With Charts

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Account of an Outbreak

of

Typhoid Fever

due to Milk Contamination

I certify that the following ~~Essay~~ Thesis is entirely composed by myself

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The epidemic of Typhoid Fever of which the following Thesis gives an account occured in the Hartlepool Union Workhouse at the beginning of this year - The first case developed on the 31st of December 1897 and the last admission to the Hospital was on the 31st of January 1898. In all 31 persons were affected and of these 5 died - Of those who contracted the disease the great majority were children; Twenty-five of the patients being between the ages of six and thirteen years. The source of the infection was traced ~~to~~ a specific contamination of the milk supply to the Institution and after steps were taken to purify the milk and water the disease was checked -

The Hartlepool Union Workhouse is situated in the County of Durham about one mile to the north of the town of West Hartlepool - The grounds

extend to an area of 13 acres and the buildings consist of three blocks - The "House" - the Schools & the Hospital - seperated from each other by a distance of about 150 yards. At the end of December 1897 the number of inmates of the Workhouse was 585 - Of these 305 were resident in the "House", 85 in the Schools, and 195 were inmates of the Hospital block.

History of the Epidemic. On the 31st of December 1897 I was called in to the "House" to see a child E.A. aged 12 years - Her illness had commenced with an attack of Epistaxis and she complained of headache, vomiting and nausea with pain in the abdomen - On examining her I found her flushed and feverish - Her temperature was 101°, her tongue covered with a white fur with swollen red papillae showing through it - The abdomen was slightly sensitive to pressure all over

The pulse rate was 120 per minute.
I considered the attack to be due to some indiscretion of diet incidental to the Christmas season and ordered 4 grs of Calomel and a mixture of Sod. Bicarb and Bismuth Subnit. In the evening the child was no better the temperature had risen to 103°.2 and she complained bitterly of headache. She had one normal motion during the day. For the next day or two the child remained in much the same state. The temperature varied between 102° in the mornings and 103° or a little over in the evenings. The headache was severe and she suffered from great thirst. The pulse was rarely under 120 per minute. Salicylate of Soda was given on January 2nd. On that day the morning temperature was 103.4 and gr iv of Antifebrin was ordered which reduced the temperature to 101°.8 at 2 p.m and at 10 p.m it was only 99°. There was no rash to be

discovered but she complained of some pain in the right Iliac region and passed two loose motions of a yellow ochre colour - She was very restless and delirious at night. January 3rd. In the morning the temperature had again risen to 103°.2 - pulse 120. The evening temperature was 104° - pulse 128. She was very listless and drowsy and resented being disturbed - Her tongue was dry and brown in the centre with red edges - Thirst was intense - The bowels moved only once not very watery but yellow in colour - The case was suspected to be one of Enteric Fever and Salol gr V every 4 hours was ordered.

On the 4th of January three other inmates of the workhouse were taken ill with feverish symptoms. The first of these E.O. aged 27 years resided at the Schools. Her illness began with a severe rigor and she complained of pains in the head

and limbs with a feeling of general Malaise - Her temperature in the morning when first attended was 101°5 which in the evening had risen to 104°.

N. W. aged 11 years was also an inmate of the schools. Her illness like the first child's began with an attack of Epistaxis - She looked flushed and feverish and her tongue was thickly coated with a white fur. The temperature was found to be 102° and in the evening 103°4. There was no diarrhoea or any sign of a rash.

H. C. aged 8 years the third patient who took ill on this date had been admitted to the Hospital from the schools on the 29th of December suffering from an Erythematous rash distributed all over the body. She had no sore throat and the temperature was not elevated. The rash had all faded by the 2nd of January though her tongue was furred and

she had not much appetite. On the 4th of January however feverish symptoms developed. The temperature in the morning was 100°2 and she had slight headache and complained of some feeling of nausea. Evening temperature 102°6. She had no diarhoea or abdominal pain.

January 5th Two other children were admitted to the Hospital from the schools also suffering from indefinite feverish symptoms. W. R. aged 8 years temperature on admission 101° Evening 103°2 He had no rash or sore throat but was languid and complained of headache and thirst with loss of appetite.

E. S. aged 10 years temperature on admission 103°. Evening 103°2. She exhibited similar symptoms with a thickly furred tongue with swollen red papillae and pulse rate of 120 per minute.

January 6th No other were attached but all the other patients continued ill and feverish with temperatures ranging from 101° in the morning to

104° and 105° at night

January 7th D.S. aged 8 years a schoolgirl took ill commencing like the other children with a temperature of 102°4 at 6 p.m when first seen. at 10 p.m the temperature had risen to 103°.

The child who had first taken ill on the 31st of December had now several rose-coloured lenticular spots on her abdomen and had again passed two watery yellow motions while the second case had also two rose spots on the lower part of the chest and she too passed a loose "pea-soup" motion.

The disease was now diagnosed as undoubtedly one of Enteric Fever and steps were at once taken to prevent the Epidemic spreading among the other inmates of the Workhouse. All milk and Water used in the establishment were thoroughly boiled before use and daily examination of all inmates was carried out with immediate

isolation of any suffering from sickness or diarrhoea or in whom there was found any rise of temperature

The further admissions of cases to the Hospital, where all were carefully isolated, was as follows:

January 8th. Three children were attached all living in the schools

January 9th. Four fresh cases were admitted from the schools and a female imbecile 26 years of age - an inmate of the Hospital took the disease.

January 10th. One boy from the school was admitted.

January 11th. Three more school children took ill

January 12th. Two more cases - one a man aged 47 years from the "House" - the other a paralysed Epileptic an inmate of the Hospital

January 13th. An old man aged 78 years was admitted from the House with a temperature of 100°. Evening 102°.4

January 14th. Two fresh cases - a man

aged 60 years an inmate of the Hospital and a boy from the schools.
January 18th one school girl developed the desease.
January 19th one case from the Schools
January 20th Two cases both boys from the schools.
January 21st one girl from the schools
January 23rd one boy also an inmate of the schools.
No more cases developed for the next 3 or 4 days and it was believed that the Epidemic was stamped out Fifteen days having elapsed since the milk and water had been boiled before use however on the 31st January one other girl took ill at the schools this being the last case which developed.
The total number of cases was 31.
26 were children and 5 adults.
Of the 31 cases 25 were inmates of the Schools being 29·4 per cent of the children resident there.
4 were inmates of the Hospitals

being 2 per cent of the 195 inmates while only 2 cases were admitted from the House - of which there are 307 inmates being only a per centage of 0·65.

The cause of the Epidemic.

The suddeness of the outbreak and the marked incidence of attack on the young children and invalids and the freedom of the older and able-bodied inmates from the disease suggested the possibility of the outbreak having been caused by the contamination of some article of food and as Milk is largely used at the Schools and Hospital and but very slightly in the House attention was carefully given to the possibility of its having been the vehicle of infection Careful inquiry was at the same time made into the Sanitary condition of the Workhouse and

as to the purity of the Water Supply.

The Sanitary condition of the Workhouse is good and no defects likely to cause an outbreak of disease could be discovered - The drains were all trapped and disconnected from the various buildings -
The means of excrement disposal consists of pail closets which are emptied every day and are kept in a cleanly condition, while none of the inmates engaged in scavenging and cleansing of the closets were amongst those attacked during the Epidemic -

The Water Supply to the Workhouse is from two deep wells, the water being derived from the gravel underlying a stratum of dense clay -
The wells are entirely covered over and have the upper part of them constructed of brick and

concrete surrounded by puddled clay for the purpose of excluding surface water. The water from the wells is pumped to a small reservoir placed at a height so that the water will gravitate to supply the workhouse buildings.

Samples of the water from each of the wells and also a sample taken from the school building were submitted for analysis to Professor Attfield and W. Frankland (water analysist to the Local Government Board) Both of these specialists reported that the water possessed a high degree of organic purity and were of excellent quality for dietetic use and gave no evidence of surface soakage or of sewage contamination and when examined Bacteriologically the presence of the Typhoid Bacillus was not detected

The following table gives the result of the Analysis expressed in parts per 100,000.

Results of Water Analysis expressed in parts per 100,000

Description	Total Solid Matters	Organic Carbon	Organic Nitrogen	Ammonia	Nitrogen as Nitrates and Nitrites	Total Combined Nitrogen	Chlorine	Hardness		
								Temporary	Permanent	Total
No. 1 Well	48.08	.047	.007	.018	0	.022	6.2	19.4	14.9	34.3
No. 2. Well	47.64	.038	.010	.011	0	.019	6.4	20.9	13.4	34.3
School Block	46.52	.052	.005	.002	0	.007	6.2	21.4	13.4	34.8

From the evidence of the Analysis it appears impossible that the water in use at the workhouse could have been the source of infection besides had such been the case it is certain that the outbreak would have been much more generally distributed throughout the Workhouse and would not have been practically confined to the Schools and Hospital

The Milk supply of the workhouse is all obtained from one Farm the daily supply averaging over sixty gallons.

On visiting the dairy and inquiring carefully into its sanitary circumstances the following facts were elicited. There had been no recent illness among any of the 24 cows on the Farm and they all appeared to be quite healthy and were well housed and attended to. The cows were milked in the Byre

and the milk was afterwards sold in an adjoining room which has no connection with the dwelling-house. A serious sanitary defect was present in the siling room in the form of an untrapped opening into a drain connected with the drains of the Farm house. An objectionable smell was noticed from this opening and any milk kept near it might easily be contaminated by the foul emanations.

The water supply of the Farm was also very seriously defective. The only supply laid on to this and an adjoining Farm was from Hurworth Burn reservoir which supplies water to the Hartlepool district for manufacturing and similar purposes but is not supposed to be used for drinking. The water was without doubt quite unfit for drinking or dairy purposes for it is collected from streams formed

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by the surface drainage of land some of which is manured and into one of these streams much of the unpurified sewage from Trimdon Grange and Trimdon colliery villages, passes in time of heavy rain. The bed of this stream near Trimdon Colliery when inspected recently contained much solid sewage. It also was ascertained that Typhoid Fever had been exceptionally prevalent at this time in these villages so that it is evident that a water supply obtained from a stream polluted by such infected sewage was most dangerous for use at a Farm.

This water was used at the Farm for supplying the cows with drinking water and also for washing out and cleansing the milk cans and for other dairy purposes. The milk cans were not washed out at the workhouse after the delivery of the milk there but were taken back to

the Farm and there cleansed.
Another most important fact was
also elicited at the Farm, namely,
that the Housekeeper, who often
milked the cows and did other dairy
work, had been seized with illness
on the 6th of December last and
ultimately died on the beginning of
January, death being certified as
having been due to Pneumonia.
The duration of the illness - one month -
was long for an uncomplicated
attack of Pneumonia and it seems
probable that the patient was
also suffering from Typhoid Fever
especially when we consider the
quality of the water supply to
the Farm - It is to be noted
also that after her death the
bedding and clothes of the Housekeeper
were burnt and other precautions
taken at the Farm as if the patient
had died of a disease of an
infectious nature.
The milk was analysed and the

sample was found to be of very rich quality and showed no evidence of adulteration. A Bacteriological examination was also made which failed to detect in the sample any appearance of the presence of the Typhoid Bacillus

The evidence appears conclusive that the milk must have been the vehicle of infection in this outbreak and this opinion is strengthened by the fact that the cases of Typhoid were almost exclusively confined to those inmates of the workhouse who were placed upon a milk diet. In the "House" there were only 14 inmates upon a milk diet out of a total of 305 and there were 2 cases In the Hospital there were 45 on a milk diet out of 195 and there were 4 cases while in the Schools where all the 85 children were on a milk diet there were 25 cases. Moreover of the 2 cases which occured in the "House" one was in the habit of

drinking much milk.

Age and Sex of those affected.

The age of the patient has as a rule been noticed to have an important bearing on the persons liability to contract this disease. It occurs with by far the greatest frequency between the ages of 10 and 25 years. Of 9,223 patients admitted into the Metropolitan Asylums Board Hospitals suffering from Typhoid Fever during the years 1871–1894. 5,582 were between 10 and 25 years of age.
The following table shows the age and sex of the present cases.

Ages	Males	Females	Total
under 5	0	0	0
5 – 10	5	8	13
10 – 15	7	5	12
15 – 30	1	2	3
30 – 70	2	0	2
over 70	1	0	1
Totals	16	15	31

It will be seen from this table that the numbers are equally divided between the two sexes and this want of marked predominance of one sex over the other in Typhoid cases appears to be the general rule though males are slightly more liable to the disease than females. Of eighty cases of S. Rengrose (Lancet Dec 4. 1897) 52·5% were males

Incubation period.

The duration of the incubation period of Typhoid appears to vary considerably and is always difficult to determine* owing to the fact that one can rarely fix the exact date at which the patient receives the poison into the system. It is probably about a fortnight. The incubation period was ascertained in 230 of the cases occuring in the outbreak at Andelfingen in 1839 though doubt has been expressed as to whether this was really a Typhoid Epidemic. Of the 230 cases. 43 were taken ill during the first five days, 123 during the second

five days, 48 during the third five days, and 16 during the fourth five days, 6 being attached on the nineteenth day. All these patients were exposed to the infection at the same time.
The milk was first boiled at Hartlepool Workhouse on the 8th of January and a case developed symptoms of Typhoid on the 31st of January so that it appears that the incubation period may be as prolonged as 24 days.

Clinical account of the cases

On the following pages I have arranged the cases in tabular form showing the age of the patient, the duration of the illness, with the presence or absence of some of the principal symptoms with the result of each case. I propose then to describe the general symptoms met with in the course of this Epidemic and then the special symptoms under the various Systems of the body.

Number	Name	Sex	Age	Duration of Illness	Highest Temperature	State of Bowels	Rash	Enlargement of Spleen	Relapse	Result
1	E.A.	Female	12 years	13 days	105°2	slight diarrhoea	a few spots	slight	no	Died
2	H.C.	Female	8 years	13 days	102°8	Constipation	a few spots	Slight	no	Recovered
3	E.U.	Female	27 years	10 days	105°	slight diarrhoea	4 or 5 spots	none	no	Recovered
4	N.W.	Female	11 years	10 days	104°2	constipation	numerous spots	none	no	Recovered
5	E.S.	Female	10 years	17 days	105°2	Constipation	numerous spots	greatly enlarged	no	Recovered
6	W.R	Male	8 years	11 days	105°	slight diarrhoea	numerous spots	none	no	Recovered
7	D.S.	Female	8 years	10 days	102°8	Constipation	none	none	no	Recovered
8	W.B	Male	7 years	31 days	104°8	slight diarrhoea	numerous spots	greatly enlarged	no	Recovered
9	J.B.	Male	12 years	14 days	105°	constipation	numerous spots	none	no	Recovered
10	H.S.	Female	8 years	21 days	104°6	Constipation	numerous spots	slight	no	Recovered
11	T.S.	Female	12 years	23 days	104°4	Constipation	numerous spots	none	no	Recovered
12	A.W.	Female	8 years	10 days	105°6	constipation	few spots	none	no	Recovered
13	E.W.	Female	26 years	8 days	106°	diarrhoea	few spots	none	no	Died
14	G.H.	Male	12 years	19 days	104°2	Constipation	numerous spots	none	no	Recovered
15	A.M.	Male	13 years	12 days	105°	Constipation	numerous spots	none	no	Recovered
16	H.C	Male	10 years	15 days	104°	Constipation	numerous spots	none	no	Recovered
17	E.H	Female	7 years	17 days	105°	Constipation	few spots	none	no	Recovered
18	L.S.	Male	10 years	5 days	101°2	Constipation	few spots	none	One relapse	Recovered
19	J.S.	Male	8 years	13 days	104°8	Constipation	few spots	none	no	Recovered
20	J.R.	Male	47 years	18 days	106°	diarrhoea	numerous spots	slight	no	Died
21	C.D	Male	20 years	4 days	105°6	slight diarrhoea	2 doubtful spots	none	no	Died
22	J.S.	Male	78 years	15 days	104°4	diarrhoea	none	Slight	no	Died
23	C.R.	Male	60 years	10 days	105°4	Constipation	few spots	slight	no	Recovered
24	J.S.	Male	9 years	22 days	104°8	Constipation	numerous spots	great enlargement	no	Recovered

Number	Name	Sex	Age	Duration of illness	Highest Temperature	State of Bowels	Rash	Enlargement of Spleen	Relapse	Result
25	S.D	Female	10 years	11 days	104°8	Constipation	few spots	none	no	Recovered
26	N.D	Female	9 years	23 days	104°4	Constipation	numerous spots	greatly enlarged	one relapse	Recovered
27	J.P.	Male	6 years	13 days	105°	Diarrhoea	numerous spots	none	no	Recovered
28	J.S.	Male	10 years	14 days	104°	Constipation	few spots	none	no	Recovered
29	B.S.	Female	8 years	10 days	103°4	Diarrhoea	few spots	none	no	Recovered
30	W.C	Male	10 years	21 days	104°4	Constipation	numerous spots	slight	no	Recovered
31	E.P.	Female	8 years	11 days	103°2	Constipation	numerous spots	none	no	Recovered

General Symptoms.

The onset of the disease in almost all the cases was characterised by similar symptoms unlike the beginning of most cases of Typhoid Fever, where there is a slow and insidious commencement, in these cases the onset was comparatively sudden. The children were well one day and the next there was a rise of Temperature with flushed cheeks, Headache, and loss of appetite accompanied in some cases with vomiting or diarrhoea and in another with a preliminary rigor. Epistaxis occured in a few cases but not to an alarming extent. The pulse

was accelerated and in a few of the patients there was some nocturnal delirium. The condition of the tongue in almost every case was different from the usual Typhoid condition being covered with a thick white fur through which the swollen ends of the papillae projected as red spots presenting a "strawberry" like appearance. This condition of the tongue will be referred to more fully later on.
The state of the bowels varied greatly in most of the cases there was constipation.
The patients continued in this state without much change for the first four or five days of the disorder. The temperature continued high particularly in the evenings and often showed marked morning remissions greater than those generally associated with a Typhoid Chart. A small minority of the case complained of abdominal pain with slight distension. On the sixth or seventh day the rash appeared in

the form of the characteristic "rose" spots, disappearing on pressure and distributed chiefly on the abdomen and lower part of the chest. After lasting for 3 or 4 days the first crop gradually faded to be replaced in most cases by other crops though in a few of the patients only one set of spots developed.

The other symptoms at this time were rather more severe. The patients were dull and apathetic and many suffered severely from Headache. The temperature remained high and the pulse besides being quickened became in many instances soft and easily compressible. The tongue in several became dry and brown in the centre, while the lips were dry and fissured. The pupils were dilated and the delirium where it occured was increased in intensity. In a few cases the spleen was enlarged at the beginning of the second week. By the tenth or

eleventh day the acute symptoms began to abate in a majority of the patients though in others they were more prolonged and it was during the third or fourth week of the disease that the temperature began to return to normal.
Recovery was in all the cases very slow and gradual after the temperature had fallen. The children were weak and emaciated and there was extreme muscular prostration which delayed convalescence. In of the cases relapses occured while some minor complications and sequelae were present in other cases.
I quote the history of one or two of the cases to illustrate the conditions found in this epidemic.

Case No 1. – Death on the Thirteenth day

E. A. a girl aged 12 years. She was first seized with Illness on December 31st. commencing with Epistaxis of moderate severity and she complained of Headache, Nausea, and pain in

the abdomen - Her face was flushed, the tongue showed a general covering of moist white fur studded with red swollen points of the papillae, Her temperature was 101° and the pulse 100. During the course of the day she vomited several times and in the evening the temperature had risen to 103°.2. There was no abdominal distention nor was the pain referable to any area in particular. Her bowels had not been moved - Calomel gr IV. and a mixture of Sod. Bicarb and Bismuth Subnit. was given.

January 1st The patient had a restless night but the vomiting had ceased though she still complained of pain all over the abdomen - The bowels were relaxed once during the night. The stool was light in colour but firm.

Pulse 116 Temperature 102°.3 Respiration 26

Urine. S.G. 1024. acid - no albumen - dark in colour with abundant deposit of urates.

In the evening. Pulse 120. Temperature 103°

Respirations 28. Abdominal pain less, had

a little sleep in the afternoon.

January 2nd

Patient had two loose motions, yellow in colour and of watery consistence. She had again a restless disturbed night and was delirious. pulse 116. temperature 102·8. respirations 24.

treatment - Salycilate of Soda. Antifebrin ℈ IV

Evening — pulse 110. temperature 101° which had dropped at 12 p.m to 98·°10

January 3rd

Patient had a bad night. complained of great headache and anorexia. Tongue was dry and brown in the centre. lips parched and tending to crack in places.

pulse 120. temperature 102·8 respirations 28.

Evening. Bowels moved once during the day stool was fluid in consistence and of a yellow ochre colour. pulse 125. temperature 104°. respirations 30. Salol ℈ V every four hours were ordered.

January 4th

Patient still very ill. She was drowsy and Apathetic and lay with half closed eyelids and disliked being spoken to. pulse 130.

temperature 103°.8 respirations 28. Her bowels had not moved again but the abdomen was slightly distended and tympanitic. She lay listless and indifferent to her surroundings with low muttering delirium at night. A few moist rales were heard on auscultation of the base of the lungs. Brandy ℥iii daily was ordered Evening. Temperature 105°.

January 5th

She continued in much the same condition Morning temperature 104° Evening 104°.6 pulse 128. respirations 29.

January 7th

Pulse 124 soft and compressible. temperature 102°.4 respirations 30. Three rose coloured raised papular spots appeared on the sides of the abdomen fading on pressure One fluid yellow motion was passed. Her tongue remained dry and brown and she suffered from extreme thirst

Evening. pulse 130 temperature 104°.3. respirations 32. during this day she coughed considerably and there were some bronchitic ronchi with a few râles

at the bases of ~~Both~~ lungs but no decided dullness.

January 8th

Pulse 112 temperature 103°.8 respirations 32 Patient very delirious all night, moaning to herself - the pupils much dilated and the eyelids drooped. several more spots appeared on abdomen and lower part of chest. She passed two loose motions resembling "pea-soap".

Evening. pulse 116 temperature 103°.5 She was very weak and prostrate and breathed badly. respirations numbering 32 per minute ℥iii extra of Brandy given daily

January 9th

Still very ill morning temperature 104° evening 104°.4. Bowels moved once similar in appearance and consistence to the previous motions. Pulse 132 dicrotic in character. 1st sound of the heart was very faint. Liq. Strychnia was ordered. Respirations 36. No enlargement of the Spleen detected by palpation but the area of dullness seemed increased to a small extent. Respirations numbered 38 at night

January 10th

No change - temperature morning 102°4 evening 104°4
4 loose motions were passed. Cold sponging
was employed whenever the temperature
exceeded 103° but only with a transitory effect.

January 11th

Pulse 144 weak and dicrotic. Temperature 105°2
Respirations 40. with numerous moist râles
all over the chest. a few fresh spots
have appeared and those first seen have
faded - She lies semi-conscious and can
only be roused with difficulty. Her tongue
is dry and brown - pupils still dilated
Urine and faeces passed unconsciously.
Evening temperature 104°.

January 12th

Pulse 160. temperature 103° and 104°4
Breathing very bad with numerous râles
all over the chest. The pulse became
very weak and flickering and could
hardly be counted - The patient gradually
sank and died at 6 p.m on the
Thirteenth day of the disease. A post-mortem
examination could not be obtained

Case No. 2. recovery. duration 13 days.

H. C. girl aged 8 years. was admitted to the Hospital on December 29th. On examination she was found to be covered with a scarlet erythematous rash. Her tongue was coated with a white fur but she had no sore throat nor any elevation of temperature. This rash died away in two days but the child was "out of sorts" and had lost her appetite. she complained slightly of headache but it was not severe.

