance. Denison places great importance on these points and regards "devitalised air toxaemia" as a prone cause of tuberculosis. Under such conditions the bronchial mucosa is bound to suffer.

Attacks of bronchitis and broncho-pneumonia and other acute respiratory diseases are common, especially amongst the children. The general nutrition suffers on account of the imperfect oxygenation of the blood. It is easy in such cases for the tubercle bacillus to invade the lung tissue, with the result that phthisis and broncho-pulmonary tuberculosis are common amongst children of school age.

Denison, writes as follows:- [60]

"Considering the evidences of the general freedom from tuberculosis under favourable conditions, and on the other hand referring to the general prevalence of the disease under conditions worse as to ventilation than that above stated, and also to the blood changes induced by breathing such devitalised air, I want to ask, is it reasonable to substitute the germ results for such causes when the latter are so plain. Do not the changes in the clogged up vessels and air cells induced by thus rebreathing devitalised air under conditions of physical restraint possibly constitute a culture field, which could not exist in a normal lung. Beyond question this condition could be so bad without germ infection that it could not be much worse with it, so near to a created toxaemia is the dyscrasia existing."

Of still greater importance scientifically and philosophically is the following statement on the conclusions of Hueppe in regard to the cause of tubercle.

"I do not wish to introduce the diversion of a discussion of the spontaneous generation of life in these mould growths which these bacilli of tubercle are supposed to be, for I am not aware of any experiments which conclusively prove this. But this I do say, that if in warm-blooded animals, marked deficiency of ventilation, prolonged even perhaps for generations, does not eventually in whole or in part produce such a biological metamorphosis, such a change in the blood and tissues of their breathing organs, as to result in the formation of this vegetable mould growth, then such spontaneous generation, to my mind is simply another way of saying that this dyscrasic state is a necessary precursor to a germ infection from without such animal body. The dyscrasia is necessary in either case.

Either supposition will help us to get at the real cause of tuberculosis, i.e. that which precedes the germ formation. Here indeed is susceptibility in the extreme, and immunity is correspondingly lost. Up to a certain period germs have yet nothing to do with it, but a condition already exists possibly as dangerous and deadly in one person as a plentiful incubation of myriads of bacilli in another."

Here then, nearly twenty years ago, is an embodiment of the more recent views of James on the same subject. The work of Williamson and Chalmers gives additional evidence to prove that in the housing, sleeping, and living conditions of a large proportion of the population, both in towns and certain rural areas, is the root cause of tubercle to be found. Infection with the bacillus is probably required. Given certain conditions as regards housing, &c. a condition of vitality and of the body tissue generally is produced which instead of destroying the germ - actually forms/

forms a suitable nidus for its growth, multiplication and pathogenicity

(8) LACK of PROPER SANITARY CONVENIENCES.

In Tarbolton village there are five flush water-closets. The remainder are ashpit closets.

In Drumley all the closets are of the ashpit type and are most objectionable in so far as they are situated five in a row and emptying into one large open ashpit. Coal-cellars, washing house and closets are all under one roof, each group being accommodation for five houses.

In Mossblown 97 of the houses have dry closets--one to every 3 families. The ashpits are built-over. In the new part of Mossblown there are flush water-closets, one to every 3 families, with enclosed ashpits. These conveniences are situated in front of the rows.

Apart from the objectionable nature of the ashpit closets, as regards the finer feelings of decency, they are a possible source of the spread of tuberculous disease and certainly a cause of infantile diarrhoea.

In Drumley and Mossblown every autumn there is a plague of flies, which find in these ashpits a suitable feeding and breeding ground. Now all sorts of refuse and excreta are emptied into the ashpits. Thus the flies be feeding on tuberculous excreta can carry infection. It has been stated, however, that tubercle bacilli in excreta rapidly die. Be that as it may, the conclusions of Lord are of great interest. [61]

(1) "Flies ingest tubercular sputum and excrete tubercle/

tubercle bacilli, the virulence of which may last for at least 15 days.

(2) The danger of human infection from tubercular fly - specks is by an ingestion of the specks on the food. Spontaneous liberation of tubercle bacilli from fly-specks is unlikely. If mechanically disturbed infection of the surrounding air may occur.

In this respect the inhabitants could help themselves greatly. In the new part of Mossblown the fly plague is just as bad as in the old part, due to the following:-

(1) Improper training of young children. Evidence of this is quite common.

(2) Emptying into the ashpit the excreta of children instead of into the water closets.

(3) Emptying into the ashpit all manner of vegetable refuse &c. which forms a suitable feeding material for the larvae.

(4) Emptying waste material into the open syvor.

Now a large amount of the waste could be burned, and as the washing houses are being used continually, it could be easily burned in the boiler fires.

(9) NOMADIC HABITS of CERTAIN CONSUMPTIVES.

In view of the experiments of Coates on the infective dust to be found in houses in which consumptives are living - it is quite evident that the disease may be spread by a patient who occupies a series of houses. Such wandering habits/

habits are found chiefly among the poorer and perhaps less thrifty people. In such cases I am sure, proper care is not taken of the sputum &c. and so each house in turn will be infected. As the infected houses will probably be occupied later with people of the same class, disinfection will not be performed and cleaning only slightly carried out.

I may here state that the Local Authority now disinfects houses:-

(1) In which a death from tuberculosis has occurred

(2) In which a tuberculous patient has lived before going away for institutional treatment.

(10) MILK and MEAT SUPPLIES.

(a) Milk. In rural areas the public have no safeguard against the supply of tuberculous milk. In going my rounds as a country doctor, I often see the conditions under which the milk is obtained. In certain cases great care is taken and in others no care at all. A large number of the country byres stand in need of improvement. Improvements however, are being somewhat tardily carried out.

Thus in one case which came under my notice, the infant daughter of a farmer who supplied milk to one of the above villages, suffered from tuberculosis of the bones of one foot. In the villages - Drumley and

Mossblown/

Mossblown especially - tuberculous peritonitis occurs not infrequently.

(b) Meat supplies. Here again there is no inspection of meat. The butcher buys, kills, and sells.

In speaking to a farmer about this the other day he admitted that it was not unknown for a farmer when he saw a cow going wrong, to send it to the market to be sold for killing purposes.

It has been suggested in the public press that rabbits, in so far as they are very liable to tuberculosis, may infect pasture land, and thus help to disseminate tuberculosis amongst cattle. Experiments in this direction would certainly be interesting.

