Vaccination vindicated : being an answer to the leading anti-vaccinators / by John C. McVail.

L. LXVI.

19/m

1/f

VACCINATION VINDICATED:

BEING AN

Answer to the Leading Anti-Vaccinators.

BY

JOHN C. McVAIL, M.D., D.P.H. CAMB.;

PHYSICIAN TO THE KILMARNOCK INFIRMARY;
MEDICAL OFFICER OF HEALTH, KILMARNOCK; PRESIDENT OF THE SANITARY ASSOCIATION OF SCOTLAND, ETC.

CASSELL & COMPANY, LIMITED:

LONDON, PARIS, NEW YORK & MELBOURNE.

1887.

PREFACE.

THIS book has considerably altered in scope since its first chapter was written, and that fact must form the apology for some want of order observable in the sequence of the subjects treated. Begun merely as a reply to Dr. Alfred Russel Wallace's monograph on "Small-pox Statistics and Vaccination," it has developed into a commentary, more or less complete, on much of the anti-vaccination literature of the day; and the reason has mainly been that so many of Dr. Wallace's statements are made at second or at third hand. Thus, for the past year or two, the author has performed the self-imposed and irksome task of reading every scrap of such writings that has come under his notice; and in doing so he has been struck by the very narrow compass within which the whole argument against vaccination is carried on. Whether in newspaper correspondence, or in pamphlets and periodicals, a statement, if it only tend to discredit vaccination, is at once accepted by a certain class of people as indisputably true; and the very same statement is reproduced again and again; and the whole of such statements, differing a little in form and arrangement, are found invariably to resolve themselves after scrutiny into a comparatively few originals. Nevertheless, it has required a considerable amount of time and investigation to demonstrate the character of the so-called "facts." This process has been particularly difficult when the "facts" have turned out to be entirely fictitious, and it is obviously impossible for every medical man, or every layman, who happens to get involved in a dispute on the subject, to devote the necessary labour to the rebutment of the various misrepresentations of which vaccination is the object. In these circumstances it has been the author's aim to construct a work which might form a handy reference-book

for medical men, who, knowing thoroughly the value and safety of vaccination, are yet unprepared to refute every assertion that may be made in its disparagement. Similarly, to members of Parliament, pestered by the attentions of local "leagues," such a source of information may be serviceable. And to those of the general public who care to look into the methods and proceedings of the more active members of the Anti-Vaccination Society, the work is offered to show the nature of the instruments from which the noise against vaccination proceeds.

In view of the purposes which have been stated, the Index has been made copious, and will be found useful in collecting under the names of the various writers and arguments, all that the volume contains in reference to each of them.

Holmhead, Kilmarnock,
August, 1887.

CONTENTS.

CHAPTER IV.

PAGE

THE MITIGATION OF SMALL-POX (*Continued*).

THE MORTALITY AMONG THE VACCINATED AND THE UNVACCINATED AT SUCCESSIVE PERIODS OF LIFE.

CHAPTER V.

RESULTS OF RE-VACCINATION.

(1) IN THE ARMY AND NAVY. (2) AMONG SMALL-POX NURSES. (3) AMONG POST-OFFICE OFFICIALS. (4) IN PRUSSIA.

CHAPTER VI.

THE ALLEGED EVILS OF VACCINATION.

CHAPTER VII.

PAGE

THE ALLEGED EVILS OF VACCINATION (*Continued*).—THE PRESENT-DAY DOCTRINE.

CHAPTER VIII.

SOME NOTES ON SMALL-POX IN THE EIGHTEENTH CENTURY.

ERRATA.

Page 20, line 4 from bottom, for "(p. 26)," read "(p. 19)."

Page 30, lines 20, 21, for "members," read "numbers."

Page 40, line 14, for "(pp. 50, 51)," read "(p. 31)."

Page 100, line 22, for "(p. 163)," read "(p. 97)."

VACCINATION VINDICATED.

CHAPTER I.

THE DECREASE IN SMALL-POX MORTALITY.

Introductory—Dr. Wallace's Monograph—The Reliability of Early and Recent Small-pox Statistics—Dr. Wallace's Four Propositions—London Small-pox, 1750-1850—The Decrease in Small-pox—Dr. Wallace's Argument—1838-53, 1854-71, 1872-82—Comparative Mortality in London and the Provinces—The Incidence of Small-pox on Different Periods of Life—Optional, Obligatory, and Enforced Vaccination—Vaccination *v.* Sanitation—Small-pox compared with other Zymotics—Vaccination an alleged Cause of Small-pox—The Protective Power of Previous Small-pox—The "Counteracting Cause" in London—The Prevalence of Vaccination—A Blunder and its Origin—Vaccination Returns—The St. Pancras Census.

THE examination of some local records of mortality in the last century, and the extraction of the very startling information they gave as to the ravages of small-pox in pre-vaccination times, have gradually led me along a by-path of medical literature, not perhaps often enough trodden by practitioners busy in spare hours with other reading.

Anti-vaccinators are not indeed the most interesting of writers. One is alternately irritated by the recklessness of selection and suppression of statistical facts, and wearied by the continuous iteration and reiteration of statements that have been shown to be baseless or erroneous. But among the various authors whose works are advertised on the covers of the *Vaccination Inquirer*, there is one whose name must catch the eye and command the respect of every reader. It was with much interest, therefore, that I perused the pamphlet on "Registration Statistics and Vaccination," by Alfred Russel Wallace, LL.D.* The importance which is attached to it is shown by the special recommendation which it receives from two such anti-vaccinators as Mr. C. H. Hopwood, Q.C., and Mr. Isaac Holden, M.P., the latter of whom, besides himself thinking it "unanswerable," states—with what authority I know not—that "such

* London, E. W. Allen, 4, Ave Maria Lane. 1885.

also is the opinion of Mr. Gladstone." (*Vaccination Inquirer*, June, 1887.) And undoubtedly it seems to me to contain by far the ablest attack that has yet been made on vaccination, and therefore, that if this assault can be repelled, it may be held that the vaccination position is, at least up till now, impregnable. In attempting its defence, it is specially satisfactory to me to have to deal with Dr. Wallace, because I am at one with the distinguished naturalist as to the weapons that ought to be used in the conflict. He says (p. 11), "The utility, or otherwise, of vaccination, is purely a question of statistics." I agree with him, and could wish that others would accept his dictum.

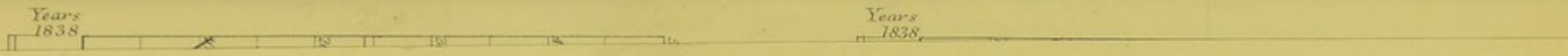
Dr. Wallace's Monograph.—The full title of the essay is "Forty-five years of Registration Statistics, proving Vaccination to be both Useless and Dangerous," and it is addressed "To Members of Parliament and others." The work is in two parts—(I.) Small-pox Mortality and Vaccination, and (II.) Comparative Mortality of the Vaccinated and Unvaccinated. After some introductory matter, Part I. is sub-divided into sections, with the following titles: (1) Vaccination has not Diminished Small-pox; (2) Small-pox has not been Mitigated by Vaccination; (3) Small-pox in the Army and Navy; and (4) Vaccination itself a Cause of Disease and Death. Part II. contains three divisions, viz., (1) The Percentages of Vaccinated and Unvaccinated Unreliable; (2) Our Hospital Statistics necessarily give False Results; and (3) Conclusion from the Evidence.

It is my purpose to discuss all the questions mooted by the author.

The Reliability of Early and Recent Small-pox Statistics.—Much of what Dr. Wallace says has reference to the death-rates (1) in London, and (2) in England and Wales, from small-pox and from zymotic diseases in the forty-five years, 1838–82. These statistics he exhibits in two diagrams, referring (1) to London, and (2) to England and Wales.*

I hope to be able to show that these forty-five years contain much unassailable proof of the value of vaccination. But it is necessary to point out that they do not include anything like the whole available evidence. Jenner's discovery was announced in 1798, and long before 1838 a large section of the population both in this and other countries had already been vaccinated. Besides, the whole argument rests on the varying incidence of small-pox on the people, and it

* I insert these diagrams exactly as they appear in Dr. Wallace's book; they have been purchased, indeed, from the Anti-Vaccination Society, with the sanction of Dr. Wallace.


Years
1838
Years
1838

is obviously of the first importance that the comparative prevalence of the disease before and after the introduction of the alleged preventive should be fully considered. In justification of the contrary course, Dr. Wallace states that the figures referring to the selected period are "the only complete series of official records that exist," "the only trustworthy statistics we possess," and so on. With the year 1838 the Registration Acts came into force, and English mortality statistics since that date have been brought nearer to perfection than ever they were before. But there are many other bodies of official statistics of which the doctor ought to have known. For Geneva they exist since 1580, for Copenhagen since 1750, and for Sweden since 1773.*

The following table † is an index of the wealth of information obtainable on the subject:—

Terms of Years respecting which Particulars are given.	Territory.	Approximate Average Annual Death-rate by Small-pox per Million of Living Population.	
		Before Introduction of Vaccination.	After Introduction of Vaccination.
1777–1806 and 1807–50 ..	Austria, Lower ..	2,484	340
Do. do. ..	,, Upper, & Salzburg	1,421	501
Do. do. ..	Styria	1,052	446
Do. do. ..	Illyria	518	244
Do. 1838–50 ..	Trieste	14,046	182
1777–1803 and 1807–50 ..	Tyrol and Voralberg ..	911	170
1777–1806 do. ..	Bohemia	2,174	215
Do. do. ..	Moravia	5,402	255
Do. do. ..	Silesia (Austrian) ..	5,812	198
Do. do. ..	Gallicia	1,194	676
1787–1806 do. ..	Bukowina	3,527	516
1776–1780 and 1810–50	Prussian (Eastern Provinces)	3,321	56
Do. do. ..	Brandenburg	2,181	181
Do. 1816–50 ..	Westphalia	2,643	114
Do. do. ..	Rhenish Provinces ..	908	90
1781–1805 and 1810–50 ..	Berlin	3,422	176
1776–1780 1816–50 ..	Saxony, Prussian ..	719	170
1774–1801 1810–50 ..	Sweden	2,050	158
1751–1800 1801–50 ..	Copenhagen	3,128	286

* "Papers relating to the History and Practice of Vaccination," by Mr. John Simon, F.R.S. (London, Eyre and Spottiswoode, 1857).

† From the table as given by Mr. Simon I have excluded eight populations as to which the statistics for last century are either entirely wanting or are given only for a single year.

As to the general trustworthiness of such statistics there can be little doubt. They were not absolutely correct. In London the Bills of mortality, dating from 1629, covered only the parish church burials. But there is no reason to think that churchmen were more liable to small-pox than nonconformists. The longer a series is, and the greater the number of facts with which it deals, the smaller becomes the mean error; and in statistics for London embracing two centuries and a half, or for the populations and periods named in the above table, the incidental error is wholly insignificant compared with the enormous value of the general truth. Writing in 1801 Heberden said* regarding the particular diseases mentioned in the Bills of mortality—"Yet it deserves to be repeated that even in these smaller divisions of the subject, the correspondence of one year, and of one week, with another, is such, as must convince every attentive observer that a considerable degree of credit is due to their report." The statistics of last century, too, have this great advantage, that it is impossible to cavil as to their source, and to say, as Dr. Wallace does regarding some modern figures, that they were untrustworthy because registered in the interests of vaccination. And if there be any disease under the sun, the deaths from which are almost unmistakable, that disease is small-pox. Even in the present day, with our comparatively rare opportunities of encountering it, once seen it can never be forgotten. But in London in the last century (a period whose records, as we shall presently see, are trusted by Dr. Wallace) it caused 84 deaths in every 1,000 from all causes, this being as many as were contributed in England and Wales in the year 1885 by the following diseases united—namely, cholera, scarlatina, measles, erysipelas, syphilis, diarrhœa, dysentery, enteric fever, and typhus fever.

If it be essential that a statistical series should be "complete," Dr. Wallace's chosen period is still at fault, for in England and Wales the figures are wanting for the four years 1843–46. [It is worth noting the use made of this omitted period by anti-vaccinators. The late Dr. Pearce,† wishing to minimise the effect of gratuitous vaccination (from 1841 to 1853), held that in the omitted years, 1843–1846, "an epidemic of small-pox occurred," namely, in 1844, and that "the exclusion of one epidemic from the period given must make a very serious difference in the results."

* "Observations on the Increase and Decrease of different Diseases, and particularly of the Plague," by William Heberden, Junr., M.D., F.R.S. (London, T. Payne, 1801).

† Report of the Select Committee on the Vaccination Act (1867), published as a Parliamentary Paper, No. 246, Session 1871.

Mr. P. A. Taylor, M.P., wanted, on the contrary, to minimise the effect of the compulsory law of 1853 by showing that the period, 1841–53, had had a low mortality. Hence he speaks of "the four years, 1843–46, which, I believe, are known to have been low in small-pox mortality."* Thus the blank space can have written into it whatever an opponent of vaccination may desire, while ordinary mortals are content to accept the official statement that in these years the causes of death were not distinguished.

Returning to Dr. Wallace] :

As to the "trustworthiness" of the Registrar-General's statistics, no reasonable being can have any doubt. But, on occasion arising, anti-vaccinators have no hesitation in describing these returns, on which Dr. Wallace relies, as "imperfect and unreliable."† And though the doctor himself, to uphold the value of his statistical data, maintains the accuracy and assumes the truthfulness of medical men in recording small-pox deaths (p. 26), he utterly denies them (p. 27) the possession of these qualities if they record on the same certificates an absence or doubtfulness of vaccination—in this matter "the reports of the Registrar-General are often erroneous." While the doctor can thus at one time freely reject the statements of those whose word he at another time as freely accepts, I have further to show that at times he can place unlimited faith in the statistics of last century, which, as a rule, he so strenuously refuses to hear of. He says (pp. 3, 4), "I propose now to establish the following four statements of fact, by means of the only official statistics which are available. These statements are—

"(1) That during the forty-five years of the registration of deaths and their causes, small-pox mortality has very slightly diminished, while an exceedingly severe small-pox epidemic occurred within the last twelve years of the period.

"(2) That there is no evidence to show that the slight decrease of small-pox mortality is due to vaccination.

"(3) That the severity of small-pox as a disease has not been mitigated by vaccination.

"(4) That several inoculable diseases have increased to an alarming extent coincidently with enforced vaccination."

Now observe what follows:—"The first, second, and fourth propositions will be proved from the Registrar-General's Reports from 1838 to 1882." But what has become of the third? On turning to

* "Current Fallacies about Vaccination : A Letter to Dr. W. B. Carpenter" (London, E. W. Allen, 1881).

† "Vaccination Tracts," London, 1877, No. 9, p. 6.

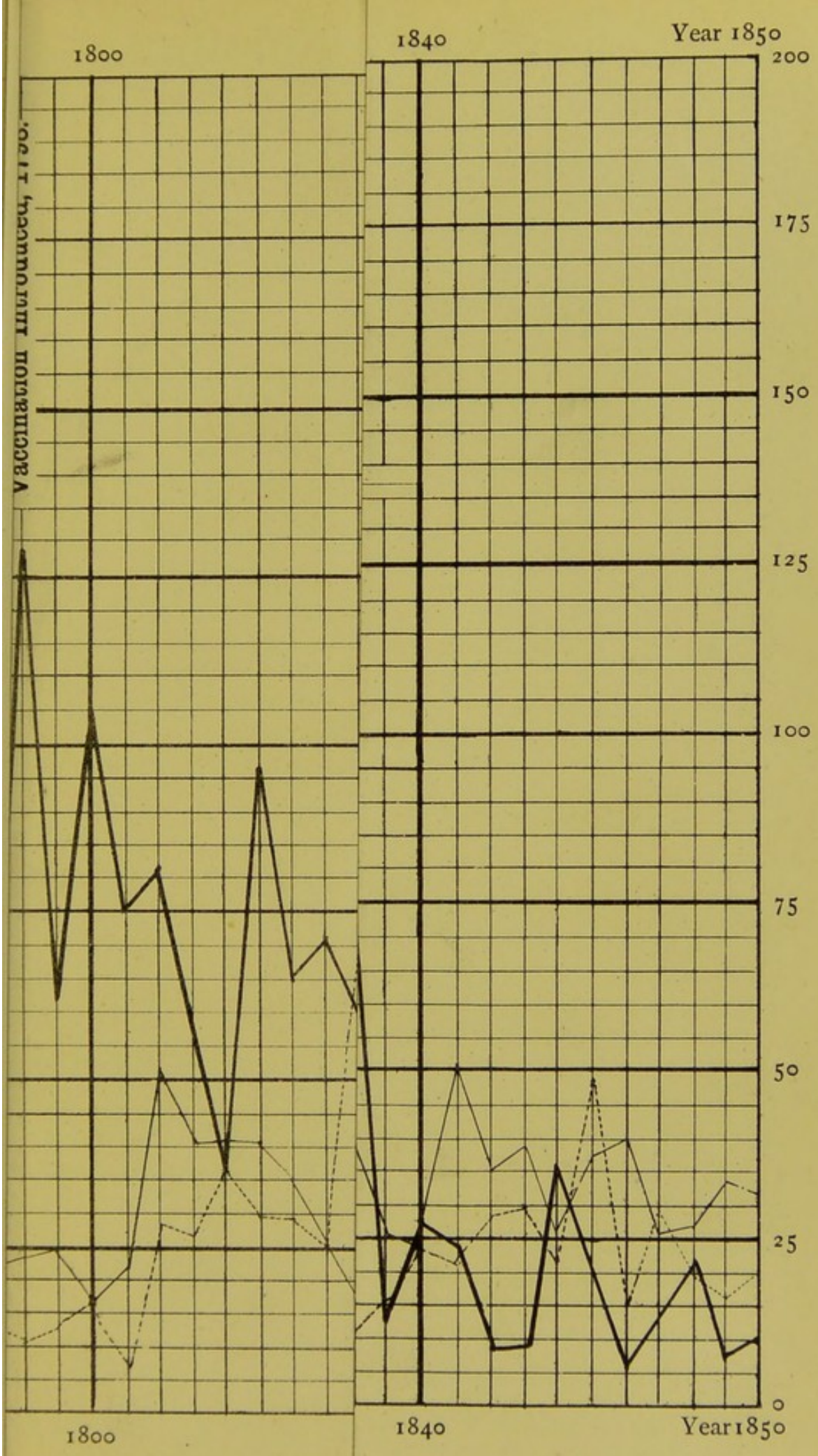
pp. 11, 12, we find that this proposition depends for its proof wholly on a comparison of statistics of the last century with those of the present century!

London Small-pox, 1750–1850.*—There need be no hesitation now in supplying a diagram of small-pox mortality previous to 1838, and as regards London this is fortunately possible, though the only measure to be had consists in the proportion of *deaths from all causes*, due to the one cause, small-pox. More or less complete statistics on this basis exist from 1629 till the present time, and from this period I select the century 1750 till 1850.† Taking the introduction of vaccination as coincident with the beginning of the century, we have thus half a century preceding and half a century succeeding that event. It will be observed that after fifty years of vaccination small-pox mortality had got so much reduced that its curve had reached nearly to the bottom of the diagram. Further fluctuations, therefore, in order to be rendered easily intelligible, require to be shown on a new and magnified scale. And from 1838 statistics exist, not only for London but for the rest of the kingdom. The further course of small-pox, therefore, will be best seen by consulting the diagram given on p. 14.

The startling difference between the small-pox chart previous to and subsequent to the beginning of this century is seen at a glance. The disease reached its highest point in 1796 (two years before the date of Jenner's "Inquiry"), when in every 100 deaths no less than 18½ were from small-pox. If, as Guy says, an epidemic be defined as an outbreak causing 10 per cent. of all deaths, then in the 48 years (1629–36, and 1647–86) of the seventeenth century there were 10 epidemics, in the eighteenth century 32, and in the nineteenth none. The highest rate since vaccination became obligatory in England and Wales occurred in 1871, when in 514,879 deaths from all causes 23,062 were due to small-pox, or 4½ per cent., actually less than *half* of the mildest of the 32 epidemics of the last century. In London, however, the epidemic rate was nearly reached, almost 10 per cent. of the deaths in the year 1871 being from small-pox. Vaccination was introduced at the beginning of this century; the National Vaccine Establishment was endowed in 1808; in 1840 gratuitous vaccination of the poor was provided from local rates; the first obligatory law was enacted in 1853; boards of guardians were permitted

* The influence of inoculation on small-pox in the last century is discussed in Chapter VIII.

† Founded mainly on Dr. Guy's "Two Hundred and Fifty Years of Small-pox in London," read before the Statistical Society, 20th June, 1882.



ALL-POX, MEASLES, AND

to appoint vaccination officers to see to its enforcement in 1867; and this permission was changed into compulsion in 1871. During all that time there has been a steady diminution in the small-pox death-rate, with the exception of the outbreaks of 1837–41 and 1870–3, the latter of which falls to be noticed separately. In the pre-vaccination era small-pox was 9 times as fatal as measles, and 7½ times as fatal as whooping-cough.* Under vaccination, however, it has sunk into a position of positive insignificance as compared with these diseases.

Can Diagrams be Manipulated?—Regarding his own diagrams, Dr. Wallace says, "I make the results clear and indisputable by presenting the figures for the whole period in the form of diagrammatic curves, so that no manipulation of them, by taking certain periods for comparison, or by dividing the period in special ways, will be possible." The assumption is that a diagram cannot be manipulated. Let us see.

But to begin with, I have to point out that in modern statistics we no longer measure the mortality of a disease by the share it bears of the mortality from all causes, as is done in my London diagram; but instead, we take the rate of mortality on the population, the usual standard being the number of deaths from any disease per million persons living. This very important distinction must be borne in mind in regard to all the figures which follow.