January 4th.

On taking the temperature at 10 a-m it was found to be 100°.2 Pulse 90.
Her skin was hot and dry and face flushed
The tongue was moist and furred with red papillae scattered over its surface -
Bowels constipated but no abdominal distension or pain. Urine. dark colour deposit of urates - S.S. 1022 reaction-acid no albumen or sugar present.
Evening. Temperature 102°.8 pulse 100.
respirations 22.
Treatment - Salol ℈ iv every 4 hours - Bowels opened by a glycerine enema. / rather loose motion

January 5th

Temperature 99°.8 pulse 90 respirations 22
Had rather a restless night and complained of headache in the morning.
Evening - Temperature 101°.6 pulse 96 respirations 22
Her general condition remained much the same for the next week. The temperature on some evenings reached 102°.8 but never exceeded this. Her bowels continued constipated with some slight pain in the abdomen. The tongue did not clean but remained furred and moist. Her sleep was restless but there was no delirium.

January 12th (eighth day)

Temperature 101° pulse 110 rather weak and compressible, regular. respirations 22.
during the night there was severe pain in the right Iliac region which was relieved on the application of hot cotton wool. 4 or 5 spots appeared on the chest and 2 on the abdomen. They were of a rose colour, lenticular, raised and disappeared on pressure. Urine. amber colour. slight deposit of urates. S.G. 1020. no albumen.
Evening - Temperature 102°. pulse 116. respirations 26

January 15th (Twelfth day)
Temperature had returned to normal but the pulse remained very weak and compressible and now was irregular in rythm: 104. On auscultation the 1st cardiac sound in the mitral area was barely audible - a mixture of Tinct Digit. and Sp. Ammon. C. was ordered - Passed one loose yellow ochre motion after using a Glycerine enema. The Spleen could not be felt but its area of dullness was slightly extended.

January 16th. (Thirteenth day)
Temperature again rose to 100°. Pulse 100 was improved in strength and tone and was now regular. 3 fresh spots on abdomen Evening - Temperature 99°6 Pulse 104 was again rather irregular in rythm.

January 17th (Fourteenth day)
The temperature was again at normal and was not again elevated during the course of convalescence. The pulse 96 was improved though still weak and compressible - Ryular. Tongue still furred with red edges and tip. Liver not enlarged -

From this date the patient gradually gained

strength. The pulse for many days was weak and now and then irregular but by the 30th of January it was reduced to 75 per minute. stronger and regular. She was allowed up on the 2nd of February and was discharged cured on February 18th.

Case No 27 Recovery duration 14 days

T. P. a boy aged 6 years. took ill on the 20th of January. Severe headache and giddiness with loss of appetite were the chief symptoms complained of. On admission at 10 a.m the temperature was 101°.6 pulse 100 respirations 20. Tongue similar to the other cases. "scarlatina" like. The bowels were moved twice. Stools loose & watery in consistence light yellow colour. No abdominal pain or distension. He had not vomited.

Evening. Temperature 104°.2. pulse 112. full and regular in force and rythm. respirations 24. Urine scanty in amount. dark amber colour. acid. deposit of urates. Sp. G. 1022. no albumen.

January 24th (Fourth day)

Temperature 102°.6 pulse 104 respirations 24

Headache still complained of. Has had 3 more watery "pea soup" stools during the last 24 hours. Abdomen slightly distended and tympanitic but has no pain or tenderness over the abdomen. was restless and delirious during the night Evening - Temperature 104° pulse 118. respiration 24.

January 26th (Sixth day)

Temperature 101°6 pulse 98. rather weak and more easily compressed - regular - respiration 22. One copious loose motion during the night - Headache still intense and he now has pain in the abdomen which is still slightly distended and tympanitic - 3 "rose" spots on the abdomen - Evening temperature 104°8

January 27th (Seventh day)

Temperature 103°2 pulse 120 respiration 26 Patient has been very restless all night muttering and talking to himself - Since 8 a.m has been vomiting frequently - bilious in character - bowels have not moved again abdominal pain not so severe and the distension has disappeared - Spleen not enlarged - liver normal - Pupils dilated - Tongue dry - red and glazed in the centre -

Evening. Temperature 102°2. Has been sick all day

January 30th (Tenth day)
Temperature 100°2 pulse 124 regular but weak and dicrotic in character - respirations 24.
The vomiting has ceased today and the pain in the abdomen is gone - Headache also relieved - Tongue red and glazed with parched, dry lips - 7 fresh spots have appeared on the abdomen none on the chest. Spleen not enlarged. Urine more abundant, amber colour - small deposit of urates - Sp. G. 1020 - no albumen - acid reaction - Great muscular prostration -
Evening - temperature 103°2 - pulse 124 respirations 26. Bowels moved once during the day - motion more solid.

January 31st (Eleventh day)
Temperature 100°6 pulse 112 regular and stronger than yesterday. No return of the vomiting or pain - pupils not so dilated. On auscultation and percussion of the lungs no abnormality to be detected. Heart sounds are pure - Bowels not moved - very emaciated and weak.
Evening - Temperature 102°6 pulse 116 respirations 24.
February 3rd (Fourteenth day) Temperature is

again normal and was not raised above 99° during the convalescent period. The symptoms from this date gradually subsided and the pulse gradually improved in tone. Muscular strength returned slowly and it was not until the 23rd of February that he was able to be out of bed. From that date he improved rapidly and was allowed to leave the Hospital on March 12."

The Temperatures

The study of the temperature in Typhoid Fever is of the utmost importance and I have appended charts of all the cases showing the condition of the temperature every six hours.

The maintenance of the temperature of the body in health depends on a balance being kept up between the production and dispersion of heat. This balance is maintained by a regulating apparatus acting through the nervous system. In Fever the regulating apparatus is disturbed by the

poison acting on the nerve centre while at the same time there is an increased combustion of the tissues causing a greater production of heat.

In Typhoid Fever the course of the Pyrexia is generally described as characteristic of the disease. It is divided into three stages

First - The initial rise lasting 3 or 4 days

Second - The Fastigium during which the temperature remains elevated.

Third - The stage of defervescence during which the temperature returns to normal by a prolonged lysis.

The temperature rises during the first 3 or 4 days in a zig zag manner, with a morning fall of about one degree and an evening rise of two degrees. so that each evening the temperature stands about one degree higher than the evening before until the maximum is reached.

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and during that time the temperature remains about its maximum falling one degree in the morning and rising again in the evening.
Defervescence takes place slowly and gradually owing to the morning remissions becoming greater than the evening exacerbations until at length the normal point is again reached.

On examining the charts of the present cases it is at once seen that the course of the Pyrexia differs in several respects from this description 1st". The onset in most of the cases was sudden and the temperature reached the maximum on the first or second days.
In 13 of the patients the temperature on the first day was either as high as that registered during any other day of the illness or within half a degree of the highest point registered.
In case No 6 the evening temperature was 105° on the 1st day. In No 9. it was 105°.

In No. 15. 105°. In No 23. 105°.4
all these being the highest degree of
Pyrexia during the attack in each case

2nd. The course of the Pyrexia was of
shorter duration than is usually
seen in Typhoid Fever.
The average duration of all the cases
was fourteen days.
In 19 out of the 31 patients the
temperature had returned permanently
to normal in 14 days or less.
Of the 5 fatal cases. one died at the
end of 4 days. one on the eighth
day. the others on the thirteenth, fifteenth,
and eighteenth days respectively.
In only 6 cases was the period of
Pyrexia prolonged over 20 days.

3rd. Great irregularity was observed
during the course of the Pyrexia
The oscillations in the Temperature
were extreme in many of the cases.
Sometimes it would almost touch
normal point and in a few hours be

again elevated to 104° or 105°.

For example in case no 14. on the sixth day at 10 p.m the temperature was 104°2 at 4 a.m it was 100° and at 10 a.m on the seventh day there was a further remission to 99° at 4 p.m on the same day it had risen again to 104°.

In case no. 30 at 10 p.m on the first day the temperature was 104°2 at 4 a.m 98°6 was recorded and at 10 a.m 103°2. On the sixth day in the same case at 4 p.m the temperature was 104° at 4 a.m on the seventh day it only reached 99° and at 4 p.m it had again risen to 103°4

In case no 31. 1st day 10 p.m 103° at 4 a.m the temperature had fallen to 99°2. at 10 p.m on the 2nd day it was up to 102°8 and at 4 a.m had again declined to 98°8. On the 3rd day at 4 p.m the temperature was normal, at 10 p.m 102°8, at 4 a.m on the 4th day lowered again to 99°4 and at 4 p.m had risen to 103°2

In case no 20. The extreme variations of temperature met with in this case were associated with severe rigors caused by septic absorption. At 4 p.m on the eleventh day the temperature was 105°.2 at 4 p.m on the twelvth it was down to 99° - at 4 a.m on the fourteenth day the temperature was 98°.4 and at 4 p.m 12 hours later it was as high as 106° which had fallen again at 4 a.m on the fifteenth day to 98°.6

These three abnormalities from the recognised course of the Pyaemia in a case of Typhoid Fever. namely:- Sudden rise of temperature at the onset, irregular variations in the height of the temperature, and short duration of the Feverish period. were also noticed during the course of an Epidemic of Typhoid which occurred at Earls House Industrial School near Newcastle about 18 months ago. D. Armstrong Medical Officer of Health of Newcastle also noticed in

the Earl's House cases a condition of the tongue similar to the form I have described as being present here and to which he applied the term "Scarletina" The Epidemic at Earls House like the Hartlepool one was traced to a contamination of the milk supply and it appears probable that the presence of these unusual symptoms in both these Epidemics may be attributed to their common origin in an infected milk supply and that this scarletina like condition of the tongue with irregular remissions and exacerbations of Temperature may be peculiarities of "Milk" Typhoid

To illustrate the condition of the Temperature seen in the cases at Earls House I add copies of one or two of the charts taken there.

On proceeding to analyse the records of the state of the temperature in the 31 cases I find that the highest elevation reached was 106° in Case NO 20

which ended fatally. In eleven other cases the temperature reached 105° or over. Between 104° and 105° there were twelve cases. Between 103° and 104° only two cases were noted. In two others the highest point which was recorded was 102°.8.

In case No 18 the maximum temperature was only 101°.2 but in this case a relapse occured and on that occasion the temperature rose as high as 102°.4

In case No. 25. 101°.8 was the greatest rise during the attack.

In the remaining case No 13. also a fatal one the temperature just prior to death on the eighth day was 106° previous to that on the fourth day a temperature of 105°.2 noted.

It is therefore seen that in a total of 25 cases out of 31 or in 80.6 per cent the highest degree of Pyrexia noted was 104° or higher.

The day of the illness and the hour of the day at which the maximum

temperature was reached also varied very greatly in the different patients. The maximum rise of temperature was noted on the 1st day of the fever in eight of the cases - of those eight it occured at 10 p.m in three, at 4 p.m in four, and at 10 a.m in one case.

On the 2nd day the maximum reached in five cases; the hours at which it was noted were - 10 p.m in two cases and 4 p.m in three.

On the 3rd day the maximum was noted in six cases - at 10 p.m in three and at 4 p.m in other three.

On the fourth day in two cases at 4 p.m in one and at 4 a.m in the other

The highest temperature recorded in the remaining cases was noted on the following days and hours.

In one case on the fifth day at 4 p.m

On the sixth day in two cases at 4 a.m and 10 p.m

On the eighth day in three cases at 10 p.m.

10 a.m, and 4 a.m respectively.
On the tenth day in two cases at 10 p.m
in both.
On the twelvth day in one case at 10 a.m
On the fourteenth day in one case at 4 p.m.

Thus out of the total of 31 cases the hour of the day at which the maximum degree of pyrexia occurred during the attack was at 10 p.m in twelve cases, at 4 p.m in thirteen cases, at 10 a.m in three cases, and at 4 a.m in three cases. Showing that in by far the greatest number of the patients the highest rise in temperature occurred in the afternoon and evening.

Symptoms under the various Systems of the body

The Alimentary System.

In the alimentary system the symptoms are many of them identical with those met with in other febrile conditions Loss of appetite, a feeling of nausea, and

with a thin white fur and the tip and edges unusually red" This condition was only seen in four of the cases and as already stated the condition of the tongue in the great majority of the cases was distinct and unlike that usually seen in Typhoid fever. It was thickly coated with a white fur but this was not continuous over the surface of the tongue but was studded over with numerous red points - the projecting swollen papillae and suggested very much the condition of the tongue met with in scarlatina. The occurrence of a similar type of tongue during a milk epidemic of Typhoid at Earls House schools has been referred to previously and it may be that the source of the contagion had something to do with this peculiar type of the tongue.

In fifteen cases the tongue continued the same throughout the illness and did not become clean for some time after the temperature had fallen.

In eleven cases the tongue became dry and

brown in the centre which was covered with a dry brown crust. All the five fatal cases were included in those eleven though most authorities record cases which ended fatally where the tongue remained moist and not brown to the end.
In three cases the fur cleared off and the tongue during the second week became red, glazed and dry in the centre.
In the remaining two cases it clean and red with a white fur at the edges.
Cracks and fissures in the tongue only occurred in two cases.

Tympanitic distension of the abdomen used to be a frequent and distressing symptom of Typhoid Fever. Murchison records its occurrence in 79 out of 100 cases and in 20 out of 21 fatal cases. Probably owing to the treatment by intestinal antiseptics this symptom is now of comparatively rare occurrence. It was only present in three cases and in these only to a slight extent. Gurgling in the right iliac region was not observed.

Abdominal pain and tenderness was not

observed in more than six cases and in only two of these was the pain of a severe character -

The condition of the spleen was carefully noted in all the cases. An enlarged spleen, especially in children, is noted by most authorities in the majority of their cases of Typhoid Fever. Goodall and Washbourne state that it can usually be felt by palpation though owing to its soft consistence it may escape detection - Though palpation was practised carefully and frequently I was only able to distinctly feel the spleen in four of my cases. The area of Splenic dullness was slightly enlarged in other seven cases. This proportion is smaller than that usually observed D. Ringrose (Lancet Dec. 4th 1897) out of 80 cases was able to palpate the spleen in 20. Henoch in 30 out of 75 cases.

The amount of Splenic enlargement does not appear to depend on or be related to the severity of the fever as the four cases in which the organ was large enough to be felt were not the worst during the epidemic

The liver was enlarged in three cases extending 1 inch to 1½ inches below the costal margin. Jaundice was not present in any case.

The state of the bowels varied greatly among the different patients the majority however were constipated throughout the attack. In 20 cases or 64·5 per cent the bowels were constipated In 2 cases the bowels acted normally and in 9 cases or 29 per cent diarrhoea was present. The most severe case in which diarrhoea occured was No 22. where the bowels were moved six times during one night. and frequently four or five times in 24 hours.

In Case No 20 there was preliminary diarrhoea lasting for three days before the feverish symptoms developed. He passed three and four loose yellow. ochre motions every day for those 3 days but when the temperature had risen the bowels acted more regularly.

Among the remaining seven cases in which diarrhoea occurred it was not excessive in amount and rarely exceeded two loose watery motions daily and often alternated with constipation.
For example in case No. 15. on January 10th he passed 2 typical pea soup motions January 11th 2 loose motions January 12. 2 loose motions January 13th one firm motion and one loose motion then his bowels did not move until January 16th when he passed another loose yellow evacuation
In cases where the bowels had not been opened for two or three days glycerine enemata were given which had the desired effect.
The cases in which diarrhoea was a symptom were the most severe during the epidemic and all the five fatal cases had some diarrhoea during the course of their illness. The appearance of the stools was of the characteristic colour and consistence typical of Typhoid. They were fluid and of a yellow ochre colour and had an offensive odour

Even where the bowels only acted after the administration of Glycerine enemata the resulting motion in many of the cases answered to this description

The circulatory System

The condition of the pulse was carefully noted in every case and although the rate was accelerated in every case the amount of the acceleration varied to a great degree. In those cases which were of the most severe type and in which the temperature was elevated highest and for the longest time the pulse was quickest in its rate and at the same time became soft, compressible, and dicrotic in character and in one case markedly irregular in its rythm.

The pulse beat over 140 per minute in four cases of whom two died.

Between 130 and 140 in five cases - two died

In the remaining fatal case NO. 22. an old man of 78 years the pulse was never quicker than 108 per minute.

Between 120 and 130 in eleven cases.
Between 110 and 120 in seven cases
In the remaining three cases the highest pulse rate recorded was 108, 106, and 100 respectively. These observations correspond very closely with those given by Murchison who records 60 per cent of deaths where the pulse-rate exceeded 140. 52 per cent where it was over 130 with a decreasing ratio of fatal cases the nearer the pulse rate fell to normal. It must be remembered too that most of the present patients were children in whom one would expect a quicker pulse without the attendant danger to life.

The variability of the pulse rate in the same patient at different hours and days noted by Murchison was also observed in these cases. and during the convalescent period the pulse was often quickened without any evident cause and without a corresponding rise of temperature.

The Heart's action was greatly impaired

in the more severe cases and the cardiac impulse became very feeble ~~in~~ Cases no. 1 & 2 being almost imperceptible. The character of the first sound was altered and became short and faint while in one case no. 10 there was present a soft systolic apex murmur which however disappeared as the childs strength returned and was probably due to degeneration of the musculi papillaris of the mitral valve allowing some regurgitation. This feebleness of impulse with a short and faint first sound was present to a greater or less degree in ~~eleven~~ out of the 31 cases and is caused in part by the action of the Typhoid poison on the Heart muscle though chiefly by the prolonged high temperature causing a granular degeneration of the muscular fibres. In the remaining 20 cases the temperature was not so high nor was the feverish period so prolonged and the heart never showed marked symptoms of loss of power or rythm.

The vaso-motor system was rendered more unstable in 23 cases as was shown by the phenomenon of the tâche cerebral being well marked and continuing to be present even for some time after convalescence was in progress.

The Respiratory System

The changes which occurred in this system come more under the head of complications than symptoms.
The breathing was accelerated in every case and where the pulse and temperature were highest the rate of breathing was quickest although the rate did not increase in the same ratio as the pulse.

The Urinary System

The quantity of urine excreted was diminished in amount during the first 8 or 9 days of the illness in every case. The colour was darker than usual and in most cases during the first week

there was an abundant deposit of urates - The Specific Gravity was raised to 1022 - 1025. Later in the attack the urine was more copious, of a pale straw colour, and the Specific Gravity was lowered to 1015 - 1018. while urates ceased to be deposited.
The urine was examined daily in all the cases and albumen was only found to be present in three cases Nos. 9, 11, and 30. where it only was present as a slight trace which cleared up after a few days - In all three the end of the second week was the time of its first appearance.
Tube casts, blood, or pus were never found in any case - Sugar was never present Retention of urine a symptom noted by many observers was not noted in any case

The Nervous System

Headache was a frequent and very distressing symptom and was exceptionally severe during the first three days of the illness. It was generally the first

symptom complained of by the children and was noted in all but four cases.
In three cases it was most severe during the second week the patients moaning continually and only being relieved on the application of evaporating lotions.
Delirium was not such a universal symptom though it occurred to a slight extent at night in twenty-two patients.
In Case No 1. after the sixth day there was almost continuous muttering delirium with only rare intervals when she was rational and understood what was said to her. In two cases Nos. 9 & 12. the delirium was active and noisy and the patients were only with difficulty restrained in bed.
Coma or Semi-coma were rare symptoms and only occurred in five cases four of which ended fatally.
Muscular prostration and emaciation were marked features of the illness. Nearly all the patients became very weak and tremulous when they attempted any movements. - Rigors, a frequent symptom

during the course of Typhoid Fever and apparently often due to quite trivial causes such as constipation, in this epidemic were only noted in two cases Nos. 3 & 20. both adults. In case No. 3 the attack commenced with rigors but in the other patient the rigors were very severe and continued at frequent intervals from the end of the second week until death on the 18.th day being caused by septic absorption.

The Cutaneous System.

The small, lenticular, rose coloured, raised, papules which constitute the rash in Typhoid Fever were observed in all but two out of the 31 cases though in some patients not more than two or three were present. In 19 cases or 61·2 per cent the rash was distinct and appeared in the form of successive crops of these spots on the abdomen and lower part of the chest. The spots first appeared from the sixth to the ninth days and after remaining 2 or 3 days faded gradually

while another set appeared on a different part of the skin. In ten cases or 32.2 per cent the rash was limited to one crop and there were only a few spots developed - During the epidemic the largest number of spots counted at one time in any case was eleven in case No. 5. though they have sometimes been noticed in great numbers - Murchison counted upwards of 1000 in one case and most observers note that several hundreds may occasionally be present; in children however the spots are rarely so numerous as they are in adults. No fresh spots appeared in any case after the temperature had returned to normal.

Occasionally the characteristic rash is preceded by an erythematous rash resembling Scarlatina Such a condition was noted in one case No. 2. where it appeared 2 or 3 days before the temperature became elevated and the other Typhoid symptoms developed.

Sudamina were observed in only two cases. In case No 20 the sudaminous rash was very profuse and extended all over the

front of the chest and abdomen - In case No. 12. it was only slight on the chest.
Desquamation is a symptom which has generally been associated with those cases where Sudamina have been observed but I noted desquamation of the cuticle in seventeen cases or 54·9 per cent. In every one of these the skin seperated in the form of minute Granny scales particularly on the abdomen - Goodhart reports a case where the peeling took the form of large flakes.
Perspiration was rare and only was noted in five cases as a rule the skin was hot and dry.
A Herpetic rash was present on the cheeks and arms in Case No. 31 appearing on the fourth day of the attack.
Tâches Bleuâtres and Petechiae described as being seen sometimes in the course of Typhoid Fever were not found in any case.

Organs of Special Sense

Symptoms referable to the eyes were not numerous - Ptosis occurred in one

case No1. and Strabismus was noted in Case No. 17. Dilatation of the Pupil a very constant symptom in this disease was observed in a considerable number of the cases. In 13 of the cases or 41·9 per cent it was present always during the second week of the attach. In the ears also the changes were few and unimportant. A temporary impairment of hearing was not at all uncommon and was observed in nine cases. This slight deafness appeared to affect both ears equally and was only of short duration at the end of the 1st and the beginning of the 2nd week was the time when it was first observed in all the cases. Tinnitus and pain were sometimes troublesome and severe four children complaining of these symptoms. In the nose the only symptom noted was Epistaxis, a frequent concomitant of Typhoid fever, this occurred in five of the children always at the beginning of the attach. It was never very serious in the amount of blood lost

though sometimes it has been so severe as to be the immediate cause of death

Relapses

The subject of relapses in relation to Typhoid Fever is one of great interest and the tendency to their occurrence appears to be great. Goodall and Washbourne report the occurrence of a relapse in 66 out of 506 cases under treatment at the Eastern Fever Hospital during 1892-94 or in 13 per cent. Other writers do not note its occurrence so frequently the figures varying from 11 per cent to 3 per cent which is the per centage given by Murchison out of 2591 cases at the London Fever Hospital. Among the present 31 cases relapses were noticed in two patients a per centage of 6·4. Relapses in Typhoid Fever are apparently due to a reinfection of the blood by a fresh absorption of the poison from the mesenteric and ileac glands. After an apyretic interval of varying length the temperature again

uses and the relapse runs through a similar course to the original attack, a fresh crop of rose spots appear and the diarrhoea with characteristic stools recurs. As a rule the attack is milder and of shorter duration than the primary attack. Prolonged cases of Typhoid fever are probably explained by the supposition that a relapse has occurred before the primary attack has ended and is indicated by an exacerbation of the temperature with a fresh crop of spots appearing after the third week. Such appears to be the cause of the prolongation to 31 days of Case NO. 8. on the 24th day of the illness the temperature had fallen to 100° for the next three days it gradually rose again to 102°.6 while a crop of 5 "rose" spots were observed on the 27th day. From that date the temperature fell again till on the 31st day it was at normal point and did not again become elevated. None of the other cases lasted longer than 23 days. In the two cases NOS 18 and 26 in which true relapses occurred the length of the

apyretic interval was 29 days and 8 days respectively - The duration of 29 days between the termination of the fever in the primary attack and the commencement of the relapse is considerably longer than is usually observed most relapses coming on within a fortnight after the first Pyretic period has ended - In this case No 8. the primary illness was the mildest observed during the epidemic and only lasted 5 days while the temperature never exceeded 101°.2. - The relapse was rather more severe than this lasting nine days and including a rise of temperature above 102°. Fresh spots developed on the 3rd day and two "pea-soup" motions were passed on the fifth day of the relapse.