(11) OTHER EPIDEMIC DISEASES.

The relationship between tuberculosis and measles and whooping-cough is well known. Owing to the nature of the above villages i.e. being built in rows, epidemics of measles and whooping-cough when they occur, spread with great rapidity. During the last measles epidemic the schools were closed without so far as I could see having any effect in shortening the course of the epidemic. The children instead of playing with each other in school, played together in the rows.

Not only so, but the close relationship of the houses allows of too much 'coming and going' on the part of the neighbours/

neighbours. A sick bed becomes a spectacle. This visitation in many cases I have no doubt takes place out of kindness, but probably just as often out of curiosity.

They evidently forget that it is wise at times to 'withdraw thy foot from thy neighbour's house; lest he be weary of thee and so hate thee.'[62]

CONCLUSIONS with regard to the PREVALENCE of TUBERCULOSIS in the VILLAGES mentioned

(1) In the rural area of Tarbolton the death-rate from Tuberculosis (1905 - 1915) (1 in 9) was almost as high as that in Glasgow 1912 (1 in 8).

(2) These deaths occurred chiefly among the mining population. The disease is found chiefly in the miners' rows and houses, which may be aptly termed 'tuberculosis infected areas.'

(3) Tuberculosis is not common among the farming population, and during the 10 years (1906-1915) not a single death from tuberculosis occurred in this section of the population.

(4) It is possible that the geological and geographical situation of the villages is a predisposing cause of the disease.

(5) Poverty does not play a prominent part as a predisposing cause.

(6) THE CHIEF CAUSE IS TO BE FOUND IN THE HOUSING AND LIVING CONDITIONS.

(a) The prevalence of one and two roomed houses

(b) The occurrence of old, damp, badly ventilated and insufficiently lighted houses, (especially in Tarbolton) many of them typical slums.

(c) Defective and insufficient sleeping accommodation. This is aggravated by the inhabitants in many cases not ventilating their houses - although they have ample means to do so, and by leaving the room unused as a bedroom.

(d) Defective sanitary conveniences especially water closets and ashpits - this evil being also aggravated to a certain extent by the habits and customs of a section of the population.

(e) The facility with which infectious diseases spread owing to the houses being built in long rows.

(7) The 'nomadic' habits of certain comsumptives.

(8) The lack of supervision of the meat and milk supplies.

PROPHYLAXIS.

The problem of the prevention of tuberculosis is such a vast subject, that it would be impossible in an investigation of this nature, to give it full consideration. Keeping in mind the causes which I have demonstrated as being the most potent in the production of the disease in the villages under discussion, I shall endeavour here to indicate the lines upon which reform should take place.[63] I should also like to state at this point that the housing conditions in the villages described are by no means the worst in Ayrshire (see appendix 1), and that the villages described are regarded by the Local Authority as being in a sanitary condition. One feels at times that the standard as regards sanitation required by the Local Authority cannot be a very high one. It would be interesting to know to what extent tuberculosis occurs in some of the villages, where the housing conditions are very sadly deficient. In order to eradicate tuberculosis - the standard as to what is a sanitary dwelling will require to be raised. The whole problem of housing reform is one which will require solution with the return of normal times, in order that recovery from the present disastrous period may be accelerated. It is generally recognised that the State will require to take action in the matter. That such State interference is necessary is proven not only by the nature of the housing conditions in Scotland at the present time, but also by the famine of houses generally. It has been estimated that the number of houses in England falls short of the actual needs of the population by 470,000. The shortage of houses in Scotland has been computed as amounting/

amounting to 120,000. Another point of great importance is the number of people living in one and two-apartment houses. The one apartment houses in Scotland contain nearly 10% of the population, while two apartment houses account for nearly other 40%. Thus approximately 50% of the population live in one and two-apartment houses. In Glasgow the number of one and two-apartment houses is 67% of the total number of houses and in Kilmarnock 68%.[64] Many methods have been suggested by means of which reform may be accomplished. Whatever method be adopted, it will undoubtedly require State assistance with regard to providing the necessary Capital wherewith to proceed with improvements. Now as regards miners' dwellings, the following seem to me to be the lines along which improvement should take place.

HOUSING REFORM.

(1) The building of houses in long rows is wrong. They should be arranged wherever possible in groups of not more than four. These groups should be situated at a convenient distance from one another and suitable to allow of the free circulation of air about the dwellings. These houses should be paved in front. Needless to say all walls should be strapped and lathed and should have damp-proof courses, with through ventilation beneath the floors. Roofs should be suitably rhoned. The rhones should be kept clean and discharged clear of the foundations. All windows should be made to open and should be of ample dimensions to allow of the apartments being bathed in good light. Miners' villages should have if at all possible a southern exposure.

(2) There should be a much greater provision of three and four roomed houses. Bearing in mind the fact that miners have as a rule several of a family, the necessity of this becomes apparent. When the children reach the age of puberty it becomes imperative from the moral stand-point. The conditions at present certainly do not tend to nurture the finer feelings of modesty and decency. A certain number of two roomed houses would be required for such as had very few or no children. The number of rooms should be such that it would not be necessary for certainly not more than three people to sleep in the same apartment. Realising that 1,000 cubic feet of air space is of itself only a sufficient supply of air for one person for twenty minutes if the CO_2 is to be kept at .6 per 1,000, the necessity for sufficient air space associated with sufficient ventilation is self-evident. Where the air-space is small or where there are several people in an apartment, the cubic capacity of which is too small for the number of inmates, efficient ventilation will be impossible without causing draughts. The greater the amount of cubic space, the more easily will proper ventilation be carried out.

(3) Sleeping accommodation. Inset beds should be abolished, and certainly on no account should there be more than one inset bed in the same apartment. Hangings and ornamentations should be forbidden. All beds should be open and freely moveable for the sake of cleanliness. The 'trolley' bed especially should be prohibited.

(4) All houses should have a separate W.C. and small wash-house. The plan of having large wash-houses for the whole Village is not to be recommended. Bathrooms would/

would be a great advantage especially where there are a number of children. Ashpits should be abolished in favour of the bucket system. Where ashpits do exist they should be covered and have doors. While the part played by defective sanitary accommodation of the villages described, in the production of tuberculosis, is difficult to determine[65] the presence of such indescribable conditions in these villages, cannot but have a lowering effect upon their 'hygienic tone.' It is difficult and practically impossible under such conditions to educate people regarding the dangers of sputa, excreta, &c., when such insanitary arrangements are so near to their doors. Such conditions favour the development of neither cleanliness nor modesty. While the conditions in these villages are bad enough, in some Ayrshire Villages the conditions at the time of the Commission on housing (and probably even to-day) were a disgrace to the county. Many W.C's had no doors, while the numbers provided for the size of many of the villages were totally insufficient.