Dr. Wallace's diagrams, like my own, are constructed as parallelograms, of which the height represents mortality, and the length represents time. But they are mainly occupied with curves relating to fevers and zymotic diseases in general, which have a much higher mortality than small-pox in the present day. The consequence is that any less prevalent malady (like small-pox nowadays) is so hidden away that a change of ten to one is barely observable, and that the space devoted to its fluctuations is so small as to conceal rather than exhibit the actual course of the disease. In any such diagram a genuine decrease can be rendered almost imperceptible by compressing the parallelogram from above downwards, and dragging it out to such a length as fancy may suggest, or convenience justify. This is the case here. Our author says that Diagram I. shows that "small-pox has very slightly diminished," and that in Diagram II. "we perceive a similar decrease in small-pox mortality." Let his readers

* Whooping-cough records begin in the year 1740. From 1740 to 1799 inclusive, small-pox in London caused 121,467 deaths, measles 13,169, and whooping-cough 15,820. These figures are calculated from Guy's paper already referred to, and are based on the Bills of mortality. See also p. 31.

look at the curve in the latter case, and then turn to p. 23 of the pamphlet, where they will find the following figures cited by Dr. Wallace for another purpose :—

Annual Deaths in England per Million Living.

Average of Five Years.	1850–4.	1855–9.	1860–4.	1865–9.	1870–4.	1875–9.	1878–80.
Small-pox ..	279	199	191	148	433	82	40

Does the curve in question give to the eye a genuine picture of the facts? Would any one, trusting to it, suppose that, with the exception of the epidemic of 1870–3, there has been a steady and rapid decrease in small-pox deaths since 1850, so that in the two last periods they are about two-sevenths and one-seventh respectively of what they were in the first period? The comparative space to be given to the elements of time and mortality is, of course, arbitrary. But this at least is essential—that the truth should be seen at a glance ; and in this essential his diagrams are total failures.

Dr. Wallace's argument is, briefly, as follows (pp. 5–7) :—

(1) In London small-pox has diminished very slightly under compulsory vaccination, "while the epidemic of 1871 was the most destructive of the whole period." The average diminution from the first to the second half of the 45 years was only "57 deaths per million per annum."

(2) The chief zymotic diseases have also decreased, but less rapidly, owing to one member, diarrhœa, having increased very much during the second half of the period.

(3) Fevers, however (typhoid, typhus, and continued), have diminished 382 per million, or more than six times as much as small-pox.

(4) This remarkable decrease is due to sanitation, personal hygiene, and probably also to improved treatment.

(5) These influences have had their effect on small-pox, and the failure of that disease to diminish so rapidly as fevers has probably a counteracting cause.

(6) This counteracting cause may be vaccination.

(7) England and Wales show a similar decrease in small-pox mortality, and, as in London, fevers have decreased far more than small-pox.

The above points fall to be discussed in some detail.

The Decrease in Small-pox.—Whether or not 57 per million is a small reduction, depends on the previous rate of mortality of the disease. It seems to me that the fall is 70, not 57 (see foot-note, p. 10), but even 57 is more than one-fifth of the total death-rate by small-pox, in London, in the present decade, and is actually in excess of the total English small-pox rate in 1878–80, as noted above by Dr. Wallace. Of course, in former centuries 57 or 70 would have been a positively trivial fall, but now the total abolition of the disease would produce a diminution considerably less than that of 382 per million, which Dr. Wallace mentions as having occurred in fevers. But the point need not detain us.

Dr. Farr, the most distinguished vital statistician who ever lived, made the following calculation as to the London death-rate in periods previous to the introduction of the Registration Act ("Vital Statistics," p. 304) :—

Years.	Average Annual Deaths per Million from all Causes.	Average Annual Deaths per Million from Small-pox.
1660–79	80,000	4,170
1728–57	52,000	4,260
1771–80	50,000	5,020
1801–10	29,200	2,040
1831–35	32,000	830

These figures are only given as approximately true,* but the information they give is worth prolonging into later times. Thus (still referring to London) we get :—

Years.	Average Annual Deaths per Million from all Causes.	Average Annual Deaths per Million from Small-pox.
1838–53	24,900	513
1854–71	24,200	388
1872–82	22,100	262

If it be here objected that the total mortality also fell, the reply is not difficult. In the successive periods (beginning 1801–10,

* Owing to the population not being known, the London small-pox death-rates per million living per annum in last century are necessarily less correct than the small-pox death-rates per 1,000 deaths from all causes, on which my London diagram is founded.

as above) since vaccination was introduced, the fraction contributed by small-pox to the total mortality has been reduced somewhat as follows: $\frac{1}{15}$, $\frac{1}{40}$, $\frac{1}{50}$, $\frac{1}{60}$, $\frac{1}{85}$. So that even in London (with its recent small-pox mortality from twofold to sevenfold that of the rest of England) the disease in the last period contributed only one death in every eighty-five from all causes, while in the beginning of the century it contributed one in every fifteen.*

I don't know whether, as to his division of the figures into two halves, the doctor would say that he practises "no manipulation of them, by taking certain years for comparison, or by dividing the period in special ways." In investigating the results of vaccination in its relations to law, the correct way is to divide the years, not arbitrarily into decades, nor halves, &c., but into periods separated only by the dates of enactment of the various vaccination laws. This is so very obvious as to need no demonstration. If we then divide the forty-five years into (1) 1838–53, or previous to compulsory vaccination; (2) 1854–71, or compulsory vaccination; and (3) 1872–82, or compulsory vaccination enforced, we get the death-rates tabulated above. So that the reduction becomes 251 instead of "57" per million persons living. In England and Wales (including London) the corresponding rates were (1) 420, (2) 223, and (3) 146, the reduction being 274 per million. In the three years, 1883–4–5, whose statistics have now been published, the rate was only 74 per million, and if these years be added to the last period, they reduce the rate from 146 to 126 per million, which makes the total reduction between the first and the last period, not 274, but 294 per million. I have already (p. 8) given the statistics for the quinquenniads from 1850 to 1880, which show rates falling from 279 to 82 per million.†

* A great decrease also took place in "fevers," but the term was so indefinite, and so liable to different interpretations at different times, that too much importance may be attached to its mutations. Of the three well-defined and easily-distinguished zymotic diseases contained in my London diagram, small-pox is the only one which shows a decline, measles and whooping-cough exhibiting an increase in the period in question.

† Once for all, I may refer to the method by which these statistics are calculated. In the Registrar-General's Reports, the death-rates from each disease per million persons living are stated for each year separately. The ordinary method of obtaining the mean of a series of years is to sum up these annual rates and divide by the number of years, and this method is, I believe, officially recognised as of quite sufficient accuracy in the General Register Office. It seems, too, to be the method by which Dr. Wallace has arrived at his reduction of 382 (? 389) per million living, in the mortality from fevers; and as he compares the reduction in fevers with that in small-pox, he must have applied the same method to both. In that case he has made a miscalculation, as

The only objection that can, with any show of reason, be urged against dividing the years into periods separated by the date of enactment of the successive vaccination laws, is that these laws have not then had time to show their effect on the small-pox mortality. Each year that elapses adds to the population under the law the children born during the year. To obviate this objection, the division into periods might be made, beginning five years after the date of each law; and the statistics might be given only for children under five years old, thus also eliminating the question of the need of re-vaccination. By such an arrangement the only fallacy remaining would consist in the existence of an unvaccinated residuum of changing amount. I have made the necessary calculation for the 39 years 1847–1885. Using as above the laws of 1853 and 1871, we get three periods—(1) 11 years, 1847–57; (2) 19 years, 1858–76; and (3) 9 years, 1877–85. And the rates per million living at this age are, for England, (1) 1,269, (2) 759, and (3) 135. Thus under the law of 1871 the mortality is less than one-ninth of that which prevailed under optional vaccination. There is a natural diminution of mortality for a year or two after an epidemic like that of 1870–3, but in the above computation this fallacy also is nearly wholly obliterated, as the last rate refers only to children born subsequently to 1871. Mr. Milnes, however, prefers to make division of his periods rather by the law of 1867 than by that of 1871. Taking it we get—(1) 11 years, 1847–57; (2) 15 years, 1858–72; and (3) 13 years, 1873–85; and the rates are (1) 1,269, (2) 919, and (3) 141. Or if we divide the 39 years into three equal periods we get (1) 1,245, (2) 889, and (3) 141. What better evidence, I ask, can one conceive of than is afforded by these figures?*

One meets with continual objection, on the part of opponents of vaccination, to the Registrar-General's method of grouping the statistics of small-pox into the three periods, 1847–53, 1854–71, and 1872–80. It seems to be to this that Dr. Wallace refers when he says, regarding his diagrams, that "no manipulation of them, by taking certain years for comparison, or by dividing the period in special ways, will be possible." These groupings, of course, have

the mean of the annual rates from small-pox fell 70, not 57, per million. It is, to say the least of it, unfortunate that Dr. Wallace does not mention the steps by which he arrives at a result which he considers so important.

* The following are the rates per million living under 5 years old for each of the 39 years, 1847-85:—1380, 2097, 1364, 1401, 2067, 2124, 893, 675, 531, 514, 911, 1379, 853, 578, 267, 339, 1176, 1525, 1144, 575, 468, 416, 297, 409, 2521, 1843, 185, 169, 83, 185, 316, 139, 38, 49, 209, 77, 62, 139, 187.

reference to the legislation of 1853 and 1871. One objection is that the 1870–3 epidemic is thus split in two. There is nothing unfair in this, however; in fact, as is shown by the ages of those who died, many deaths in that epidemic were of persons born in the period prior to 1853, and very obviously none of them had anything to do with the years following the epidemic. But the fact is that the Registrar-General is supported in this principle of grouping by the anti-vaccinators themselves. For in 1877 Mr. C. H. Hopwood, one of their Parliamentary champions, moved for a Return of the mortality from certain diseases alleged to be due to vaccination for the periods 1847–53, 1854–67, and 1868–75, thus classifying his periods according to the legislation of 1853 and 1867, and endorsing the subsequent action of the Registrar-General. The constant use of this Return up till the present time shows that in disparagement of vaccination its enemies use methods of evidence to which they would object when applied in support of vaccination. Thus Mr. Wm. White, on page 20 of his review of Playfair and Dilke,* quotes Hopwood's Return as "a remarkable confirmation of the increase of infant mortality coincident with more thorough vaccination," but on page 40, criticising the Registrar-General's figures, he denies that there was any increase in the number of vaccinations, and suggests that that authority's method of grouping the figures is an example of "'cookery,' that would be fraudulent in finance." So, too, in 1871, Dr. Garth Wilkinson strongly objected to the evidence *for* vaccination yielded by statistics which Dr. Lyon Playfair had (in 1870) grouped in a manner similar to that under discussion.† But when, later on, the first of Hopwood's Returns was published, Dr. Wilkinson (along with Mr. Wm. Young) hailed it as quite satisfactory evidence *against* vaccination. Their article, moreover,‡ is entitled "The Registrar-General on the Situation," and they make no reference whatever to Mr. Hopwood's name in connection with the statistics.

Comparative Small-pox Mortality in London and the Provinces.—This is a subject not mentioned by Dr. Wallace. He has been very wise in selecting London, rather than the whole of England and Wales, as a foundation for his first contention. It is obvious that the latter would have been a broader and stronger basis for any superstructure of true reasoning. But on that very ground it

* "Sir Lyon Playfair Taken to Pieces and Disposed of: likewise Sir Charles W. Dilke, Bart.," &c., by William White (London, E. W. Allen, 1884).

† White, *op. cit.*, p. 8.

‡ "Vaccination Tract," No. 13, p. 5.

would have been less suitable for any anti-vaccination argument. For the metropolis has had a much worse small-pox record than the kingdom as a whole. The causes of this will be discussed further on. For example, in the epidemic years 1871–2, the death-rates from this disease, per million living, were in London 2,420 and 540 respectively, and in England and Wales 880 and 780; the average being 830 as against 1,480 in London. Here are the figures, in groups of years, for London and the provinces respectively, from 1838 to 1884 :— *

Deaths from Small-pox per Million Living.

Period.	1838–42.	1847–49.	1850–54.	1855–59.	1860–64.	1865–69.	1870–74.	1875–79.	1880–84.
London	755	460	300	237	281	276	654	292	244
Provinces	547	274	271	192	175	122	389	48	34

The accompanying diagram (p. 14), reduced from Dr. Buchanan's original,† shows very clearly the same differences between London and the rest of England.

The above figures show how very far the case is affected by confining the argument to London, and mentioning England and Wales merely for general corroboration. For, even if we omit the first period owing to its containing an epidemic, we find that from 1847–49 to 1880–4, while London mortality fell only from 460 to 244, the provincial rate fell from 274 to 34. And if we take a careful view of the figures we see how utterly unfounded is the allegation that small-pox has not materially diminished since registration was introduced. But the doctor makes London do double duty. He entirely devotes the first diagram to it, and in the second he gives England and Wales as a whole, including London, and so shows a considerably higher rate than if he had deducted the metropolis, and let the provinces speak for themselves.‡ But even then he does not quote the statistics for England and Wales. The decrease in the case of London he had stated to be 57 per million. In England and

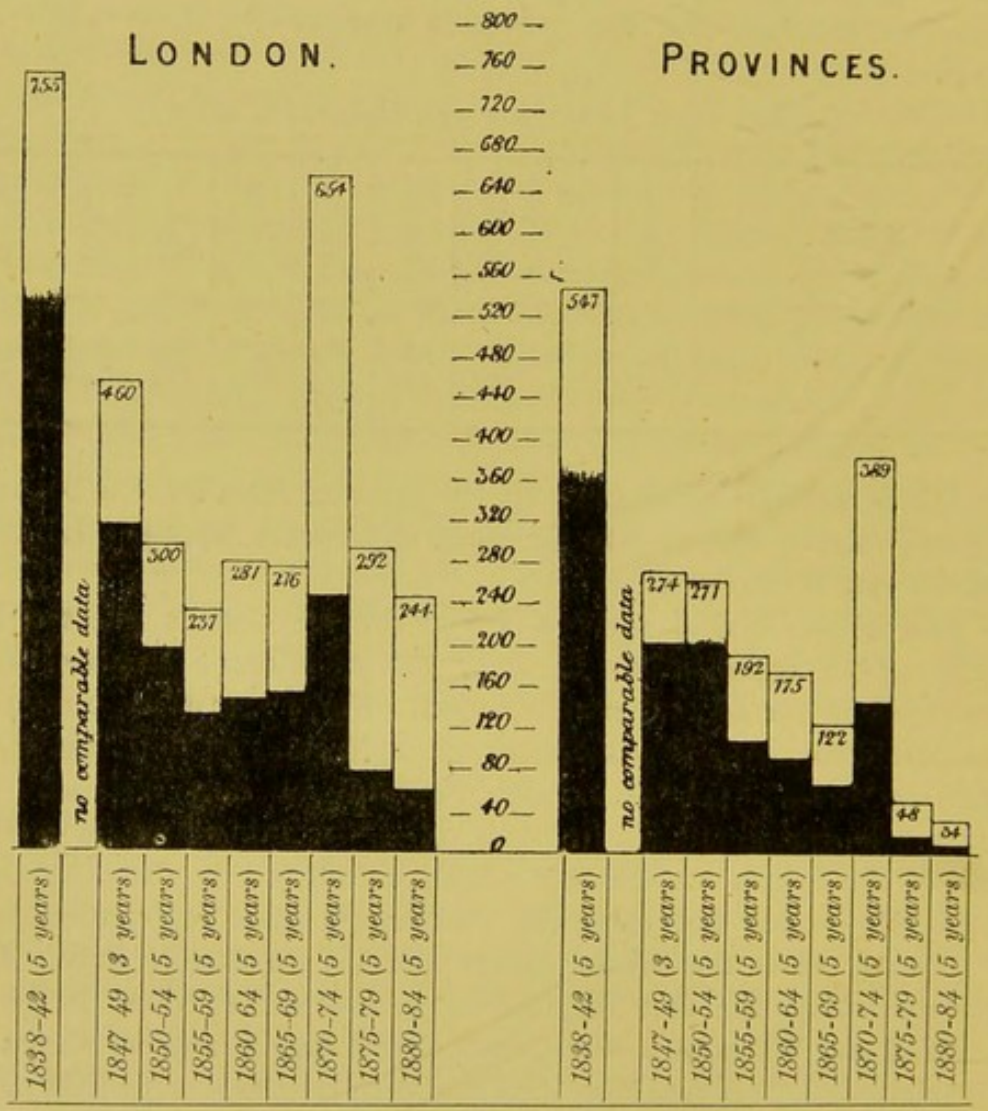
* Dr. Buchanan's Supplement to 15th Annual Report of the Local Government Board, p. xi.

† *Ibid.*

‡ The figures for London and the provinces separately were first published in the Hospitals Commission Report, 1882. From the Registrar-General's Reports they could be got by subtracting the London statistics from those of England and Wales.

Wales the diminution was 139 per million. And yet he says, "Here too we perceive a similar decrease."

Diagram showing Mean Annual Small-pox Rates, per Million Population at all Ages, during Successive Periods, since the Commencement of Registration. The share of Small-pox Mortality borne by Children under Five, in each Period, is shown in Black.



The Incidence of Small-pox on Different Periods of Life.

Continuing my comments on Dr. Wallace's first proposition, I need not further demonstrate the absurdity of taking this 57 (or 70) per million as a ground for doubting the efficacy of vaccination. There is, however, another consideration of the very first importance in connection with small-pox mortality, and of it Dr. Wallace takes no notice whatever from the beginning to the end of his book, namely,

the influence of vaccination on the small-pox mortality at various periods of life. The Registrar-General says, "In discussions concerning the protective influence of vaccination, too exclusive attention is usually given to the change that has occurred since its introduction in the death-rate from small-pox *at all ages*. It is important that not only this but also the changes in the death-rate at successive periods of life should be taken into account."

Table L.—Mean Annual Deaths from Small-pox at Successive Life-periods per Million Living at each such Life-period. (Page xxii. *loc. cit.*)

Sub-period.	Age.						
	All Ages.	0	5	10	15	25	45 upwards.
(1.) Vaccination optional (1847–53)	305	1,617	337	94	109	66	22
(2.) Vaccination obligatory, but not efficiently enforced (1854–71) ..	223	817	243	88	163	131	52
(3.) Vaccination obligatory, and more efficiently enforced by Vaccination Officers (1872–80) ..	156	323	186	98	173	141	58
Entire period of obligatory vaccination (1854–80) ..	198	633	222	92	167	135	55

"The figures show conclusively that coincidently with the gradual extension of the practice of vaccination, there has been, in the first place, a gradual and notable decline in the mortality from small-pox at all ages; and, in the second place, that this decline has been exclusively among persons under ten years of age, and most of all among children under five, in which group the rate fell no less than 80 per cent. in the interval between the first and third sub-period; and, thirdly, that after the age of ten years the mortality, so far from having declined, has actually increased; very slightly among persons of from 10 to 15 years of age, but very greatly for persons older than this; and, lastly, that the increase has been the greater the more advanced the time of life. Thus again, comparing the first with the third sub-period, the ratio for persons from 15 to 25 years of age rose 59 per cent., from 25 to 45 years of age it rose 114 per cent., and after 45 its rise was no less than 164 per cent.

"These striking changes in the rates at successive periods

of life are, it will be noted, not petty differences, nor mere matters of decimal points, or the like, but enormous changes of such magnitude as utterly to preclude all explanations which would refer them to chance fluctuations or to errors in registration. How then are they to be explained?

"Some persons who are opposed to vaccination have attempted to account for the decline in small-pox mortality by referring it, not to vaccination, but to the general improvement that has been effected in the sanitary conditions of life." (Page xxi. *et seq.*, Registrar-General's 43rd Report, for 1880.)

The Registrar-General goes on to argue that, had this been the case, other diseases would have shown corresponding alterations in the mortality at the various life-periods; but they do not show this. While the small-pox death-rate fell 80 per cent. in children under five years, other diseases fell only 6 per cent.; and while the small-pox rate increased 164 per cent. in persons over 45 years, other diseases fell 3 per cent. Or, "taking the deaths at all ages, one-seventh part —and one-seventh part only—of the reduction in small-pox mortality may be claimed as possibly resulting from other causes than vaccination; for while the death-rate from other causes fell 7 per cent., the death-rate from small-pox fell 49 per cent."

The conclusion arrived at is:—"The hypothesis then that would explain the great fall in small-pox mortality by referring it, not to vaccination, but to general sanitary progress, must be rejected as utterly untenable. There can be no rational doubt but that the death-rate from this disease fell not merely coincidently with, but in consequence of, the extended use of vaccination."

Dr. Wallace quotes from the very report, even from the very pages, that contain the Registrar-General's argument. And when occasion arises he makes all the use he can of the line of reasoning involved. So that, adapting his own words (foot-note to page 35), I may say, "It seems incredible, but is nevertheless a fact, that in the whole body of Dr. Wallace's pamphlet there is no recognition whatever of the necessity of comparing *corresponding ages* in order to obtain *true results* as to the *comparative mortality*" from small-pox in successive periods of time.

It now falls to be shown how these considerations as to age influence the argument for vaccination as regards both London and the provinces. The facts are obtainable from Dr. George Buchanan's evidence in the Report of the Hospitals Commission of 1882. If vaccination lessens small-pox, then seeing that vaccination and small-pox (when unaffected by vaccination) are alike in

having far greater concern for infants than for older people, it is plain that we should most readily discern the facts of vaccinal influence by an examination of the small-pox mortality of children during periods when vaccination was coming more and more into vogue, and by noting the share of small-pox deaths contributed by infants during one and another of these periods. The following are the figures in groups of 5 years, for children under 5 years of age, with, for comparison, similar figures as to scarlatina :—

PERCENTAGE OF TOTAL SMALL-POX MORTALITY BORNE BY CHILDREN UNDER 5 YEARS OLD.