In case No. 26 where the interval was 8 days the relapse was much less severe than the primary illness - The first Pyretic period was prolonged for 23 days, during the relapse it only lasted 10 days. Two crops of spots appeared but there was no diarrhoea nor was the spleen enlarged - A temperature of 104°.4 was noted during the first attack

but it never exceeded 103°.6 during the relapse. No other case showed symptoms of a true relapse though occasionally there was a transient rise of temperature due to constipation and which disappeared when the bowels were relieved -

Complications

Typhoid Fever is a disease in which complications are frequently met with - They occur in a variety of forms and are often the cause of a fatal termination to the case - The most important and severe complications arise in the Alimentary System and are caused by the severity of the Intestinal Lesions - Haemorrhage, Peritonitis, and Perforation are the chief of these complications and one or other of them are said to be present in from 3 - 7 per cent of all cases. During the course of this Epidemic neither Perforation nor Peritonitis arose in any case and in only one No 13 was Intestinal Haemorrhage observed - This occurred two days before

death on the 8th day and was not very copious in amount though it intensified the already great cardiac weakness and thus hastened the fatal termination from failure of the Heart. The blood was very dark in colour, and fluid. The Haemorrhage was not, as is often the case, indicated by any sudden fall of temperature -

The only other complication which arose in the alimentary System was in case No. 31. where on the 15th day the mouth and tongue became affected with severe ulcerative stomatitis - The inside of the cheeks, gums, and palate, with the edges of the tongue, were covered by small irregular ulcers, the breath was foetid and offensive - under appropriate treatment the ulcers soon healed.

Otitis Media with Meningitic symptoms was noted in case No 17. The symptoms arose on the 10th day of the illness. On the 20th January she was very restless & complained bitterly of headache, moaning almost constantly The tongue was dry and brown and the

pupils were slightly dilated. Temperature at 4 p.m 105° reduced by a tepid water pack to 104° at 4-45 p.m at 5-30 a cold pack reduced the temperature at 6 p.m to 103°
Pulse 120. respirations 30.

January 21st Tongue very dry and brown lips cracked and fissured - Frequent vomiting of green watery fluid - Patient semi-comatose - Pupils more dilated, marked internal strabismus. Passed me loose motion in bed - Temperature 104° - pulse 118 respirations 28.

January 22nd
Patient still in a semi-comatose state, with largely dilated pupils and marked strabismus vomiting still frequent being ejected in sudden gushes from the mouth.

January 23rd
Right ear has begun to discharge thick pus, child still semi comatose and other symptoms unchanged - Temperature 103°6
Pulse 112. Respirations 30 - vomiting not so frequent

January 24th
The ear continued to discharge pus and after this date the cerebral symptoms

gradually abated, the headache became less severe and the vomiting ceased - On the 24.th January 3 loose watery yellow stools were passed. The temperature continued elevated until the 27.th January when it returned to normal -
The patient remained for a long time in a very weak and feeble condition convalescence being retarded by the breaking out of an eruption of boils all over the scalp and body - These often became as large as Hazel nuts when they broke and discharged pus. The child was not finally discharged cured until the 2:1 of March.

Patches of Pneumonia complicated the progress of Case No 3. On the 3:d day of the attack she complained of severe pain in the right side - On percussion a small area of dullness was detected in the region of the angle of the scapula On auscultation the breathing was found to be bronchial with a few fine râles. Cough was troublesome and for a day

or two the expectorated rusty viscid sputum - A second patch of partial dullness showing the ordinary physical signs of Broncho-Pneumonia developed the day after on the other lung but both patches soon cleared up though the patient remained in a critical state for some days -
The only other complication noticed during the Epidemic was an unimportant eruption of Urticaria which appeared in Case No 12 on the 10th and 11th day of the illness

Case No. 21, where death occurred on the fourth day of the attack, was a young man of 20 years of age, a paralytic Epileptic who had long been a helpless inmate of the workhouse Hospital and was often subject to five or six severe Epileptic fits recurring every day or two for weeks - From the second day of this illness the Epileptic attacks were frequent and on the night previous to his death he had six fits in which

the convulsions were severe and prolonged. The typical Typhoid stools were present in this case and never previously had he had a rise of temperature during or preceding his convulsive attacks so that there seems little doubt but that the case was also one of Typhoid Fever. Case No 13, also a fatal one, was an imbecile but she had previously always been in robust health.

Passive congestion of the lungs, more a symptom than a complication, was noted in several of the cases, including all the fatal ones, where the cardiac weakness was noticeable - It was present to the most extreme extent in Case No 1. where for the few days before death the chest when examined showed an excessive amount of hypostatic congestion the bases of both lungs being much affected.

Morbid Anatomy

In only two of the five fatal cases was I able to obtain permission to

make a post-mortem examination.
The results of these were as follows:-

Case No 20 - male aged 47 years. Death on the eighteenth day preceded by severe rigors and heart failure.
Autopsy 14 hours after death.
Cadaveric rigidity well marked - no spots visible - Abdomen distended particularly on the right side.
Heart healthy with some dark clot in cavities on right side - left side empty. weight 11½ ozs
Lungs showed no signs of old or recent disease except marked Hypostatic congestion
Right Lung weighed 27 ozs Left 25 ozs
The Stomach and Intestines were healthy down to within 1½ feet from the Ilio-caecal valve. At this situation several ulcers were present in the Peyer's patches and solitary follicles. The ulcers were surrounded by a ring of swollen injected tissue and had ragged undermined edges. The floor of each of the ulcers, which were about ⅓ of an inch in diameter, was occupied by a yellow bile stained slough which adhered

to the muscular tissue of the intestine. The ulcers were few in number amounting to seven in all the lowest being 5 inches above the Ilio-caecal valve. The corresponding mesenteric glands were enlarged and swollen and on section were soft and breaking down in the centre.

The spleen weighed 15 ozs and was very dark in colour. The capsule was slightly thickened and rough. On section the spleen was soft and pulpy and the tissue was much degenerated.

The liver weighed 3 lbs 7 ozs It was of a pale almost clay colour studded over with grey spots. On section it was of a general pale hue and had scattered over it numerous small yellowish deposits chiefly in the Portal canals. These appeared to be the early stage of the formation of Pyaemic Abscesses in the Liver and accounted for the severe and prolonged rigors met with towards the termination of this case.

The Kidneys were healthy except for being swollen and slightly hyperaemic.

Case No 22. Male aged 78 years. Death on the fifteenth day from gradual heart failure.

In this case I was particularly glad to be able to obtain permission to make a post-mortem examination as it is very unusual to find Typhoid Fever in a man of his age. However the presence of the Pyrexia, Typical Stools, with increased Splenic dullness had made the diagnosis almost certain although this was a case in which the rash was not present.

Autopsy 12 hours after death.

Cadaveric rigidity well marked. Body much emaciated. Abdomen rather full and distended.

The Heart weighed 10 ozs and was soft and pale with some dilatation of both the right and left ventricles. The right ventricle containing some dark clot.

Both lungs were congested and oedematous some old pleuritic adhesions were present on the right side.

The Larynx and Stomach were healthy.

On examining the Intestines no sign of

ulceration of the Peyer's patches was discovered until about 2 inches above the Ilio-caecal valve where one ulcer was present in the Ileum. The ulcer was as large as a shilling and presented the usual features of a Typhoid ulcer. The surrounding was raised, and pink with the excavated floor of the ulcer bile stained and occupied by a small seperating slough. One of the adjacent Peyer's patches was raised and swollen but no other ulcers were detected There were also three enlayed and inflamed mesenteric glands about the size of hazel-nuts.

The Spleen was enlarged and weighed 17 ozs. The capsule was dull, opaque, and irregularly thickened. The spleen on section was extremely dark in colour, and was soft, friable, and easily broken down

The liver was enlarged weighing
It was of a dark purple colour and like the spleen was soft, pulpy and degenerated - The other organs were healthy

Mortality

The number of deaths during the course of the Epidemic was five showing a per centage of 16·1. In considering the mortality however it must be taken into consideration that two of the cases, in which the disease ended fatally, were subjects in whom the occurrence of any disease whatever would have been attended by the gravest danger. I refer to Cases Nos 21 and 22 one a chronic Epileptic in an already debilitated, paralysed condition and the other an old and feeble man of 78 years of age.

Only one of the children attached died showing a mortality among the children under 15 years of 4 per cent.

The causes of death in the five cases were as follows:-

In Case No 1. death resulted from the severity of the attack causing gradual heart failure with hypostatic congestion and oedema of the lungs and death from asthenia

Case No 13 also ended in death from Heart failure the cardiac debility being in this patient aggravated by the loss of blood owing to the slight intestinal haemorrhage which occurred.
Case No. 20 was that in which septicaemia was present the repeated rigors and pyrexia resulting like the preceding cases in death from asthenia.
Case No 21 ended in Coma the result of the repeated Epileptic convulsions and pyrexia from which he suffered.
Heart failure and Dylatation was the cause of death in Case No 22 old age and exhaustion from diarrhoea assisting to bring this about.

Prognosis

From the foregoing account of the cause of death in these cases it is evident that the state of the Heart Sounds and of the pulse is of the utmost importance in forming a prognosis.
Danger is to be feared where the pulse becomes very quick, compressible, or dicrotics

in character or where the 1st. sound of the heart becomes faint and soft in tone. Signs of great interference with the pulmonary circulation shown by passive congestion and oedema at the base of the lungs are also of grave import.
In addition to these any previous disease and increased age of the patient add to the gravity of the case. Complications particularly abdominal ones are reasons for forming an opinion that the case is a serious one.

Diagnosis

For the first few days a diagnosis was not arrived at the cases being regarded as of a Gastric catarrhal character, occurring at the Christmas season added to the likelihood of this diagnosis being correct. After the first six days the characteristic rash, with continued Pyrexia, and typical stools made the correct diagnosis easy and certain. I regret that there was no

opportunity afforded of applying the test of Widal's serum reaction which it appears now to be proved is of the utmost value in securing an early diagnosis of Typhoid Fever though the evidence seems to show that an absolute diagnosis cannot always be obtained by the serum test a very few undoubted cases of Typhoid having given a negative result -

Treatment

The plan of treatment adopted in these cases was to try and control the fever and so prevent its injurious effects on the organism by keeping the temperature throughout the course of the disease at a moderate fever heat at the same time preventing excessive putrefactive changes from taking place in the intestines, the seat of the specific lesion, by the administration of an intestinal antiseptic. These two objects were attained 1st by sponging the patients with cold or tepid water when the temperature after the first day or two

was elevated above 104° or a little over. as a general rule this had the desired effect and controlled the temperature for the time causing a fall of about one degree - Where this plan of treatment was ineffectual recourse was had to the tepid, and then to the cold, pack if the temperature still rose to 105° or over. In the milder degrees of pyrexia where the temperature registered over 103° a few grains of Sulphate of Quinine were administered to check the fever - No other antipyretic drugs were given owing to their depressing influence on the heart. To instance the effects of the application of external cold the followings may be cited. On the 9th day of the attack in Case No 17. The temperature in spite of cold sponging every two hours had risen at 4 p.m to 105° the patient was placed in a tepid pack which only reduced the temperature at 4-45 p.m to 104°.2. The temperature having risen again at 5-30 p.m to 105° recourse was had to the cold pack which resulted in a reduction to 103° at 6 p.m

Next day the temperature was again 104°6 and the patient was semi-comatose with severe headache, and dry, brown tongue a repitition of the cold pack brought the temperature down two degrees in three quarters of an hour.

Besides reducing the temperature the application of cold has a beneficial effect on many of the most distressing symptoms of Typhoid caused by the Pyretic condition, Thus the dry tongue, thirst, headache, etc are all relieved and the general condition of the patient improved.

The question of the administration of purgatives in Typhoid Fever is one of great difficulty as there is always the fear of their use causing perforation or inducing uncontrollable diarrhoea - Still it is imperative that constipation, where present should be overcome and at the beginning of the disease before the ulceration has reached an advanced stage a dose of 5 grains of calomel is often of service - In the present cases where constipation was a frequent symptom the bowels

were emptied by means of glycerine enemata which were found to act well and cause little discomfort. In an article in the Lancet (Nov. 27th/97) D. Paget of Fremantle W. Australia advocates the use of copious doses of salad oil used as an enema and if necessary by the mouth. He states that he has attended over 100 cases with no deaths and attributes this remarkable result to the use of salad oil. He believes that its use keeps the ulcer at rest and removes any irritating substances and thus assists the healing process in the ulcerated area.

Dietetic Treatment is of course of the greatest importance during the course of a case of Typhoid Fever when one considers the form and site of the specific lesion and the danger of any indigestible substance coming in contact with the ulcerated surface and causing haemorrhage or even perforation to ensue. All the patients were kept upon a strictly milk diet except in

those cases where there was no diarrhoea and in them a little beef tea was allowed in addition. Afterwards when the temperature had returned to normal for a week or a little longer the patients were allowed a rather more extended dietary - Egg flip, arrowroot, well boiled rice puddings etc. Later on in convalescence fish was added to the children's daily meal at mid day. Almost all the cases required the exhibition of a stimulant after the disease had progressed for some time and the heart and pulse began to show signs of losing strength and tone. Brandy and Whisky in small repeated doses were given during the acute stage while after convalescence was established a few of the children who still suffered from cardiac debility were allowed about 2 ozs of Port wine daily.

The treatment of special symptoms may be briefly referred to.

In Case No 1. when the heart began to

fail recourse was had to doses of
m v. Liq. Strychninae Hydrochlor. but without
any appreciable amelioration of the case
the heart continuing to fail in power.
In the other cases where cardiac failure
was a prominent symptom great improvement
followed the use of a combination of
Tinct Digitalis and Sp. Ammon. Arom.
In Case No 20 neither of the above remedies
improved the cardiac condition nor did
Tinct. Strophanthus which was also given
do more than very temporarily improve
the pulse.
To relieve the thirst and dryness of
the tongue and lips the mouth was
painted with Glycerine and Borax. which
was found useful in relieving the
discomfort.
Diarrhoea was in no case so severe as
to require special treatment.
In case No 2 the abdominal pain was severe
but was soon better on the application of
hot cotton wool.
After convalescence was established and
the tongue still remained coated a

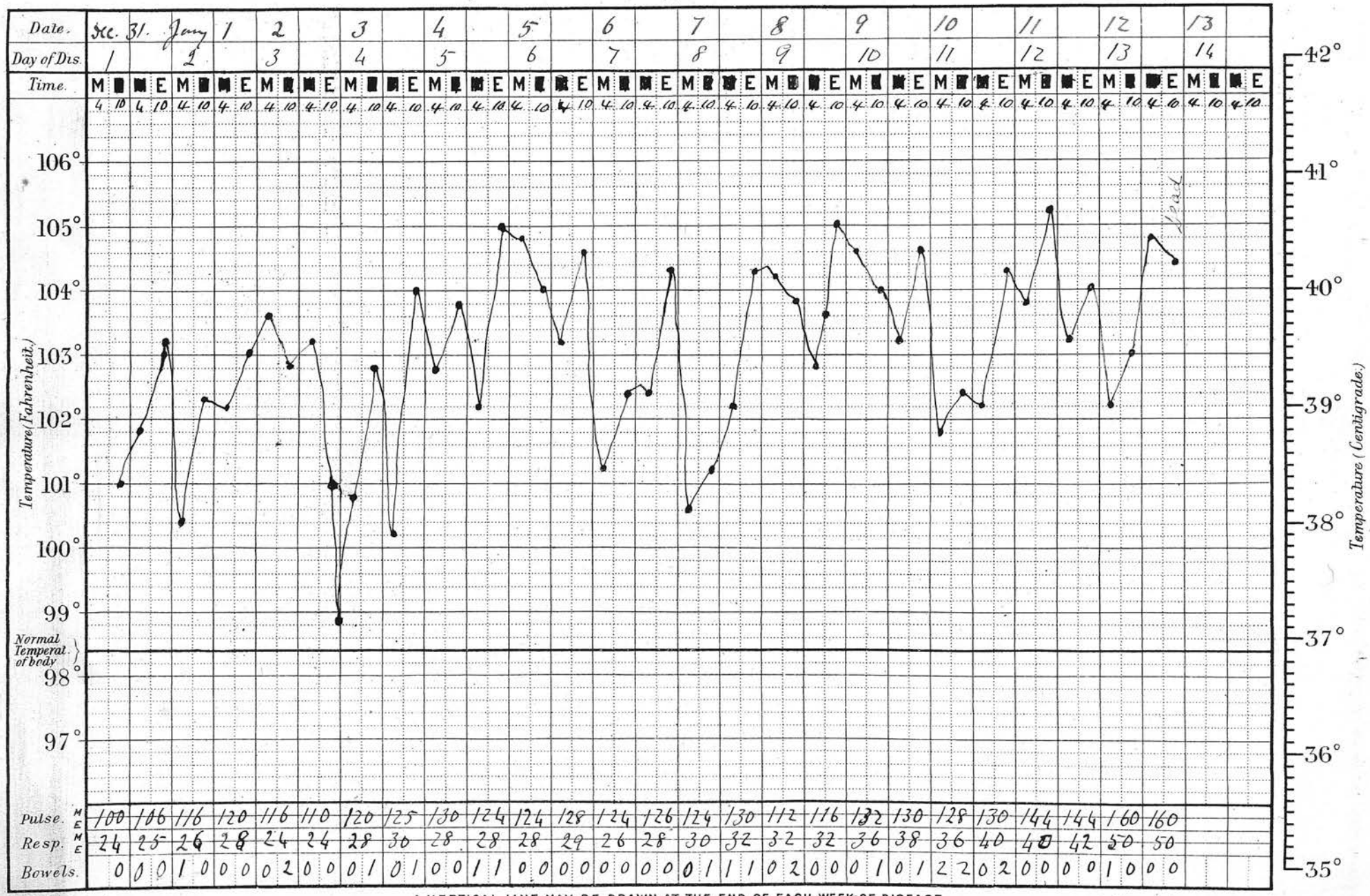
mixture of Sod. Bicarb. and ~~Inf.~~ Gentian. was given. A tonic of Easton's Syrup was given to most of the children to complete the cure.

Preventive treatment was at the same time carried out by the careful and immediate isolation of all cases, disinfection of the dejecta, and by thoroughly boiling all milk and water used in the workhouse.

Charts from cases of Typhoid Fever

Henry Moncrieff. Mac Gill

Name Eva Arnitt Age 12 yrs Disease Typhoid Fever Admitted December 31st



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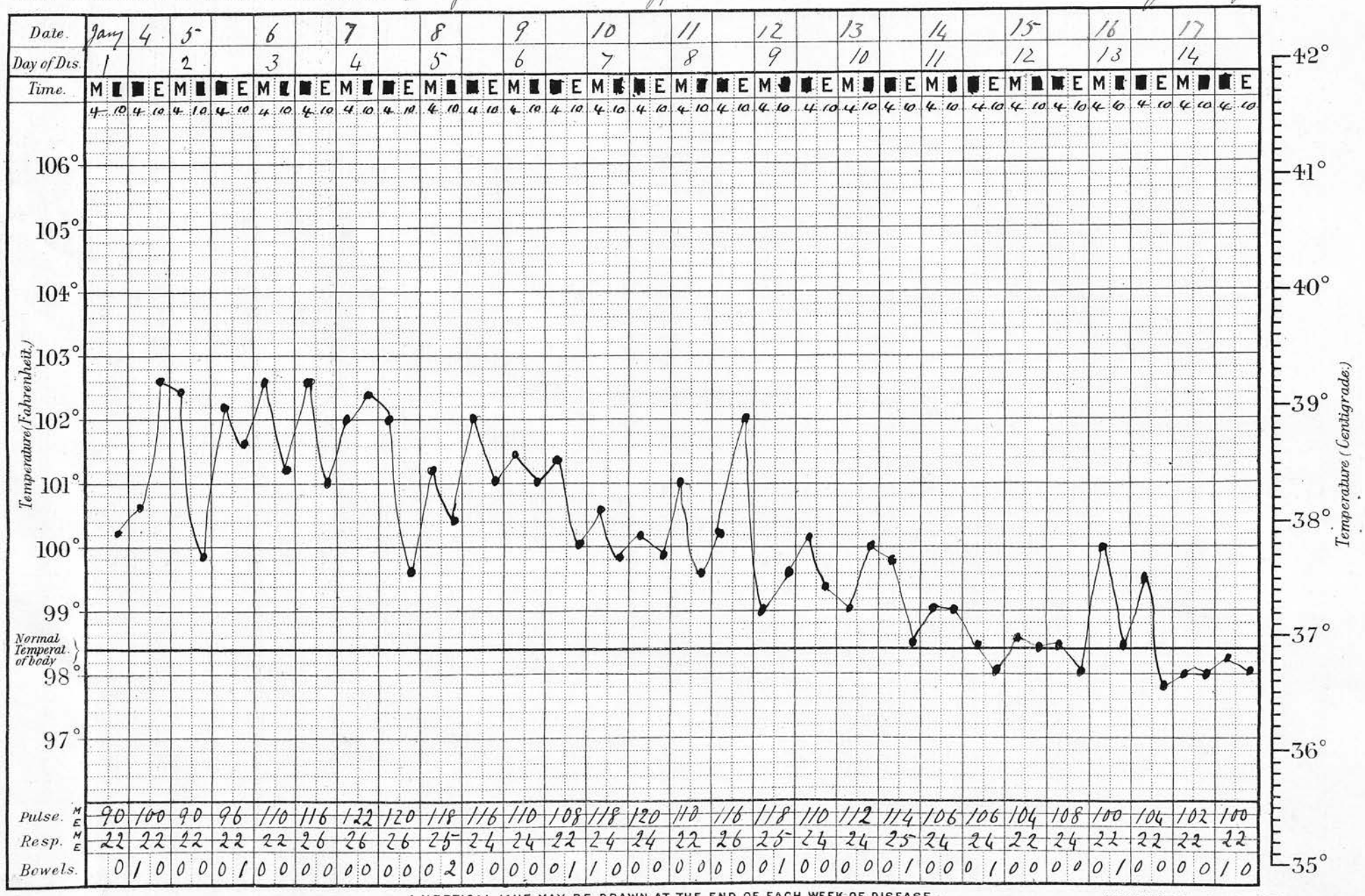
Name Hannah Gates Age 8 yrs. Disease Typhoid Fever Admitted January 4th