INSPECTION of MEAT and MILK SUPPLIES.

The part the bovine bacillus plays in the production of tuberculosis has been mentioned previously; that the matter requires attention is shown in a paper by Mitchell[66] who made some investigations into the milk supply of Edinburgh. Having shown first that the milk sold in the shops comes from the country byres, he gives the results of his investigations of 406 samples. 82 of the samples (20%) were found to contain tubercle bacilli. He thus demonstrates/

demonstrates the necessity for bacteriological examination of milk and veterinary inspection of cows in rural areas.

The experiments of Delepine into this matter are interesting.

Lane-Claypon[67] states Delepine's results as follows:- "Delepine points out that one cow giving tuberculous milk can infect a much greater quantity of milk than her own, when the milk from several cows is mixed together. In one experiment he took some milk from a cow whose udder was in a state of advanced tuberculous mastitis and diluted it with various quantities of cows' milk which contained no tubercle bacilli. The mixed milk of varying dilutions was inoculated into different guinea pigs and the result showed that one part of the tuberculous milk was capable of infecting 100,000 parts of non-tuberculous milk." Delepine adds that had the dilution been pushed further it is probable that one part of tuberculous milk would have been found capable of infecting 1,000,000 of non-tuberculous.

(3) Education of the Public in matters regarding public health and communal welfare. If the full benefits of housing reform are to be reaped - such reform must be accompanied by a simultaneous awakening of the public to their duties in regard to the public health.. In this parish ignorance in public health matters prevails. Such ignorance usually goes hand in hand with prejudice. The people have heard that 'consumption' is a family disease and that it is invariably fatal. It is difficult to get them to believe in its infectious nature: not only so, but they turn the argument over and reason that since it is a family/

family disease it cannot occur in such and such a case because there is no family history. Again and again I have had this statement made to me. One woman when I told her that her child was very thin stated that how could I expect anything else when she herself had always been thin. I could quote many other instances but the following is certainly the worst.

I was asked to see an old woman with a suppurating bunion. I did so and prescribed an antiseptic dressing. Great was my surprise when a neighbour told me that the old lady had caught a mouse, skinned it, and applied the skin to the suppurating wound as a sure and certain cure.

In regard to the education of the public in matters relating to tuberculosis, the value of the sanatorium especially in the treatment of children, cannot be over-estimated. The children not only receive treatment which enables them to regain their health, but they also receive a practical lesson in the value of fresh air with regular and simple habits. They also learn the dangers of sputa.

One cannot understand why, in the village of Mossblown, for instance, it is so common to find the kitchen alone used as a sleeping apartment and the room in many cases lying unused for this purpose, with the result that it is common to find any number of inmates, up even to eleven in number, sleeping in the kitchen.

The people are apathetic, and as public opinion to a large extent regulates the progress of a community, it is time the public were forcibly reminded of their duties as citizens. In the first place, practical education by providing the workers with proper houses is necessary.

Thereafter/

Thereafter the provisions of the Public Health Acts should be rigidly enforced. Were the people as a body eager and interested in the eradication of tuberculosis and venereal disease, it would greatly help in the solution of those urgent social problems.

Similarly in all such villages certain of the provisions of the Public Health Acts (1897 and 1907) should be displayed permanently in a prominent position.

Thus Section 50.

"If a person knowingly casts or causes or permits to be cast into any ashpit or otherwise exposes any matter or article infected by infectious disease, he shall be liable &c."

Any breach of such laws should be severely dealt with.

Other suggested remedies:-

(1) The compulsory notification of the M.O.H. by all householders in whose houses tuberculosis exists, of any contemplated permanent change of address, so that the M.O.H. could see to the disinfection of the house after it has been vacated.

(2) Systematic examination of all 'contacts.'

(3) Greater facilities for the diagnosis, in the local hospitals, by means of the X-rays of obscure pulmonary conditions especially 'hilus tuberculosis.'[68]

NOTES on the ETIOLOGY and DIAGNOSIS of TUBERCULOSIS.

ERYTHEMA NODOSUM occurred in two instances in the series of cases described above. The cases were both children, one being a case of early phthisis, while the other had enlarged broncho-pulmonary glands.

Erythema nodosum is now recognised as being really a manifestation of tuberculosis and not of rheumatism.[69] In this connection it is interesting to note that it is not uncommon to find early cases of tuberculous infection complaining of joint pains.

EPILEPSY and INSANITY. In 5 cases there was a family history of insanity or epilepsy. The relation between insanity and tuberculosis is well known. Tuberculosis is common in institutions for mental diseases. Shallow breathing is common in all forms of insanity. Shaw, who investigated the relationship between epilepsy and insanity, summarises his conclusions thus:-[70]

(1) That it is to the INDUSTRIAL DISTRICTS we owe our high epileptic ratio in the County Mental Hospital Stafford and that urbanization appears to affect principally the females in this direction in our neighbourhood.

(2) That a high epileptic ratio is constantly associated with a high tuberculosis incidence and vice-versa.

(3) That the number of positive and suspiciously positive reactions to tuberculin amongst epileptics here is 95%.

The above conclusions are interesting. Of the deaths which occurred from tuberculosis in the villages described (1906 - 1915) however only one was an epileptic. It is possible/

possible that both epilepsy and tuberculosis are largely due to the unnatural environment in which people in industrial and densely populated districts live.

RHEUMATIC PAINS. Quite a number of the cases investigated by me complained of pains in the joints and bones. These 'rheumatic' pains occurred chiefly in children and were probably due to the action of the tuberculo-toxins liberated from the tuberculous focus.

Poncet, indeed, goes so far as to say that tuberculosis is one of the chief causes of rheumatoid arthritis.[71] In several of my cases the definite pulmonary symptoms were preceded by an attack of tonsillitis.

EARLY DIAGNOSIS. It is said that the late Sir William Gairdner used to tell his students that the one essential to good treatment was a correct diagnosis. By this he meant, not merely the naming of the malady with which the patient was affected - but diagnosis - 'a knowing through' - a complete understanding of all the factors at work in the production of the clinical picture.