	Mean percentage of	Metropolis.	Provinces.	Scarlatina in England & Wales
Vaccination optional.	2 years 1843–4	68	?	?
	5 ,, 1845–9	68	(yr. 1847) 74	65
	,, ,, 1850–4	65	?	?
Vaccination obligatory, 1853.	,, ,, 1855–9	56	57	?
	,, ,, 1860–4	53	56	64
	,, ,, 1865–9	56	53	65
Vaccination enforced, 1871.	,, ,, 1870–4	38	30	65
	,, ,, 1875–9	28	29	66

Having seen that in London, owing to some "counteracting cause," small-pox has not declined as in the provinces, we yet see the influence of vaccination in the almost exactly similar changes of age-incidence that have occurred in the two cases.

The same facts as to age brought up to 1884 are exhibited in the diagram at page 14. Elsewhere * I have given figures which show that in 100 deaths from small-pox in Kilmarnock, in the eighteenth century, no less than 91 were under 5 years old—as I say, the disease had far greatest concern for the infantile population. In 1843–4, vaccination being optional, some 70 per cent. of the small-pox deaths of the country were under this age. The first compulsory law reduced the number to 56; and under the present law, with vaccination improved in quality, the 56 have been reduced to about 30. Of course sanitation could not do this. If it acted at all on small-pox, it would reduce the mortality at all ages. See how scarlatina has been affected. In the first period, of 100 deaths from scarlatina, 65 were under 5 years old; in the next, the number is the same; and in the last, it is 66. It is as clear as noonday that some powerful agency was at work on small-pox, and on small-pox

* Extracts from "Small-pox in Kilmarnock in the Last Century," contained in the Report of the Medical Officer of the Local Government Board for 1884.

alone, to make it thus different from other zymotic diseases. What other possible agency was there than vaccination? No anti-vaccinator has suggested an answer to this question.

Dr. Wallace is not alone in passing over in silence this subject of age-incidence. It is carefully steered clear of in most of the anti-vaccination literature that I have read. Mr. White, however, by reason of having set himself to reply to *all* that was said by Sir Lyon Playfair and Sir Charles Dilke in the House of Commons, has found it necessary to make some reference to the point. Here is how he skims over the subject (p. 135)—"Small-pox, as we have pointed out, is chiefly a disease of the young; at some times, and in some countries, it has been almost exclusively so. Consequently, when small-pox falls off, the decline is most conspicuous among the more numerous class of sufferers. Latterly, small-pox, in common with other forms of zymotic disease, has exhibited a tendency to attack a higher range of ages. The causes of such alternations in disease we understand as little as those of the weather and the seasons; and in so far as they leave the death-rate unaffected they are of little practical importance."

These remarks amount to nothing else than an affirmation of a potent influence latterly introduced, and resulting in the special protection of the young, the affirmation being qualified by insistence that the nature of the influence is unknown: it may be anything else you can guess at, but it shall not be vaccination. Mr. White adduces no evidence as to other zymotics acting like small-pox in regard to the age of the victims. That a disease which, like measles, whooping-cough, &c., formerly had belonged to infancy, should become transferred to adult life, is as surprising as if cancer, which has always belonged specially to adults, should now become mainly prevalent among infants. The phenomenon is without a parallel in the history of human mortality, and can only be accounted for by an agency equally unparalleled.

Small-pox Mortality compared with that of other Zymotics.—The above facts regarding age-incidence might be deemed a sufficient reply to any argument founded by Dr. Wallace on a comparison of small-pox with other zymotics, but as I am desirous of leaving no point unnoticed, it will be necessary to answer more specifically his statements on this subject.

He says that "the mortality from the chief zymotic diseases has also decreased, more especially during the last thirty-five years; but the decrease of these diseases is not, proportionally, so great,

owing to the fact that deaths from diarrhœa have considerably increased in the latter half of the period."

Omitting fever, which is considered by itself, the zymotics referred to are measles, scarlatina, diphtheria, whooping-cough, and diarrhœa. The mean of the annual death-rates of these diseases united is, for the first ten years, 2,892 per million, for the central 25 years 3,584, and for the last ten years of the period 2,977.* There is thus merely a central plateau with a valley on either side. There are evidences that the later valley may be prolonged into a plain, but we are dealing with Dr. Wallace's chosen period, and the figures do not show any steady decrease. "On the other hand," the doctor goes on, "typhus and typhoid fevers have diminished to a much greater extent than small-pox, the reduced mortality from this cause alone being 382 per million, or more than six times as much as that from small-pox." It would be equally reasonable to mention that 382 units of body weight lost by an elephant was "more than six times as much" as 60 units lost by a horse. Fevers fell 39 per cent., and small-pox 16 per cent. But 39 per cent. is not "more than six times" 16 per cent.; it is indeed less than two and a half times that figure. And I have already shown that, treated rationally, the London small-pox fall is 251 instead of 57 or 70 per million.

As with small-pox, so with zymotics as a whole, the main discussion ought not to rest so much upon the particular case of London. The figures for England and Wales, which were equally accessible to Dr. Wallace, show that while small-pox has diminished much more rapidly in the provinces than in London, zymotics on the other hand have maintained their mortality more firmly in England as a whole than in London.

Death-Rate per Million Living, per Annum.

Period.	Measles.	Scarlatina and Diphtheria.	Whooping Cough.	Diarrhœa.	Total of Foregoing.	Fevers.
1838–40 (3 years) ..	580	770	500	220	2,070	1,110
1841–42 and 1847–50 (6 years)..	430	870	490	710	2,500	1,160
1851–60 (10 ,,)..	410	990 †	500	920	2,820	910
1861-70 (10 ,,)..	440	980 190	530	970	3,110	890
1871–80 (10 ,,)..	380	720 120	510	910	2,640	480

* From p. lxv. of the Registrar-General's 46th Report, the rates being multiplied by 1,000.

† Includes some diphtheria.

Dr. Wallace and other anti-vaccinators are anxious to prove something by comparison of the fall of "fevers" with the fall of small-pox. But what do they prove? Of typhoid fever we know that its principal cause is the prevalence of fæcal impurities which have largely been got rid of in recent years, and typhoid along with them. Of typhus fever we know that its principal causes are personal filth and overcrowding, and that these too have been largely diminished under active inspection of nuisances, and typhus has been correspondingly diminished. Of other diseases called "fevers" we know that the phrase was formerly used in certificates of death to an extent that it is not used now. So that, thanks to better means of excrement removal, better ventilation and cleanliness, and better certification, the class of diseases registered as "fevers" has been vastly diminished. But what has this to do with small-pox and vaccination? Has anybody said that fevers must be kept up in order to prove the efficacy of vaccination? Not at all: sanitary workers aim at getting rid of "fevers" at the same time that they are getting rid of small-pox; and they are succeeding with both, though by different and independent methods. "But they are not independent," it is answered; "the drainage that has lessened typhoid is the agency that has also lessened small-pox." Really it would be just as sensible to contend that it is vaccination, not drainage, that has lessened typhoid fever. No evidence is adduced of a connection between the diseases. They are not only different in their manifestations on the human body, but the whole natural history of their infection is different from beginning to end. If it be replied that they are alike in being zymotic diseases, and that similar measures should act alike on both, the answer is obvious. Whooping-cough is also a zymotic: why has drainage not influenced it? So is measles: but measles has not decreased as fevers have. Scarlatina, too, was stationary or increasing long after the fall in fevers had set in. And diarrhœa, until quite recent years, increased enormously. If the agencies that diminished small-pox as well as fevers were drainage and ventilation, why did they not also equally diminish all other such maladies?

It is passing strange that our author is not stumbled in his reasoning by the statistics of the other zymotics. He holds that, but for a "counteracting cause," small-pox would have gone down as fevers have done. But the statistics already given (p. 26) show that, up till 1880, *no other zymotic* had diminished as fevers had. Measles had a less decrease, whooping-cough was practically stationary, scarlatina and diphtheria increased during the first four

of the five periods mentioned in the table, and diarrhœa rose from 220 deaths per million to 900 or more.* He does not suggest the necessity of any "counteracting cause" for these diseases, but with the facts staring him in the face he unhesitatingly assumes that had it not been for such an influence (and that influence probably vaccination), small-pox would have diminished as fevers have! Surely, at least, the very diverse courses of the various zymotics ought to have taught him that each disease must be considered by itself, or in accordance with its affinities for other members of the group.

The contention that "sanitary measures" have caused the reduction in small-pox has been already sufficiently disposed of by the Registrar-General; and indeed Dr. Wallace seems ashamed to use it. He says, "All these causes of amelioration have certainly had," but here one would expect him to go on to say, "an *equal* effect on small-pox;" instead, he lets himself down by writing "*their* effect on small-pox," which is a very vague and impotent conclusion, incapable of contradiction, in fact, even axiomatic in its truthfulness, for in this world all things have "their effect" on all other things, and Dr. Wallace's proposition reduces itself to a harmless truism.

It happens that the London Bills of Mortality furnish statistics of two well-defined and easily-diagnosed zymotic diseases, with which, for long periods of time, the statistics of small-pox may be compared. They are measles and whooping-cough, and they resemble pre-vaccination small-pox in being diseases of childhood, in being epidemic every few years, and in being *personally* infectious.

The facts are very striking. Measles and whooping-cough have had any advantage that small-pox may have had from better food, better houses, and better hygiene. In the last century small-pox had a death-rate enormously greater than either disease, or than both together. In the seventeenth century, the small-pox rate was 57 per 1,000 deaths from all causes, and the measles rate was 6·3. In the eighteenth century, small-pox caused 84 deaths in every 1,000, measles 9, and whooping-cough 12. Now the very opposite is the case. In the decade beginning with 1872, small-pox in London killed only 13, measles on the other hand killed 24, and whooping-cough 36. These changes were gradual, small-pox diminishing under the growing influence of vaccination, and in spite of increasing density of population, while the latter agency has

* We shall see by-and-by that this very increase is used as an argument against vaccination.

produced until recent years a steady rise in measles and whooping-cough, these two diseases having no preventive corresponding to vaccination. The following are the figures for London in various epochs :—

Deaths per 1,000 Deaths from All Causes in London.

	Whooping-cough.	Measles.	Small-pox.
Seventeenth Century...	?	6	57
Eighteenth Century ...	12	9	84
1800–53	29	23	31
1854–71	36	24	16
1872–81	36	24	13

Note.—In this table decimals are omitted, the nearest integer being used.

As regards England, in the three periods 1847–53, 1854–71, and 1872–80 the rates per million were—for measles, 420, 435, and 377 ; for whooping-cough, 528, 517, and 520; and for small-pox under five years of age, 1,617, 817, 323.

Vaccination an Alleged Cause of Small-pox.—It is difficult to treat this allegation seriously, but it is actually put forward by Dr. Wallace. Let us see what are the facts. In the seventeenth century there was no vaccination, and small-pox in London was responsible for 5½ per cent. of the total mortality. In the eighteenth century there was no vaccination,* and small-pox caused 8½ per cent. of the deaths. In the first 53 years of the nineteenth century vaccination was more or less prevalent, but small-pox fell to 3 per cent. From 1853 till 1881, inclusive, there has been much more vaccination, and much less small-pox—less than 1½ per cent. of the deaths from all causes in London, and much less in the provinces. In the army and navy constant re-vaccination is going on. In 1882 there were 20,000 re-vaccinations in the army, 15,000 of them being more or less successful, and the small-pox deaths were five. In the 12 years ending 1884, there was only one small-pox death in the Home force of the navy, and yet the men are constantly mingling with the freshly re-vaccinated recruits. The suggested cause of small-pox is constantly present, but small-pox itself is almost as constantly absent. In Kilmarnock during the last twelve years there have been over 10,000 vaccinations, but there has not been one case of small-pox. Is it conceivable that, in a town of 25,000 inhabitants, 10,000 cases of an infectious eruptive fever

* The influence of Inoculation on small-pox in the eighteenth century is discussed at p. 156 *et seq.*

could be introduced, not all at one time, but carefully spread over twelve years, in all seasons, and in all climatic conditions, and yet that not one resident should be attacked? A similar tale can be told of hundreds of other communities—in fact, of all communities in this country. Any quantity of children are vaccinated, and any quantity of opportunity is given for the spread from them of any disease that can spread; yet small-pox is not spread. But let small-pox be introduced into the neighbourhood, and the case is changed. Now we see people who for years have been daily and hourly in the presence of vaccination, affected by small-pox. The vaccination which had been going on among them had never given them small-pox. But small-pox brought into their midst spreads among them, and (unless they have themselves been vaccinated) kills them by the score or the hundred at its will. And yet vaccination, Dr. Wallace says, may possibly spread small-pox. No case of small-pox has ever been proved to result from any of the millions of vaccinations that are annually performed throughout the civilised world.

In reference to this question, Dr. Wallace says (pp. 9, 10) "that in 1863 there was a very great number of vaccinations, followed in 1864 by an *increase* in small-pox mortality. Again, the number of vaccinations steadily rose from 1866 to 1869, yet in 1870–1 small-pox mortality increased; and yet again, in 1876 an *increase* in vaccination was followed by an *increase* of small-pox deaths. In fact, if the dotted line showed *inoculation* instead of vaccination, it might be used to prove that inoculation caused an increase of small-pox." Does the doctor know of any one who ever tried to prove the influence of inoculation by so feeble an argument? There is no attempt to show that in any special district an excess of vaccination was followed by an outbreak of small-pox. For anything the writer says, the extra vaccinations may have been in one end of England, and the extra small-pox in the other. And an outbreak would be less likely to follow the 646,000 vaccinations of 1,863 than the 677,000 vaccinations of 1854. But in 1855 there were only 2,525 deaths from small-pox, while there were 7,684 in 1864. The doctor suggests that 646,000 vaccinations in 1863 caused 7,684 deaths in 1864, and then he propounds the view that a mean annual vaccination of 495,000 persons in the four years 1866–9, caused a mean annual small-pox mortality of 21,110 in the years 1871–2. There is no relation here of cause and effect, and it is very hard to connect the years 1866–9 with 1871–2. As to the third example, the influence of excessive vaccination in 1876 on

the mortality of 1877, the doctor is entirely wrong about the facts. There was no excess of vaccination in 1876.* The numbers for the three years 1875–6–7 were—(1) 498,952, (2) 506,587, (3) 529,376, so that the argument is founded on a blunder; and the number of vaccinations in the years 1863 and 1866–9 had no more to do with the subsequent small-pox than had the blunder as to 1876 with the small-pox of 1877. But in order to demolish the doctor's argument, it is enough to point out that the vaccinations of 1854, by far the most numerous of the series, were followed by the very low mortality of 1855, and that a similar sequence of much vaccination and little small-pox connects the years 1852–3, '58–9, '60–1, '65–6, '72–3, &c. And *vice versâ*, vaccination declined in 1870, and small-pox rose in 1871; so also in '57 and '58, in '66 and '67, &c.

It is of course true that the years 1871–2 were high in both small-pox and vaccination. Every one knows that when small-pox appears, people rush in crowds to get the protection which vaccination affords. But the fact that these get vaccinated because they know that others have died of small-pox cannot by any possibility bring the dead to life again, nor blot out their names and numbers from the records of mortality.

In the end the thesis becomes too audacious for even Dr. Wallace to defend. After having spoken as above, he concludes thus (p. 10): "I only maintain, however, that it [the dotted line] does *not* prove that vaccination diminishes the mortality from the disease." But Dr. Wallace is not to be let off in this way. I don't suppose that any one holds that infantile vaccination immediately preceding a threatened epidemic could prevent such epidemic. The children vaccinated would themselves be very much protected; but their seniors, unless duly vaccinated and re-vaccinated, would be liable to suffer. And so we find it. The principal incidence of the disease is not now on children, as it was in a last-century epidemic, but on the contrary, of the 44,433 deaths in the 1870–3 epidemic nearly 20,000 were over 15 years of age;† and the average age at death from small-pox is now found to be nearly 20 years.‡ On Dr. Wallace's showing, Why this change? In England vaccination is compulsory at three months, and children have come to be the class least affected by small-pox, instead of being, as formerly, the class to which small-pox was almost exclusively confined. Dr. Wallace should explain this. It is not enough for him to profess that his "dotted line" does not prove the value of vaccination; and

* See p. 29. † See p. 51. ‡ See "Small-pox in Kilmarnock," *loc. cit.*

this in the middle of a contention that vaccination "may possibly be" the cause of such small-pox prevalence as still remains.

Does One Attack of Small-pox Protect against a Second Attack?—The view that when small-pox prevails it is due to the practice of vaccination is held more strongly by some anti-vaccinators than by Dr. Wallace. In many instances it is an accepted part of the creed. But if vaccination can spread small-pox, it follows that the vaccine disease is small-pox unbereft of its contagion. Now it belongs to the accumulated experience of centuries that small-pox, like scarlatina, measles, and whooping-cough, very rarely occurs twice in the same individual. In other words, one attack prevents a second. The anti-vaccinator is, therefore, on the horns of a dilemma. On the one hand, there is the confession that the vaccine disease, being small-pox, must prevent small-pox; and on the other, the denial of the universally acknowledged protective power of small-pox against small-pox. The confession would strike at the root of the whole agitation. Mr. Alfred Milnes, M.A., sees this, and heroically accepts impalement on the second horn.* He says that he examined the question "as a statistician," and here is the remarkable result: "My theory is that small-pox recurs in the same individual pretty nearly as often as it ought to be expected to do on the ground of mathematical probability. Allow me to illustrate this in a familiar way—thus: if you take a handful of peas, and throw them from the top of the Monument, you would hit some man on the top of his hat with a pea; but you might throw peas to the end of your existence before you would hit the same man on the top of his hat a second time; it would be millions to one that you would not do so. Now I venture to think that the concurrence of all the circumstances which go to make up an attack of small-pox—a sufficient virulence of contagion *plus* a sufficient susceptibility in the patient—is, like the concurrence of the hat and the pea, one that would necessarily be of very rare occurrence the second time." To refute this, let us see how the illustration applies to Kilmarnock,† where in the last century, of every 1,000 children born alive, 161 died of small-pox. But, of these, 147 died before reaching 5 years of age, and only 14 during all the rest of life. Or, to take the case of Geneva,‡ in the period 1580–1760, of every 1,000 deaths from small-pox, no less than 805 were under 5 years of age. How does the "pea" illustration do here? Why were only the children hit,

* *Vaccination Inquirer*, May, 1886, p. 31. † *Loc. cit.* ‡ Simon, *op. cit.*

though people at all ages were constantly walking backwards and forwards under the Monument? Obviously, it was no mere matter of chance, but there was a reason for the difference; and equally obviously the reason is to be found in that susceptibility or insusceptibility of which Mr. Milnes makes such casual mention. And why were adults insusceptible rather than children? Surely because they had already had small-pox. And as with small-pox in childhood, so with vaccination. The vaccinated are (in their measure) insusceptible, while the unvaccinated come in for the peas. This is why among 1,000 unvaccinated small-pox deaths in London in 1884, no less than 612 were under 10 years old; while among 1,000 vaccinated, only 86 were under that age.* This is why the peas in the one case hit the young, and in the other the old. The nurses in small-pox hospitals may be described as living in a constant downpour of peas, ceasing neither night nor day. Why is it that, if re-vaccinated, they escape being hit—why is it, indeed, that they are not constantly being hit, that as soon as they have recovered from one attack they are not prostrated by a second, and a third, and so on? The deluge of peas never ceases. And if it be replied that the absence of either one or more attacks is due to want of "susceptibility," that is the very answer I desire and agree with. Truly this Monument and pea argument does great credit to Mr. Milnes "as a statistician"!

It is amusing to note the change of front in this matter. In 1871 before the Select Committee of the House of Commons, Dr. Pearce spoke of "the ordinary law that those who have had small-pox are less liable to a second attack than those who have not had it," and Mr. G. S. Gibbs said "it is a patent fact that persons very seldom have the small-pox a second time." It seems, therefore, not to have struck anti-vaccinators at that time to assert that one attack of small-pox does not prevent another. They held the reverse, and used their opinion in support of their view that hospital nurses don't take small-pox because of the supposed fact that they had already had small-pox.†

The actual number of cases in which the disease recurs seems to be very small. The point was discussed by the German Vaccination Commission in 1884, and numerous statistics were given, the result being that in over 56,000 cases of small-pox there were not more than 88 second attacks.‡

* Dr. Buchanan's Report for 1884, p. xxi.

† Select Committee's Report, 1871, Q. 166–271, 897, and 1,625.

‡ See a paper by Dr. E. J. Edwardes, in the Transactions of the Epidemiological Society, Dec. 9th, 1885.

The "Counteracting Cause" in London.—While it has been shown that in England as a whole there is no need to search for a "counteracting cause" to explain a purely imaginary (when sufficiently long periods are included) want of decrease of small-pox as compared with other zymotics, it is evident that there must be some agency at work to account for the great excess of the small-pox rate in London as compared with the provinces. That the cause is not to be found in any lessened power of vaccination in London, is proved by the similarity of the two populations as to the diminution in the relative number of children's deaths to deaths at all ages.* Yet it operates in a way that Dr. Wallace might properly describe as a "counteracting cause," to *hide* the beneficial action of vaccination in the metropolis.

One such cause is well known and widely known; it formed the subject of a Royal Commission in 1881, the proceedings of which are published in a large folio volume.† I refer to the great metropolitan small-pox hospitals. It is surprising that Dr. Wallace should omit all mention of this alleged factor, even if he do not believe in its influence, amply proved as it is by the careful and exact investigations conducted by Mr. Power and others. It was found that in Fulham, Hampstead, &c., the death-rate from small-pox distinctly and considerably increased when the hospitals in these districts were open, and fell again after they were closed. The hospitals were centres of contagion, and the various zones of population surrounding them were affected very exactly according to their propinquity to or distance from these centres. The difference between London and the provinces consists in this, that in the former, owing to the great size of the community and to difficulties of transit, the hospitals are not sufficiently isolated to prevent them acting as propagators of disease, while in the latter the reverse conditions very largely prevail, except perhaps in a few instances where the London experience seems to have been repeated. If the figures on p. 13 be examined, it will be seen that while London has always been above the provinces, before 1871 its rate was seldom the double of theirs. But the Metropolitan Board Hospitals were opened in 1871, and, as Dr. Buchanan observes in his last report, since then a sixfold and sevenfold rate has been reached. So that the counteracting cause belongs entirely to years included in the latter half of Dr. Wallace's period.