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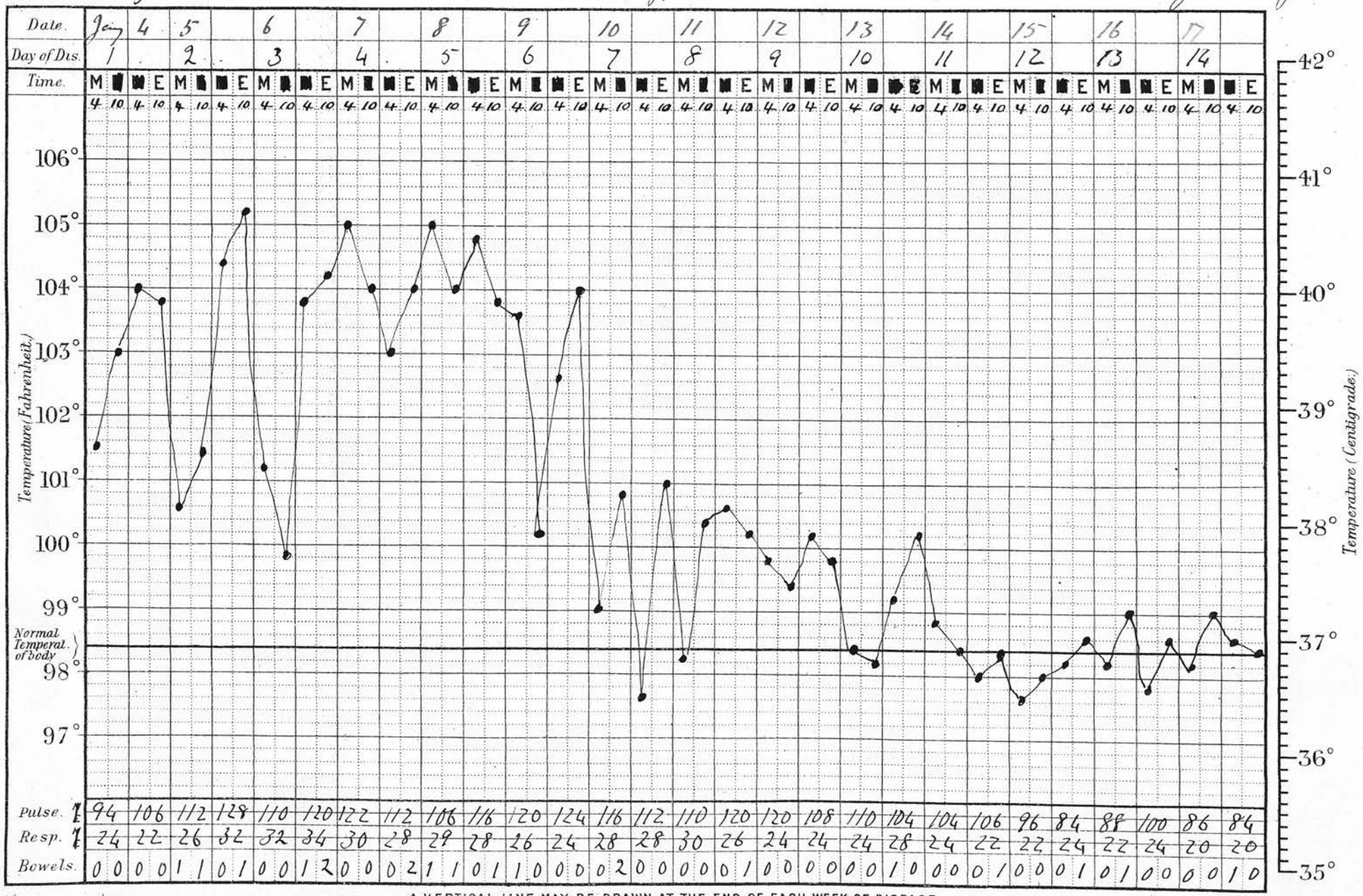
Name Elizabeth Usher Age 27 yrs. Disease Typhoid Fever Admitted January 4th



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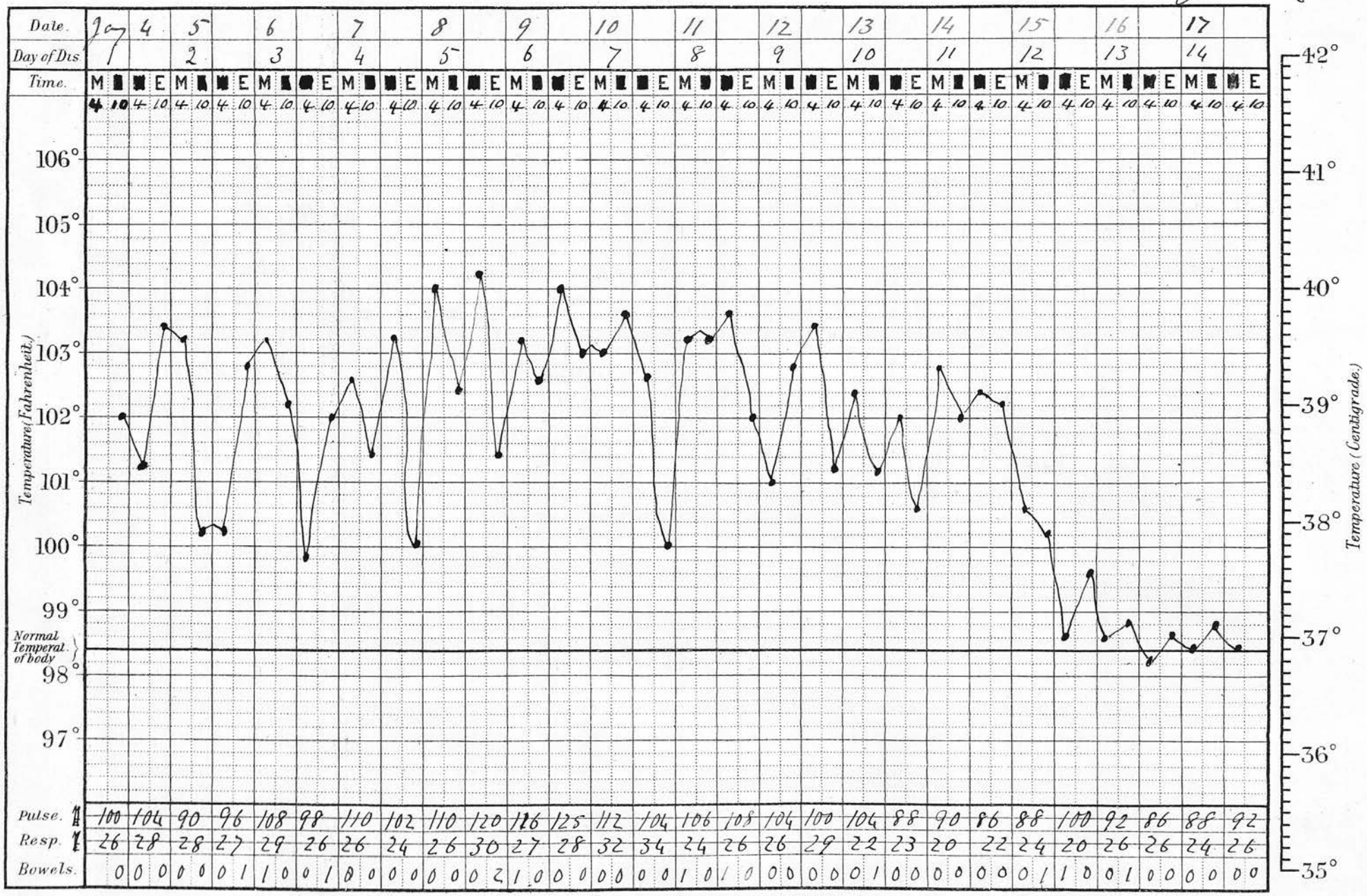
Name Nellie Wear Age 10 yr. Disease Typhoid Fever Admitted January 4th



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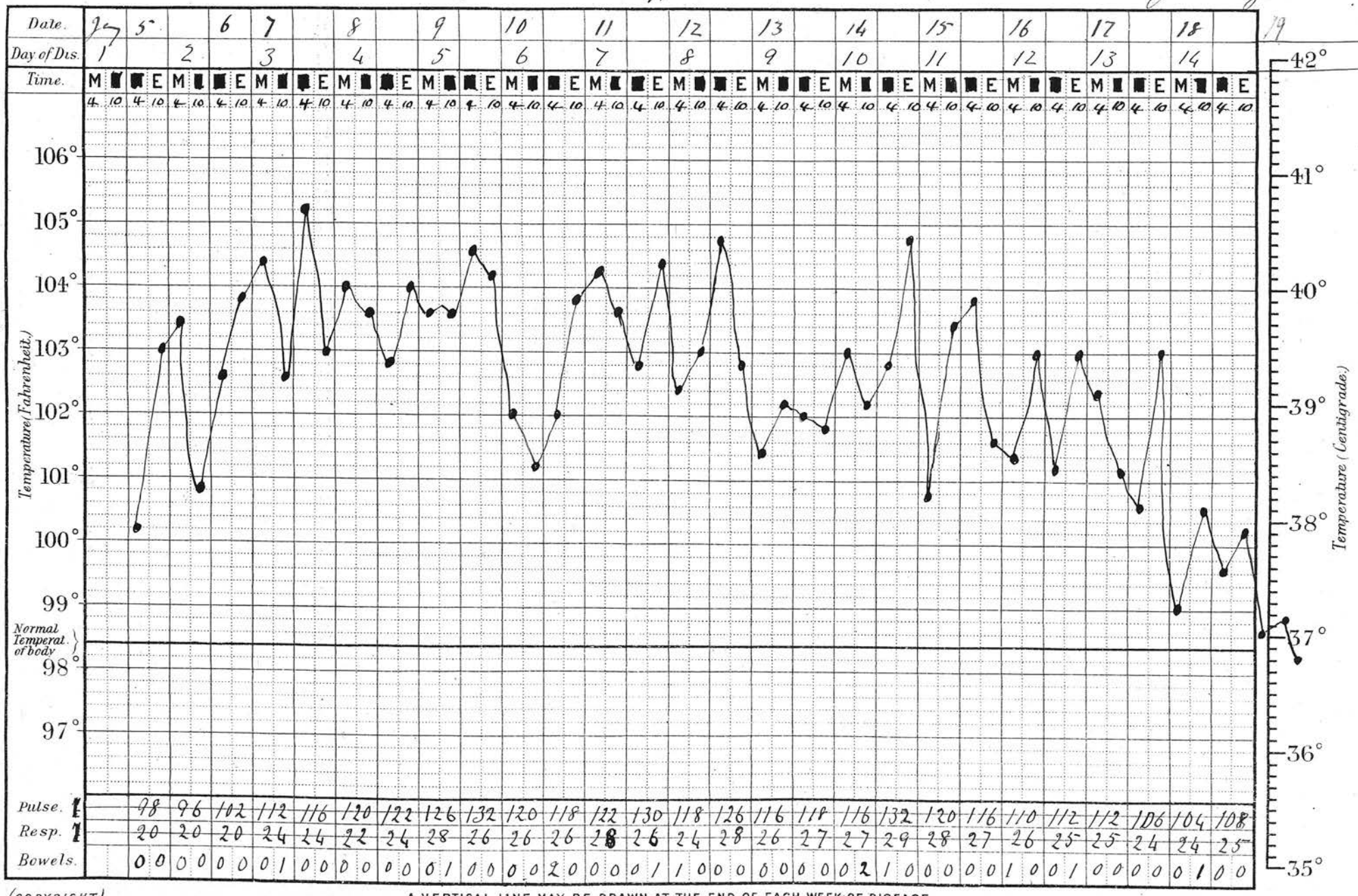
Name Emma Stabler Age 10 yrs Disease Typhoid Fever Admitted January 5th



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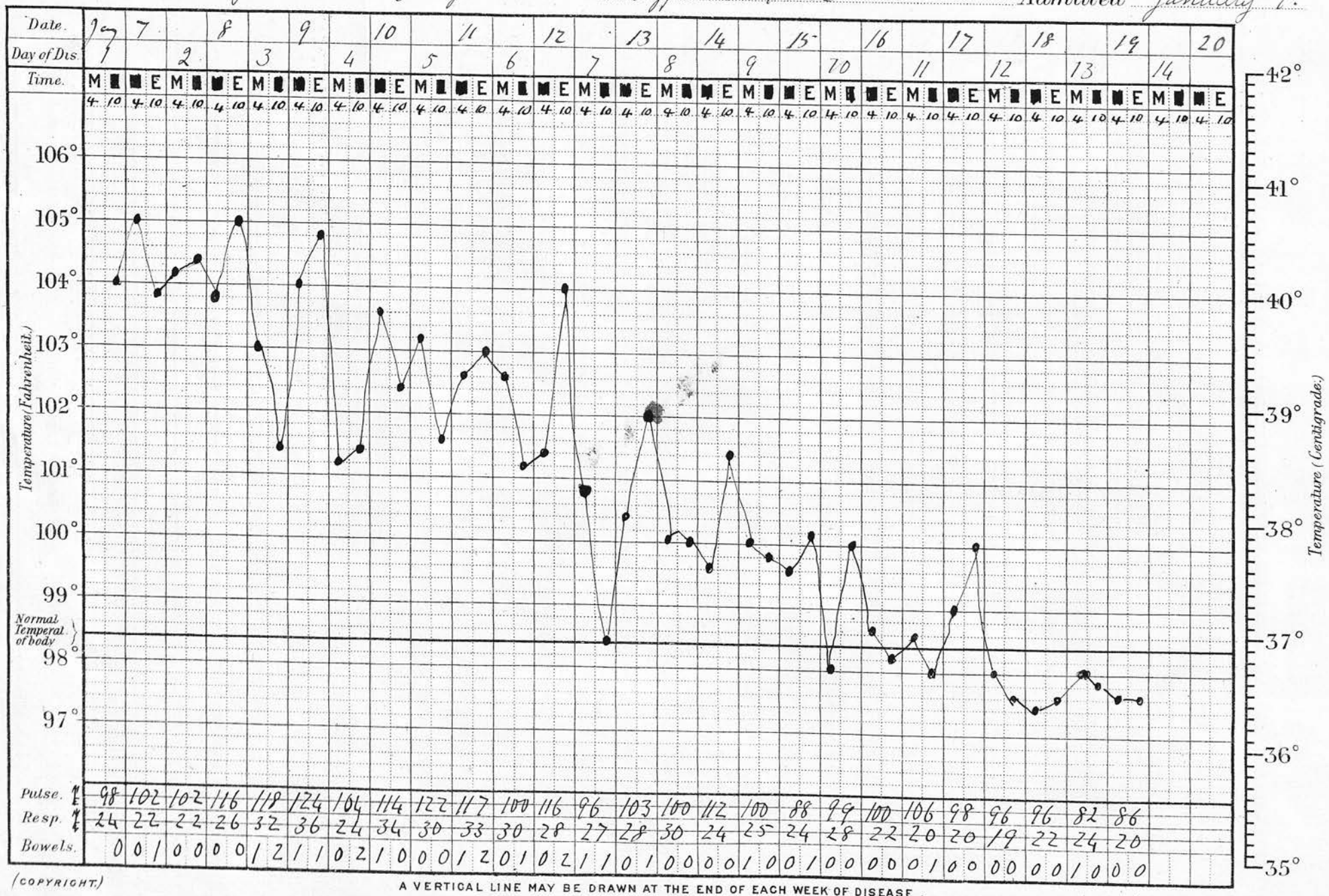
Name Willie Rymer Age 8 yrs Disease Typhoid Fever Admitted January 7th



Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse. M	98	102	118	104	122	100	96	100	112	88	99	106	96	96
Pulse. E	102	102	124	114	117	116	103		100	100	100	98		82
Resp. M	24	22	32	24	30	28	28	30	24	25	28	22	19	22
Resp. E	22	26	36	34	33	30	27			24		20		24
Bowels.	0	0	2	2	0	1	1	1	0	0	0	0	0	0

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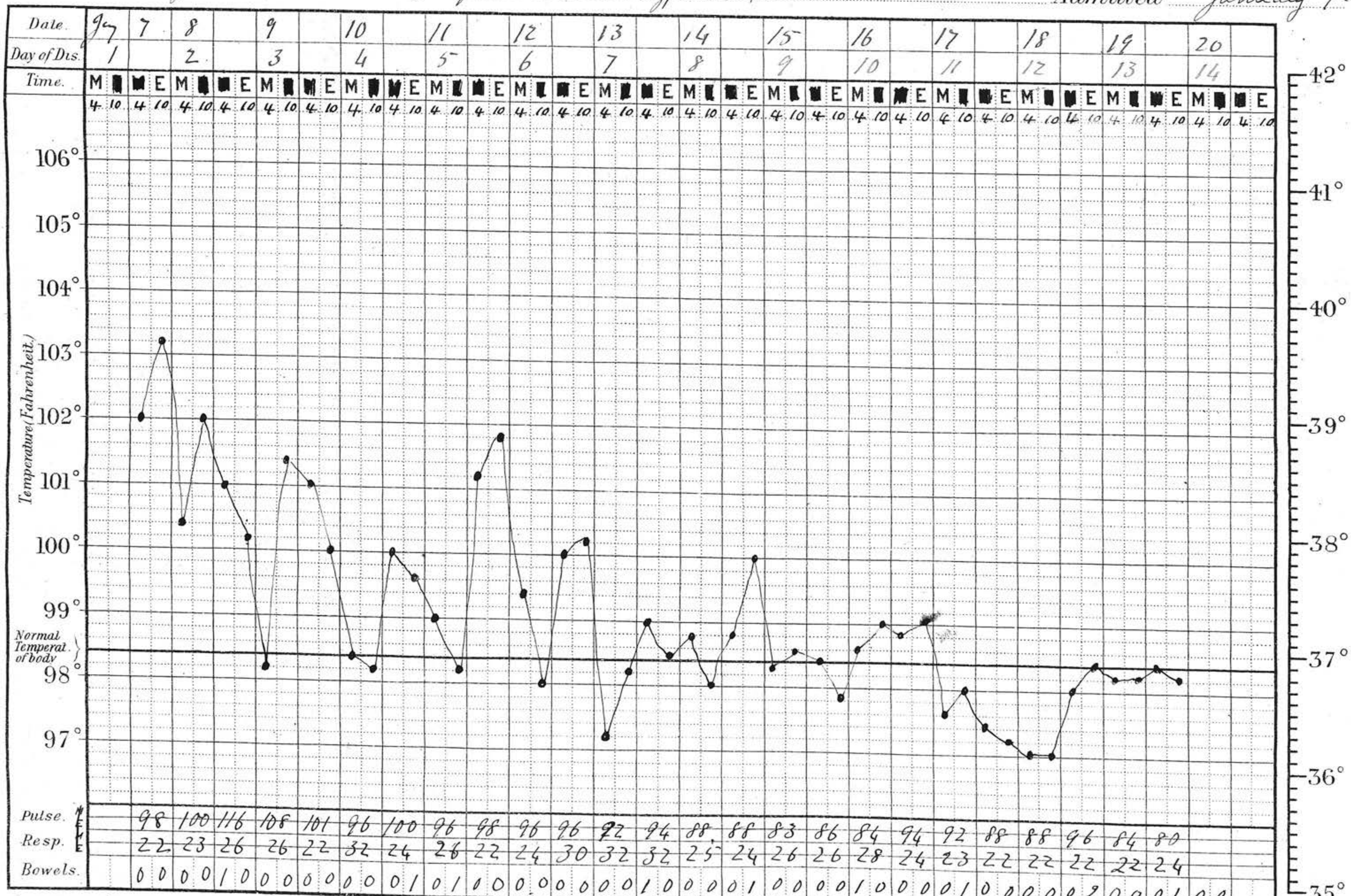
Name Daisy Stabler Age 8 yrs Disease Typhoid Fever Admitted January 7th



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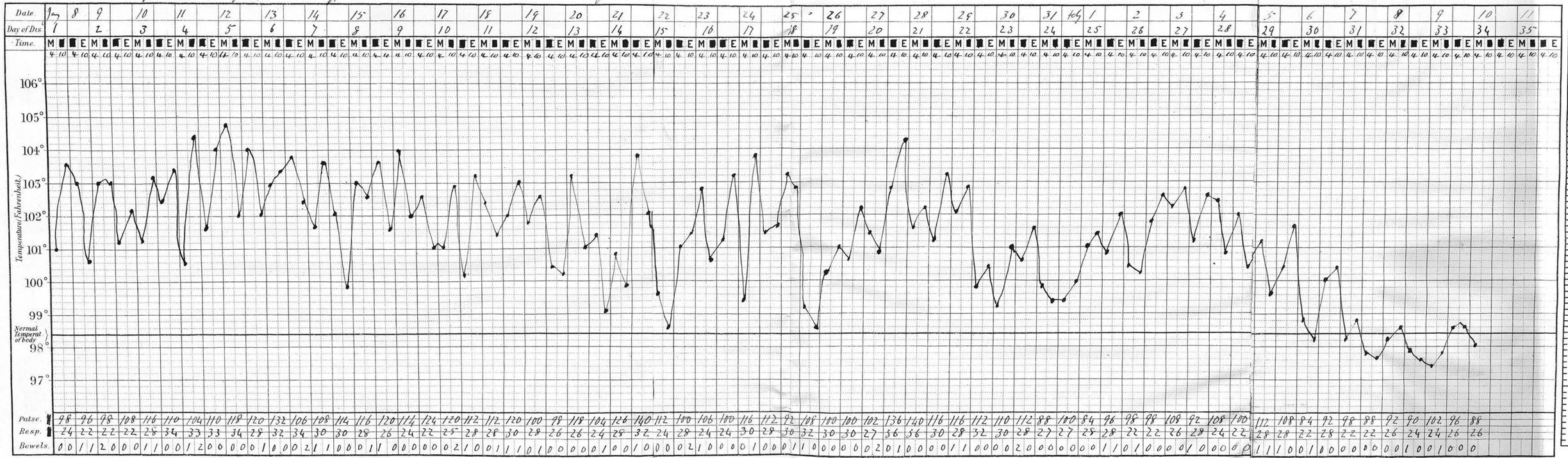
7

Name Willie Bailey Age 7yrs Disease Typhoid Fever Admitted January 9th

Age Disease Admitted

Admitted



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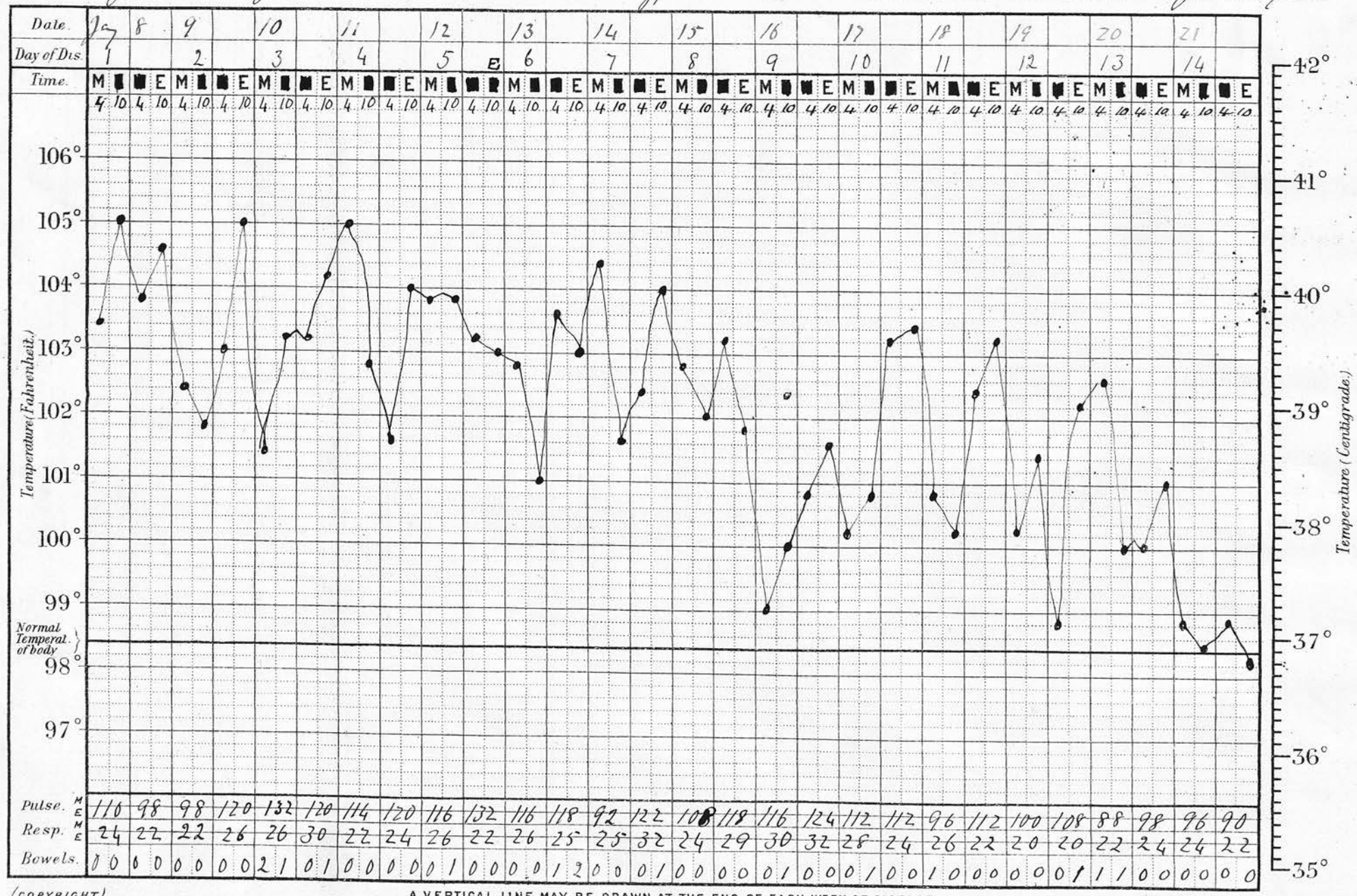
Name James Boylen Age 12 yrs Disease Typhoid Fever Admitted January 8th