In tuberculosis, it can truthfully be also said that the most important point in treatment and a very important point in the eradication of the disease, is not only a diagnosis, but an early diagnosis.* So far as phthisis is concerned, it is folly to wait until tubercle bacilli are present in the sputum and until the 'consonating râle' reaches the ear on auscultation. By this time, if I may use a war simile, the disease has not only acquired territory but is solidly entrenched. Such cases too often die or become chronic, and are thus unfit for any active/

(N.B.)
* Public Health (Tuberculosis) Regulations (Scotland) 1914
Article VI

active work in life.

To the general practitioner is given the difficulty and the honour of the diagnosis of disease in its earliest stages and when the clinical picture is incomplete. While therefore, it is possible that mistakes may be made (and have been made), and patients diagnosed as early phthisis who had no phthisis, the practitioner will stumble least at the present time who suspects tuberculosis on every hand. Not only so but there are very few, if any, diseases, in which rest and fresh air will not produce some improvement, so that even if the diagnosis has been somewhat premature, the patient will not suffer thereby.

PHTHISIS. Too much importance cannot be placed on the early subjective signs. Mackenzie's well-timed words as regards the diagnosis of cardiac disease are very applicable to phthisis.[72] The patient often complains merely of feeling run-down. Cough may be absent or little, and only by careful observation combined with systematic examination will the diagnosis be evident.

Lees and Riviere both emphasise the importance of light percussion. Kronig, Minor and Aufrecht also agree in regarding light percussion as being able to give earlier evidence of lung involvement than auscultation.

To percuss the front of the chest, Lees maintains that the patient should lie on his back on a comfortable couch. I append diagrams of the positions of the earliest dull areas according to Riviere[73] and Lees.[74]

Dull areas in Phthisis, according to Rivière.

B. M. J. 12. Sept. 14

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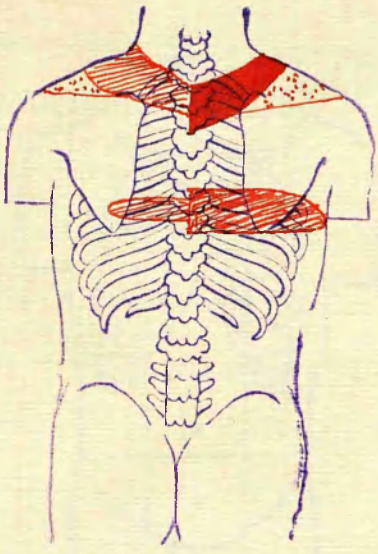
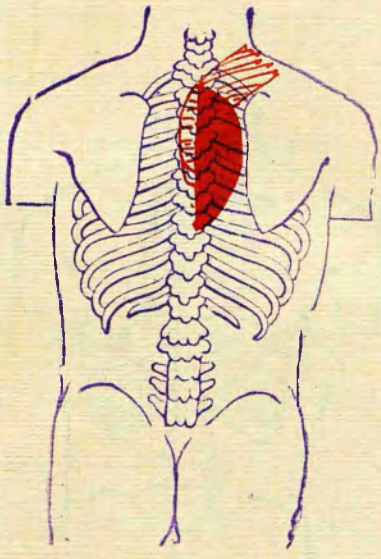


Dull areas in broncho-pulmonary (glandular) tuberculosis



Rivière.

B. M. J. 12 Sept. 14.

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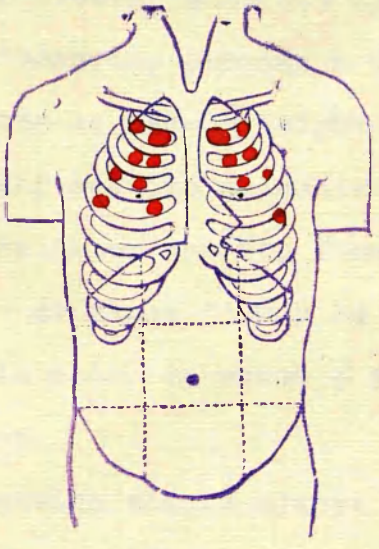
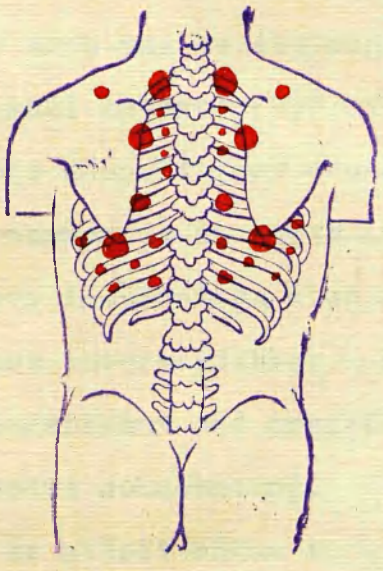
Dull areas in Early Phthisis Pulmonalis

after Lees



Anterior



Posterior

Vide Incipient Pulmonary Tuberculosis by

D. B. Lees. p 25 Lewis 1913.

The examiner however must not expect to obtain over these areas of commencing disease a typically dull note. Very often the note is merely heightened and not so clear as normally and may require an acute ear for its detection. Only by light percussion can the finer shades of dulness be appreciated. At times it may be necessary to percuss somewhat firmly in order to reach a focus deeply situated in the lung tissue.

Special attention should always be paid to a spot mid-way on a line drawn from the space between the seventh cervical and first dorsal spinous processes to the tubercle found on the spine of the scapula about the junction of its inner and middle thirds, the 'alarm area' of St. Chauvet. Particular attention should also be given to the percussion of Kronig's areas. The extent of the resonance should be the same on both sides. The breadth of the isthmus should be not less than four cm. In tuberculous disease of the apex the outline becomes blurred. In rare cases in health the whole area may be dislocated outwards on one side - the "physiological heterotopia" of Kronig.[75]

Regarding the auscultatory phenomena, weakening of the respiratory murmur is an early and important sign. Cog-wheel and wavy inspiration also occur. In some cases the R.M. is almost imperceptible. Regarding râles, the earliest are subcrepitant and crackling. As consolidation proceeds they become consonating. Potassium iodide is sometimes given to elicit râles in a suspicious area.

During auscultation, it is a good plan to compare the inspiratory part of the R.M. on both sides and thereafter the expiratory phenomena.