* See table, p. 17, and diagram, p. 14. † *Op. cit.*

The Prevalence of Vaccination.

One of Dr. Wallace's main arguments, and some of the most extraordinary of his blunders, relate to this question. He says (pp. 7, 8) "we have fortunately a means of directly testing the alleged efficacy of vaccination. The Eleventh Annual Report of the Local Government Board gives a table of the number of successful vaccinations, at the expense of the Poor Rate, in England and Wales, from 1852 to 1881. From the figures of this table I have calculated the numbers in proportion to the population of each year, and have exhibited the result in the dotted line of my Diagram II.; and to this I beg to attract the reader's attention, since it at once dispels some oft-repeated erroneous statements.

"In the first place we see that, instead of vaccination having increased since the enforcement of penal laws, it has actually diminished; so that the statement so often made by official apologists for vaccination, and repeated by Sir Lyon Playfair in his speech to the House of Commons last year—that the progressive efficiency of legal vaccination has diminished small-pox—*is absolutely untrue, since there has been a decrease rather than an increase of 'efficient vaccination.'*"

The following considerations refer to this subject:—

(1) The curve of vaccination is given in Dr. Wallace's diagram in a manner so fallacious as to be wholly inexcusable. I have had to complain of the flattening down of the small-pox curve, so as to make it convey no true idea of the great decline in mortality. Not so with the vaccination curve. *It has no relation whatever to the figures at each side of the parallelogram.* The highest point (in 1854) corresponds to the side number 2,700, and the lowest point (in 1853) stands opposite the number 1,000. It would thus seem that the vaccinations in 1854 were more than two and a half times as numerous as those of 1853, while in reality they were much less than twice as numerous; and so on along the whole curve. It has no base-line, and is entirely misleading.

(2) It has been shown (p. 24) that there is a grave error as to 1876, and that an argument has been founded on the error.

(3) Though the annual number of vaccinations were decreasing, the percentage of the vaccinated population might be increasing. At the further end of the bridge of life, those who are dropping through the broken arches have a much smaller amount of vaccination among them than those who are only beginning their journey,

and so long as that remains true, the percentage of the vaccinated must be constantly increasing.

(4) *A Blunder and its Origin.*—The remarkable ignorance with which Dr. Wallace writes is shown in this—that he apparently does not know that *the statistics of public vaccinations for the years ending* 1872 *are wholly incomparable with those beginning in* 1873. The two sections do not represent similar facts. Up till 1872, both vaccinations and re-vaccinations are included in the statistics on which the curve is based, and after that year re-vaccinations are not included. (Thus in 1854 the vaccinations were actually 8 per cent. more than the total births.) This discovery needed no difficult investigation. *It is specially stated in a note in the middle of the very page* (346) *of the official Report containing the "table" from which Dr. Wallace asserts that he has obtained his figures. And the whole argument is founded on the omission of this fact.* Here is the "note":—

"Up to the year 1872 inclusive there was no separation in the public returns of primary vaccinations and re-vaccinations. The number of persons successfully vaccinated, therefore, as given in the above table, includes the successful re-vaccinations performed at the expense of the Poor Rate."

I have succeeded in discovering the origin of this extraordinary blunder. Dr. Wallace specifically mentions "a table" in the 11th Annual Report of the Local Government Board, as the source of his information. He says, "From this table I have calculated the numbers"; but the fact is that no such table exists in the Report. He got his figures from p. 39 of Mr. White's book on Playfair and Dilke. From the same source he got his error as to 1876, already noted (p. 24). In White's book the figures for that year are misprinted, 566,587 instead of 506,587. The misprint is in itself nothing, but it serves to track Dr. Wallace; and it is to White, not to Wallace, that belongs the responsibility of omitting the all-important note just quoted, Wallace's share of blame consisting in the mis-statement that his figures were calculated from the original Report, they being really got at second hand from White's book. White gives no hint as to the truth. In replying to Sir Lyon Playfair, he gives a "record of vaccinations," which, he says, was "copied from the 11th Annual Report of the Local Government Board." Then he takes two separate tables, Nos. 76 and 77, the former for 1852–72, including re-vaccinations, and the latter for 1873–81, excluding re-vaccinations. He leaves out the note and the separate headings of the two tables, adds some statistics regarding population and small-pox mortality, and so constructs a statement

which simply falsifies one essential fact of the case. By this Dr. Wallace has been misled. Having built up a table of his own, White adds triumphantly (p. 40), "This record completely nullifies Sir Lyon Playfair's assumptions." Oddly enough, it is on the same page that White has the following (see also p. 12, *ante*): "'Cookery' that would be accounted fraudulent in finance, acquires another character when undertaken for the glory of vaccination. 'Deceit,' it has been said, 'is good or evil according to the purpose for which we deceive.'" I have no thought of applying this language to Mr. White himself, but wish to point out the contrast between his own doings and his own indignation, which moreover is called forth by the simple fact that Sir Lyon Playfair had ventured to quote the Registrar-General's statistics of small-pox mortality at all ages, which are given by me on p. 15.

Evidence as to the Prevalence of Vaccination.—The question arises, are there any data on which to found an opinion regarding the prevalence of vaccination? Dr. Wallace replies in the negative. He says (pp. 8, 9), "It is true that this curve does not exhibit the members of the vaccinated population, which there is no means of arriving at. Dr. Seaton, in his evidence before the Parliamentary Committee in 1871, stated that before 1853 the average vaccinations were 31·8 per cent. of the births, and in the ten years 1861–70, 49·46 per cent. These are public vaccinations, but they probably include the bulk of the whole; and the figures seem to show that the proportion of the population vaccinated is much less than is usually supposed." But in the very page from which Dr. Wallace gets these figures,* Dr. Seaton points out (1) that the above percentages take no account of deaths previous to the vaccination age, (2) that they include only children *under one year*, and that "15 or 16 per cent." should be added for public vaccinations over one year, and (3) that in addition there is an "immense amount of private vaccination." Yet Dr. Wallace, shutting his eyes, assumes that 31·8 and 49·46 per cent. "probably include the bulk of the whole"!

But there is other evidence.

(1) The returns of the vaccination officers are published in the annual Reports of the Medical Officer to the Local Government Board, and include a statement of the number of children "unaccounted for" as regards vaccination, and this statement, though not including cases postponed under medical certificate, yet indicates with sufficient accuracy the amount of the unvaccinated residuum in each year. In

* Report of Select Committee on Vaccination Act of 1867, p. 299.

the five years ending 1877, this amounted to 8·1 per cent. of children born in the metropolis, and 4·1 per cent. in the rest of England; and in the five years ending 1882, the corresponding figures were 6·8 and 4·4. It is passing strange that Dr. Wallace, ignoring these facts, goes back 20 or 30 years to get evidence which, to be of any meaning, must refer to the present condition of things. But if prior to 1853, 32 per cent., and in 1861–70, 50 per cent. formed "the bulk of the whole," his own diagram shows (or would have shown had he graduated it) that, since 1870, well on to 60 per cent. of children born have undergone public vaccination. And yet he says public vaccinations are diminishing! At one time he shows few vaccinations in 1861–70, by quoting Dr. Seaton's 50 per cent.; at another he shows that more were vaccinated then than now, by pointing to a diagram founded on figures ranging from 60 to 90 per cent.

It is doubtless due to the exertions of Dr. Wallace and his friends that the infants "unaccounted for," who in the 10 years 1873–82 formed 4·8 per cent. of the births, had come in 1883 to form 5·1 per cent. But no such trivial change is what Dr. Wallace had in view in decrying Sir Lyon Playfair's statement.

(2) In 1863, under the direction of the Privy Council, a vaccination census was taken in a number of schools throughout the country. In the provinces, 78 to 95 per cent. had scars of vaccination; and in 53,185 children in London, 93·6 per cent. were marked.*

(3) In the 14th Report of the Medical Officer to the Local Government Board (for 1884) there is an account of a vaccination census in the parish of St. Pancras. There were found at home 142,788 persons, or three-fifths of the total population. Part of the population under one year had not reached the vaccination age. But of nearly 26,000 children from 1 to 10 years old, fully 99 per cent. had been vaccinated or were "under vaccination;" and of 112,000 over that age, only 1,000, or 1¼ per cent. were unvaccinated. Of the vaccinated over 10 years old, only 19 per 1,000 had scars of small-pox; but of the unvaccinated, 622 per 1,000 were scarred. Very similar results were obtained in a census of West Ham.

Now that Dr. Wallace's argument as to the annual lessening of vaccinations has been razed to the ground, I confess that I look with some regret on the ruins. For as it stood it formed a delightfully easy and complete reply to one of his own main contentions. On p. 23 he blames vaccination for causing a steady and rapid

* See Privy Council Report, and Parliamentary Paper No. 275, Session 1881, p. 3.

increase in the mortality from various other diseases. And he does not for a moment see that a constant *decrease* in vaccinations could hardly be held responsible for a constant *increase* in these maladies !

In the course of his summing-up of the section under review, Dr. Wallace asks if people should "continue blindly to accept the dogmas of an interested and certainly not infallible body of professional men." The imputation of interested motives may be safely left to the judgment of the reader.

CHAPTER II.

SMALL-POX AS IT IS.

Jenner's Hopes—Why Small-pox is not Extinguished—Vaccination not an Absolute Preventive—The Unvaccinated and the Imperfectly Vaccinated—The Comparative Value of Vaccinal Operations—Vaccination Marks, their Quality and Number—Small-pox, Discrete and Confluent—Russell's Diagram—Marson's Statistics—Mr. P. A. Taylor—The Value of Best Vaccination—The Need of Re-vaccination—The Increased Fatality of Small-pox—The 1870-3 Epidemic—Anti-vaccinators on the Epidemic—Baxendell, Taylor, Tebb, Milnes, White—Statistical Evolution—Dr. Seaton's Report—The Verdict of the Select Committee.

JENNER at first believed that he had discovered "an antidote capable of extirpating from the earth a disease which is every hour devouring its victims—a disease that has ever been considered the severest scourge of the human race"—such, be it observed, was small-pox to the knowledge not only of a profession, but of Parliament, when the nineteenth century began.

But the fact remains that small-pox lingers amongst us. Baffled but not beaten, scotched but not killed, it still seizes an occasional victim and exhibits in his destruction all its old ferocity. Or, like the smouldering remains of a great conflagration, when danger is thought to be over, and the water ceases to play on the smoking ruins, the fire now and again bursts afresh into a feeble imitation of its former fury, and is only again subdued by the re-application of the controlling power.

Very soon, indeed, Jenner's view was modified. Inquiry proved what for the moment seems to have been forgotten, that natural small-pox itself did not *invariably* prevent small-pox; and also that in odd cases an attack occurred in persons who had previously received the disease by inoculation. Similarly, as early as 1804 or 1805, instances arose of small-pox following vaccination. So that the disease which, with the insight of genius, Jenner had designated "variolæ vaccinæ," was found to resemble human small-pox in the occasional failure of its protective power.

(1) Here, then, is one reason why small-pox has not been permanently stamped out. Just as, through constitutional idiosyncrasy, some people take scarlatina a second time, so small-pox may in

certain rare cases follow even natural small-pox, and less rarely it may follow inoculated small-pox, or inoculated cow-pox.

(2) Not even in the first flush of enthusiasm did Jenner imagine that vaccination would abolish small-pox *unless all the susceptible were vaccinated.* The protection of London would not benefit Edinburgh or Dublin, and the vaccination of 95 per cent. of a nation would not, except by lessening possible sources of infection, have a vicarious influence on the unvaccinated residuum. This is so perfectly patent that one listens only with amazement to the clamour that is raised by anti-vaccinators over outbreaks, which owe their origin and spread very largely to the existence in our midst of a small section of the people, who, owing either to gross carelessness, or to the influence of writers like Dr. Wallace, remain still in constant danger of attack by the disease. If one accepted the author's view, "that the proportion of the population vaccinated is much less than is usually supposed," we might safely leave him to answer himself—to show that the existence of small-pox is exactly what a vaccinator would look for in a country so incompletely protected. But I have shown that the accepted estimate for the unvaccinated over the whole country is about 5 per cent. In England and Wales, therefore, this would give in the year 1885, for example, an unvaccinated population of about 1,375,000, surely a sufficient field for a very considerable epidemic, even if we take into calculation the fact that many of this great residuum have already suffered for their own temerity, or for their parents' folly, by an attack of small-pox.

The Comparative Value of Vaccinal Operations.

(3) Another and most important factor in the production of our present-day small-pox, is the existence of a very large class of badly-vaccinated people. The second edition of Reynolds' "System of Medicine" was published in 1870, and contains a long article on vaccination by the late Dr. Seaton of the Local Government Board. This was just previous to the great epidemic of 1870–3, and the four years 1866–9 had had a very low small-pox mortality. This is sometimes depicted as a "piping time of peace" among believers in vaccination—a time when they were given up to vain boastings about the efficacy of the "rite"—a time when they were living in a fool's paradise, believing the reign of small-pox to be at an end. This sanguine view was certainly not held by those whose duty it was to have an accurate knowledge of the whole matter. Dr. Seaton says,* "In the official inquiries [of 1860–4], in the course of which

* *Op. cit.*, 2nd Ed., vol. i., p. 295.

the arms of nearly half a million vaccinated children were examined, evidence was obtained of the great extent to which imperfect or insufficient vaccination had heretofore prevailed in England; taking the country throughout, not more than one child in eight was found to be so vaccinated as to have the highest degree of protection that vaccination is capable of affording; not more than one in three could, on the most indulgent estimate, be considered as well protected; while in more than one in four the vaccination had been of a very inferior kind indeed, resulting in marks of imperfect character, or in only one or two marks of merely passable character." These words, read after the event, look almost like a prophecy. They go a long way in interpreting the outbreak which followed so shortly after they were written.

Vaccination Marks, their Quality and Number.—The difference in protective power of various procedures classed under the one term, vaccination, is widely acknowledged. Subdivision of these procedures may be based (1) on the quality of the vaccination marks, (2) on their number, and (3) on both quality and number.

In Scotland, at least until recent years, attention has been concentrated more on quality than on number. Dr. Russell's experience in the Glasgow hospitals * was that of patients with "good" marks, 3·81 per cent. died, and of patients with "bad" marks, 21·1 per cent. died; that "the contrast is apparent at all periods of life, but rises steadily from a minimum in the earliest to a maximum at the latest periods;" and that "badly-vaccinated persons are in the aggregate not much better protected from a fatal result than the unvaccinated," the mortality of the latter having been 29·75 per cent.; and further that, "looking to the age, the badly vaccinated approach the unprotected condition more and more nearly as they become older."

Dr. Russell very effectively disposes of a fallacy common amongst anti-vaccinators. Mr. Alex. Wheeler, for example, points out † that "the eruption is the key to the disorder." In the discrete form nearly all recover, while in the confluent, and especially in the malignant form, the disease is untractable and often fatal. Then he asks, "What varies the exhibition?" and the answer is, "The condition of those attacked," and "the soil and the surroundings." But Wheeler never discusses the question, Does vaccination influence the character of the eruption? and on the reply to this depends the

* "A Study of 972 Cases of Small-pox"—*Glasgow Medical Journal*, Nov., 1872.

† "Vaccination, 1883" (p. 7), by Alexander Wheeler (London, E. W. Allen).

whole value of his argument. I don't suppose any one ever attempted to prove that the nature of the soil on which a hospital was built affected the amount of small-pox eruption on the body of a patient. But this question is got rid of by taking the facts as to eruption in a single hospital, where of course soil and surroundings are alike for all. And as to "the condition of those attacked," the accompanying diagram, copied from Dr. Russell, shows that *the* condition which influences the eruption is vaccination. The diagram shows (1) that "vaccination diminishes the original extent of the eruption;" (2) that "age has a slight influence in increasing the tendency to confluence in the natural disease;" (3) that "the influence of vaccination on the extent of the eruption diminishes as the age increases" (*i.e.*, re-vaccination should be performed); and (4) that "the influence of a 'good' vaccination is very stable, and of a 'bad' very unstable."

In England special attention has been paid to the number of marks, and the following are Mr. Marson's well-known figures,* being "the result of his observations made during 25 years, in nearly 6,000 cases of post-vaccinal small-pox" in the London Small-pox Hospital:—

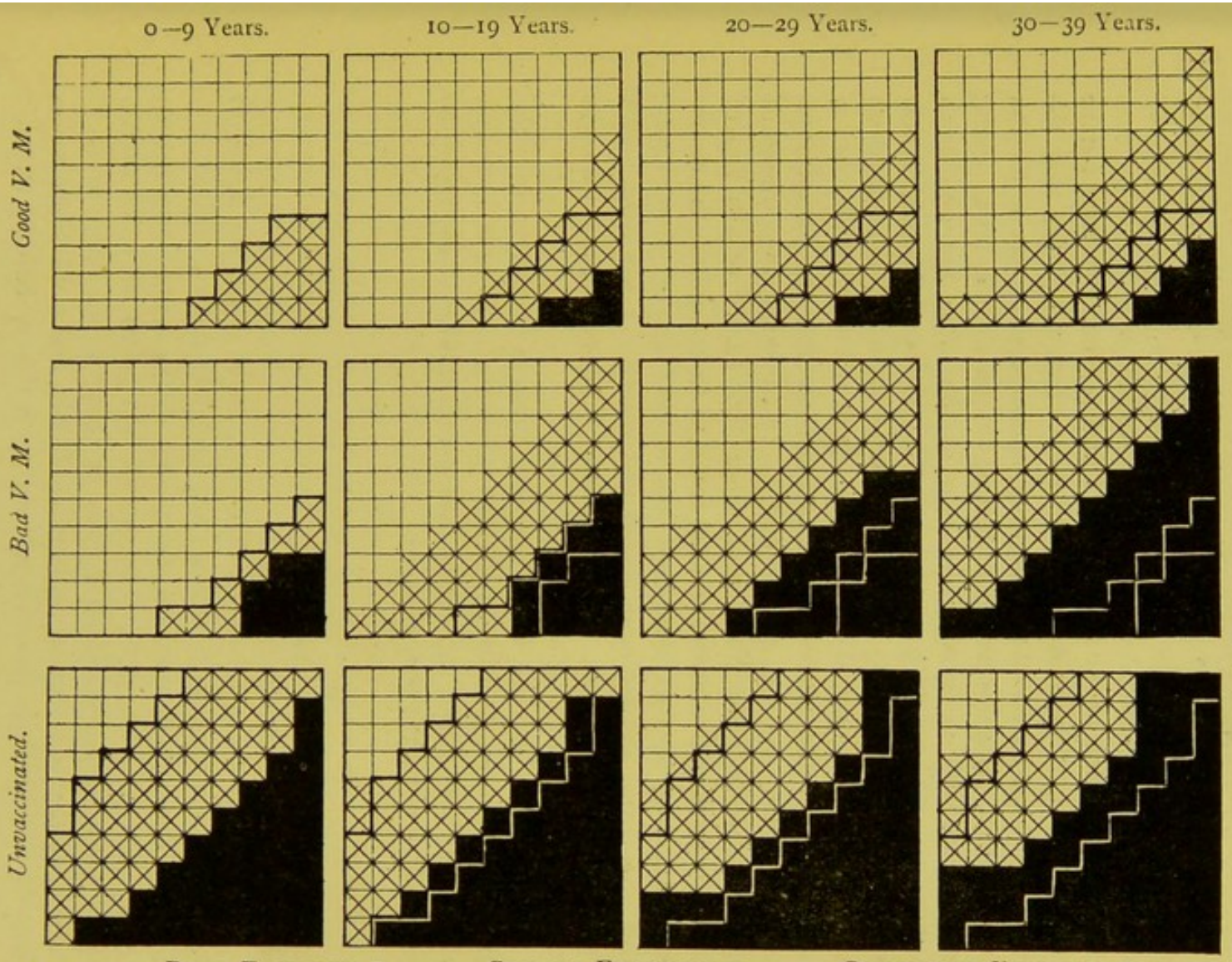
Cases of Small-pox, classified according to the Vaccination Marks.	Number of Deaths per cent. in each Class respectively.
Unvaccinated	35½
(1) Stated to have been vaccinated, but having *no* cicatrix	21¾
(2) Having *one* vaccine cicatrix	7½
(3) Having *two* vaccine cicatrices	4¼
(4) Having *three* vaccine cicatrices	1¾
(5) Having *four or more* vaccine cicatrices ..	¾

As to Class 2, it is stated that where the one cicatrix was *well marked* the death-rate was 4¼, but where badly marked it was 12; and as to Class 3, the corresponding figures were 2¾ and 7¼.

Naturally enough, opponents of vaccination have been much exercised as to the evidence contained in the statistics of Marson and others, of the power of vaccination well done, as against vaccination ill done. Mr. P. A. Taylor† tries to discredit the evidence by giving the following list of death-percentages in children under five years old, extracted from a table in the

* Parliamentary Paper 275, Session 1881.

† *Op. cit.*, p. 23.



N.B.—The large squares contain 100 smaller ones, so that the varieties of the smaller squares represent percentages. ("V. M." means Vaccination Marks. The thicker black and white lines indicate the original percentages at 0—9 years.)