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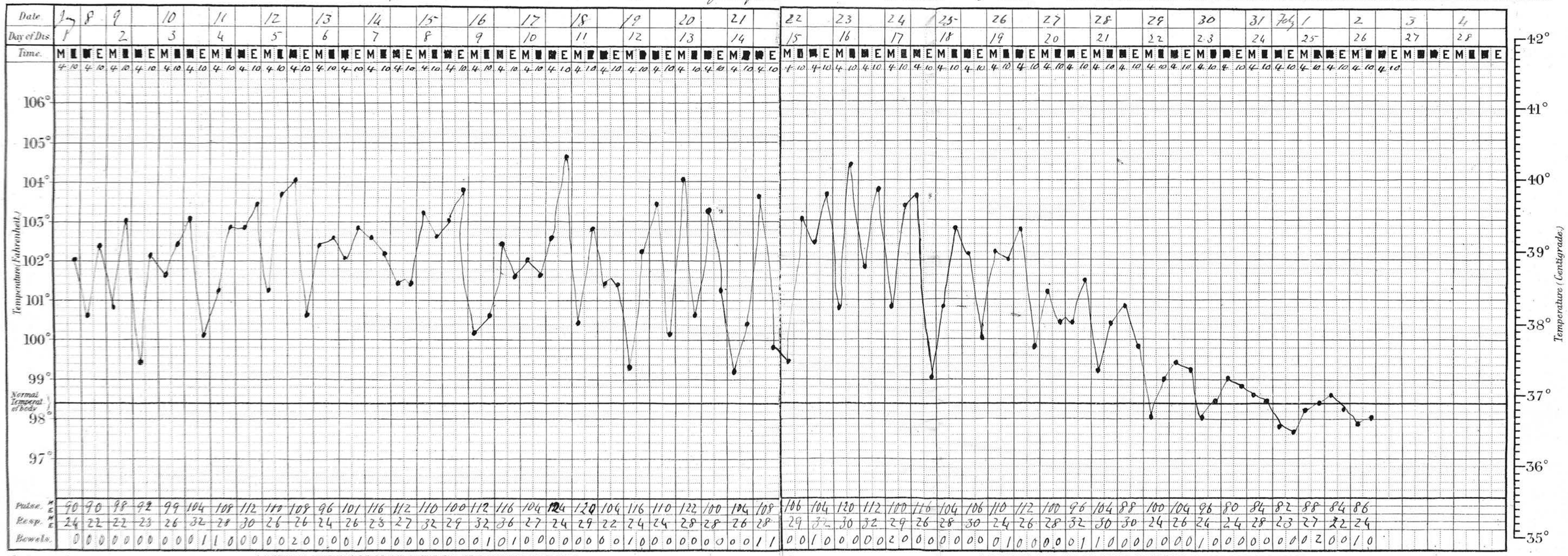
Name Harriet Stephenson Age 10yrs Disease Typhoid Fever Admitted January 8th

Age Disease Admitted



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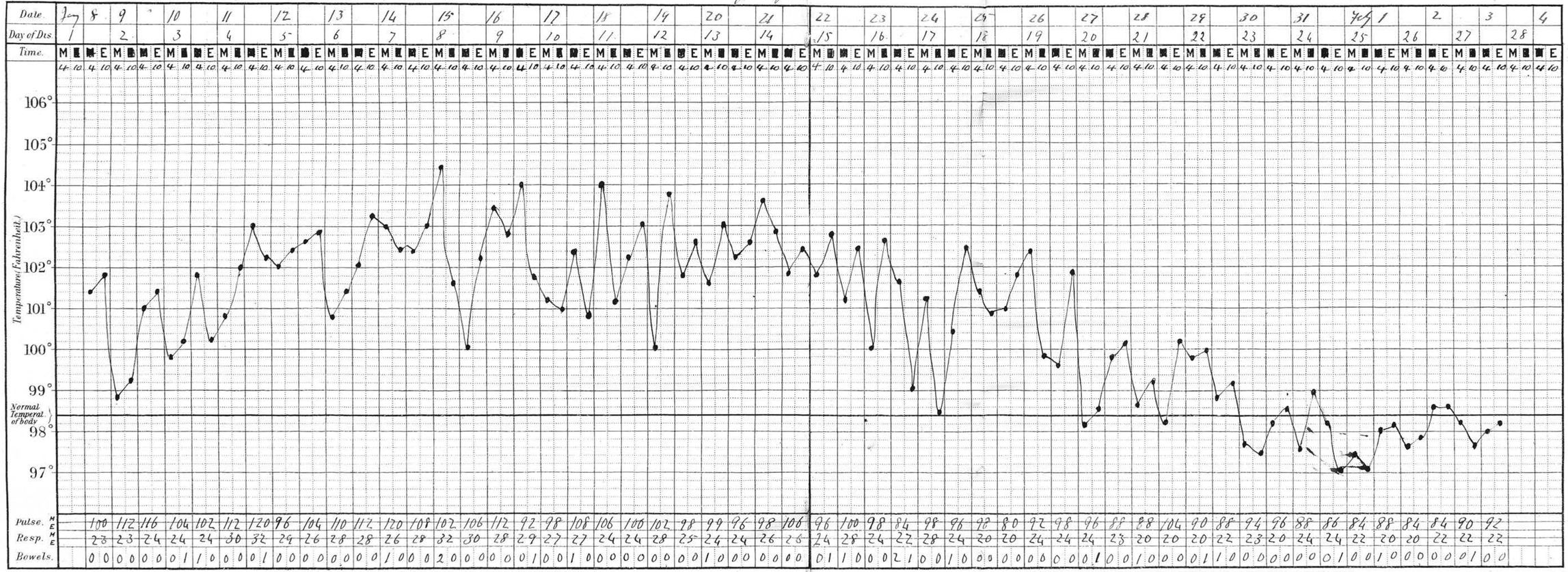
Name Florrie Stabler Age 12 yrs Disease Typhoid Fever Admitted January 8th

Age Disease Admitted



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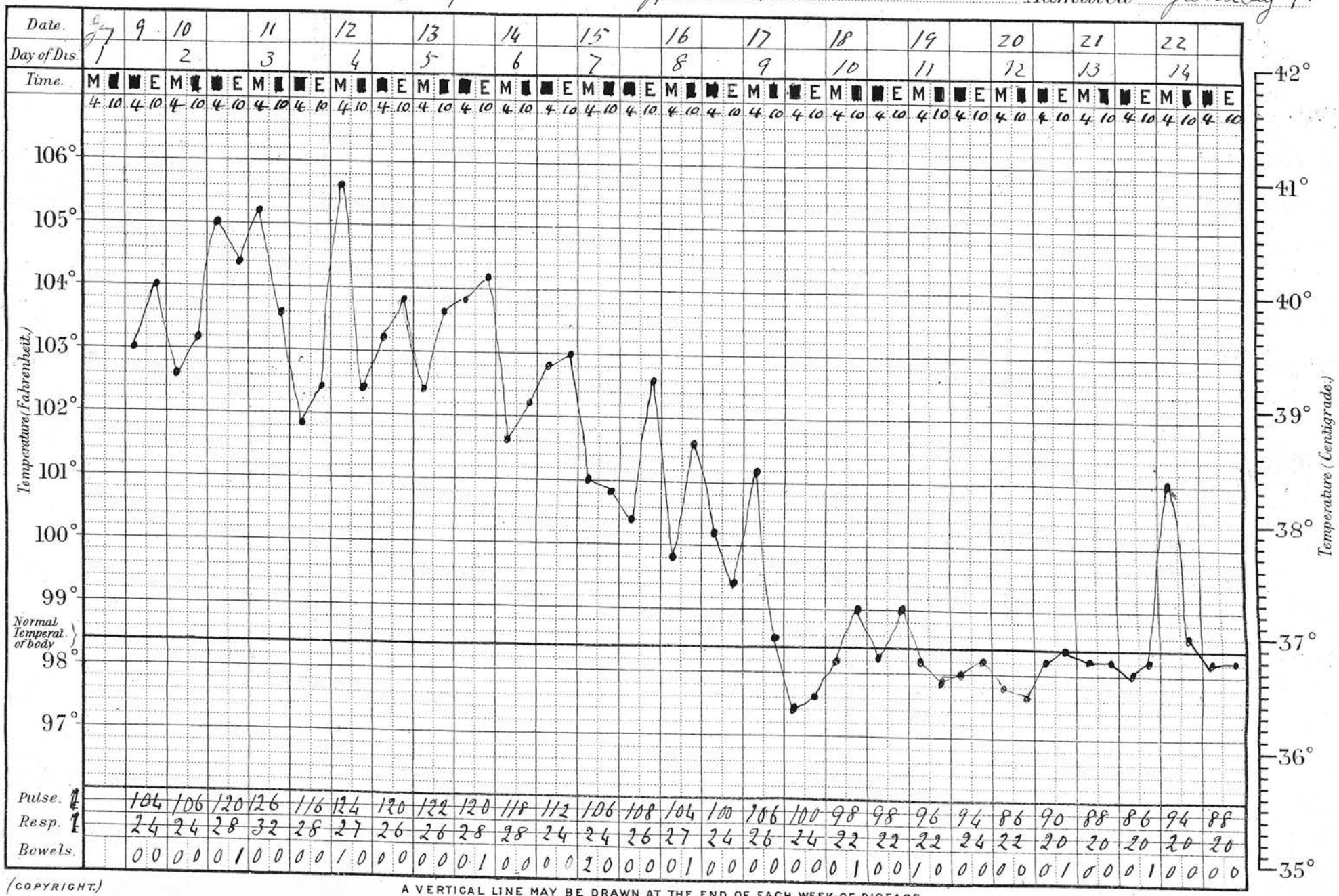
Name Annie Walker Age 8 yrs Disease Typhoid Fever Admitted January 9th



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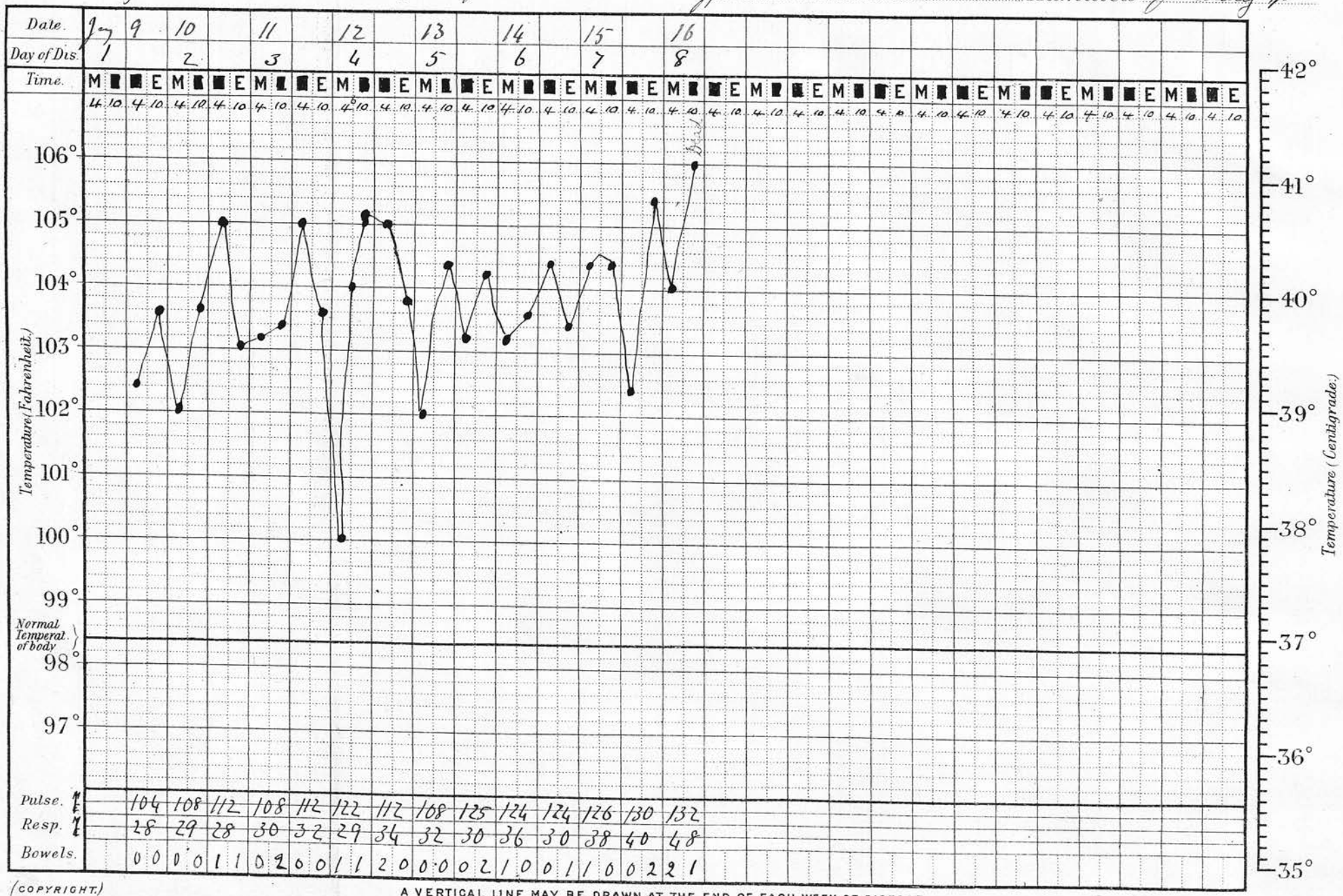
Name Elizabeth Woodward Age 23 yrs Disease Typhoid Fever Admitted January 9th

13.



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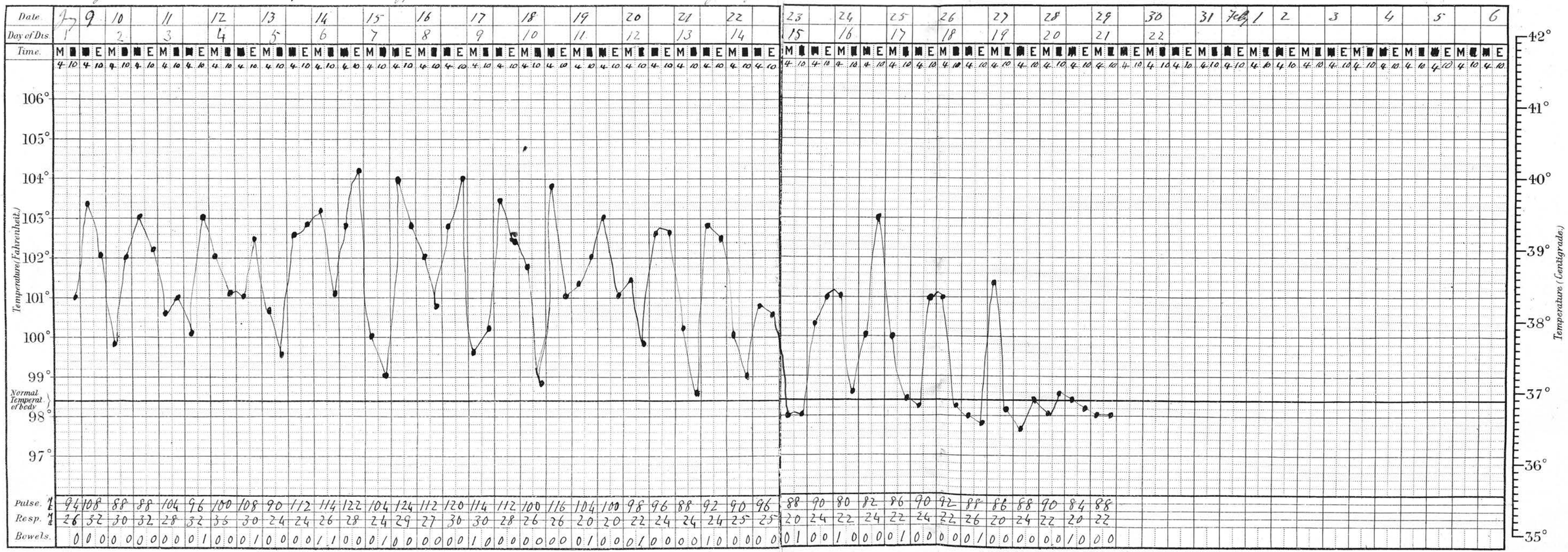
Name George Harwood Age 12 yrs Disease Typhoid Fever Admitted January 9th

Age Disease Admitted

14.



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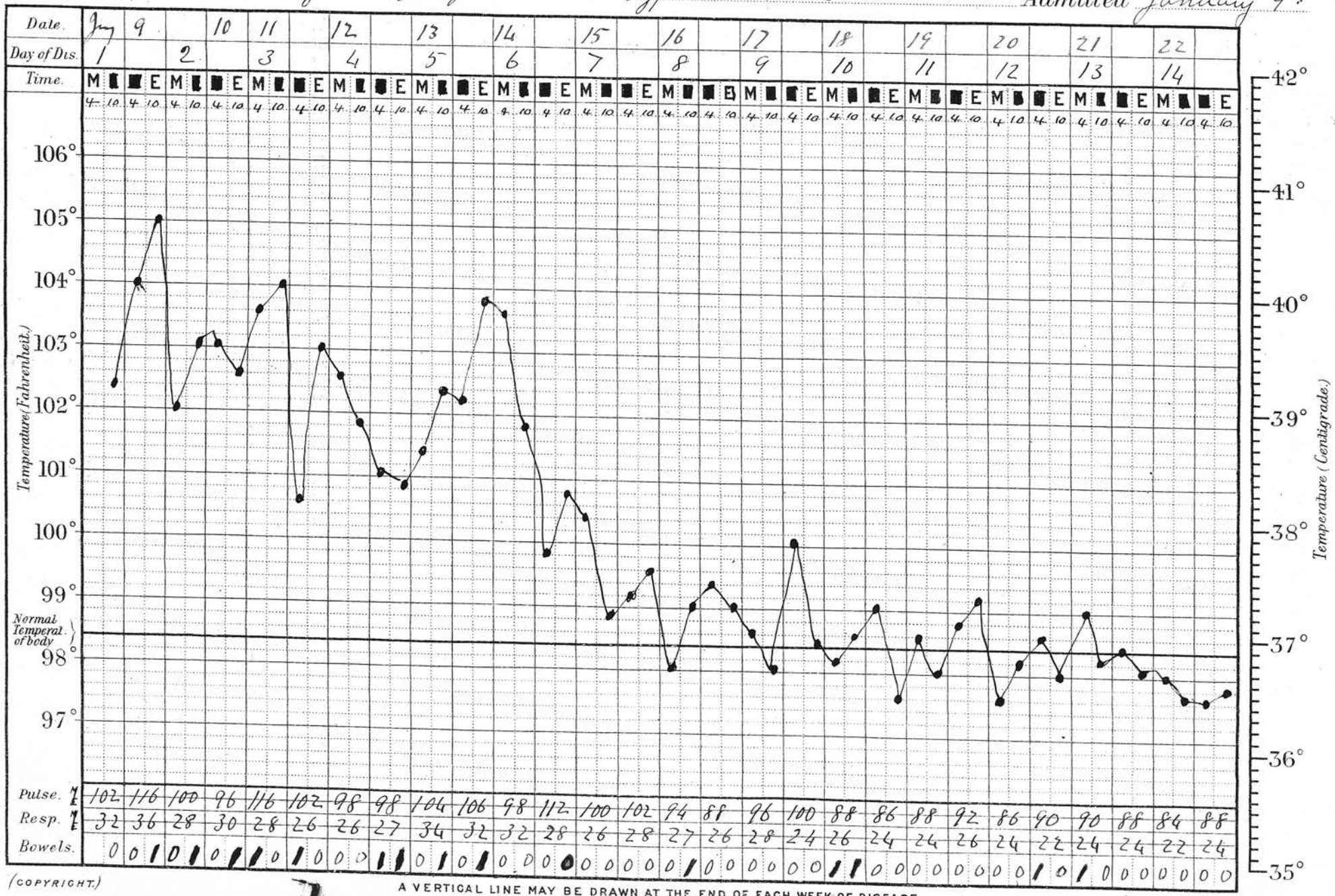
Name Alfred McCarthy Age 13 yrs Disease Typhoid Fever Admitted January 9th



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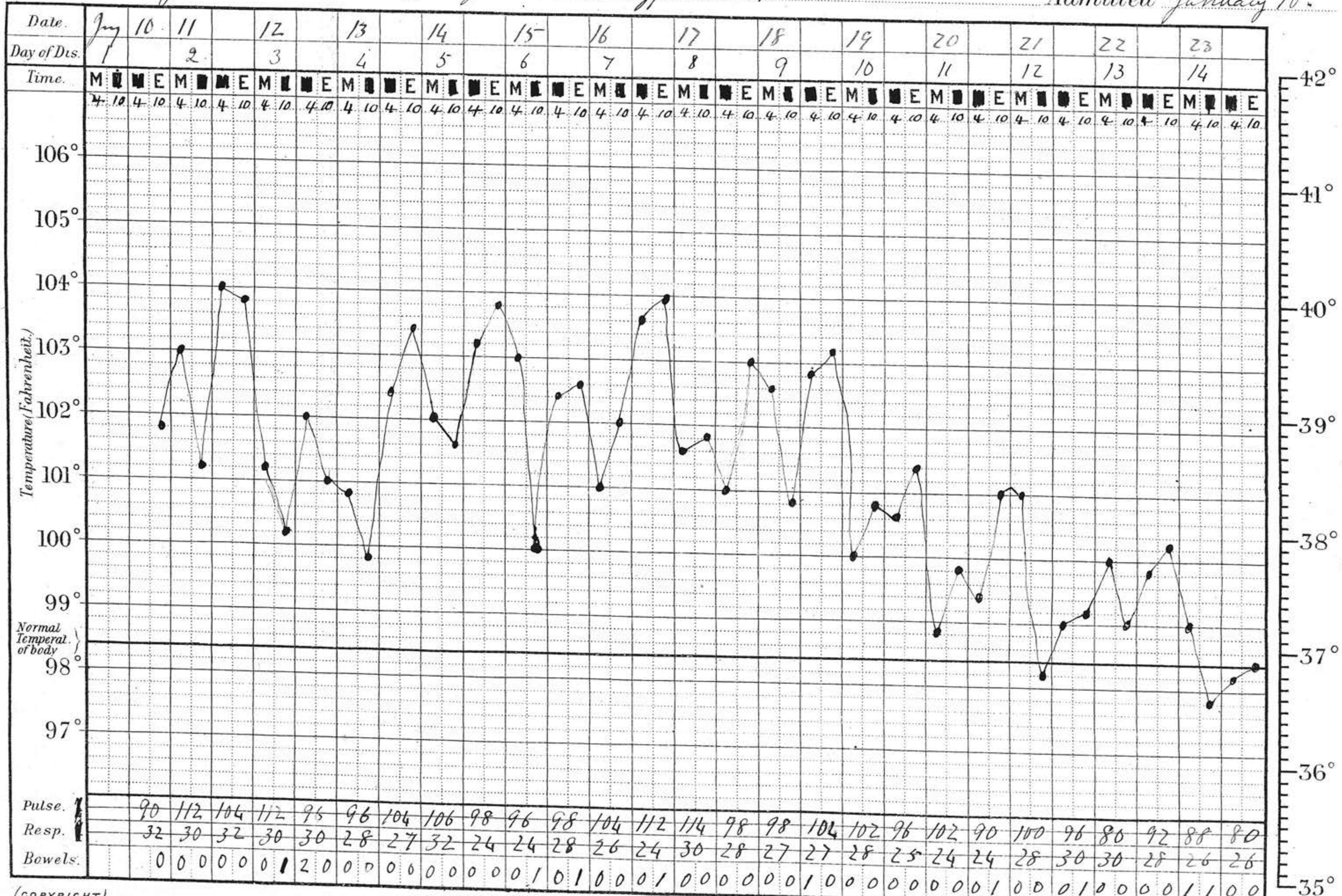
16.