ANAEMIA. In many cases of early phthisis there is a definite anaemia and in one case in the foregoing series the skin was actually sallow. Especially in young females is an anaemic condition to be found. Some authorities state that early phthisis is almost as common a cause of anaemia in young women as chlorosis.

In other cases - GASTRIC symptoms are the earliest signs of toxaemia. The following case is interesting:-

A young man, aged 26 years, joined a well known Highland regiment in March, 1916. He was present at the Somme front during the beginning of the Somme offensive. Before he went to France he had five medical examinations and in France other two. He was passed as perfectly fit for active service.

He was present in eight charges altogether. On the occasion of his eighth and last charge, he collapsed on reaching the second enemy trench and was picked up unconscious. (He had been suffering a few days previously with sickness, vomiting and some diarrhoea). When he was picked up, his kilt had been perforated in several places with shrapnel but he himself was untouched. He was invalided to England. After being in bed a few weeks he was allowed up but took a relapse, his temperature being raised every evening. About this time he communicated with me and stated that his chart had written on it, "Examination of sputum, T.B. present, 2 per field." Finally he was discharged. When I examined him, the signs of phthisis were distinct. His family history is good and he is now apparently perfectly well.

The gastric disturbance may be of such a nature as to suggest gastric of duodenal ulcer. A patient under my care suffered from recurring attacks of slight haemoptysis associated with purulent sputum. I examined his sputum on three different occasions and at each examination found an almost pure culture of diplococci but no T.B.

His family history was as follows:-

(1) He has a cousin at present in Sanatorium (Feb. 1917)

(2) He had a brother died from phthisis.

(3) His last child died at the age of 6 weeks with complete consolidation of the left base associated with oedematous swellings on the hands and feet.

(4) His wife recently had an attack of slight haempptysis associated with pleurisy.

This patient consulted Dr. McAllister of Kilmarnock. He was admitted into Kilmarbock Infirmary and had a laparotomy performed. No ulceration or pathologic condition of the stomach was found except "an infiltration of the mucosa such as I have seen in the bronchial mucous membrane in certain cases of phthisis." His pulmonary signs were indefinite but he has probably a small cavity deelpy situated, communicating with a bronchus. He is at present in Sanatorium. Now in this case the gastric signs were such as to warrant, in the opinion of the operating surgeon, the performance of a laparotomy. Beyond the slight haemoptysis his pulmonary signs were indefinite.

In certain acute cases - the onset may simulate Enteric TYPHOID FEVER, but the absence of Widal's reaction, and of rose spots, and the irregular nature of the pyrexia should serve/

DISEASE *Lobar pneumonia (Double) - pleurisy no effusion*

NAME *William Davidson*

ADDRESS *Stonefield Rd. Blantyre*

AGE *26*

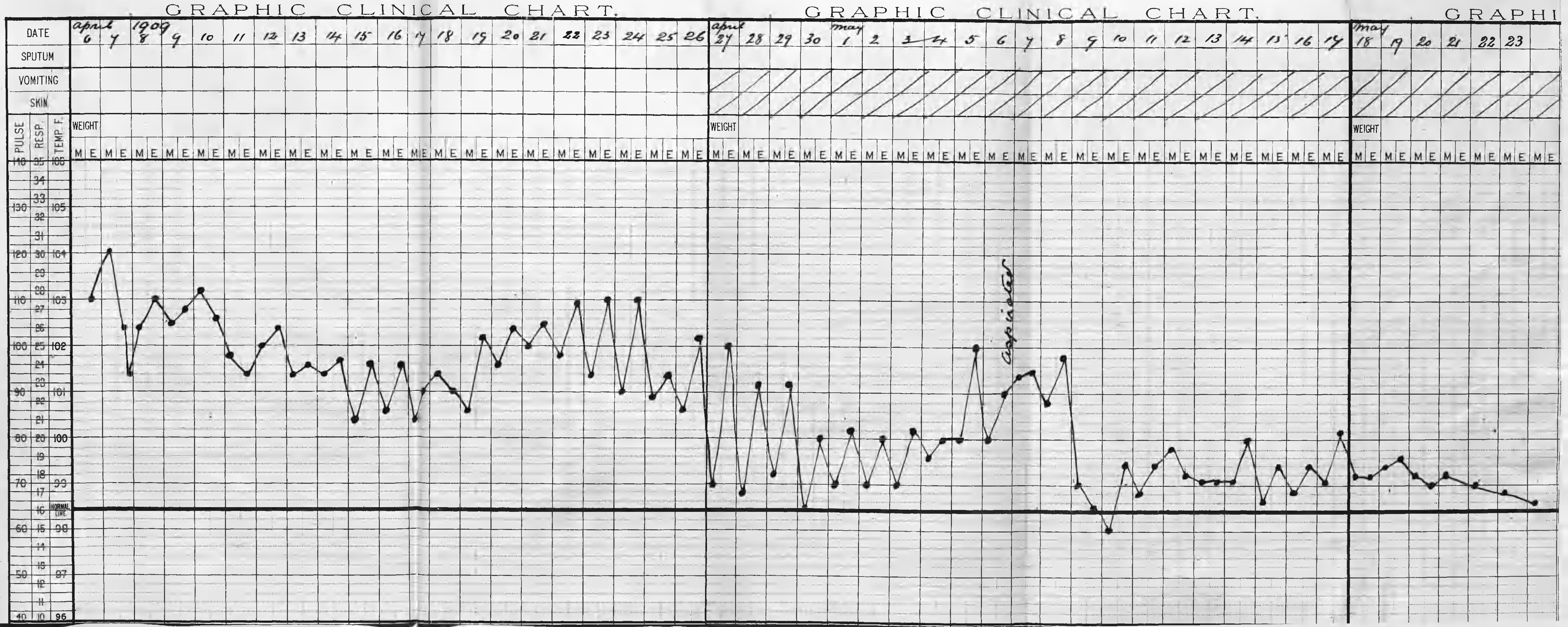
OCCUPATION *Policeman*

NOTES OF CASE

Widal's Reaction Negative.

URINE REACTION —

CONTAINS —



serve to help in the diagnosis.