Report of a Committee of the Managers of the Metropolitan Asylum District:—

(*a*)	One mark	22 per cent.
(*b*)	Two marks	28 ,,
(*c*)	Three marks	18 ,,
(*d*)	Four marks	0 ,,
(*e*)	Five marks	16 ,,

But on turning to the table itself I find (1) that the marks have been tabulated "without regard to their character;" (2) that the percentages are based on the following microscopical series of deaths: (*a*) 5 deaths, (*b*) 4 deaths, (*c*) 3 deaths, (*d*) no deaths, (*e*) 1 death; and (3) that with *no* marks there were at the same age 238 cases with a mortality of 68·5 per cent.* The views of Messrs. Young and Wilkinson regarding the "percentage swindle" are stated on p. 79. The table quoted from contains both the number of cases at each age and the percentage of deaths, so that the actual number of deaths can be got at once. It includes the whole of life under eight age-periods, and while Mr. Taylor selects two of these—(1) under five years, and (2) from 30 to 40 years—the death-percentages for all ages combined are, without marks, 56 per cent.; with one mark, 15 per cent.; with two marks, 11 per cent.; with three marks, 9 per cent.; with four marks, 6 per cent.; and with five marks, 5 per cent.

Mr. Taylor, for the same purpose, gives a statement of "the number of cases admitted in various hospitals." Here is a sample, which he has made up from the same table—"Metropolitan Hospital Report, 1870–2, gives:—

One mark	1,124
Two marks..	1,722
Three and more	1,677"

He here adds together (as, of course, he is at perfect liberty to do) those admitted with three, four, and five marks, and so gets 1,677. The actual numbers were—one mark, 1,124; two marks, 1,722; three marks, 936; four marks, 471; five or more marks, 270. Then he adds, "Such figures as these would really seem to show that the vaccination authorities boldly make whatever assertions fit in with their theories, relying upon the probability that the public will not trouble itself with hospital reports"!

* One wonders if Mr. Taylor in compiling his statistics was not struck by the fact that the small unvaccinated fraction of the London child-population sent 238 patients to hospital, while the great vaccinated whole sent only 65.

But in regard to all such statements of admissions to hospitals, an essential question is, What are the comparative numbers of the general population with one mark, two marks, and so on, respectively? About two-thirds of all vaccinations in England are done by the public vaccinators, and in all these cases the operator is now bound to make four or more marks, and a great many private practitioners make as many. We have therefore perhaps four-fifths of the total juvenile population with four or more vaccine cicatrices. But in the Homerton Hospital, in 1871–7, in a total of 1,285 cases under 10 years old, only 95 had four or more marks. Thus the better-vaccinated majority of the population supplied less than one-thirteenth of the total hospital cases, while the worse-vaccinated and unvaccinated minority supplied over twelve times as many.*

If A and B are debating a subject, it is clear that A must attack the opinions actually held by B, and not some other opinions which A thinks B ought to hold. So the opponents of vaccination should try to confute by evidence the views really held by the great bulk of its supporters. And yet a deal of ink is wasted in trying to show that vaccinators *ought* to believe what an isolated few, having some hobby about zymosis or the like, actually *do* believe, namely, that vaccination ill done is as effective as vaccination well done—that one mark is as good as four. On this point anti-vaccinators might have the consistency to accept the views of the man whom they most frequently put forward as having special acquaintance with the practice—their "public vaccinator," of so-called "twenty years' experience."† But Dr. Collins is not with them here. In answer to a question (522) before the Select Committee of 1871, he said, "That is what I say, that if there is to be any protection, *the operation should be thoroughly performed, and the full complement of marks established.*" To which all who know anything of the matter must add a hearty "Amen."

Returning to Mr. Marson's figures, they show that while persons with four or more marks have a mortality of only $\frac{3}{4}$ per cent., those with one bad mark have a 12 per cent. rate. In other words, the ratio of deaths to attacks is sixteen times as great in the worst-vaccinated as in the best-vaccinated. The facts are amply confirmed by the more recent experience of the hospitals of the

* In the years 1871-7, there were at all ages 5,479 cases, of whom 500 had four or more marks. In the Hospital Reports for 1881 (see p. 89), the numbers with four marks are not stated.

† As to his claims to this title, see p. 120.

Metropolitan Asylum district. Picking up again the Homerton results for 1871–7, I find that, at all ages, the best-vaccinated (*i.e.*, with four or more good marks) had a mortality, among males, of $2\frac{1}{2}$, and among females of 1 per cent.; while the corresponding figures among the worst-vaccinated (*i.e.*, with one imperfect mark) were 18 and 13 per cent.

The above evidence shows the difference in power of good and bad vaccination, to protect against death, among those attacked by the disease.

But, in addition, there is a difference in the power of preventing attacks. The degree of this difference may be tested by the prevention among children of such attacks of small-pox as can leave scars. In the school census of vaccination already referred to (pp. 50, 51), among upwards of 50,000 children, the following results were obtained :—*

Classification of Children Examined.	Proportion marked with Small-pox per 1,000 Children in each Class respectively.
(1) Having no vaccine marks	360
(2) Vaccinated—	
(*a*) One cicatrix	6·80
(*b*) Two cicatrices	2·49
(*c*) Three cicatrices	1·42
(*d*) Four or more cicatrices	0·67
(*α*) Cicatrix or cicatrices of bad quality	7·60
(*β*) ,, ,, tolerable ,,	2·35
(*γ*) ,, ,, excellent ,,	1·22

Amongst those having any vaccination at all, the difference in the protective power against attack by small-pox between the best vaccination and the worst vaccination is represented by the figures 7·6 and ·67, the ratio being 11 to 1. The difference in the ratio of deaths to attacks was as 16 to 1. Firstly therefore a child vaccinated in the best manner is eleven times less likely to be attacked by the disease than another vaccinated in the worst manner: and secondly, if attacked, he is sixteen times less likely to die of it. If the two ratios are multiplied, the full benefit of best vaccination would seem to be about 170 times that of worst vaccination.† This, however, refers only to children of school age, and

* Reynolds' Medicine, 2nd Ed., vol. i., p. 291. I am not aware that any anti-vaccinator has ever quoted or commented on these figures.

† The difference would appear to be even greater. For seeing that the ratio of deaths to attacks was higher among the badly-vaccinated than among the well-

an exact comparison of ages is so important here, that the calculation is not advanced as being more than approximately correct. The influence of primary vaccination lessening with advancing years, the ratio would also lessen, unless indeed re-vaccination were performed at adolescence. And this leads me to the statement of another cause for the existence among us of small-pox as it is, namely—

(4) *The Need of Re-vaccination.* Commenting on the increased mortality from small-pox at the ages of from 15 years to 45 and upwards (as exhibited in the table on page 15), the Registrar-General says * :—

"Before vaccination came into use, few persons escaped having small-pox at some time or other in their lives. The great majority had it when young, and of these a large proportion died, causing a very high death-rate in the earlier age-periods. But those who survived the attack enjoyed a practically complete immunity for the rest of their lives, and, as they formed a considerable proportion of the population at the later age-periods, the small-pox death-rates at these later periods of life were very low. But when vaccination came into use, and in proportion as its use became more and more general, the relative conditions of the different age-periods as regards immunity were materially altered, and partially inverted. Childhood, previously altogether unprotected, now received a very considerable immunity; while the later ages, previously much protected, now had their immunity considerably diminished, and the more so, the later the period of life and the more remote therefore the date of vaccination."

This explanation is based on the doctrine that an attack of small-pox gives a longer protection against a second attack than does the operation of vaccination.

The Registrar-General holds "the practical lesson to be drawn from" the figures to be, that "those persons who would avoid or lessen their risk of small-pox in the later stages of life, must give themselves and their adult offspring the same protection which is found so efficacious in childhood. They must, that is to say, be re-vaccinated."

(5) *A Decreased Power of Recovery from Small-pox.*†—There

vaccinated, a smaller percentage of the former than of the latter would remain to show small-pox marks in the school census, and so the figures in the table are less favourable to the better-vaccinated than they ought to be.

The whole calculation is suggested by a lecture by Dr. Vernon, of Southport, entitled, "Why Little Children Die," in which he holds that, taking the mean of all vaccination, good, bad, and indifferent, a vaccinated person is "twenty-seven times safer" than an unvaccinated person. "Health Lectures for the People," 1875-8 (Manchester, John Heywood).

* *Loc. cit.*

† The Registrar-General in the Report referred to suggests a cause practically the converse of this—namely, a possibly increased intensity of small-pox virus, the theory being that there may have been "a weeding out of the less resistant varieties of small-pox" by vaccination.

is every probability that this agency is involved, but it has to do solely with the rate of deaths to attacks of the disease, and not with the rate of deaths to the population living.

It is generally admitted that in England in the last century the mortality among small-pox cases outside of hospitals was in many outbreaks about 16 or 18 per cent.* But it is only in hospital practice that a comparison with modern rates is possible. The hospital mortality in 1746–63 was 25 per cent.† Coming, however, to the last quarter of the century, Dr. Woodward says,‡ "the records of the Small-pox Hospital show that during the last 25 years of last century (when the patients were of course all unvaccinated) the death-rate in the hospital was 32 per cent. of the admissions." From 1835 to 1865 Mr. Marson's already-quoted experience is unequalled in extent by that of any other observer, and the rate he gives is 35½ per cent. among the unvaccinated. Still more recently, Dr. Gayton, who treated over 10,000 cases,§ had a mortality of 43·2 per cent. These figures and those given on page 80 seem to show that even within the past fifty years the severity of the disease has tended to increase. A slight rise is also observable in the mortality among the vaccinated, Mr. Marson's rate having been 8·7, while the modern rate ranges from 8·8 to 11·5. These views are supported by Dr. Munk in his evidence before the Royal Commission of 1881.‖ Speaking of the percentage of deaths to cases, he said, "Small-pox is becoming in each year a more severe and fatal disease. If you take the epidemics of the present century, each successive epidemic has become more severe, and the mortality far greater" (Q. 4,664). Exceptions to the metropolitan experience are to be found in Glasgow and Dublin. Dr. Russell, in the former, had in 1871–2 a death-rate of barely 30 per cent. among the unprotected, while in Dublin, in 1876–81, it reached 64 per cent. In Philadelphia, Sir Lyon Playfair (in his speech to the House of Commons) states that the same enormous figure was reached, while in Montreal it was 54 per cent., and in Boston 50 per cent.

What may be the explanation of this rise it is not possible with certainty to say, but no doubt questions of age are very largely concerned in the problem. To learn what the exact rise has been, it would be necessary to compare the small-pox mortality at each

* See pp. 57–9. † *Ibid.*

‡ Quoted by Mr. P. A. Taylor in Select Committee's Report, 1871, p. 70.

§ See p. 88.

‖ Report of the Commissioners to inquire respecting Small-pox and Fever Hospitals. Folio. (London, 1882.)

age at successive periods of time. The question is an important one, and might well occupy the attention of some one interested in the subject. However that may be, it will be noted that the rise had fairly begun before vaccination was introduced, and that it is now visible in the vaccinated as well as in the unvaccinated, so that among the latter it is clearly not due to the cause that would be at once suggested by an anti-vaccinator, namely, that medical men are dishonest, and that they hold recovery to be a proof of vaccination, and death a proof of non-vaccination.

How far the fearful mortality in our own country is due to increased activity of the poison, and how far to increased susceptibility of the patient, it is impossible to determine. On either hypothesis, the power of vaccination must be all the greater, whether we look on it as protecting a more vulnerable people, or as guarding against a more dangerous invader. The greater capacity for resistance possessed by our adult forefathers (as compared with the unvaccinated of the present day) was obtained at an enormous cost. The expense consisted in a death-rate from small-pox in European populations of about 3,000 per million inhabitants per annum,* and in London, as approximately calculated by Dr. Farr,† of 4,000 per million in 1660–79, and 5,000 in 1771–80, besides the scarred and mutilated, the blinded and deformed, among 20,000 or 30,000 per million, who in London in the same periods were annually seized on by the common enemy, but succeeded in escaping alive from its terrible grasp.

In brief, therefore, the causes for the fact that small-pox has not yet been extirpated, that its curve has only closely approached to, but has not become incorporated with, the base-line of Dr. Wallace's Diagram II., may be thus summarised :—

(1) In certain rare cases, neither vaccination nor small-pox will prevent subsequent small-pox.

(2) About five per cent. of the population have never been vaccinated.

(3) A much larger percentage has been imperfectly vaccinated.

(4) Very much of the adult population has not been re-vaccinated.

(5) The power of recovery from an attack of small-pox appears to be decreasing.

The Epidemic of 1870–3.

The considerations adduced above may be applied to small-pox wherever and whenever it appears. But the 1870–3 outbreak

* See p. 155. † See p. 9.

merits special notice as the most important that has occurred for many years.

It is, and always has been, the habit of small-pox to assault a given community more intensely in some years than in others; to be what is called an epidemic disease. For some years it will be entirely quiescent, and then it will burst forth with fresh vigour, only to die out and return again as before. Even in its decline it maintains this character. Were it not so, were the disease so changed in its nature as to have become endemic instead of epidemic, causing a diminished fatality differing little in amount from one year to another, then, indeed, anti-vaccinators might hold that the small-pox which vaccination pretends to quell, is not the old and ferocious giant of earlier times, but a degenerate descendant, requiring no chains to bind it, and no plate armour to resist it. But the very opposite is the case. We have seen that among the unvaccinated of our own land it is even more fatal than of old.

In this century and in this country, with the preventive generally though by no means universally employed, "epidemics" have occurred at much longer intervals, and have been much more limited in scope than in pre-vaccination times. In fact, Dr. Guy's epidemic standard has to be reduced in order to include even the severest of our modern outbreaks. As has been already stated, he applies the term to any outbreak causing one-tenth or more of all deaths in any year, and he finds that in London there were 10 such in 48 years of the seventeenth century, 29 in the eighteenth century, and none in the nineteenth. If, however, the standard be reduced to 7½ per cent., the number of outbreaks is in the seventeenth century increased to 14, in the eighteenth to 60, while in the nineteenth there are 4—that is, still referring to London only; for in England and Wales as a whole we should continue to find a total absence of epidemics even if the standard were further brought down to 5 per cent. The worst year under obligatory vaccination has been 1871, in which, of 514,879 deaths from all causes, 23,062 were from small-pox, or barely 4½ per cent., a proportion which in London in the last century was exceeded no less than 93 times! Of the 100 years there were only 7 in which the London small-pox death-rate (per 1,000 deaths from all causes) was less than that of the year 1871 in England and Wales as a whole.

But, comparatively trifling as it was, the opponents of vaccination have to use for the purposes of their crusade the 1870–3 outbreak in lieu of a better. And one use consists in arranging certain periods of time, so as in all cases to make the last period include

the epidemic, and thus show an apparent increase in small-pox mortality. It is hardly possible to pick up any sample of anti-vaccination literature without finding this done in one form or another.

Thus Mr. Joseph Baxendell, F.R.A.S.,* gives, "as the best test of the value of vaccination," the fact that in 1849–53 "the death-rate from small-pox in London was ·292," while in 1869–73 "the rate was ·679 (of the total mortality), thus showing the extraordinary increase of 132·5 per cent." Mr. Baxendell, therefore, thinks that, because small-pox mortality is highest during an epidemic, vaccination is proved to be useless.

Mr. Taylor himself, until lately the recognised Parliamentary champion of the crusade, improves on this, in so far that, instead of giving rates according to the numbers living, he gives the total deaths, without taking any cognisance of increased population. In the House of Commons† he submitted the following small-pox mortality for three decades :—

1851–60	42,071
1861–70	34,786
1871–80	57,422

Then he asks in triumph, "What are the answers we get to these tremendous facts?" An answer which covers one part of the ground is that in the middle of 1851 the population was under 18 millions, and in 1881 it was over 26 millions. Another answer is unintentionally given by himself in his letter to Dr. Carpenter,‡ when he says "that there occurred no serious small-pox epidemic between that of 1838–40 and that of 1871–2;" so that, on his own showing, he exhibits an increase only by comparing a period containing a serious epidemic with periods free from such occurrences. A third answer is suggested by the statistics given on p. 48.

Another favourite grouping of figures was made originally by Dr. Pearce, and has been adopted, among others, by Mr. Wm. Tebb,§ President of the Anti-Vaccination Society, and by Mr. Alfred Milnes, M.A.‖ It is true, as Mr. Taylor says, that there was no serious epidemic from 1838–40 to 1871–2. But in order to make still further use of the latter period, some intermediate years have to be introduced for comparison therewith. This is done by labelling

* See Mr. Taylor's Letter to Dr. Carpenter, p. 7.

† Speech on Vaccination, June 19th, 1883 (London, E. W. Allen, 1884).

‡ *Op. cit.*, p. 6.

§ "Compulsory Vaccination in England," &c., by William Tebb, p. 54 (London, E. W. Allen, 1884).

‖ "Is Vaccination Desirable?" (London, E. W. Allen, 1885).

the mortality of 1857–9 and of 1863–5, with the word "epidemic," and so forming the following "three epidemics of small-pox"* :—

	Date.	Deaths from Small-pox.
1st	1857–8–9	14,244
2nd	1863–4–5	20,059
3rd	1870–1–2	44,840

The amusing thing is that all these statistics stop short at 1870–2. It is now 15 years since that outbreak, but no notice is taken of subsequent "epidemics." In London, for example, in 1871 the rate per million was 2,422; in 1877 it was 710, and in 1881 it was 619. Here, under the law of 1871, is a descending mortality, regarding which a judicious silence is invariably maintained. Nor is any list given of outbreaks earlier than 1857. No mention is made of the existence of the following series, as to which it will be noted that the last and smallest outbreak forms the starting-point of the above table.

Mean of Annual Death-rates per 100,000 Living.

"Epidemic."	1838–40.	1851–2.	1857–9.
Death-rate ..	78	40	24

The figures given in the foot-note † show how far from true it is that small-pox, either in years of comparative prevalence or in years of comparative absence, is on the increase.

The plan pursued seems to be simply this: to glance along the statistics of all the years since 1838, to select those showing any successive increments of mortality, and to publish them without reference to either preceding or succeeding diminutions of the small-pox death-rate. It is not to be supposed that in the course of its decline small-pox will exhibit a mathematical exactitude of progress, and by careful selection it will perhaps always be possible to find

* "Vaccination Tract," No. 1, p. 2.

† The following are the rates of small-pox mortality per 100,000 persons living in England and Wales, in each of the 48 years, 1838-85. The figures for 1843-6 (marked "?") are wanting. The years which have been selected in the above table of "three epidemics" are marked "*" (See Hospitals Commission Report, p. 224, and Registrar-General's Report):—107, 60, 68, 40, 17, ?, ?, ?, ?, 25, 39, 26, 26, 39 41, 17, 15, 13, 12, 21*, 33*, 20*, 14, 7, 8, 29*, 37*, 31*, 14, 12, 10, 7, 12* 102*, 83*, 10, 9, 4, 10, 17, 8, 2, 3, 11, 5, 4, 8, 10.

two or three short periods of mortality in which the earlier will have a less death-rate than the later periods.

On the whole, Mr. Tebb seems even more unreasonable than his official inferiors. In the case of London, he carefully picks out the year 1853, with its exceptionally small number of small-pox deaths, and compares this with the decade containing the 1871–3 outbreak, thus succeeding in showing that small-pox had become seven times as fatal as formerly! As I have said elsewhere,* it is hardly worth wasting ink on such an argument, but adopting for a moment Mr. Tebb's own method, I would point out that in London in 1871 the death-rate was 2,422 per million living, and that—the last and most stringent compulsory Act having been passed at this time—the mortality fell steadily to 13 per million in 1875, thus showing that while small-pox had become seven times more fatal under the inefficient law of 1853, it became, within five years, 186 times less fatal under the more effective law of 1871. This of course is sheer nonsense, which exactly completes its parallelism with Mr. Tebb's argument. And on being challenged as above, Mr. Tebb explains that he selected the year 1853 because "it was the date when compulsion, by means of medical intervention, was initiated." But the last intervention occurred in 1871, and if low mortality had nothing to do with his choice, then by a parity of reasoning he should begin anew, and compare 1871 with the subsequent decade. By so doing he would find that while in London the deaths had been 2,422 per million in 1871, in the next ten years the mean of the annual rates was only 277, or less than one-eighth of the earlier rate. Again, in the year 1853 the law was made, not only for London, but for all England and Wales. Why does Mr. Tebb confine the figures to London? Does he not know that the rate for all England—instead of being seven times as great in the decade 1871–80 as in the year 1853—was less than double, the figures being 170 and 245 respectively, and that while in 1871 the rate was 1,012 per million, it fell to 156 in the decade following the last enactment?

The manner in which all such figures for different periods would be influenced by noting the age of those who die—by noting, that is to say, not under what vaccination law they die, but under what law they were born—is shown by the following example.† The law of 1867 was intended to amend that of 1853 by the appointment of vaccination officers. But unfortunately this was left

* See correspondence on vaccination in *Glasgow Herald*, in May, 1886.

† Willoughby's "Principles of Hygiene," p. 284 (London: Collins, Sons, and Co., 1884).

optional until corrected by the law of 1871. Still some anti vaccinists think they get a better result by using 1867 rather than 1871, as a date by which to divide statistics. Let us do so, and we find in the eight years 1858–67, 41,606 deaths from small-pox, while in the eight following years there were 53,933 deaths. The latter period, it will be seen, again contains the epidemic, and again we take no account of increased population. But, in addition, let the facts as to age be noted thus :—

Age.	1858–67.	1868–75.
Under five years	22,885	18,300
Five to ten years	4,788	7,981
Over ten years	13,943	27,625
	41,606	53,933

Here we see that though the total deaths in the latter epoch were 12,000 more than in the former, yet of children under five years old, the majority of whom were born under the new law, there were 4,500 less deaths in the second than in the first period, and the excess of deaths consisted wholly of those born under the law of 1853. And at least over 27,000 of those who died in the second period had been born previous to, or early in, the first period.

Statistical Accuracy.—Here is a sample of the accuracy with which anti-vaccinators carry on the argument. In the *Glasgow Herald* of May 25th, 1886, Mr. Tebb gives some extracts from the Registrar-General's *London* Report for 1880, regarding the *London* mortality in the last decade. But Mr. Tebb omits all reference to the fact that the figures belong to London only. He merely speaks of them as taken from the "Registrar-General's Report for 1880," and leaves his readers to assume that they belong to England and Wales, which of course had a very much lower small-pox mortality than the metropolis. And in the *Scottish News* of December 17th, 1886, Mr. Milnes, after specifically referring to cholera in *Britain*, exactly follows the course pursued by Mr. Tebb as to small-pox, giving the same extracts, and again leaving out all mention of the word *London*. So, too, in his debate with Branthwaite (London, E. W. Allen, 1885), Milnes quotes the small-pox mortality in *England and Wales*, and then gives the extracts in question from the London Report, but once more forgets to mention that they refer to London only.