Name *Henry Connor* Age *10 yrs* Disease *Typhoid Fever* Admitted *January 10th*



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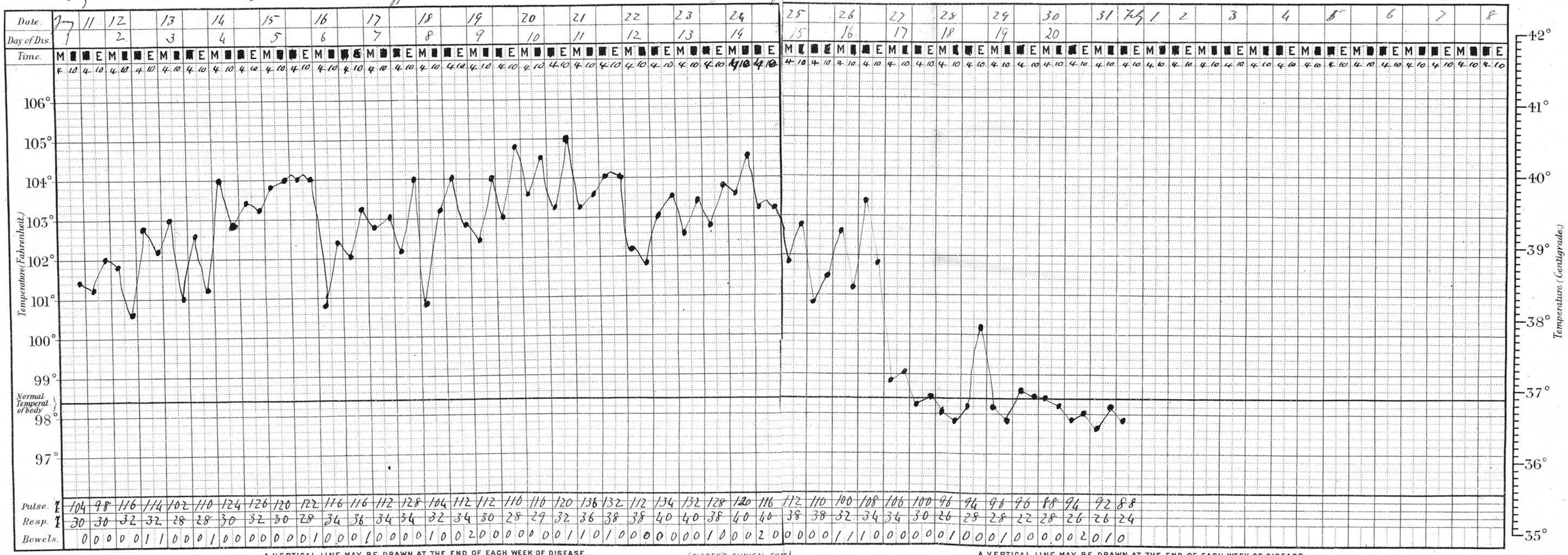
Name Elizabeth Hardman Age Disease Typhoid Fever Admitted January 11th Age Disease Admitted

17.



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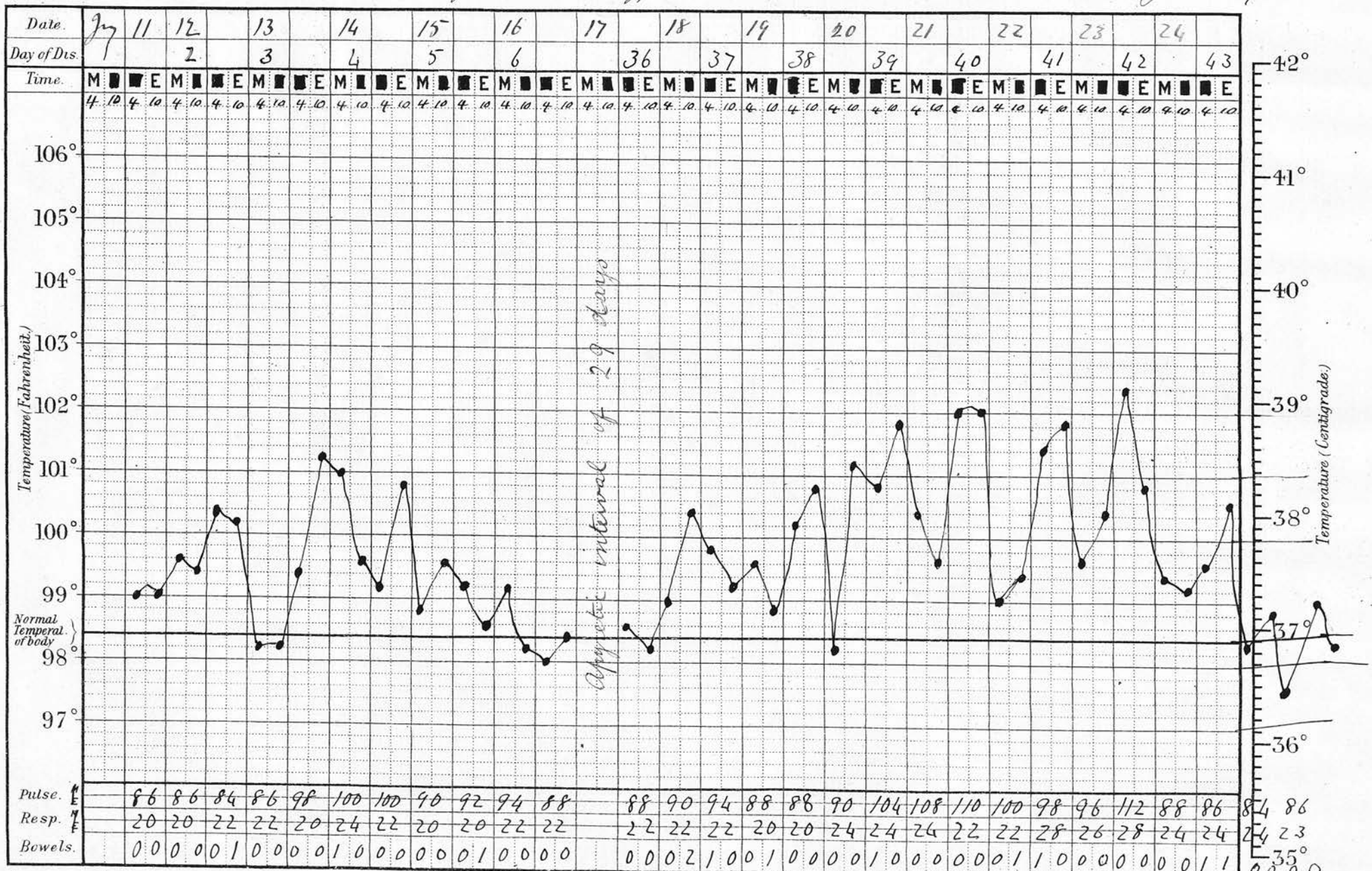
Name Leonard Short Age 10 yrs Disease Typhoid Fever Admitted January 11th



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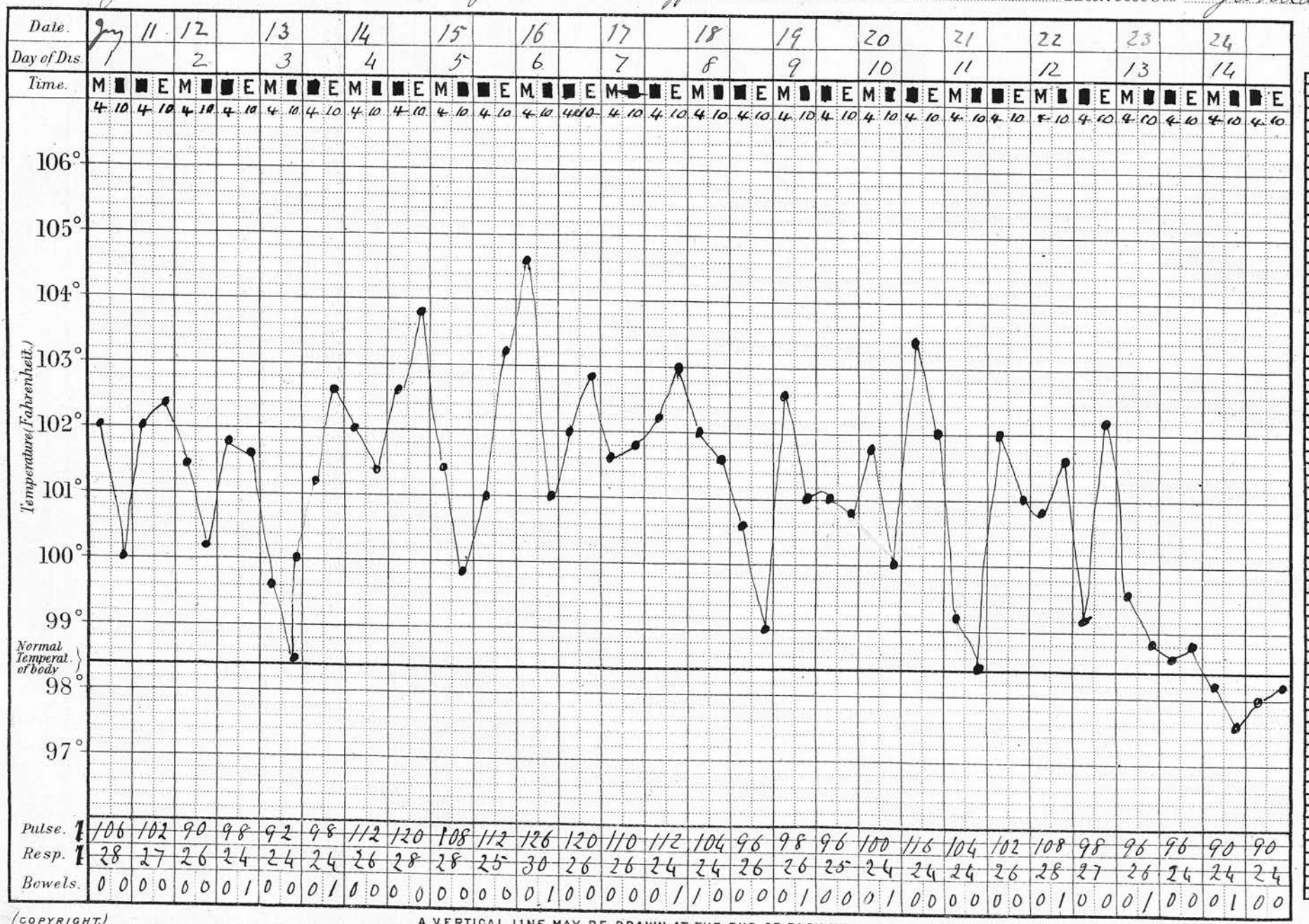
Name J. Stevenson Age 8 yrs. Disease Typhoid Fever Admitted January 11th



Date	Jan 11	12	13	14	15	16	17	18	19	20	21	22	23	24
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse.	106 102	90 98	92 98	112 120	108 112	126 120	110 112	104 96	98 96	100 116	104 102	108 98	96 96	90 90
Resp.	28 27	26 24	24 24	26 28	28 25	30 26	26 24	24 26	26 25	24 24	24 26	28 27	26 24	24 24
Bowels.	0 0	0 0	0 1	0 0	0 0	0 0	1 0	0 0	0 1	0 0	0 1	0 0	0 1	0 0

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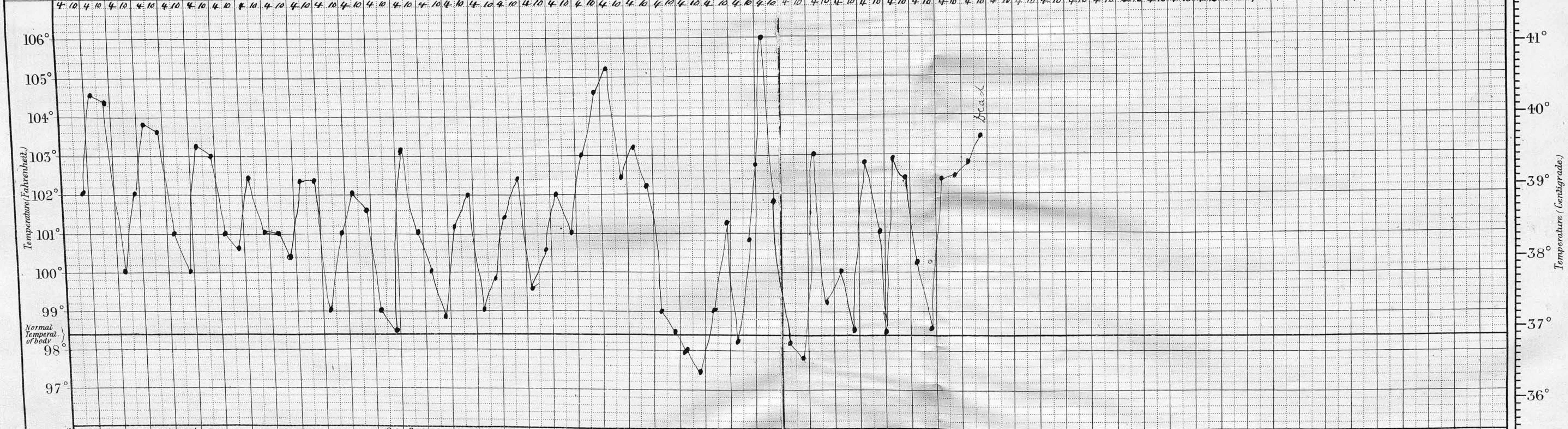
19

Name *James Robson* Age *47 yrs* Disease *Typhoid Fever* Admitted *January 12* | Age Disease Admitted

Date.	Jy 12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Time. M E (4 10)



Pulse.	104	100	104	88	106	104	102	110	88	92	98	100	96	98	88	92	96	98
Resp.	28	24	24	20	24	24	26	34	28	22	28	24	24	22	20	22	24	22
Bowels	3 1	0 0	1 0	0 0	0 1	1 0	0 0	0 0	2 1	1 0	0 0	0 0	0 0	1 0	0 0	0 0	0 0	0 0

Pulse.	90	94	116	120	132	118	100	92	124	130	80	100	92	120	126	120	124	142
Resp.	26	28	32	36	30	34	28	24	24	32	28	28	36	32	30	32	36	40
Bowels	1 0	1 0	0 0	0 0	1 1	0 0	0 0	0 1	0 0	0 0	0 1	0 1	0 0	0 0	0 2	1 0	0 1	0 0

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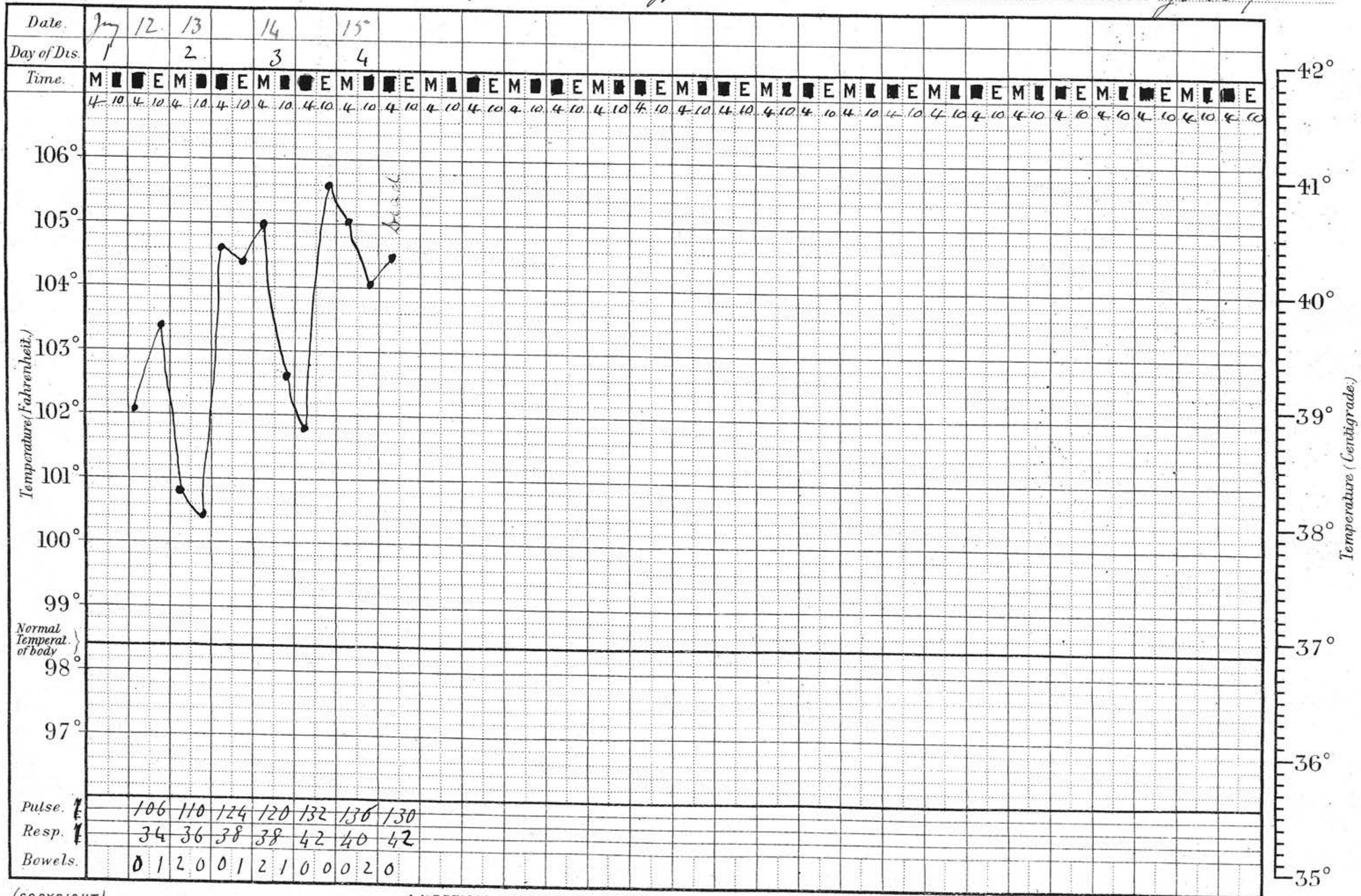
Name Charles Dixon Age 20 yrs Disease Typhoid Fever Admitted January 12th

21.



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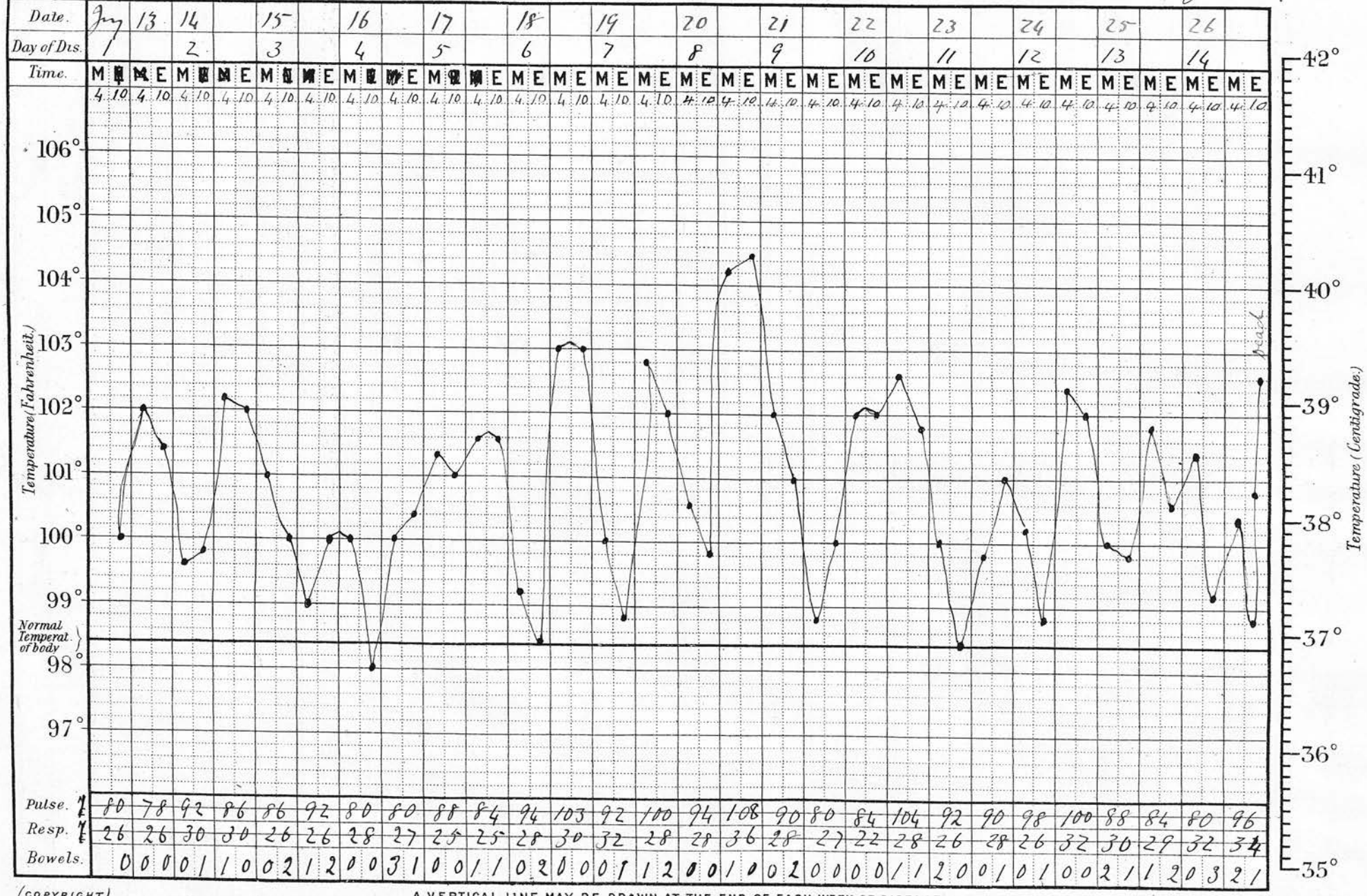
(RIGDEN'S CLINICAL CHART.)