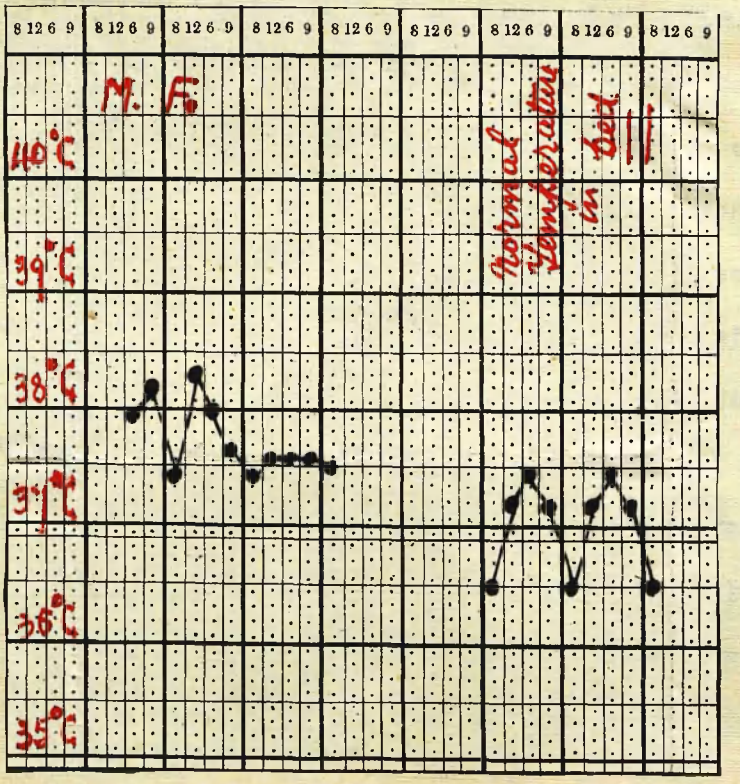
Association with PNEUMONIA. In this connection it is wise to remember that broncho pneumonia in children (especially if it follows measles or whooping-cough) may be attended by decided wasting, and this condition may be prolonged, recovery being very tedious and slow. One is apt in such a case to suspect tuberculosis, and I remember once making the mistake of giving a hopeless prognosis in such a case where recovery ultimately took place.

Regarding lobar pneumonia, the chief difficulty is to be found in cases with delayed resolution and where pyrexia is prolonged. I append the chart of such a case. In this particular case Widal's reaction, and aspiration of the chest were both negative. Apparently complete recovery ultimately took place and the patient regained his health. His pulse however after his illness kept persistently from 90 to 100 per minute. Vide 'The Principles & Practice of Medicine' Osler 6th Edition p 186.

Again in certain cases of unresolved pneumonia and pleuro-pneumonia, extensive fibrosis of the lung may occur. The fibrosis often starts from the pleura and we get the condition known as "pleurogenic cirhosis" of the lung. In such cases, the sputum may be absent or very small in amount. Diagnosis is often exceedingly difficult.

TEMPERATURE. It is usually stated that the temperature in early cases is only raised in the evening. I wish, however, to draw attention to the following:-

(1) In every case of suspected tuberculosis especially where physical signs are indefinite the patient should be put to bed.


8 12 6 9
M. F.
40°C
39°C
38°C
37°C
36°C
35°C
Normal Körpertemperatur im Bett

(2) Thereafter the patient's temperature should be taken per rectum every morning.

(3) Very commonly the temperature at this time, instead of being about 36.5°C. is found to be raised to 37° or 37.5°C.

(4) This slight morning pyrexia is often found in patients who have been able to go about, but who have been gradually going down in weight and general health. In such cases the tissues are approaching the condition of being saturated with toxin, the patient being able as it were to hold his own against the onslaught of the disease and no more.[76]

(5) While this slight morning pyrexia may not be diagnostic of early tubercle it certainly calls the attention of the physician to the existence of a toxin producing focus present somewhere in the tissues.

(6) In such cases, there are often no night sweats but the patients often feel tired and listless during the morning and afternoon.

The chart appended is that of Case, M.F. (see page 65)

This child appeared perfectly able to run about, and was anxious to do so. This slight temperature was associated with progressive loss of weight. Case R.H. was of a similar character. (see page 83)

PLEURISY. Too much importance cannot be placed on the occurrence especially in children of slight attacks of pleurisy. Too often I fear such conditions are diagnosed as muscular rheumatism, intercostal neuralgia &c. Diaphragmatic pleurisy is common and has to be carefully diagnosed, as the pain is often abdominal and may be referred to the appendicular region. I have seen a case of empyema, which was accompanied by rigidity of the abdominal wall over McBurney's point so marked/

marked as to simulate appendicitis. In this particular case the signs of appendicitis were so marked that I endeavoured to obtain a post-mortem after the child's death. Permission unfortunately was not given.
Such slight pleurisy may indicate the existence of a sub-pleural focus or of a focus in the hilus of the lung (due to the peculiar arrangement of the pulmonary lymphatics).

Chill at times is the determining cause of these slight attacks of pleurisy. In adults, injury may precede the onset of the pleurisy. One should never forget however the possibility of malignant disease of the lung being present which in its early stages is often diagnosed as phthisis.

BRONCHO-PULMONARY TUBERCULOSIS. Enlargement of the broncho-pulmonary glands is very common in school children. The histories of such cases are nearly always similar. A child previously healthy begins to lose flesh and grow pale. He does not play about as he used to but prefers to sit in the house crouched over the fire. He is subject to repeated colds and often has a paroxysmal cough. This cough may be worse at night. In the morning he wakens feeling tired and if sent to school, often goes without his breakfast. Later in the day he returns home thoroughly exhausted. Such children are often stated to be merely 'run down' or to be suffering from debility due to the strain of school life &c.

The following points however should be noted:-

(1) They are often of the phthinoid type, i.e. smooth skins, long eyelashes, pink and white complexion, chest often flattened, dystrophy of the thoracic muscles.

(2) Small venules are distinctly seen over the upper thoracic spines.

(3) The veins of the chest wall in front are often distinct, especially on the right side beneath the clavicle. Here one often finds one or two very distinct superficial veins.

(4) Temperature may be raised in the evening and often the temperature taken per rectum in the morning before rising is found to be elevated (37°C. - 37.5°C.)

(5) Physical signs are chiefly confined to the right apex, where some slight dulness can be detected on light percussion. The normal oval area of interspinous dulness is increased in size. Percussion of the thoracic spines is recommended by Dacosta.※ In some cases this dulness may extend as far down as the 7th thoracic spine.