Statistical Evolution.—As a last example of the fallacies, and

worse, that hang around this epidemic, I give an instance of anti-vaccination statistics in the process of fabrication. So seldom can one trace the various "facts" in the course of their creation and development, that it is interesting to note, in any case that presents itself, the stages of evolution—from egg to tadpole, and from tadpole to toad.

(1) Beginning at the end, I refer to the *Scottish News*, of December 17th, 1886, where I find a letter from Mr. Alfred Milnes, M.A., containing the following statement :—"When Dr. Cuthbertson pleads that vaccination mitigates small-pox, I am content to simply answer that in the 1871 epidemic your own Scotland lost 517 vaccinated infants under one year of age by small-pox, they constituting more than one-tenth of the total victims of that epidemic in Scotland."

Turning to the Scottish Registrar-General's Report, I find as to 1871—

(*a*) That the total deaths from small-pox of children under one year old were 206 ;

(*b*) That this number included both vaccinated and unvaccinated ; and (*c*) that there are no records as to how many were vaccinated and how many unvaccinated.

(2) In Mr. White's review of Playfair and Dilke, published in 1884 (p. 53), I read—"From the Scots' Registrar-General's Returns we extract the following :—

Deaths by Small-pox in Scotland of Children Under One Year of Age in 1871–3.

Years	Vaccinated.	Unvaccinated.
1871	64	142
1872	314	64
1873	139	39
Total ..	517	245

"It can hardly be alleged that in the instance of these 517 babes their 'protection had worn out by age,' or that, constituting a tenth of the victims of the epidemic, their deaths were 'rarities.'"

Going again to the reports for each of the three years, we find that they do not contain any such figures. It is simply *not true* that Mr. White extracted these statistics "from the Scots' Registrar-General's Returns." But, comparing the statement of Mr. White with that of Mr. Milnes, we see a connection. If the figures for the

"vaccinated" in the three years be summed up as in the table, they amount to 517, the exact number given by Mr. Milnes for "the 1871 epidemic" alone—a simple and handy way of exhibiting a heavy small-pox mortality. But there is another curious thing about these figures. The total small-pox deaths under one year, given by the Registrar-General in the three years, were 202, 378, and 178—a total of 762. And if Mr. White's numbers be added up, they also reach 762. Thus the totals are the same, and the totals for each year are the same, so that the question is reduced to this—by whom were they originally separated into vaccinated and unvaccinated?

(3) The answer is to be found in a pamphlet published in 1878 and entitled "The Tables Turned," &c., being "A Letter to the Registrar-General of Scotland by George S. Gibbs, F.S.S."* And we find here that the division into vaccinated and unvaccinated was made, not by the Registrar-General at all, *but by Mr. Gibbs himself!*† Here is how he arrived at the conclusion. Referring to the Registrar's reports, he said, "In the Table of Vaccinations there is a column of figures given with the heading 'Insusceptible of Vaccine Disease. In respect of the children having already had small-pox.' Now if we allow that one unvaccinated child attacked by small-pox died for every one that recovered, or a mortality of 50 per cent. of the cases, the deaths of children under one year occurring in 1873 would then divide into—vaccinated 139, unvaccinated 39, total 178—and so on for the other years stated." Then Mr. Gibbs gives statistics concocted in this way for the decade ending 1873. By degrees, we are getting seasoned to anti-vaccinators' methods; soon hardly anything they can say will taste "hot in the mouth." But this calculation takes one's breath away. For Gibbs does not seem to have observed that in the same period (1871–3) there were 7,562 children classed as "Removed from District before Vaccination, or otherwise unaccounted for." It need hardly be pointed out that among these there was necessarily a multitude of unvaccinated. But he takes no account of them; any balance of small-pox mortality under one year, unaccounted for by the number recorded as insusceptible to vaccination owing to previous small-pox, is deliberately set down to the account of the vaccinated! At the best, Gibbs' calculation was a guess, but it had not even the merit of being a likely guess.

Thus we have the evolution completed :—

(1) Gibbs' guess.

* Darlington, Harrison Penney, Prebend Row, 1878.

† Mr. Gibbs is one of three well-known anti-vaccinators of the same name.

(2) White's statement of the guess, as statistics extracted "from the Scots' Registrar-General's Returns," and

(3) Milnes' statement of the three years' statistics as belonging solely to the "1871 epidemic," while 1871 was only the first year of the three.

[Since the above was written, and, fortunately, in time to allow of my noting the interesting fact, the process of involution has begun regarding this statistic. In the *Vaccination Inquirer* of May, 1887, Mr. White withdraws his assertion that he got his figures from the Registrar-General, and explains that they originated with Mr. Gibbs. He still, however, holds that Gibbs' fabrication is characterised by a "fairness and accuracy" which are "not likely to be impugned"!]

Dr. Seaton's Report on the Epidemic of 1870–3.*—This Report gives an admirable summary of the main facts. While the year 1871 had a rate of small-pox mortality almost as high as had the year 1838, it is not the case that the epidemic of which it formed a part was nearly so great as the epidemic which included the earlier year. For "during the 1837–41 epidemic there were registered from July 1st, 1837, to the termination of the epidemic in 1841, 48,012 small-pox deaths in a mean population of 15½ millions; during the 1870–3 epidemic, 44,433 deaths in a mean population of nearly 23 millions. The proportionate mortality of the epidemic of 1870–3 has been less than two-thirds that of 1837–41."

The imperfect Vaccination Act of 1853 had been 18 years in force at the height of the 1870–3 epidemic. The deaths of persons above 15 years old in the epidemic years were 19,591, of whom 16,303 were over 20 years old. Of the former "a half or thereabouts" were vaccinated, and the remainder unvaccinated. Thus at once about 10,000 deaths are disposed of as having no bearing on the question of vaccination. Except negatively; for "it must be borne in mind that the proportion of our adult population which is protected against small-pox by vaccination is at least 25 to 30 times as great, and much more probably, from 50 to 60 times or more as great as that which is unvaccinated." So that the death-rate of the adult unvaccinated was from 25 to 60 times or more as great as that of the adult vaccinated population.† But the question remains, why did 10,000 vaccinated adults die? "The answer," Dr. Seaton says,

* Report of Medical Officer of Privy Council and Loc. Gov. Board for 1874, p. 51, *et seq.* (Eyre and Spottiswoode, 1875).

† This is probably an over-estimate; our present knowledge leading us to believe that the vaccinated are 19 or 20 times as numerous as the unvaccinated.

"is not difficult, though it is not one which can be given with any satisfaction. The cases were, ... with comparatively few exceptions, cases in which vaccination had not been thoroughly and efficiently performed." Mr. Marson's 32 years' (up to 1867) experience of hospital small-pox is cited in solution of the problem. "Summarily, the 32 years' observations show that, of 13,765 reputedly vaccinated patients admitted to the hospital during that period, the vaccination was very defective in 11,172, of whom 1,027 died; was reasonably good (as represented by three characteristic marks) in 1,079, of whom 21 died; and was quite up to the now acknowledged standard in 1,505, of whom only 13 died." Taking deaths instead of cases, "an analysis of 1,161 small-pox deaths . . . . in persons stated to have been vaccinated, shows that in 614 . . . . the vaccination had been little else than nominal, for in . . . . 180, no mark whatever of successful vaccination could be discovered, and in 434 only a slight mark of imperfect character. Of the remaining 547 deaths, 513 were in cases which . . . . fell considerably short of the standard of good vaccination . . . . There had been in the hospital but 34 deaths altogether in persons who had three or more proper vaccine marks, though 2,584 patients having such marks had been admitted."

Next, among infants under one year old, in 1870–3, 5,817 deaths occurred, and this number includes those under the age at which vaccination is compulsory. The deaths under one year formed less than 14 per cent. of the total small-pox mortality, while previous to the Act of 1867 they formed 24 per cent.

Regarding children under five years, the percentage that they have contributed at various epochs to the total small-pox mortality has already (p. 17) been stated. Dr. Seaton makes their mortality the basis of a most interesting comparison of various populations having vaccination laws of different degrees of stringency. In Scotland, a compulsory law was not enacted till 1863, but it was, as regards the numbers who came under its sway, a very efficient law, so that in this respect Scotland was better off than England as to children under five years old at the time of the epidemic under consideration. In Prussia the law was very lax. The compulsory age was one year, but there was no penalty for disobedience, except in the event of subsequent small-pox, and naturally, prosecutions were seldom undertaken then. The result was that in Berlin the epidemic found great numbers of unprotected children. Hamburg was still worse off, there being no compulsory law, and the only enactment on the subject being that children without certificates of vaccination could

not be admitted to the "schools of the poor." In Holland, there was, says Seaton, no vaccination law whatever, and in some only of the communes had children to be vaccinated before admission to the communal schools. These five populations, therefore, namely Scotland, England, Berlin, Hamburg, and Holland, form a *descending* series as regards vaccination; and as regards small-pox, the following figures show that they form an *ascending* series, the two facts of vaccination and small-pox standing exactly in an inverse ratio to each other. The death-rates given are those under five years of age, per million living at all ages, this standard, though not perfect, being the best available for the comparison :—

Scotland (chief Towns), 1871–4	692
London, 1870–2	1,180
England, 17 Unions, most nearly corresponding with the 17 chief Towns, 1871–4	1,180
Berlin, 1871–2	3,448
Hamburg, 1871–2	5,717
Holland (chief Towns), 1870–2	6,455

Many more facts of a similar character could be given from Dr. Seaton's Report, but the above are sufficient to show that an analysis of the epidemic of 1870–3 gives most convincing evidence of the power of vaccination as a preventive of small-pox, and of the wisdom of the Select Committee of the House of Commons when it speaks thus regarding the epidemic * :—"Your committee, however, believe that, on the one hand, if vaccination had not been general, this epidemic might have become a pestilence as destructive as small-pox has often been, where the population has been unprotected; and that, on the other hand, if this preventive had been universal, the epidemic could not have approached its present extent."

* *Op. cit.*, p. iii.

CHAPTER III.

THE MITIGATION OF SMALL-POX BY VACCINATION.

Mitigation not a New Doctrine—Ratio of Deaths to Attacks in the Past and the Present Century—Wheeler's Statistics—Prevalence *versus* Mortality—Mortality among the Vaccinated—A Table of Hospital Statistics—The Value of Modern Statistics—Who are the Unvaccinated?—Poor-Law Vaccination—The Prevalence and Fatality of Other Diseases among the Vaccinated and Unvaccinated—Errors in Registration—Obliterated Marks—Medical Honesty.

Is Mitigation a New Doctrine?—The chief anti-vaccinating writer on this subject is Mr. Alfred Milnes, M.A., who devotes a pamphlet to it, consisting mainly of an account of Keller's statistics, which are reviewed in the course of the next chapter. But Mr. Milnes makes a remarkable mis-statement regarding the whole theory that vaccination mitigates small-pox. He asserts that the doctrine is a new one only in process of acceptance by the medical profession, and that it is a *substitute* for the doctrine that vaccination prevents small-pox. He says regarding it (p. 3)—"That such a change in medical opinion with regard to vaccination is already in progress can hardly be doubted," and "we find the theory of vaccination in progress of change, and *mitigation* taking the place of *protection*."

It must be known to every one who knows anything at all of the subject that this is sheer nonsense. At the beginning of the practice it was, of course, impossible for Jenner to be aware of the fact in question. His vaccinations were necessarily recent, and were tested by variolous inoculation. But the lesson that vaccination mitigates small-pox was learned, and could not but be learned, as soon as the first cases of vaccinal small-pox were observed. Cline noticed it in 1804. The Royal College of Physicians recorded it in their Report in 1807.* Professor F. W. Newman states† that "in his early youth, or boyhood," he learned it from a medical journal of the period.

* They said, "Where small-pox has succeeded vaccination it has been neither the same in violence nor in the duration of its symptoms, but has, with very few exceptions, been remarkably mild, as if the small-pox had been deprived by the previous vaccine disease of all its usual malignity."—Quoted from Playfair's Speech, p. 7 (London, Jarrold and Son).

† White's "Story," &c., p. 545.

Mr. Cross of Norwich proved it in 1820.* And in later years Marson's experience of its truth, beginning in 1836, is recorded in Simon's Papers, 1857, which also contain the amplest evidence of the universality both of the medical opinion on the matter, and of the grounds for that opinion, as exhibited in the table of European experience there given. And the statistics of every small-pox hospital during the past thirty years constitute proof of its correctness. Yet Mr. Milnes, intimately acquainted as he is with the literature of the subject, begins his monograph by wishing his readers to believe that "the medical profession is *now* about to subscribe" to a new doctrine!

This section of Dr. Wallace's brochure has for its title the statement that "small-pox has not been mitigated by vaccination," and this he attempts to prove by a comparison of hospital statistics in the past and the present century. The argument involved is so inseparably connected with much of Part II. of the work under review, on the "Comparative Mortality of the Vaccinated and the Unvaccinated," that the two subjects must be considered together, the sections omitted being returned to afterwards.

Dr. Wallace says, "It is often asserted that, although vaccination is not a complete protection against small-pox, yet it diminishes the severity of the disease, and renders it less dangerous to those who take it. This assertion is sufficiently answered by the proof above

* Any one who wants to see how completely an anti-vaccinator can shirk the whole point of an argument ought to read (1) the "History of the Norwich Epidemic," by Cross, and (2) chap. xxxiii. of Mr. White's "Story of a Great Delusion," which he devotes to Cross's book. One great lesson taught by Cross was the mitigation of small-pox by vaccination. In 112 families of which he made observation, (1) there were 603 persons; (2) of these there were protected by previous small-pox 297, of whom none were attacked; (3) 91 others had been vaccinated, of whom 2 were attacked, and none died; (4) 215 were unprotected, of whom 200 were attacked and 46 died. White, however, reads Cross upside-down. He mentions not one of the above points, but writes on, discussing a variety of other matters; as, for instance, his favourite subject of how in Norwich 10,000 vaccinated could protect 30,000 unvaccinated, shutting his eyes to the three facts, (1) that Cross found nearly one-half—297 of 603—*protected by previous small-pox*; (2) that the unvaccinated *were not* protected, that in Cross's list nearly all these (200 in 215) *took the disease*; and (3) that the vaccinated *were protected*. White's book is so full of mis-statements that it is difficult to leave off without giving a sample. Thus, he says in the same chapter (p. 437), "that at this day the chief mortality of small-pox is among the vaccinated young;" whereas, for example, in a given time in the London hospitals there were 195 vaccinated under five years old, these including all sorts of marks, good, bad, indifferent, and invisible, and of these only 38 died, while at the same age there were 708 unvaccinated, of whom 433 died. (These figures are contained in a Report of a committee of the managers, dated July 13, 1872.) And we have already seen (p. 15) that in England the small-pox mortality among children under 5 years old has fallen "no less than 80 per cent." since the days when vaccination was only optional.

given, that it has *not* diminished small-pox mortality; but more direct evidence can be adduced." We have here a *non sequitur*, which Dr. Wallace could not have failed to detect had he been more familiar with the subject. Even though he *had* proved that vaccination "has not diminished small-pox mortality" per million living, it would not necessarily follow that it had failed to diminish the ratio of mortality to attacks of the disease.

Ratio of Deaths to Attacks in the Past and the Present Century.

Dr. Wallace, in passing to this question, accepts a total mortality of all classes and ages occurring in small-pox hospitals as the basis of his computation for the present century, quoting from Mr. Marson and from the "Reports of the London, Homerton, Deptford, Fulham, and Dublin Small-pox Hospitals, between 1870 and 1880." The mean mortality in the statistics given is, for the last century 18·8, and for the present century 18·5, and this in spite of "the improved treatment and hygiene of the nineteenth as compared with the eighteenth century." These figures, it is said, "go far to prove that the disease has been rendered more intractable by" vaccination, seeing that the death-rate among those attacked has not lessened "notwithstanding the great advance of medical science and the improvements in hospitals and hospital treatment."

With all their bad qualities, medical men are thus credited with having made "great advances" in their science, and with having adopted "improved treatment." The theory that small-pox "has been rendered more intractable" by vaccination is, in fact, founded on the view that the treatment has improved. True, it sometimes fits anti-vaccination better to assert the opposite. And then it does so without hesitation. It is freely stated that "medical treatment and success have made no advances since the last century," and that "no progress has been made in this century in the treatment of small-pox by the orthodox schools of medicine."*

The reliance which Dr. Wallace places on last-century statistics, up till now deemed by himself unreliable, has already been adverted to,† and his distrust of medical men has also been noted. He now compares two sets of figures. The first set is, according to his own showing, entirely outside of "the only trustworthy statistics we possess," and the second set is the work of a body of

* "Vaccination Tracts," (1) No. 9, p. 13, and (2) No. 13, p. 23.

† Pages 5, 6, *ante*.

men incorrect in their records, and not to be relied on, owing to self-interest. It is on this rotten foundation that Dr. Wallace builds an argument which he asks his readers to accept as incontrovertible! But let us see where the statistics come from, and what they are worth.

Mr. Wheeler's Hospital Statistics.—The figures founded on by Dr. Wallace are evidently those originally collected by Mr. Alexander Wheeler, of Darlington. They have now gone through six editions, have been quoted and re-quoted times without number, and are held by anti-vaccinators to be of the greatest importance. Mr. Tebb certifies that, to begin with, they were drawn up by Mr. Wheeler, "after careful investigation." They therefore demand more than a passing notice, and as regards the last century, I quote them in their entirety from the latest edition, given by Mr. Wheeler himself in the Appendix (pp. 140–2), to the Report of the Annual Meeting of the Anti-Vaccination Society, on April 14th, 1886.

They are headed—

HOSPITAL SMALL-POX.

THE FALLACY OF THE MITIGATION DOGMA,

Demonstrated by a comparison of the Fatality of Hospital Small-pox Cases before and since the adoption of Vaccination:

and are as follow:—

Date.	Authority.	Cases.	Vaccinated.	Deaths.	Deaths per cent.
1723	Dr. Jurin, quoted by Dr. Duvillard	18,066	None	2,986	16·5
1746–63	London Small-pox Hospital ..	6,456	,,	1,634	25·3
1763	Lambert, quoted by Dr. Duvillard	72	,,	15	20·8
1779	Rees' Cyclopædia	400	,,	72	18·0
		24,994		4,707	18·8

Then follow a number of figures relating to the present century, showing a hospital mortality of 16.9 per cent.

It is necessary to dissect these figures with some minuteness.

(1) *Jurin's Statistics.*—In the year 1722, Dr. Jurin began to collect and publish, in successive annual reports, all the statistics of small-pox death-rates that he could get hold of. In 1723 he had

gathered only 4,626 cases,* so that at that date he gave no such figures as those cited above. [In fact, Jurin never gave these figures. Through inacquaintance with English geography, Duvillard† blundered in his quotation, giving 3,405 cases twice over, firstly as belonging to "*le duché d' Yorck*" (his translation of "Yorkshire"), and secondly as belonging to the individual towns, Halifax, Leeds, Bradford, &c. The correct figures, as given by Jurin in his report of 1724, are 14,559 cases, with 2,351 deaths, or 16.1 per cent. By 1726, they had grown to 17,151 with 2,848 deaths, or 16.6 per cent., and so on.]

But above all, Mr. Wheeler and his followers have made a fundamental blunder regarding these records. *The statistics have nothing to do with hospital mortality.* They are entirely culled from the private practice of various medical men throughout England, besides over 5,000 cases from Boston, New England. Further, Duvillard did not make this mistake. His table is headed, "Enumeration of Persons of All Ages attacked by Small-pox, and of those who Died, published by Dr. Jurin." The mis-statement seems to owe its birth to Mr. Wheeler himself. Jurin's figures, therefore, have to be struck out of the table of hospital small-pox previous to vaccination.

(2) So, also, to Lambert's seventy-two cases the same remark applies. They are given by Duvillard as "observations of Dr. Sulzer" of Winterthur, made in 1763, and are merely reported by Lambert. But there is no hint that they occurred in hospital.

(3) To the last item, "Rees' Cyclopædia (year 1779), 400 cases and 72 deaths," a different criticism applies. These figures are quite incompatible with the other groups, and are not fit to form part of any table, whether referring to hospital or private practice. The Cyclopædia gives a statement of rates, not of cases. All the same, Wallace and Wheeler, and their allies, add the figures to the others in the table. They might as well have inserted 40 cases and 7·2 deaths, or 4,000 and 720, or 40,000 and 7,200. The value of the rates given by the writer in Rees' depends on the correctness of his information, and he evidently blundered, for the only small-pox hospitals in London at that time were the "hospitals for the small-pox and inoculation," whose actual figures are given in Mr. Wheeler's table,

* "A Comparison between the Mortality of the Natural Small-pox and that given by Inoculation," by James Jurin, M.D., Secretary to the Royal Society. Page 17. (London, 1723.)

† "Analyse et Tableaux de l'Influence de la Petite Vérole sur la Mortalité à chaque Age," &c. (Paris, 1806).

the death-rate being over 25 per cent. It is interesting to try to trace the blunder. Sermons were preached periodically to the governors of these hospitals. The sermons were published, and appended to each was a table, chiefly financial, but also containing the results of treatment in the hospitals, from their foundation in 1746, onwards. It is from one of these appendices that Mr. Wheeler's 25·3 per cent. has been calculated. But in addition, each publication contained a short statement of the need for and usefulness of the hospitals, and each such statement contains the following words :— "Upon a general calculation, 25 or 30 die out of 150 patients having the distemper in the natural way."* This estimate refers, not to hospital practice at all, but to the experience of the general community. But the writer in the Cyclopædia, as quoted by Dr. Wallace, appears to have seen and mistaken it for the results obtained in the hospital. His words are almost similar—"From a general calculation it appears that, in the hospitals for small-pox and inoculation, 72 die out of 400 patients having the distemper in the natural way."