Name Thomas Greenwood Age 78 yrs Disease Typhoid Fever Admitted January 13th



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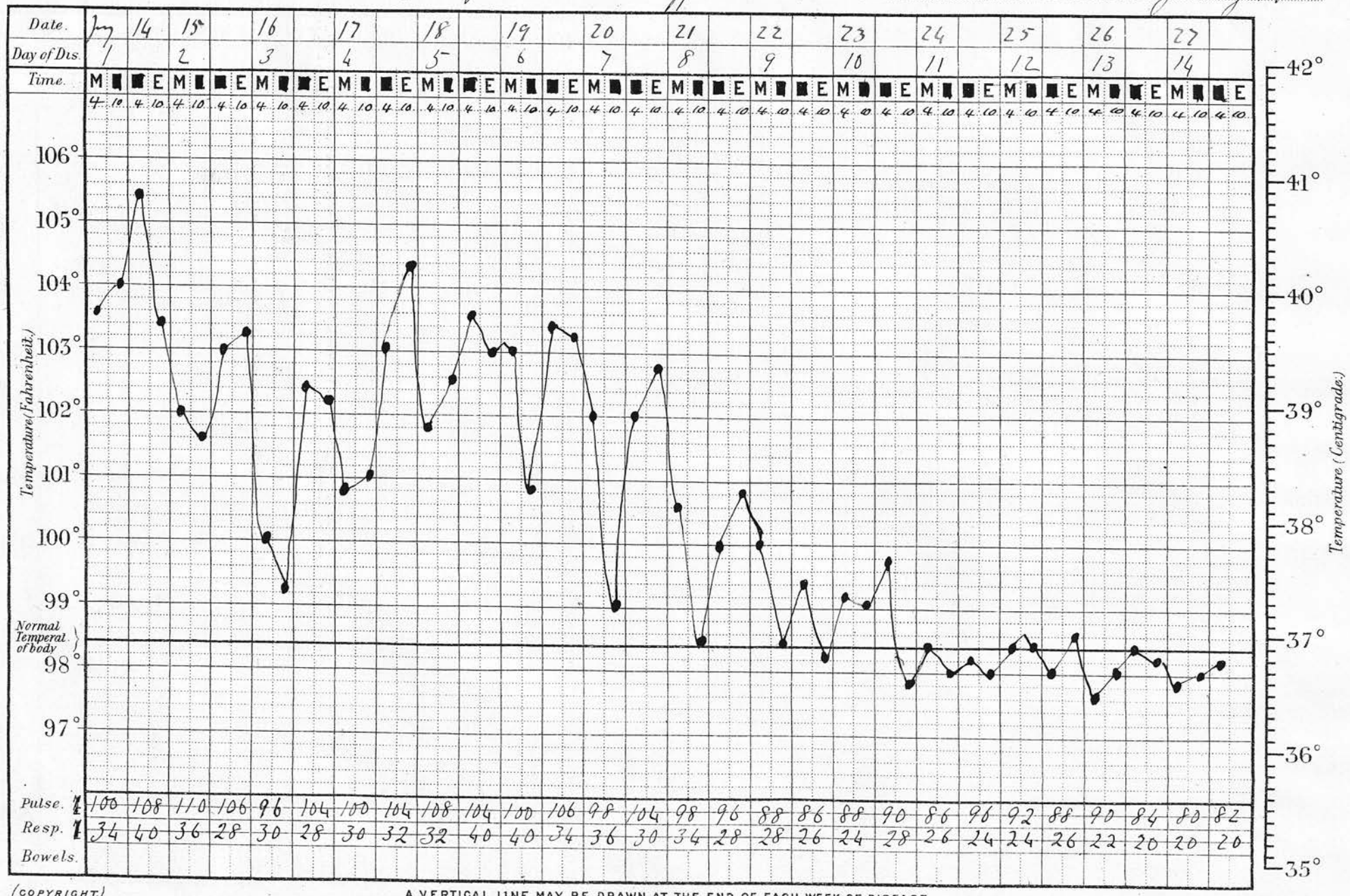
Name Cuthbert Rowantree Age 60yrs Disease Typhoid Fever Admitted January 14th



Date	Jan 14	15		16		17		18		19		20		21		22		23		24		25		26		27	
Day of Dis.	1		2		3		4		5		6		7		8		9		10		11		12		13		14	
Pulse.	100	108	110	106	96	104	100	104	108	104	100	106	98	104	98	96	88	86	88	90	86	96	92	88	90	84	80	82
Resp.	34	40	36	28	30	28	30	32	32	40	40	34	36	30	34	28	28	26	24	28	26	24	24	26	22	20	20	20
Bowels.																												

23.

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Name James Slattery Age 9yrs Disease Typhoid Fever Admitted January 14th Age Disease Admitted

24.

Date	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse.	96 80 96 108 100 96 112 104 116 98 96 104 104 108 100 104 96 88 100 116 112 112 98 116 118 110 100													
Resp.	26 30 30 24 24 28 22 34 28 32 28 28 29 32 32 30 28 30 30 26 22 24 24 27 24 22 22													
Bowels.	0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0													

Date	28	29	30	31	July 1	2	3	4	5	6	7
Day of Dis.	15	16	17	18	19	20	21	22	23	24	25
Pulse.	118 118 112 116 106 100 104 96 94 118 100 104 100 98 116 112 114 98 96 102 98 90										
Resp.	24 28 28 30 32 24 28 28 24 22 24 25 25 24 26 26 24 28 30 24 26 26										
Bowels.	0 1 1 0 0 0 0 1 0 0 1 0 0 0 0 0 2 0 1 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0 1 0										

106° 105° 104° 103° 102° 101° 100° 99° Normal Temperat. of body 98° 97°

Temperature (Fahrenheit.)

42° 41° 40° 39° 38° 37° 36° 35°

Temperature (Centigrade.)

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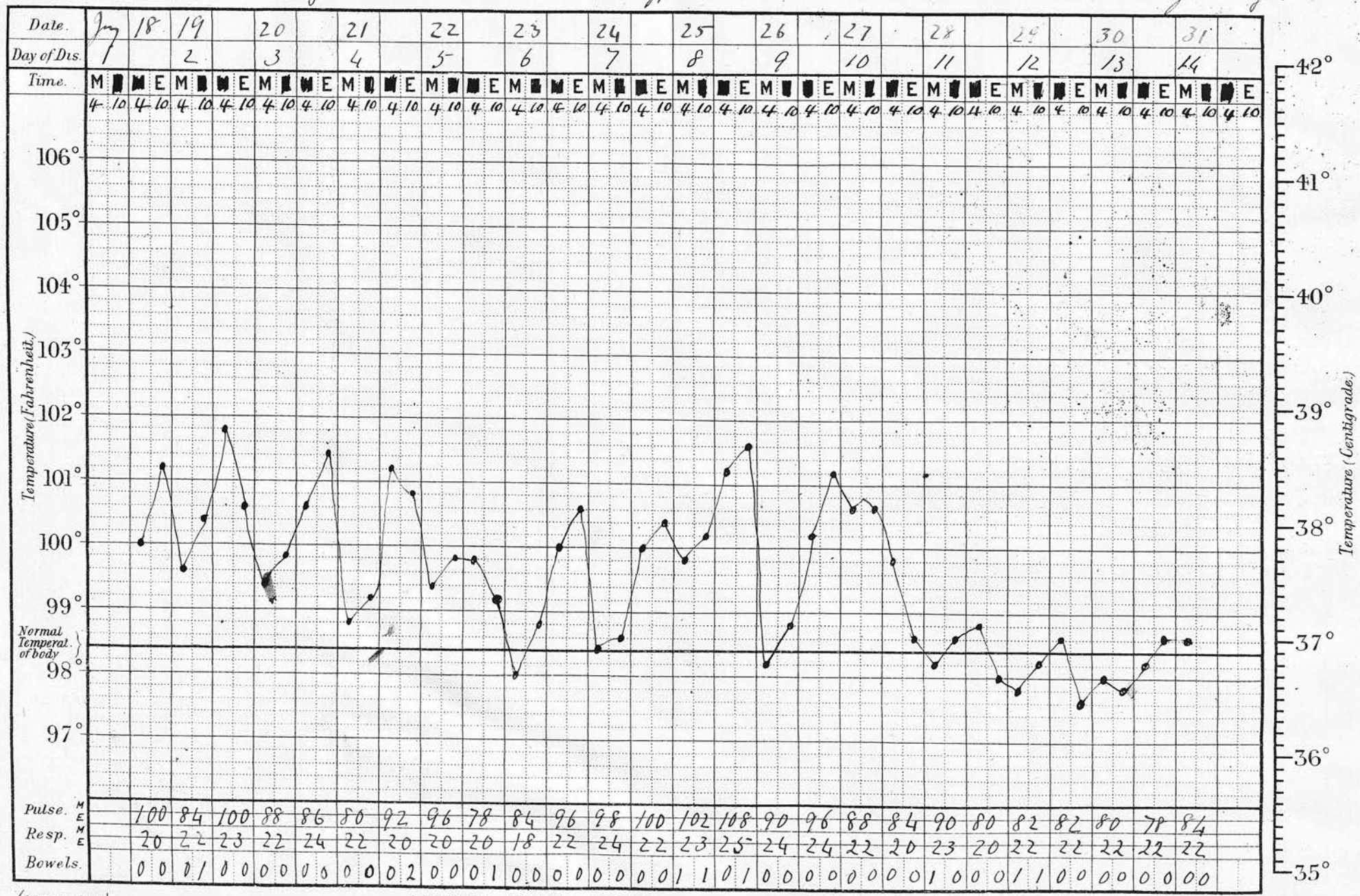
(RIGDEN'S CLINICAL CHART.)

Name Sarah Delaney Age 10 yrs. Disease Typhoid Fever Admitted January 18th



25.

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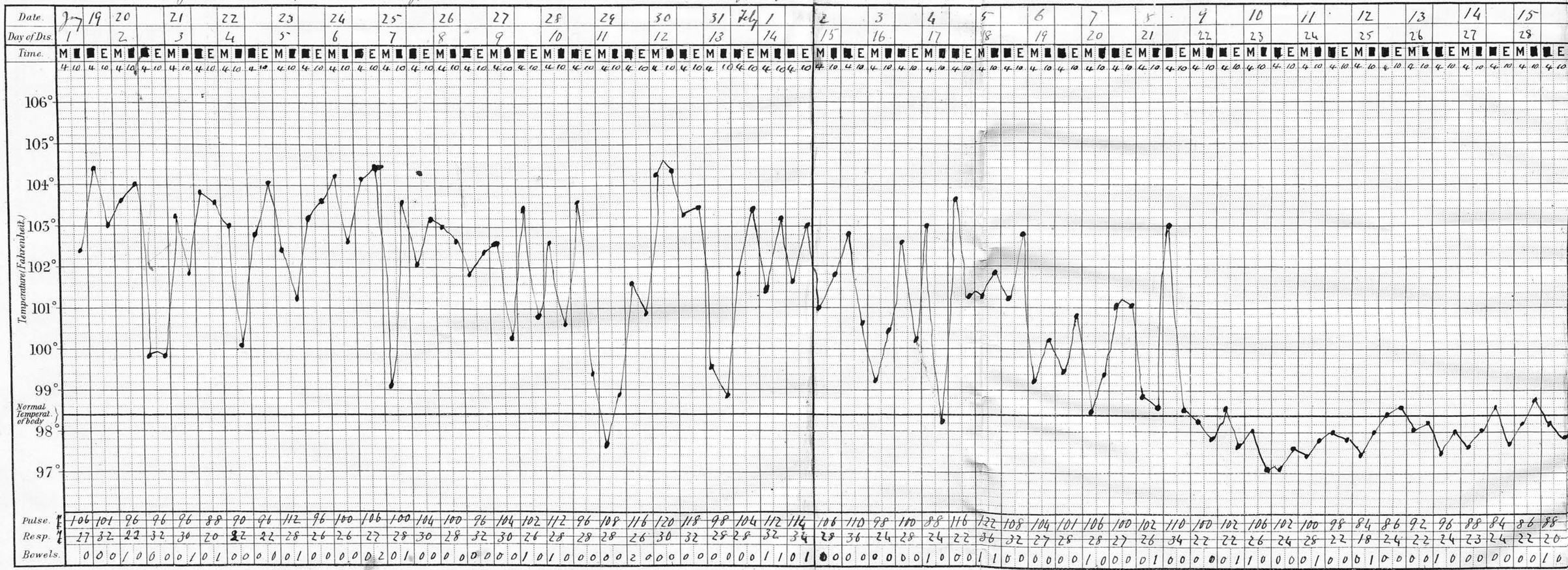
Name Nellie Delaney Age 9 yr. Disease Typhoid Fever Admitted January 19th

Age Disease Admitted



26.

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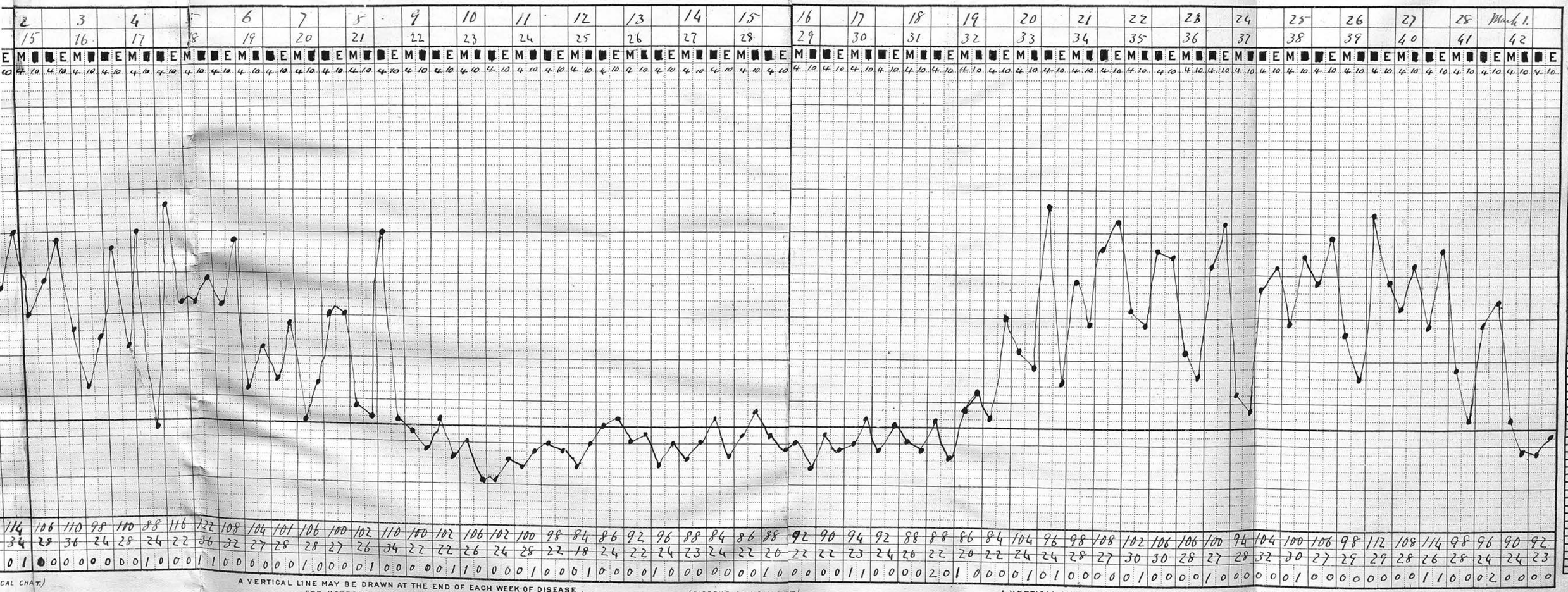
FOR NOTES OF CASE SEE BACK OF CHART.

Printed & Published by H.K.Lewis 136 Gower Street W.C.

Age Disease Admitted

Age Disease Admitted



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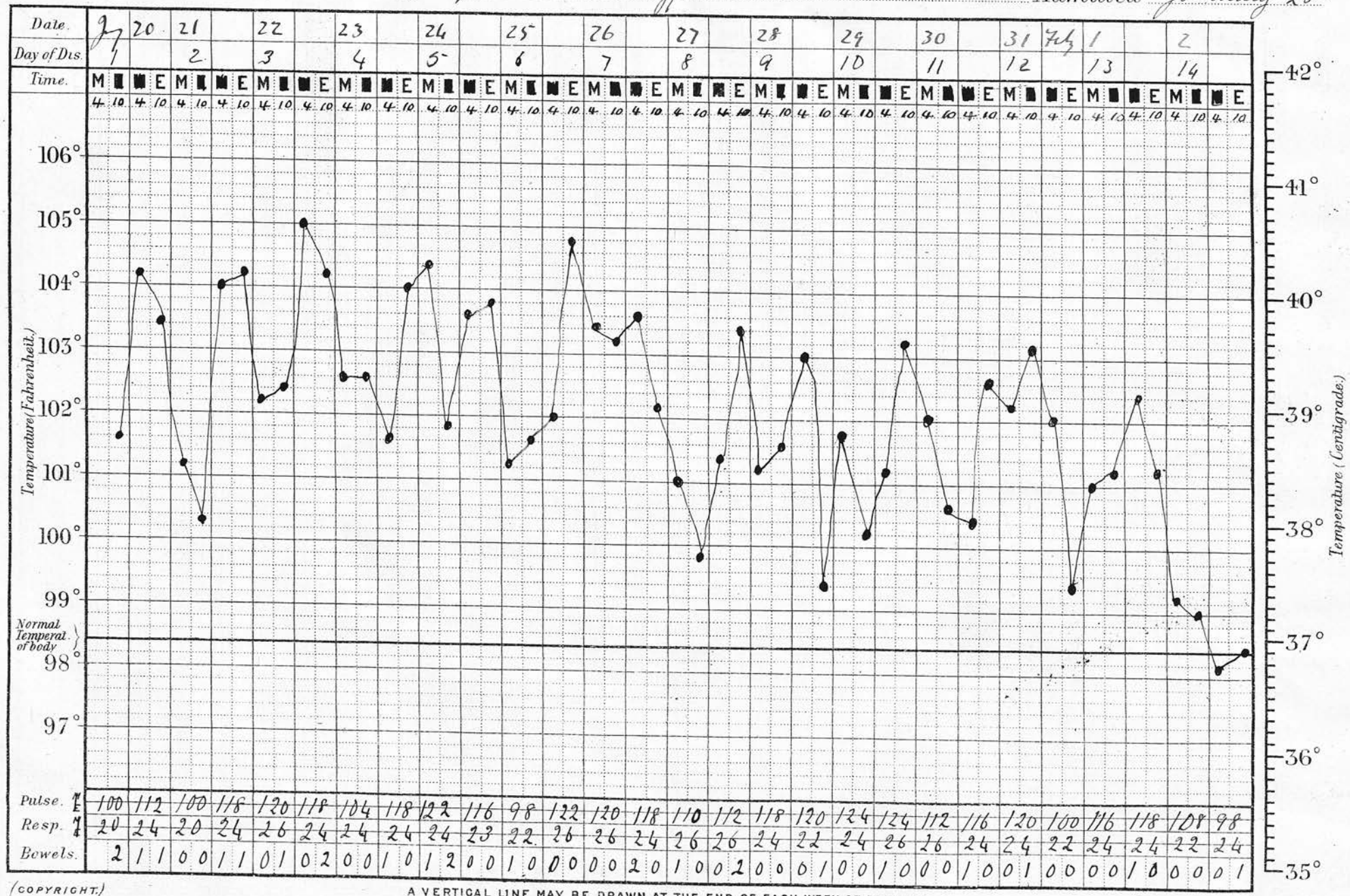
Name Frank Porter Age 6 yrs. Disease Typhoid Fever Admitted January 20th



27.

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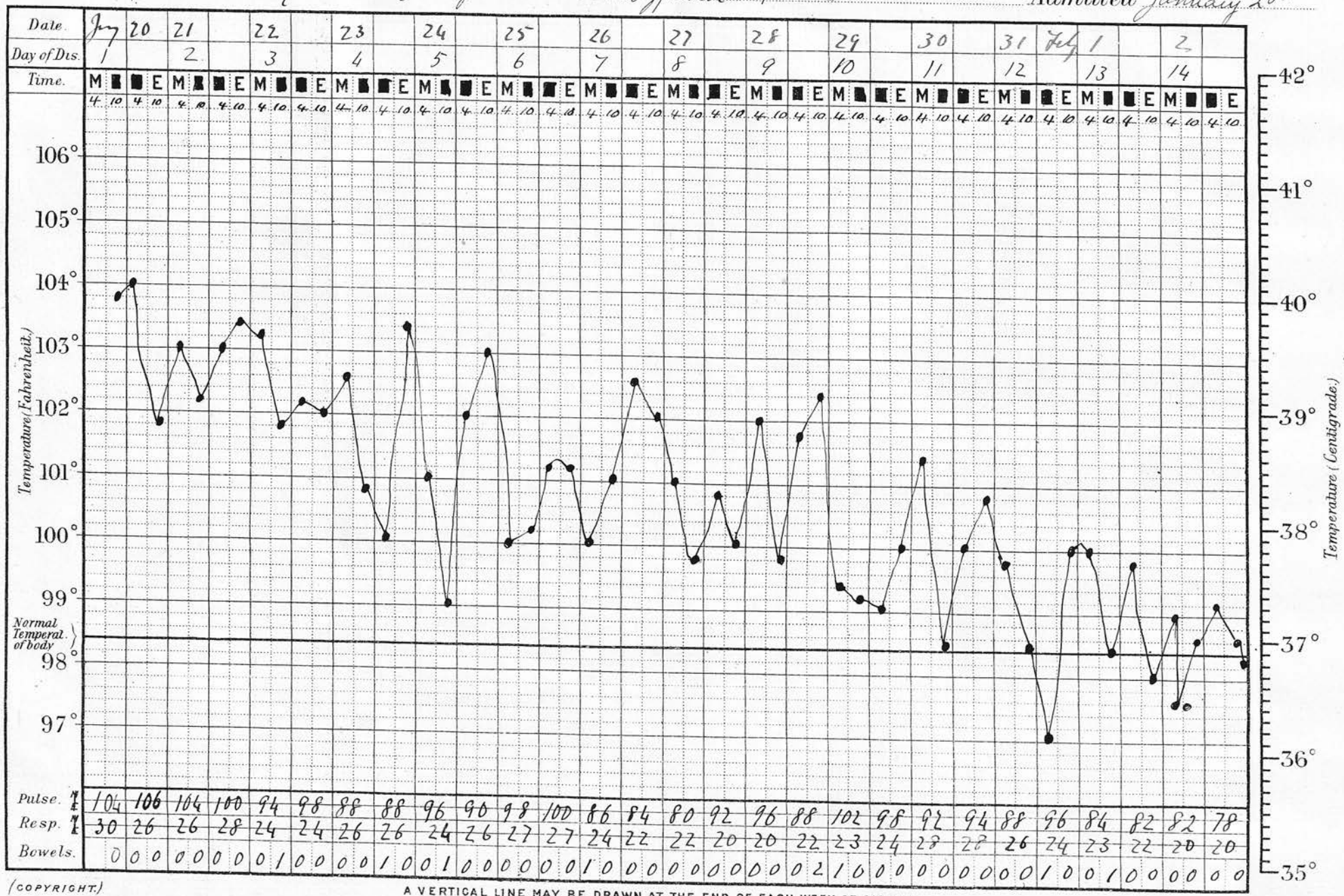
Name Thomas Garrity Age 10 yrs Disease Typhoid Fever Admitted January 20th



28.