(6) Auscultation. The R.M. over the right apex is harsher than normal with expiration prolonged, being merely an exaggeration of the normal condition often found at the right apex in children. Crepitations may also be heard at the right apex. Especially common are these crepitations in children who have enlarged tonsils and adenoids.

They are possibly due to oedema occurring within the alveoli associated with partial collapse of lung tissue.

Often at the base (right) the R.M. is weakened. Riviere calls attention to the fact that the R.M. is weakened not only in that part of the lung supplied by a bronchus which is compressed but also if there is pressure on the particular branch of the pulmonary artery supplying the affected area. In the diagnosis of broncho-pulmonary enlargement and also in certain cases of pulmonary phthisis where the disease has commenced in a deep seated focus, the Xrays are particularly useful.

In Ayrshire unfortunately the general practitioner has/

※ The Medical Annual 1915 p. 185

has not up to the present time been able to receive this aid in diagnosis.

Smith's murmur may be heard anteriorly. The murmur is heard in conditions other than broncho-pulmonary glandular enlargement. In a case under examination recently in which the broncho-pulmonary glands were evidently enlarged, I could not detect the murmur.

TUBERCULOUS PERITONITIS. Gee, in his admirable monograph,- gives as pathognomonic signs of tuberculous peritonitis the following:-[77]

(1) Induration. (2) Suppuration.

(3) Tympanites. (4) Ascites.

He also states however that in certain cases the diagnosis is impossible. In this connection I should like to draw attention to the case of D.F. p.74.

This lad died after an appendicectomy. His peritoneum at the time of the operation was found to be covered with tubercles. His parents maintained that up to the time of his appendicitis he had never complained and appeared to be in perfectly good health.

It has been suggested by Maylard[78] that such cases, i.e. where the onset is so insidious and the subjective symptoms so slight as to cause no alarm to the child or the parents, are possibly examples of primary tuberculosis of the peritoneum.

He mentions somewhat similar cases reported by Wallace, Kennedy and Owen.

It is profitable to keep in mind the rich lymphatic anastomoses between the peritoneal and pleural lymphatics through/

through the diaphragm.

TUBERCULOUS MENINGITIS. Still lays stress on the occurrence of vomiting with persistent constipation early in this fatal affection. In one case which came under my notice - the first sign of anything being wrong with the child was a transitory squint..

In many cases of tuberculous meningitis the primary focus is difficult to find. Careful examination of the broncho-pulmonary glands should always be made.

FINALLY, THE ERADICATION OF TUBERCULOSIS WILL ONLY BECOME POSSIBLE WHEN HUMAN LIFE IS ALLOWED TO DEVELOP IN A HEALTHY ENVIRONMENT. SUCH AN ENVIRONMENT MUST OF NECESSITY INCLUDE 'GOOD FOOD, GOOD CLOTHING, GOOD HOUSING AND GOOD HABITS.'[79]

A P P E N D I X I.

EXTRACT from EVIDENCE submitted to the ROYAL COMMISSION on HOUSING (Scotland) by Thomas McKerrell and James Brown, Agents of the Ayrshire Miners' Union.

DRONGAN. *

This village is situated on the main road to Littlemill, and the houses are built in rows on both sides of the road.

On the left hand side going towards Littlemill there is a block of five houses and one of ten built of stone and slated. These houses are all two apartment ones, but one of the apartments is so small that both apartments together are not much larger than an ordinary single apartment house. The roadway in front of the houses is unpaved, and in a very muddy condition.

There is one earth closet for the 15 families and one ashpit. The population for which this lavatory accommodation provides is 63. The closet has no door, and from the construction it appears that no door was intended to be placed there. There are three compartments in the closet, but they are all open. Owing to human excretion being littered about the floor of the closet and for some yards around it there was a considerable stench. From conversation we elicited the information that grown up people seldom or never use the closet, and owing to want of privacy it is impossible for the women to use it. This leaves the grown up people without any closet accommodation at all.

No outhouses of any kind have been provided, and the people store their coals below their beds. We observed one woman doing her washing in the open air while the rain was coming down so heavily that it was with the utmost difficulty that we could take our notes.

We discovered one house with a husband, wife, three of a family, and three lodgers. The rent of these houses is 2/1 per week.

On the opposite side of the street there is a row consisting of 5 one apartment houses, and one house of two apartments, built of stone. The roadways in front of the houses are unpaved and very muddy.

There is one earth closet and ashpit for this row. The closet has no door, and three open apartments, which provide for a population of 33. The ashpit was in an abominable condition. It is, as is the case with regard to all the other ashpits in Drongan, entirely uncovered, and in this instance fermenting matter was responsible for a very strong stench.

* Situated in the Parish of Ochiltree. I can testify to the accuracy of this report.
L.L.B.

No outhouses are provided, and coals are kept below the beds.

In a single apartment house (12 feet by 12 feet aprox.) we discovered 9 inmates.

The rent for the single apartment houses is 1/5 per week, and in the case of the house described as a two apartment house (the family here has rented two single apartments), the rent is exactly double, viz., 2/10 per week.

Row No 3. This is situated further down on the left hand side of the street. There are 12 single apartment houses. The conditions are similar to those described in the other rows, viz., roadways unpaved, no wash-houses, etc. There is one closet for 12 families with a population of 46. The closet and ashpit are in the same condition as the others previously described, but in this case the ashpit is so far away from the houses that heaps of refuse have been thrown all over the yard immediately behind the houses, and it would appear to be a playground for the children as for many yards the kitchen ashes and fermenting potato and other vegetable refuse has been strewn about.

The rent of these 12 houses is 1/5 per week, each.

Row No 4. This row is situated on the opposite side of the street, to Row No. 3. It consists of 4 blocks of houses with 8 houses in each block, 32 houses in all.