This, however, is mere surmise, but the fact remains that the London Small-pox Hospitals mortality in 1746–63 was 25.3 per cent. And in the last quarter of the century it was 32 per cent.† So that instead of 18·8 per cent as given by Wheeler, we have an average hospital mortality of about 29 per cent. And in the present century he shows that it is only 16·9 per cent.

Thus "after careful investigation," Wheeler's vaunted evidence melts entirely away, and thus also disappears the ground for Dr. Wallace's question, "How can we account for the mortality among small-pox patients being almost exactly the same now as a century ago, notwithstanding the great advance of medical science and the improvements in hospitals and hospital treatment?" The answers are—(1) the facts are not as stated; (2) small-pox, apart from vaccination, has become a more fatal disease, and (3) the unvaccinated keep up the gross small-pox mortality of a hospital, as we shall presently see.

Small-pox Prevalence versus Small-pox Mortality.—But in regard to the whole question of pre-vaccination small-pox, the anti-vaccinator is in a difficulty. On the one hand he desires to minimise

* All the sermons and appendices, &c., are contained in the library of the Highgate Small-pox Hospital. Why this odd ratio (25 or 30 in 150) is chosen, does not appear, but it happens to be almost a multiple of Jurin's "five out of thirty-one," given in his second "Account," dated 1724.

† See p. 42.

the mortality of the malady among those whom it attacks, and on the other hand to minimise the prevalence of the disease, or in other words, the number of those attacked. Now it happens that nearly all available statistics are of deaths, not of attacks.* We are told that in London in the year 1710 there were 3,138 deaths, and in 1796, 3,548 deaths, and so on. But it is manifest that the lower the mortality was, the more numerous the attacks must have been. If the death-rate were only 15 per cent., then 3,000 deaths represent 20,000 cases: if it were 25 per cent., there would be only 12,000 cases. Mr. P. A. Taylor says,† "One of the characteristics of the devotees to vaccination is enormously to exaggerate the prevalence of, and mortality from, small-pox in pre-vaccination times." It is obvious that the surest way to exaggerate the prevalence of small-pox is to under-state its mortality, seeing that the fact with which we start is in nearly every instance the number of deaths, not the number of cases, so that whatever Dr. Wallace and Mr. Taylor gain in one respect, they lose in the other.

Small-pox Mortality among the Vaccinated.—Now we come to the other factor in the comparison—the ratio of deaths to attacks among the vaccinated. But the extraordinary thing here is that this is *not* the factor used by those who adopt Mr. Wheeler's statistics. Of set purpose they give the death-rate of vaccinated and unvaccinated together, and on this Dr. Wallace founds the view that "small-pox has not been mitigated by vaccination."

To compare the death-rate per cent. of the vaccinated and unvaccinated when they are placed under circumstances similar in every respect—of similar age; located in the same wards of the same hospitals at the same time; under the same dietary, the same (stationary or improved) medical treatment, and the same nursing;—that this is a correct way to arrive at the comparative mortality of the two classes, is a proposition so transparently clear as to be incapable of further elucidation. But this is exactly the comparison which Dr. Wallace refuses to make.

The modern percentage which he gives of vaccinated and unvaccinated combined is got from seven authorities. In the following

* In my own paper on Kilmarnock Small-pox in the last century, I made the mistake of assuming that 500 deaths among children represented only 1,000 cases, as would be the case among the unvaccinated in the present day. But if Jurin's rates apply here, then 500 deaths would mean 3,000 cases. Mr. White, in the *Vaccination Inquirer* of May, 1887, points out my error, but fails to see that the correction tells against his own case.

† *Op. cit.*, p. 9.

table I take the same authorities and the same statistics, and separate the two classes which Dr. Wallace has joined into so unnatural a union. The result is that the mortality of the unvaccinated is seen to be enormously greater than that of the vaccinated. The rate of the former ranges from 37·2 to 64·2 per cent., and of the latter from 8·7 to 12 per cent. Moreover, everything which was called vaccination is included as vaccination, whether it had left a good, bad, or indifferent mark, or (with the exceptions noted) no mark at all, so that there can be no quibble as to what is embraced by the term.

Authority or Hospital.	Total Cases.	Unvaccinated, including those who had had Small-pox.		Alleged to be Vaccinated, with or without Evidence of Cicatrix.		Total Mortality.
		Total.	Mortality per Cent.	Total.	Mortality per Cent.	
Mr. Marson (1836–51)	5,795	2,701	*37·2*	3,094	*8·7*	21·9
London S.-P. Hospitals (1870–2) ..	14,808	3,634	*44·8*	11,174	*10·1*	18·7
,, ,, (1876–80) †	15,171	3,759	*44·4*	11,412	*8·8*	17·6
Homerton Hospital (Feb. 1, 1871, till Dec. 31, 1877) ..	*5,479	1,243	*46·1*	4,236	*11·5*	19·4
Deptford Hospital (1881)	3,185	531	*47·4*	2,654	*11·3*	17·3
Fulham ,, (1881)	1,752	210	*44·2*	1,542	*10·1*	14·2
Dublin ‡ ,, (1876–80) ..	2,404	448	*64·2*	1,956	*12·0*	21·7

* Dr. Wallace has not obseved that some of the 5,479 are also included in the preceding 15,171.
† Mr. Jebb says, in his letter to *The Times* of November 8th, 1879, that "among the 11,412 vaccinated patients are included the *majority* of those who stated that they had been vaccinated, but upon whom no traces of vaccination were discernible."
‡ In Dublin all cases without cicatrix are entered as unvaccinated.

We thus see that, just as Dr. Wallace's 18 per cent. rate for last century was got by lumping together hospital and non-hospital mortalities, so his 18 per cent. rate for the present century is got by lumping together the vaccinated and unvaccinated mortalities.

If, leaving our own country, we turn to foreign lands, there too we find the same unvaried experience of the protective power of vaccination against death from small-pox.

Mr. Simon's "Papers" contain a very important table, which gives a summary of the results found in over 80,000 cases of small-pox which occurred in about 20 Continental populations in various years between 1816 and 1856, and in every case the lesson is the same. If all this depends on a great medical conspiracy to give false results, then indeed the combination must be of the widest ramifications both as to time and locality.

The Value of Modern Vaccination Statistics.

Part II. contains the defence of Dr. Wallace's disbelief in the statistics of the vaccinated and unvaccinated. Quoting Sir Lyon Playfair's statement that in the metropolitan hospitals, "45 per cent. of the unvaccinated patients die, and only 15 per cent. of vaccinated patients," Dr. Wallace undertakes to prove, "firstly, that the figures here given are unreliable; and, secondly, that such statistics *necessarily* give false results unless they are classified according to the age-periods of the patients."

The Percentage of Vaccinated and Unvaccinated Unreliable.—In support of this assertion several reasons are given. It is said that "deaths registered as unvaccinated include:—(1) infants dying under vaccination age, and who, therefore, have no corresponding class among the vaccinated, but among whom the small-pox mortality is greatest." The vaccination age in England is 3 months. Some children, therefore, may die of small-pox before vaccination. To the natural question, How many do so? Dr. Wallace makes no reply. In the hospital reports, deaths under 3 months are included in those under one year, no separate statement being given. In Gayton's 10,403 cases there were 173 under one year. Of these, only 2 had good marks; 9, of whom 1 died, had inferior marks; other 9, said to be vaccinated, but without evidence, included 6 deaths; and 153 were unvaccinated, of whom 98 died. Not very favourable materials are these for an argument against vaccination. Supposing that, of the 153 unvaccinated, 70 were under 3 months old,* then we get a total of 70 among over 10,000 cases as a possible basis for Dr. Wallace's contention. And the contention refers, not to the number admitted, but merely to their death-rate, and not even to their total death-rate, but only to the excess of that rate compared with the rate at other ages. Thus the doctor's argument reaches the vanishing-point, and there we may leave it. And further on, I have to show that the mortality is much greater among the unvaccinated than among the vaccinated not only at all ages, but at each separate age.

(2) "Children too weakly or diseased to be vaccinated, and whose low vitality renders any severe disease fatal." This point is, if possible, more microscopic than the last, and here again actual facts are steered clear of. The percentage of children in England and Wales whose vaccination was postponed was, in the year 1882 for

* In Scotland, in the 9 years ending 1877, of 1,041 small-pox deaths under one year, 452 were under 3 months.

example, 0·85, and in 1883 it was 0·91. Postponements are, as a rule, due to very trifling causes. If a child has the slightest eczematous eruption behind the ears or elsewhere, has caught a cold, has any derangement of the bowels, &c. &c., delay is usually the consequence. And when granted, it only holds for two months, after which a renewal can be obtained if necessary, but such renewals are the exception, not the rule. At the end of two months, therefore, the great bulk of the 0·9 per cent. would have been operated on. The fact simply is, that of 10,000 children born, in 90 the performance of vaccination is permitted to be put off from three months till five months, and that in a fraction of the 90 it is still further postponed. Dr. Wallace's argument amounts to this:—(1) That possibly during the two months or more of postponement some few children of the 90 may take small-pox; (2) that of these, some may have been postponed through really debilitating disease; and (3) that of the deaths among this last class, some may have been in children whose illness was so finely balanced that the influence which decided for death was not small-pox itself, but the pre-existing weakness. He is quite welcome to the infinitesimal fragment of a "reason" which on analysis is left to him here.

(3) "A large but unknown number of the criminal and nomad population who escape the vaccination officers. These are often badly fed and live under the most unsanitary conditions; they are, therefore, especially liable to suffer in epidemics of small-pox or other zymotic diseases."

As to this, I have to remark that criminals and nomads form a very minute fraction of the total population of this law-abiding country. Next as to their chances of vaccination, it is to be observed that a great proportion of this class is not born within it, but joins it in after-life. Of those born of criminals and nomads, very many first see the light in gaols and workhouses, besides having frequent temporary residence there. And Mr. Tebb devotes a whole section of his book to a complaint that vaccination is so very prevalent in workhouses and prisons. He quotes a regulation that "all persons sentenced to penal servitude who do not present good marks of vaccination, should be re-vaccinated;" and also a standing order that all children born in prison must be vaccinated. He adds "that these regulations are often exceeded in practice is generally allowed," and that among convicts "general re-vaccination is the rule." In fact, he complains that attempts are made to operate even on anti-vaccinators imprisoned for refusal to pay fines incurred by disobedience of the

compulsory law. Mr. Pickering goes even further. He says,* "The very fact that the victims of small-pox and other zymotics are found among the lowest classes of society is, as a rule, proof positive of their vaccination; for show me a vaccinator that will let one of these escape him? Why, they are hunted down "like a partridge in the mountains," and not more than one in twenty is sent into the world untainted, unpoisoned." And in addition to all this stringency there is the fact that if in the course of their chequered career any nomads join the army or navy, they can hardly there escape submitting to "the rite." How far Mr. Tebb is right, I do not myself venture to say, as statistics are unfortunately wanting.

There is, too, a mighty difference between "unsanitary conditions" during an illness, and such conditions previous to attack, to which latter Dr. Wallace refers. Anyone who knows aught of small-pox hospital treatment must be aware how absolutely without weight such antecedent conditions are, as compared with the question of vaccination or no vaccination, in the prognosis of a case. In the golden words of Dr. Russell †:—

"After closely observing over 1,000 cases of small-pox in hospital I have become deeply impressed with the helplessness of medicine when face to face with the unmodified disease. In this sense, the only successful mode of treating small-pox is by vaccination. To take firm hold of its efficacy and necessity, and enforce their convictions in practice without wavering, is the most useful, almost the only useful action the medical profession can adopt against variola. When a case presents itself, the first question in prognosis is regarding vaccination, although then the chief work of vaccination has been done, inasmuch as the only other circumstance in the patient's condition which is worth mentioning as affecting the prospects of recovery is the extent of the eruption, which I shall show is the direction in which post-vaccinal small-pox is chiefly modified. If *vaccinated*, then the attitude is one of hope that the disease may be cut short, however bad present appearances are, though, in fact, the probability is that the symptoms are from the first trivial. If *unvaccinated*, then the attack will probably be severe, the eruption copious or confluent, and we recognise a virulence and deep constitutional disturbance against which the resources of medicine are powerless.

* See p. 14 of a Letter to the Leeds Board of Guardians, published by F. Pitman, 20, Paternoster Row, in 1876.

† "A Study of 972 Cases of Small-pox," by James B. Russell, M.D., F.F.P.S.G. —*Glasgow Medical Journal*, 1872.

"As regards the individual, the opportunity for medical interference is past, and we can only turn his case to profit by following on those about him the practice from the neglect of which he suffers."

This is the deliberate verdict of a physician who might well have been tempted to attribute much importance to treatment, for under him the mortality both of vaccinated and unvaccinated was strikingly low;* and Dr. Russell is an authority to whom, when they think it suits them, anti-vaccinators are delighted to appeal: Messrs. Taylor, White, and Wallace, all quote from him. Surely such a statement as the above, coming from such a source, ought to make our author pause and ask himself if it is not possible that Dr. Russell may be right and Dr. Wallace wrong.

The general argument that the class of society to which a patient belongs has considerable influence on his chance of attack by small-pox or recovery therefrom, and therefore appreciably complicates the issue as to the influence of vaccination, receives no support from such statistics as can be brought to bear on the question. Dr. Buchanan, in reference to the statistics quoted on pp. 91–2, says:†

"If any one should advance the opinion that the vaccinated may have owed their escape from death by small-pox, not to their vaccination, but to their belonging to that richer class of the community which, through being better lodged and guarded, is less exposed to the infection of small-pox, the reply is at hand. Let us consider separately the class of the population which has its children vaccinated at the public expense. We know that it is not less than half the population, and that almost the whole of the poorer population is included in this class. No one will say that this half is the better housed, or its children more out of the way of infection, or that its children can command better aids to recovery if they should be attacked.

"The children under ten living in London, and having been vaccinated at the public expense, number about 430,000. If the rate of death which prevailed among the unvaccinated children of London had prevailed also among this section of the vaccinated, then, among these vaccinated children there would have been more than 6,000 deaths from small-pox last year. But out of these children, being in chief part children of poorer class, what was the number of deaths that actually did occur from small-pox? Not

* See p. 71.

† Supplement to 14th Annual Report of Local Government Board, pp. 29, 30.

6,000, nor 1,000, but at the outside 35; more truly 23, for 12 of them were not vaccinated till small-pox had actually taken hold on their bodies."

It seems, therefore, that the value and virtue of vaccination are best shown by that section of the community to which belongs the bulk of the "criminal and nomad" class. For Dr. Buchanan shows that however great may be the influence of bad hygienic conditions in spreading zymotic diseases, yet the poorer classes in London, owing to the superior quality of public vaccinations, actually suffer less from small-pox than their betters in social position.

The Comparative Prevalence and Fatality of other Diseases among the Vaccinated and Unvaccinated.—Taking the unvaccinated as a whole, there is one other possible way in which an anti-vaccinator might attempt to prove that they are "a quality as well as a quantity"; and that way would be to show that they suffer more than the vaccinated from other diseases. It is obvious that if there is anything at all in Dr. Wallace's argument, the unvaccinated should die of "measles, scarlatina, and other diseases," as well as small-pox, much more readily than the vaccinated. But in his evidence before the Select Committee of 1871, Dr. C. J. Pearce, the then leader of the movement, tried at great length to establish the following among other propositions,* "That all other diseases than small-pox are more severe and more fatal in the vaccinated than in the unvaccinated, especially scarlatina, measles, whooping-cough, diarrhœa, fever, erysipelas, and phthisis," and he said, "there is no question, I think, that all who have been vaccinated suffer more than the unvaccinated." This view is adopted in "Vaccination Tract No. 1," by Dr. Wilkinson and Mr. William Young, who state that Dr. Pearce "has demonstrated" that "the mortality of children afflicted with measles, scarlatina, and other diseases is far greater in the vaccinated than in the unvaccinated." On the other hand, Mr. Tebb, the present leader, holds an opinion diametrically opposed to that of his predecessor Dr. Pearce. He says, "I have no doubt that the unvaccinated in hospitals die at a higher rate than the vaccinated of pneumonia and scarlet fever."† It is Mr. Milnes who states that "the unvaccinated are a quality as well as a quantity . . . . the congealed misery of whose infancy small-pox *and all other diseases* are ever ready and equally ready to stay with kindly death."‡ The italics are his own.

* *Op. cit.*, p. 40.

† "Sanitation, not Vaccination," &c. p. 22 (London, E. W. Allen).

‡ *Vaccination Inquirer*, Nov., 1886, p. 124.

And Mr. White* says, "With whatever disease affected, the unvaccinated would therefore compare unfavourably with the vaccinated."

But in this matter anti-vaccinators not only contradict each other, they contradict themselves. For I learn from the *Vaccination Inquirer* of January last that at a meeting of the London Society the following resolution was carried unanimously:—"As the latest returns of the Registrar-General show a considerable reduction in the death-rate at Keighley and Leicester since the substitution of sanitation for vaccination: Resolved, that the attention of Insurance Companies be drawn to the fact that there is now unimpeachable statistical evidence that the unvaccinated are the better lives, and should be accepted at lower premiums than the vaccinated." It will be observed that while Keighley and Leicester are mentioned in the preamble, there is no such restriction in the resolution itself, so that while it is maintained on the one hand that the unvaccinated are more liable than the vaccinated to die of any disease that may attack them, Insurance Societies, on the other hand, are gravely advised to accept them "at lower premiums than the vaccinated."

Neither at first sight, nor on close examination, is there any way of reconciling these opposing views. It goes without saying that Pearce, Wilkinson, and Young entirely fail to demonstrate the truth of their proposition, and Messrs. White, Wallace, and Milnes produce no statistics in support of their assertion. Each simply states what suits his own argument. Of course there is no incompatibility in the beliefs, (1) that the unvaccinated are originally a weakly class, and (2) that the vaccinated are weakened by vaccination. But the utter incompatibility lies in this—in holding, on the one hand, that the original debility of the unvaccinated causes them to have a greater mortality than the vaccinated from all diseases, and on the other, that the acquired debility of the vaccinated causes them to have a greater mortality than the unvaccinated from all diseases. And as I shall show farther on, statistics prove that there has been in recent years a steady diminution in infant mortality from all causes combined throughout the kingdom, so that the allegation of acquired debility through vaccination is as false as that of original debility among the unvaccinated.

Errors in Registration.—In further support of his proposition that "the percentages of the vaccinated and unvaccinated [are] unreliable," Dr. Wallace goes on to say that "there is much direct evidence that the records 'unvaccinated' and 'no statement,' in the

* On Playfair and Dilke, p. 162.

Reports of the Registrar-General, are often erroneous," and he cites *three* instances of some vaccinated children who died of small-pox having been registered as unvaccinated.

I am not prepared to hold that in the registration of deaths from small-pox mistakes are never made as to previous vaccination. Absolute correctness is not to be expected in any large series of registrations. If, for example, anti-vaccinists would spend their time in extracting the registered ages of all who die in London in the course of a single year, and in verifying each case by a reference to the birth records, they would find dozens of errors for every one that can be given as to the subject in hand. But no one would dream, on that account, of saying that the age records as a whole are untrustworthy. Every now and then one hears of the prosecution of parties who have falsely registered the death of some living person, in order perhaps to obtain payment of a life assurance policy. But that would be no ground for arguing that the death registers of the United Kingdom form an unsafe basis for calculations of rates of mortality. And though Dr. Wallace had produced thirty instances instead of three, or three hundred instead of thirty, they would not have justified his assertion that "no dependence can be placed on the official records," &c.

But withal, even the three instances given are not trustworthy. "(1) Mr. A. Feltrup, of Ipswich, gives the case of a boy, aged 9, who died of small-pox, and was recorded in the certificate as 'unvaccinated.' By a search in the register of successful vaccinations, it was found that the boy, Thomas Taylor, had been successfully vaccinated on the 20th of May, 1868, by W. Adams. (*Suffolk Chronicle*, May 5th, 1877.)"

Now it happens that this case formed the subject of a question in Parliament by Mr. P. A. Taylor, on June 14th, 1877, and it was there elicited that the mother stated that the boy had been vaccinated three times, *but always unsuccessfully*. The mistake consisted in registering the opposite, and is accounted for by the fact that before the Act of 1871, "certificates were sometimes given without inspection of result." This is the case placed by Dr. Wallace in the forefront of his "evidence."

The next case is of a similar character. Two children, named Snook, died from small-pox in the Homerton Hospital, in 1883, and were registered as unvaccinated. Subsequently it appeared that an anti-vaccinator published, again in a country newspaper, what purported to be a statement on the part of Mrs. Snook, that the children had been vaccinated. No Parliamentary champion seems to have

been foolhardy enough to ask a question on the subject, and the "case" has, therefore, not yet been demolished. But so very small are the chances of errors in registration having been made regarding two children of the same family, that there can be no doubt as to the bogus character of the whole story.