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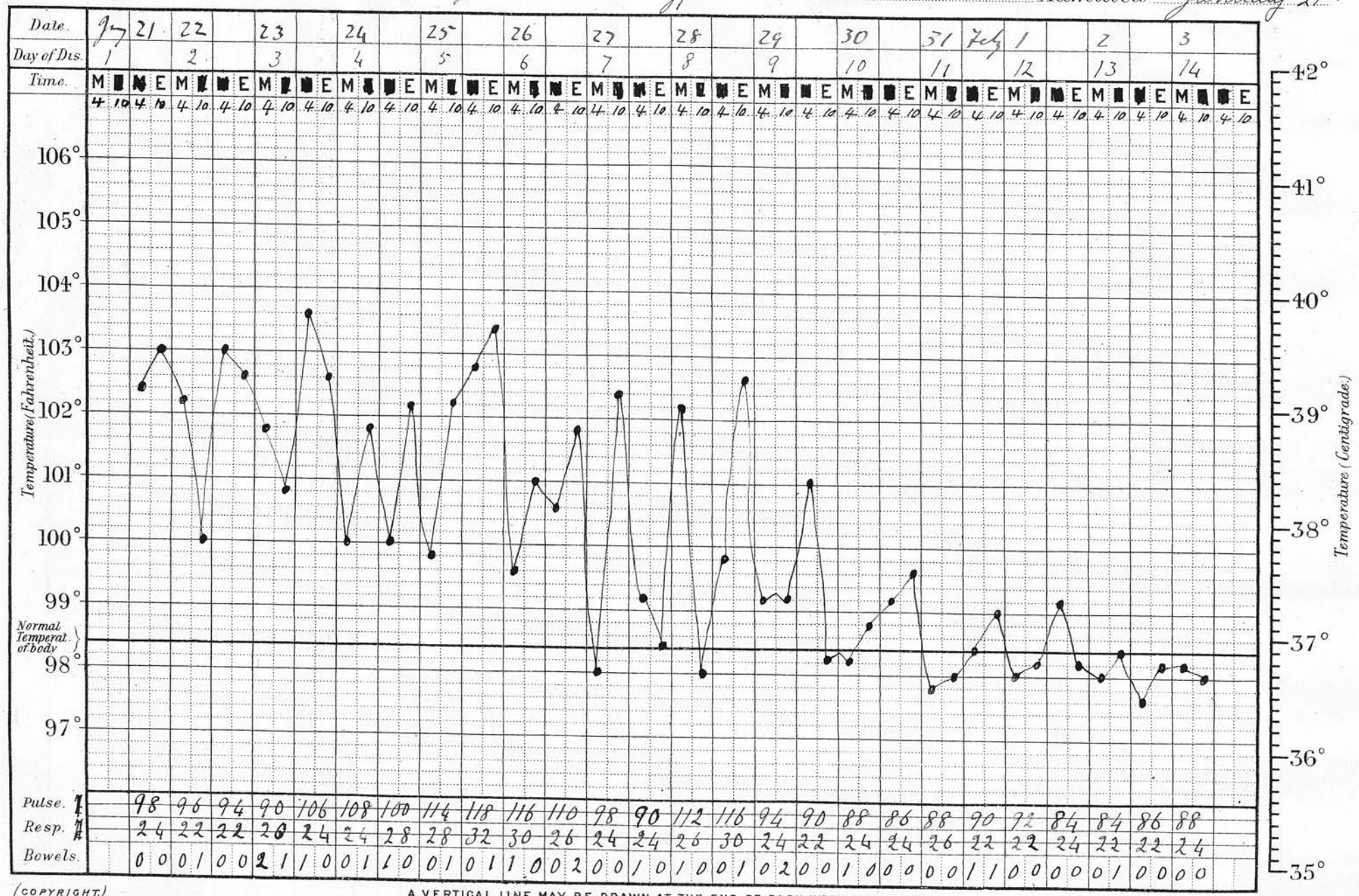
Name Budget Smith Age 8 yrs Disease Typhoid Fever Admitted January 21st

29.



Date	Jan 21	22	23	24	25	26	27	28	29	30	31	Feb 1	2	3
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse. M	98	96	90	108	100	118	110	90	112	94	88	88	90	84	86
Pulse. E	96	94	106	108	114	116	98	90	116	90	86	90	72	84	88
Resp. M	24	22	20	24	28	32	30	24	26	24	24	26	22	24	22
Resp. E	22	22	24	24	28	32	26	24	24	24	22	24	22	24	24
Bowels. M	0	0	2	1	0	1	1	0	2	0	1	0	0	0	0
Bowels. E	0	1	1	0	1	0	1	0	0	1	0	0	0	1	0

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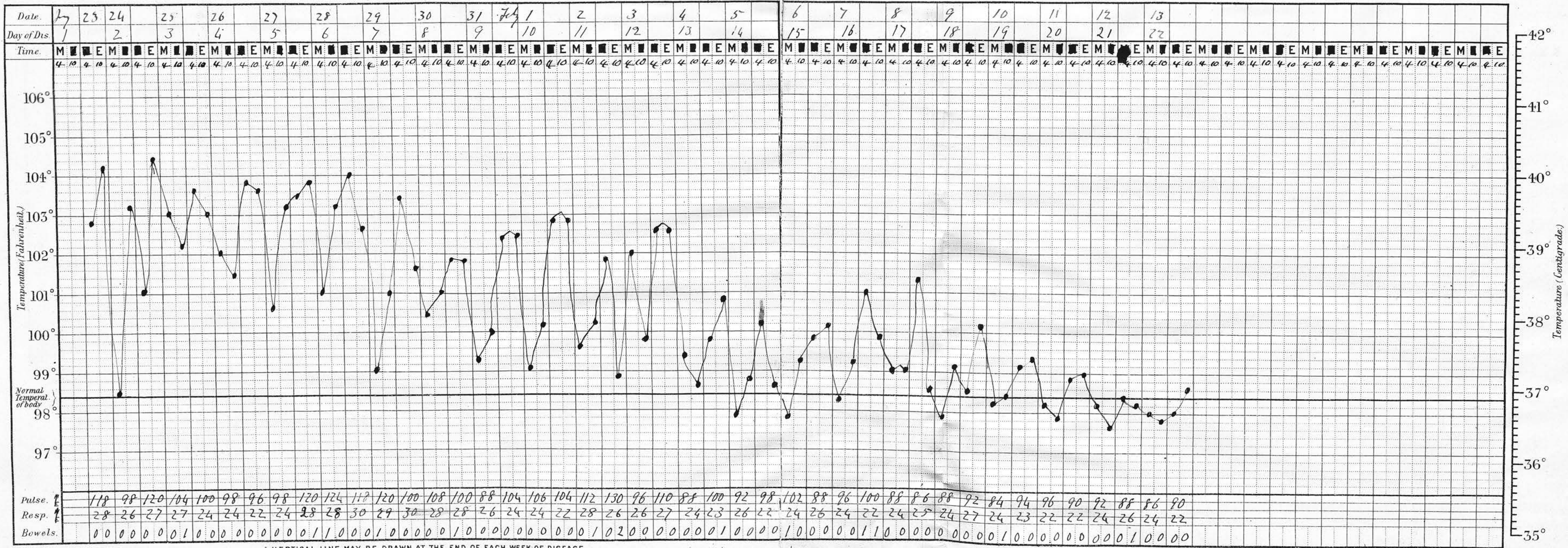
Name Walter Carlsen Age 10 yrs Disease Typhoid Fever Admitted January 23rd Age Disease Admitted



30

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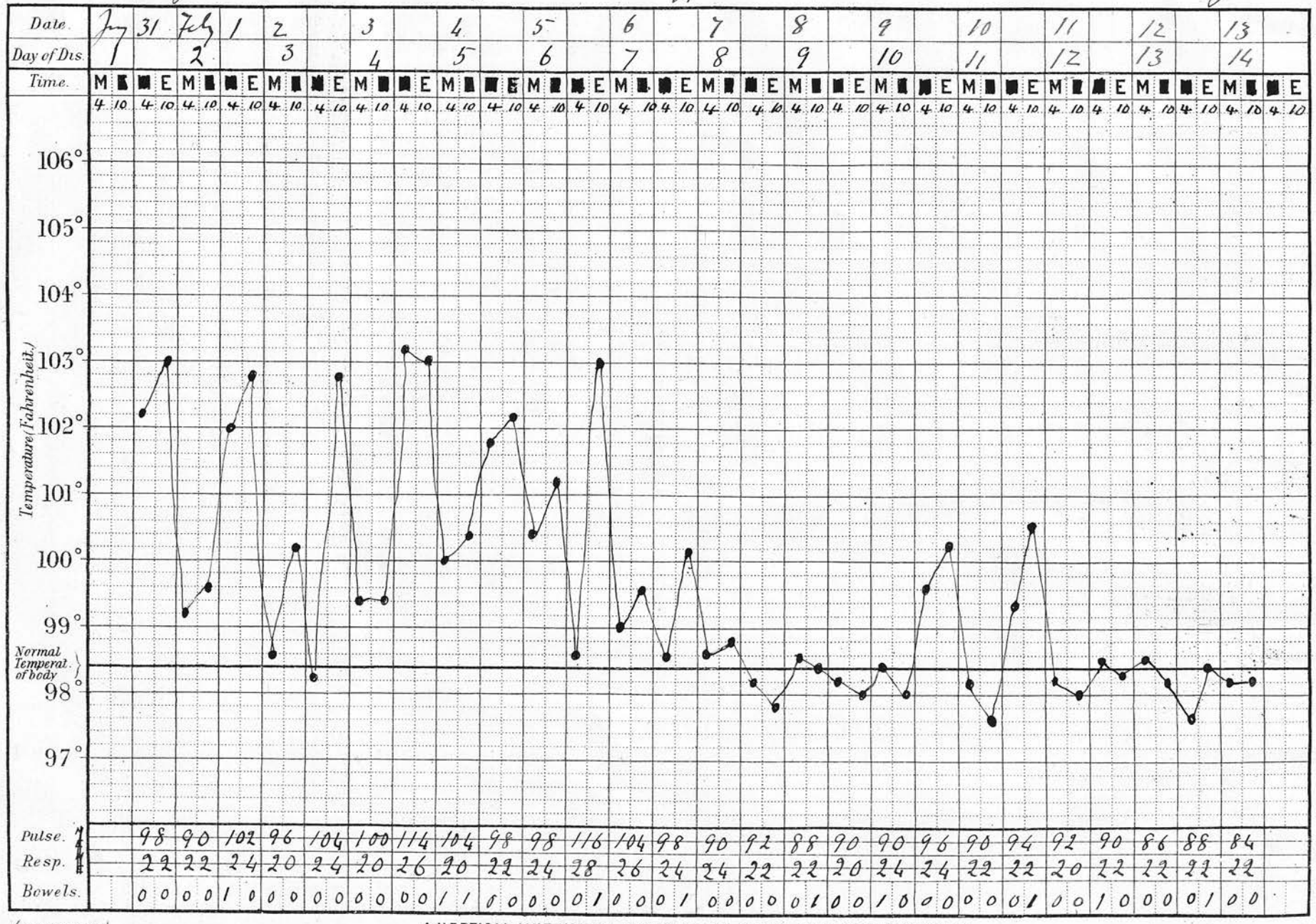
Name Emily Parkes Age 8 yrs Disease Typhoid Fever Admitted January 31st



31.

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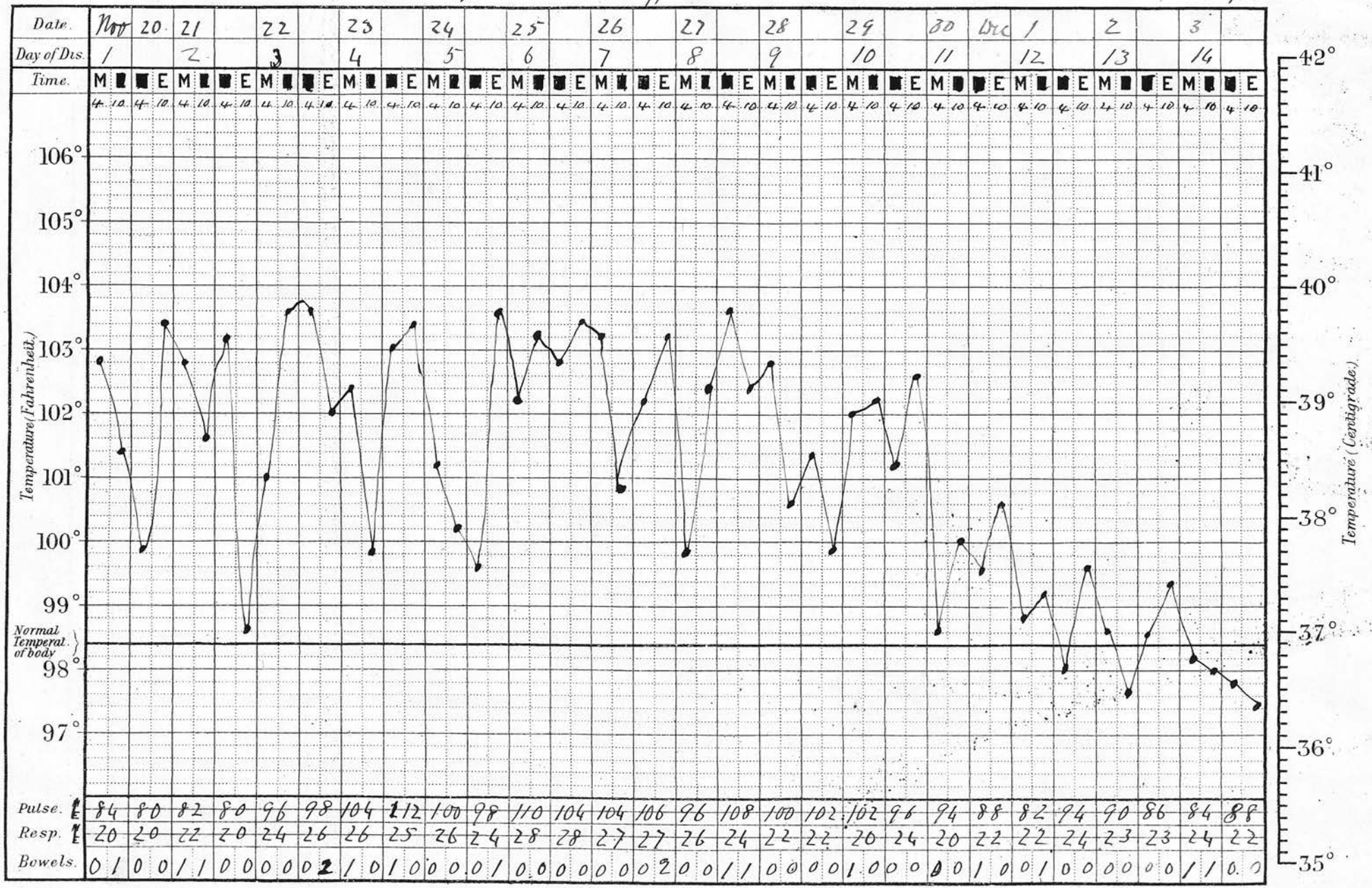
Name Thomas Bendelow Age 14 yrs. Disease Typhoid Fever Admitted Nov. 20/95



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FOR NOTES OF CASE SEE BACK OF CHART.

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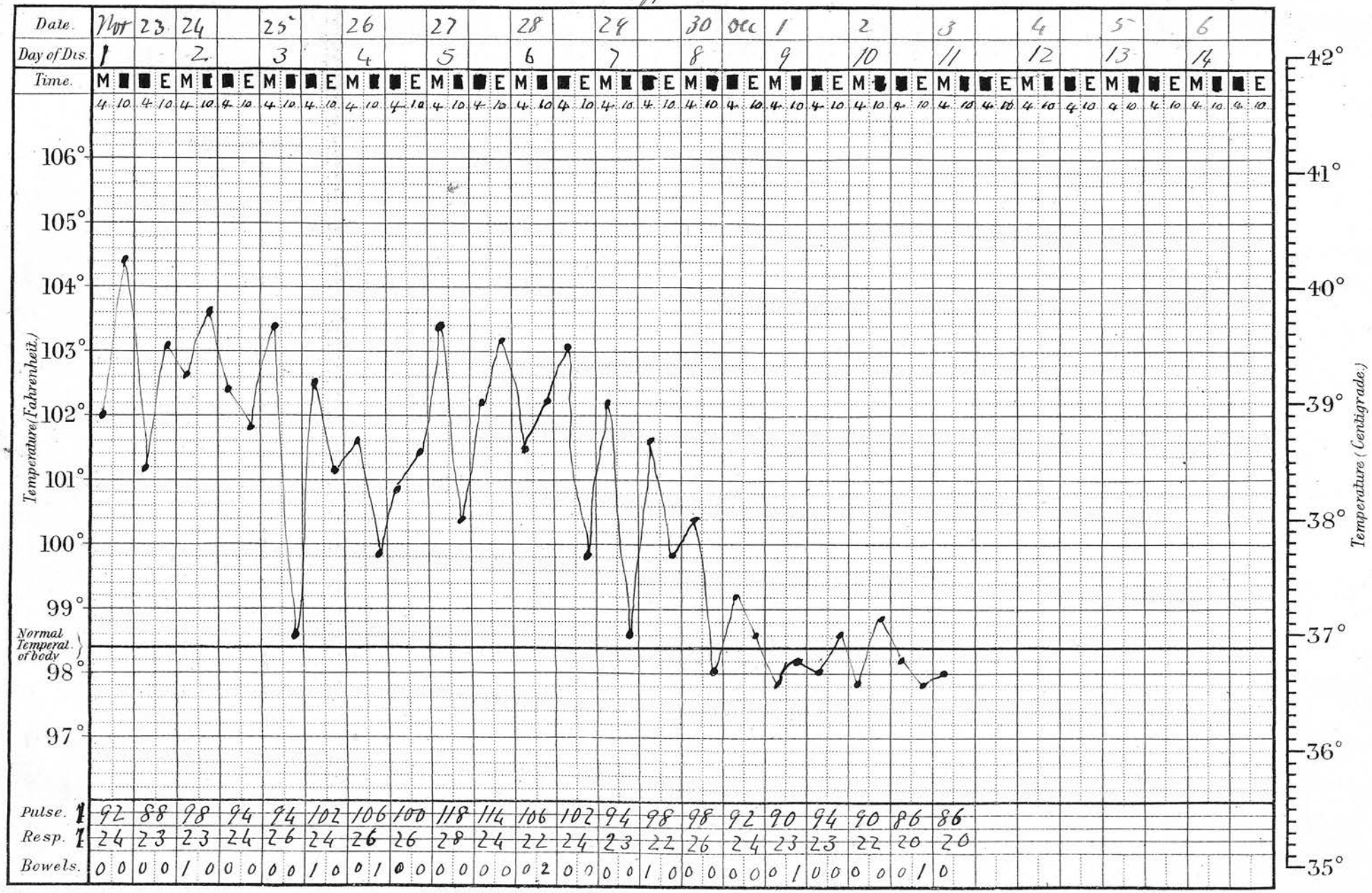
Name Robert Stamper Age 14 yrs. Disease Typhoid Fever Admitted Nov. 23/95



2.

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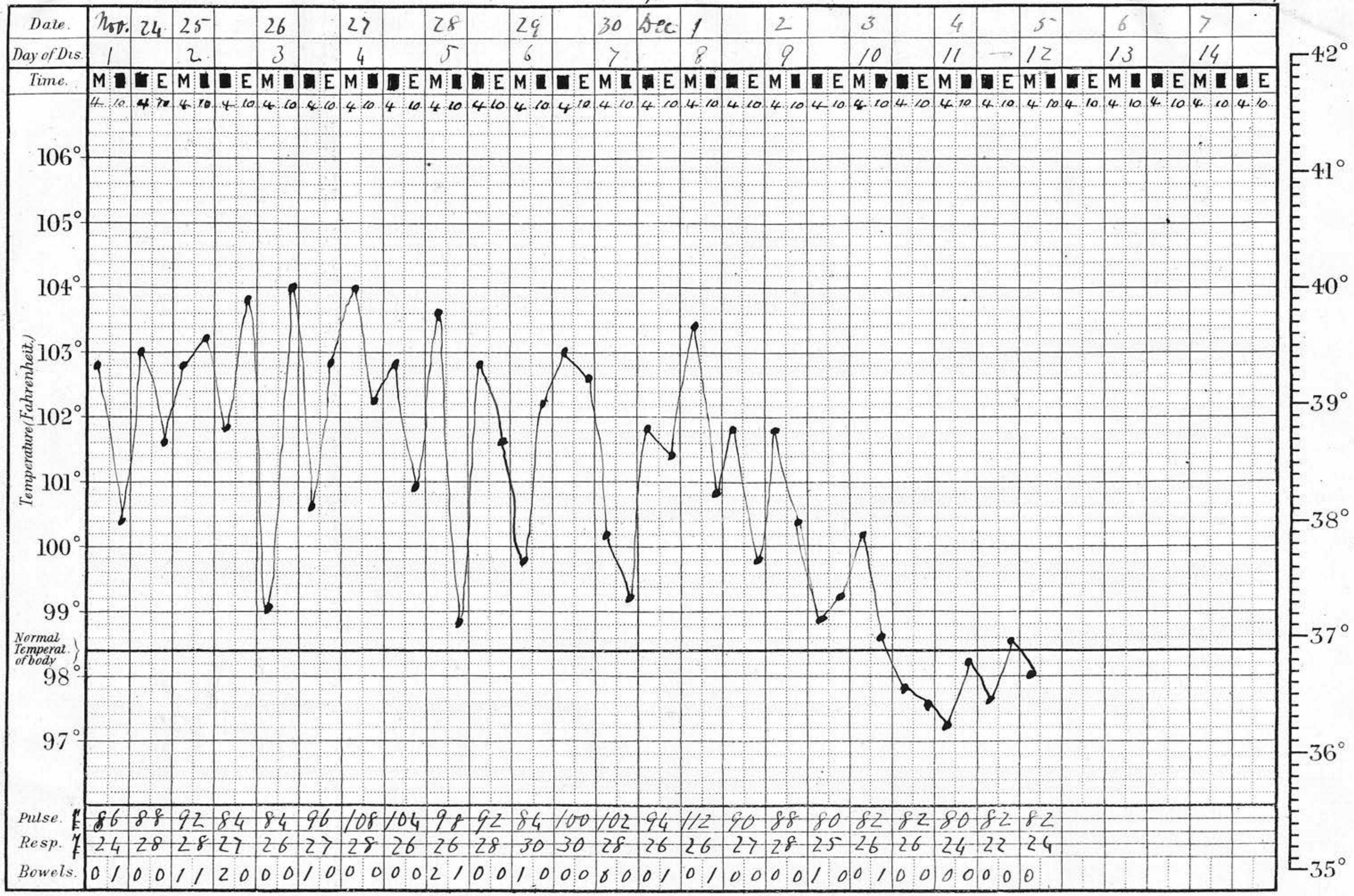
Name *Robert Dawson* Age *13* Disease *Typhoid Fever* Admitted *Novemb. 24/95*



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3.