Conditions are practically the same as in the other rows, viz., unpaved roadways very muddy, closet built purposely without doors, and open compartments. In this row the people are provided with coalhouses, which are within three yards of the doors, and one of the tenants informed us that when these coalhouses become empty they are often used as the dumping ground for refuse of all kinds, and that in the Summer time the stench at the very doors is abominable. (The people in disposing of their refuse have to travel to the end of the block, and carry their refuse to the ashpit behind, a considerable distance from some of the houses.) These houses are all two apartment ones. This row appears to have suffered from a considerable subsidence. The windows and doorways appear to be badly twisted, and in some of the blocks several courses of bricks have been added to the stone walls to bring them up to the level of the roofs. The floors of the houses consist of large brick tiles, and the subsidence appears to have had the effect of breaking, cracking, and twisting the tiles. In one of the houses we inspected there was not a whole tile in the kitchen floor, and the surface was very uneven. In this house there was a hole in the floor several inches deep, and so large that one of the party put his boot right into it. Many of the houses are in such a bad state of repair that one woman showed us the bottom of her door where the holes were so large "that cats came into the house during the night." The holes were easily large enough to admit of that possibility. Many of the tenants complained of the condition of the doors, and told us that in the Winter time the cold wind rushing through the house was almost unbearable. The houses are very damp.

The population of this row was 208, and the lavatory accommodation for this population was 4 doorless earth closets. We discovered one house with 13 inmates. The rent is 2/1 per week.

In the mining rows of the village of Drongan there are 48 two apartment houses, 17 one apartment houses, with a population of 350, for which 7 doorless earth closets, with open compartments, are provided.

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3. Ibid. Page 1.

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10. Diseases of the Lungs. Powell & Hartley. Fifth Edition. Page 365.

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14. Royal Commission on Housing. Precis of Evidence by Hugh R. Wallace on Housing of Ayrshire Miners. Page 13.

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16. Evidence by McKerrell & Brown, Ayrshire Miners' Union to the Royal Commission on Housing (Scotland) Page 44.

17. County of Ayr, Minutes of Meetings of Housing Committee. Page 38.

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26. Vide Ref. No. 6.

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30. H. Sutherland. Pulmonary Tuberculosis in General Practice. Page 6.

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32. On certain Media for the Cultivation of the Bacillus of Tubercle. See Ransome's Campaign against Consumption. Cambridge University Press. 1915. Page 159.

33. Prevention of Tuberculosis. Newsholme. Chapter 12.

34. Transactions of the British Congress on Tuberculosis. 1901. Volume II. Report of the State Section. Page 88.

35. The Primary Lung Focus of Tuberculosis in Children by Anthon Ghon. Page 144.
Compare this quotation with the paragraph in italics on page 124 of Ghon's book. In this latter paragraph there is evidently a translator's error The whole purpose of the book is to demonstrate the primary nature of the lung focus.

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38. Quoted by Newsholme in The Prevention of Tuberculosis Page 113.

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41. See reference 38.

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48. Ibid page 485.

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51(a) Tubercular Disease and Germ. Reprint from the 'Scotsman.' May 30th and June 6th 1916.

(b) See also Pleurisy. Pages 41 - 47. Alexander James, M.D. Oliver & Boyd. 1911.

52. The Influence of Strong Prevalent Rain-bearing Winds on the Prevalence of Phthisis. Page 82. William Gordon, M.D. Lewis. 1910.

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54. Vide Article on Neurasthenia, Greens Encyclopedia of Medicine and Surgery. Vol. 7.

55. Quoted by Chalmers in The House as a Contributory Factor in the Death Rate.

56. See 'Tubercular Disease and Germ' by Alex. James. Compare also with the views of Rokitansky. I have seen several cases in entire contradiction to Rokitansky's statement, and also to the cases noted by Ransome. Vide The Medical Chronicle. April 1905.

57. The House as a Contributory Factor in the Death Rate by A. K. Chalmers, M.D., M.O.H. Glasgow.

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59(a) The Influence of Housing on Health by A. Maxwell Williamson, M.O.H., Edinburgh. Paper read before the British Labour Housing Association at Glasgow, 3rd Jan., 1917.

(b) 'Some Evidence respecting Tubercular Infective Areas'. A. Ransome in the Transactions of the Epidemiological Society of London. Vol. VI. 1888.

(c) The following extract is interesting. It is taken from a paper 'The House Famine' by Ex-Bailie McKerrell, J.P., Kilmarnock and printed by the "Standard" printing works, Kilmarnock.

"For the year 1915 the infantile mortality rate was as follows:- Out of every 1000 children born in England and Wales in 1915, 114 died before they were one year old. Out of every 1000 born in Scotland, 126 died in the first year of their life. That is the loss in human life in such houses as the working-people live in. Let us see what is the loss in life in localities where the people are properly housed. Messrs Cadbury have built a large village named Bournville, near Birmingham, where self-contained cottages of 4, 5, 6, and 7 rooms, with bath room, standing in their own grounds, with gardens at the front and gardens at the back, and not more than from 7 to 10 to the acre. The people living in those houses are mainly of the artisan and labouring class, such as we have in all parts of the country, and what is the death-rate among children - 37 per 1000! Think of that! The children of Scotland die off at the rate of 126 per 1000 in the first year of their birth, and only 37 per 1000 die at Bournville, where the same class of people are properly housed. That is to say, that more than 3 times more children die in the first year of their birth in Scotland than is the case at Bournville.

That is not the only instance of the effect of good housing. Messrs Lever Brothers have erected a village after the style of Bournville named Port Sunlight, and the infantile mortality there is 40 per 1000, as compared with 126 per 1000 for Scotland. If similar housing conditions were provided for all the people as have been provided for the people of Bournville and Port Sunlight the lives of approximately 100,000 children would be saved in Great Britain every year."

(d) Also the following by the same writer taken from a leader in the "Ayrshire Post". April 6, 1917.

> A further communication from the pen of Ex-Bailie McKerrell adds proof to the already grimly demonstrated fact that one and two-room houses - and notably the former - and a heavy death-rate go together in Ayrshire, as elsewhere. Largs has 2 per cent houses of one and two-apartments, Galston has nearly 47 per cent of them: for 1914 the death-rate for the one was 39 per 1000, for the other 102, and over a long term of years the relative percentages were 63.96. ..... The death-rate in the county area of Ayrshire for all ages was in 1914, 13.9, and 1781 people died in that year. If the Bournville rate of 5.5 applied to Ayrshire, only 704 people in Ayrshire would have died, and the lives of 1077 would have been saved. Giving an equal proportion to the rest of the county, and we have the astounding fact that bad housing conditions in Ayrshire kill 2160 people every year.

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65. Alcohol, Housing Conditions and Consumption, by Harold Vallow, M.D. B.M.J. 28:2:14. Page 477.

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70. The Relation between Epilepsy and Tuberculosis by B. Henry Shaw, M.B. B.M.J. 16:5:14. Page 1063.

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