The third instance is sixteen years old, and is stated to have occurred in the Leeds small-pox hospital. Mr. Pickering (already referred to on p. 64), says that he found nine vaccinated children who died registered as unvaccinated. But on the other hand he confesses to finding six recoveries also falsely entered as "unvaccinated." He ferreted out eight other cases in which vaccination had not succeeded, and which had been, correctly of course, entered as "unvaccinated." Dr. Wallace complains of these also, but on turning to Pickering's pamphlet I find that they all got well. And of four postponed cases, also truly registered as unvaccinated, two died, and two were cured.* Even granting the assertion to be correct, therefore, there were 16 recoveries against 10 deaths, so that in the matter of registration, vaccination lost more cases on the one hand than it gained on the other, and all that is shown is inaccuracy, not bad faith. But it happens that Pickering refers incidentally, and in very violent language, to a letter in the *Leeds Mercury* from the medical officers of the hospital. Utilising this hint, I find that all the cases adduced up to that date, September 3rd, 1875 (by a Mr. Kenworthy), were completely disposed of by the medical officers. Yet these very cases are rehearsed by Pickering, and included by Dr. Wallace in his list. The medical officers having cleared themselves conclude by stating that they "decline any further communication on the subject." This seems to have given a free hand to Pickering, for his pamphlet was written shortly afterwards, and according to promise it has never been replied to. It contains some of the most furious language I have met with, even in what anti-vaccinators are pleased to call their "literature." Here are some samples:—Vaccination "is little better than cool and deliberate murder" (p. 20). "The *immortal* Jenner was a poor, ignorant, superstitious, hare-brained fanatic, a small country apothecary, a man who was totally destitute of scientific accuracy; a man who adopted a craze that immediately turned itself into a curse, and whose followers, to this day, are making as great a blunder as he by perpetuating a rite whose 'sweltered venom' is destroying the best blood of the nations" (pp. 26, 27). "Was Jenner sane? I think not . . . his greed for gold had obscured his judgment . . . Better for him had he never been born," &c. (foot-note, pp. 26, 27). "If I could believe in vaccination

I should argue thus—there is no God, and *if there be no God, then vaccination may be true*" (p. 30). "How the *King of Terrors* must revel as he follows the wake of the public blood-poisoner! How he gloats over this annual Herodian massacre, which is perpetrated for the sake of *two shillings* a life!"

It is pitiful to think of Dr. Wallace as being driven to appeal for one of his three instances of incorrect registration to such ravings as those of Mr. Pickering. But the abuse of vaccination is so largely buttressed by the relation of "cases" that the examination of these samples, specially selected by so able an author, seems not without use, as illustrating the character of the whole class.

The classification of small-pox deaths.—Another line of argument adopted by Dr. Wallace is that, in the case of a small-pox death, "whether the deceased had been vaccinated or not, is a fact by no means easily ascertained, because confluent small-pox (which alone is ordinarily fatal), obliterates the vaccination marks in most cases, and the death is then usually recorded among the unvaccinated or the doubtful." In this opinion, be it noted, he is at variance with Dr. C. T. Pearce, the late high priest of the movement, who, while holding that the value of marks could not be judged of by their appearance, said, in reply to a question on this subject—"It is quite possible to ascertain whether the mark is there." *

The following is the evidence adduced in support of this contention:—". . . . we have the following statement in Dr. Russell's Glasgow Report 1871–2 (p. 25):—'Sometimes persons were said to be vaccinated, but no marks could be seen, very frequently because of the abundance of the eruption. In some cases of those which recovered, an inspection before dismissal discovered vaccine marks, sometimes very good.'" Turning to Dr. Russell's paper, I find that, having met this difficulty he at once obviated it, as would have been shown had the quotation been continued as follows:—"those who died, or who were not so examined, are placed in a separate column as 'said to be vaccinated but V. M. not visible.'" But Dr. Wallace cuts short the extract when he reaches this point.

Moreover it is manifest that during an epidemic, cases, and especially bad cases, will be removed early to hospital, before the disease is at all well developed, and that only in exceptional circumstances will there be, on admission, the full eruption of confluent small-pox. In Glasgow these exceptions seem to have been oftener met with than in London, possibly owing to some difference in practice as to notification or removal. Dr. Russell indeed refers

* Select Committee's Report, Q. 901

to this. He says, "I do not observe in the reports on small-pox, as observed in London or Dublin, any allusion to this difficulty." But Dr. Wallace does not cite the figures even for Glasgow. The fact is that in close on 1,000 cases, those said to be vaccinated, but without marks, numbered only 46, and these included not only confluent cases, but all others which, though clearly without marks, were yet said to have been vaccinated. But to avoid cavil, if we include the whole 46 cases among the vaccinated, the result is that their total mortality was 9·4 per cent., against 31·2 per cent. among those "admitted to be unvaccinated." And in the larger practice of Mr. Marson exactly a similar course was followed, as he stated before the Select Committee of 1871 (Q. 4323–4).

Dr. Wallace further quotes from Dr. Vacher's "Notes on the Small-pox Epidemic at Birkenhead, 1877," in which it is said, "As regards the patients admitted to the fever hospital or treated at home, those entered as vaccinated displayed undoubted cicatrices, as attested by competent medical witnesses, and those entered as not vaccinated were admittedly unvaccinated or without the faintest mark. The mere assertions of patients or their friends that they were vaccinated counted for nothing, as about 80 per cent. of the patients entered in the third column of the table ('unknown') were reported as having been vaccinated in infancy." By-and-by we shall see that Dr. Wallace and all other anti-vaccinators attach the supremest importance to the views and statistics of Dr. Leander Joseph Keller. Would the doctor be surprised to learn that in obtaining his statistics Dr. Keller pursued exactly the same method as Vacher? The following were among the instructions issued to his 80 subordinates by Keller:—"In particular, your attention is drawn to this point, that in the case of vaccinated or revaccinated, or in the case of those who had already suffered from small-pox, *you should not confine yourselves to the statement of the sick or of their relatives, but that you should convince yourselves by ocular demonstration of the marks left behind.*" *

The purpose of the quotation from Dr. Vacher is to convey the suggestion that a large part of the 80 per cent. of the unknown may have been confluent cases with concealed marks, and ought to have swelled the death rate of the vaccinated. Here again we will give the doctor the full benefit of the doubt, by adding all the unknown to the vaccinated. We then get 443 vaccinated of whom 40 died, or 9 per cent., against 72 not vaccinated, of whom 53 died, or 73 per cent.! But as before, this writer—who holds that "the utility or

* "Blätternepidemic, 1872, 1873, 1874 bei den Bediensteten der Staatseisenbahn Gesellschaft." Vom Chefarzte Dr. L. Jos. Keller in Wien.

otherwise of vaccination is purely a matter of statistics"—*entirely omits the statistics.*

The above is the only evidence given in support of the statement that many deaths in confluent cases have obliterated marks, and are entered among the "doubtful." But this is a trifling charge, compared with the alternative assertion that such cases are entered as "unvaccinated," so that one expects the main weight of evidence to be reserved for the more important accusation.

Will the reader think that I am trying to impose on his credulity if I tell him that Dr. Wallace does not bring forward one iota of proof for this, the major charge of the indictment? Yet such is the fact, and such is the manner in which Dr. Wallace hopes to convert "members of Parliament and others." And since the doctor wrote his monograph his statements seem to grow more and more divorced from any connection with facts. In a recent communication addressed to Mr. Tebb, and quoted in the *Glasgow Evening Times*, he speaks as follows:—"I have also been struck by the (apparent) want of honesty in the defenders of vaccination in repeating over and over again statements which are not true, *and in actually falsifying the records of small-pox mortality by entering all doubtful cases as 'unvaccinated.'*" The italics are mine. Thus of his two assertions, the doctor seems to have entirely given up that one as to which he made some slight show of attempted proof, and now all the more prominently advances the other, as to which he has made no pretence to adduce one jot or tittle of evidence.

But it happens that Dr. Buchanan's Report for 1884 contains a table (p. 52-3) of 1,000 consecutive small-pox deaths in London, as to which I cannot conceive that even Dr. Wallace could raise an objection. For in compiling it the vaccination officers proceeded without the least reference to marks, and took the word of parents and friends, to the exclusion of all medical evidence. And the result is, as before, entirely in favour of primary vaccination, and of the need for subsequent re-vaccination.

[Since writing the above I have been led to doubt whether Dr. Wallace himself is wholly to blame for his manner of citation of Russell and Vacher, except in so far as he has done so at second hand, and without acknowledgment of the source of his information. Both extracts are given in a foot note to page 20 of Mr. P. A. Taylor's letter to Dr. W. B. Carpenter already mentioned. And, as in a similar instance already noted (see page 29 *ante*), the connection is traced partly by means of a blunder. In making his extract from Vacher, Taylor wrote "admitted unvaccinated," instead of

"admittedly unvaccinated," and Dr. Wallace repeats the mistake. So also he cites "Dr. Russell's Glasgow Report, 1871–2," using exactly the same abbreviation of title as Taylor does. But there is one difference. Taylor gives Vacher's statistics, *and they form the only part of the quotation omitted by Dr. Wallace.*]

The last medical man put into the witness-box is Mr. Henry May of Birmingham. In January, 1874, he wrote regarding death certificates as follows:—"In certificates given by us voluntarily, and to which the public have access, it is scarcely to be expected that a medical man will give opinions which may tell against or reflect upon himself in any way. In such cases he will most likely tell the truth *but not the whole truth*, and assign some prominent symptom of the disease as the cause of death. As instances of cases which may tell against the medical man himself, I will mention *erysipelas from vaccination*, and puerperal fever. A death from the first cause occurred not long ago in my practice, and although I had not vaccinated the child, yet *in my desire to preserve vaccination from reproach, I omitted all mention of it from my certificate of death.*"

It is not surprising to find this extract in Dr. Wallace's book—indeed, its omission would have been surprising. It seems hardly the correct thing to write an anti-vaccination book without including it. Mr. White gives the whole, or part of it, in both his books,* Mr. Pickering gives it,† Messrs. Young and Wilkinson give it,‡ Mr. Milnes gives it,§ and the *Vaccination Inquirer* is continually giving it.‖

But while the doctor was doomed to find room for it somewhere, he has been singularly unhappy in his choice of a place. What possible connection has Mr. May's concealment of a death from vaccinal erysipelas with "the percentages of vaccinated and unvaccinated," which is the subject under discussion? Dr. Wallace himself could not tell. If it is merely introduced as a fitting *finale* to the section, then the fitness must consist in its being used as an utterly unjust vilification of the whole medical profession. But if ever there was a case of the exception proving the rule it is found in this quotation. It is now in its 'teens, and yet it is the solitary evidence of the kind that can be produced. It has been hawked through pamphlet after pamphlet, through journal after journal, and has been repeated and re-repeated till a reader of anti-vaccination writings can almost give it by rote. But in all these years it has never found an

* On Playfair and Dilke, p. 17. "The Story of a Great Delusion," p. 67.
† *Op. cit.*, p. 7. ‡ Vaccination Tract, No. 12, p. 31.
§ Debate with Branthwaite, p. 23 (E. W. Allen).
‖ June, 1886, p. 46; February, 1887, p. 176; April, 1887, p. 2.

ally. So, too, both Russell and Vacher have been quoted by White, Taylor, and Wallace, but these writers have been able to discover no other example of a physician experiencing even the minute amount of difficulty found by Dr. Russell regarding obliterated marks, or the large percentage of cases without marks, and yet said to have been vaccinated, found by Dr. Vacher.

Doctors ought, no doubt, to rely on the common sense of mankind, and not allow themselves to be placed in any difficult position by the malignity of anti-vaccinators. But, in fact, they are apt to feel their position towards vaccination a vexatious one, and a weak brother may sometimes be tempted to yield. On any other subject than this they can tell each other and all mankind without interference, their supposed observations and doubts, and can request fresh observations and help from one another; and they ought to do the same about vaccination. But as soon as vaccination is in question, the man who records an observation, or a doubt, or an unusual experience, is quoted or misquoted by a hostile onlooker who claims to be a judge, and the man is represented as making "astounding admissions" (as if something were forced out of him by the thumbscrew), and all that is said in debate and for mutual help and understanding of the truth is straightway interpreted by the same onlooker, as being on the one hand an "astounding admission," or on the other hand a falsehood. This is more or less the case in these cavils at Drs. Russell and Vacher. They, wanting to give or to get information about circumstances conducing to difficulty in the correct registration of vaccination marks among small-pox patients, communicate with their profession. Their observations are at once treated by anti-vaccinators as universal truths, and are with requisite exaggeration held up as evidence that no reliance can be placed on "the percentages of the vaccinated and unvaccinated" in a hospital. The mass of the medical profession, whose general experience is to the contrary effect, are held up to scorn as caring nothing for the truth; and the whole body of their observations and certificates concerning the marks of vaccination is treated by anti-vaccinators as being false or unreliable. And so it has come to pass that the extracts in question, along with the cases of Pickering, Snook, and Feltrup, are all the evidence Dr. Wallace adduces to prove that "no dependence can be placed on the official records of the proportions of vaccinated and unvaccinated among small-pox patients." Seldom has a proposition so important in itself and so injurious in its inferences been based on proof combining such poverty of volume with such irrelevance of application.]

CHAPTER IV.

THE MITIGATION OF SMALL-POX (*continued*).

THE MORTALITY AMONG THE VACCINATED AND THE UNVACCINATED AT SUCCESSIVE PERIODS OF LIFE.

Are our Hospital Statistics fallacious?—Mortality at Corresponding Ages—*Keller's Austrian Railway Statistics*—His First Paper—The "Percentage Swindle"—His Conclusions—The Quality of the Railway Vaccination—Panic Vaccination—Statistical Discrepancies—The Railway Population compared with Modern England and Old Kilmarnock—Dr. Vernon of Southport—English Hospital Statistics at Various Ages—Dr. Wallace's Mis-statement—The Deptford Hospital—Gayton's Statistics—The Mortality per Million Living among the Vaccinated and the Unvaccinated.

Do our Hospital Statistics necessarily give False Results?—In continuation of his argument on the comparative mortality of the vaccinated and the unvaccinated, Dr. Wallace, having satisfied himself that the percentages of the vaccinated and unvaccinated are unreliable, goes on to state that "even if the records in our hospitals, 'vaccinated' and 'unvaccinated,' were strictly correct, it can be demonstrated that true results cannot be deduced from them without a comparison of *the mortality of the vaccinated and the unvaccinated at corresponding ages*, and this information our official returns do not give."

To clear the way, I may state *in limine* that, in any question of mortality statistics it is necessary to discover whether or not any error may lie in neglecting to observe the ages at which deaths take place. The manner in which anti-vaccinators rush into this very mistake has been already abundantly illustrated * in discussing the influence of the successive vaccination laws. And the doctor's absolute disregard of this canon law in failing to note in his own diagrams the 80 per cent. decrease of small-pox mortality in childhood has had exactly the effect that he predicates—namely, that the diagrams, even if "strictly correct," yet "give false results." So far, therefore, I am at one with Dr. Wallace. Adopting the principle of an illustration which he takes from Keller, it is evident that the mortality from whooping-cough is less in children who attend school than in those who have not yet gone to school.

* See p. 48, &c.

But it would be absurd to suppose that going to school prevents this disease. The obvious explanation is that the ailment belongs mainly to children who have not attained to school age, the mean age at death from whooping-cough being under two years. On the other hand, there are some influences that tend to prevent some diseases alike at all ages. The protection afforded by one attack of measles against a second attack could be shown quite independently of age periods, by comparing the susceptibility to contagion of any two groups of persons, provided one group had had the disease and the other had not. In times when fighting men wore coats of mail, if one half of an army were supplied, and the other not supplied, with shirts of chain armour, the protective influence against wounds would be seen after a battle, whether the men were examined as a whole, or a comparison made of the protected and the unprotected at each separate age. The question is, which analogy applies to vaccination—has it a delusive and imaginary influence like that of school attendance on whooping-cough, or has it a shielding power like that of chain mail against wounds, or of a first attack of measles against a second?

Keller's Statistics.—The essence of the case set up by Dr. Wallace consists in his citations from Keller, so to avoid cavil I quote the passage in full (pp. 32–34):—"The requisite comparison has, however, been made on a population of about 60,000, consisting of the officials and workmen employed on the Imperial Austrian State Railways, by the head physician, Dr. Leander Joseph Keller; and his results during the years 1872–73 are so important that it is necessary to give a brief abstract of them.

"(1) It is shown that the death-rate of small-pox patients is greatest in the first year of life, then diminishes gradually to between the 15th and 20th year, and then rises again to old age; *thus following exactly the same law as the general mortality.*

"(2) The small-pox death rate, among over 2,000 cases, was 17·85 per cent. of the cases, closely agreeing with the general average. That of the unvaccinated was *23·20* per cent., while that of the vaccinated was only *15·61* per cent.

"(3) This result, apparently so favourable to vaccination, is shown to be wholly due to the excess of the unvaccinated in the first two years of life, and to be *a purely numerical fact entirely unconnected with vaccination.* This is proved as follows:—Taking first all the ages above two years, the death rate of the vaccinated is *13·76*, and of the unvaccinated *13·15*—almost exactly the same, but with a slight advantage to the unvaccinated.

"Taking now the first two years, the death-rate is found to be as follows:—

	Vaccinated.	Unvaccinated.
First Year of Life	60·46 ...	45·24
Second Year of Life	54·05 ...	38·10

"Thus the small-pox death-rate is actually *less* for the unvaccinated than for the vaccinated infants, and *equal* for all the higher ages; yet the average of the whole is higher for the unvaccinated, *simply on account of the greater proportion of the unvaccinated at those ages at which the mortality is universally greatest.*

"It is thus made clear that any comparison of the small-pox mortality of the vaccinated and the unvaccinated, *except at strictly corresponding ages*, leads to entirely false conclusions."

Keller's statistics are like Wheeler's hospital-mortality table, and like the extracts from May, Russell, and Vacher, already noted. They form one of the stock weapons of the anti-vaccination armoury. They have been treated of by Geo. S. Gibbs, Mrs. Hume Rothery, Milnes, Wilkinson and Young, as well as by Dr. Wallace.*

Keller wrote three papers on the subject, the first giving results for 1872, the second including also 1873, and the third embracing the three years 1872–3–4. The last, therefore, is the most complete, and was published in 1876. In 1878 Gibbs† gave the three years' statistics, but more recent writers have returned to the figures for 1872–3: Milnes, for example, who devotes a whole pamphlet‡ to the subject, never hinting at the existence of a later report. The point is of no practical consequence, as Keller's figures are untrustworthy alike for all the three years. But I may inform the reader that while in 1872–3 the mortality of the vaccinated was *15·6* per cent., and of the unvaccinated *23·2* per cent., in 1874 the corresponding figures were *14·15* and *28·8*—statistics obviously much less suitable for anti-vaccination purposes.

Here is a sample of what Mr. Milnes would have lost by telling the whole truth, by including, that is to say, the year 1874. The

* It would be unfair to class Mr. Sprague, who also writes on this subject, with anti-vaccinators. He is careful, in stating his conclusions, to say that he does so only because he sees "no reason to doubt" that Keller's figures are "entirely trustworthy." In this he is wrong. But even then he concludes that "Dr. Keller's statistics certainly do not justify the conclusions he has drawn from them as to the uselessness of vaccination." (See "The Journal of the Institute of Actuaries and Assurance Magazine," Vol. XX., p. 216, or Mr. Sprague's reprint therefrom.)

† "The Tables Turned," by Geo. S. Gibbs, F.S.S. (Darlington, 1878).

‡ "The Mitigation Theory of Vaccination" (London, E. W. Allen, 1886).

vaccinated mortality in each of the four quarters of the first year of life was, in 1872–3, as follows:—

	Cases.	Deaths.	Deaths per Cent.	But the inclusion of 1874 gives Deaths per Cent.
1st Quarter	1	1	*100*	*50*
2nd ,, ...	16	11	*69*	*68*
3rd ,, ...	16	9	*56*	*50*
4th ,, ...	16	7	*44*	*34*

The utter worthlessness of the first ratio is shown by the fact that Milnes' 100 per cent. consists of *one* case which died, while the 50 per cent. got by including 1874, is due to the occurrence of *one more* case which had recovered. So that, while in 1872–3 *100* per cent. died, in 1874 *100* per cent. recovered!

If now we turn to Keller's first paper, we can pick up a hint or two as to the methods he adopts. Here is a table which he gives of death-rates at various ages:—

Between 2 and 3 years	of vaccinated children	30 per cent.	died.
	of unvaccinated ,,	19	,,
,, 3 ,, 4 ,,	of vaccinated ,,	15	,,
	of unvaccinated ,,	9	,,
,, 4 ,, 5 ,,	of vaccinated ,,	14	,,
	of unvaccinated ,,	10	,,
,, 5 ,, 10 ,,	of vaccinated ,,	11	,,
	of unvaccinated ,,	10	,,
,, 10 ,, 15 ,,	of vaccinated ,,	8	,,
	of unvaccinated ,,	8	,,

It will be observed that in this table, only ratios are given, the actual figures being omitted. It is a well-known law—of which Milnes' 100 per cent. is an extreme example—that the value of a statistical series lessens with the lessening of the number of facts which compose it. The actual numbers founded on in the above table are much less imposing than the percentages. To begin at the beginning, the 30 per cent. means 3 deaths; so, too, 19 per cent. means 4 deaths; 15 per cent., 2 deaths; 14 per cent., 1 death; and so on.

I have before me a work in which these percentages of Keller are submitted to English readers, without any hint being given as to the insignificance of the figures which lie behind them. In Keller's original paper it is possible to search out these figures in an appended table. But in the translation in question the table is not

included, so that the unwary reader falls into the trap. I have before me also a work in which this method of treating figures is exposed. It is called, in italics, the "*Percentage Swindle.*" The following extreme illustration is used—"Let there be a country in which there are 33,000,000 people vaccinated, and one person unvaccinated. A considerable death-rate takes place, no matter how many. The unvaccinated *one* dies. One out of one is ten out of ten, a million out of a million, and so forth: it is 100 *per cent.;* it is all." The passage continues thus—"The result is, that if this unvaccinated Pan, this ALL dies, his unlamented decease would require to balance it the death of all the small-pox cases throughout the country." The practice is further described as a "statistical fraud," and much strong language is used regarding an example of it, in which, the statement being that 100 per cent. died, it is remarked that "a plain man would naturally suppose that a large number of unvaccinated persons died, *whereas only four died.*"

The authors of these denunciations are Dr. Garth Wilkinson, a Vice-President of the Society, and Mr. Wm. Young, its secretary. It is pleasant to find in the forefront of the anti-vaccination ranks, leaders of such high-souled integrity as to declaim, in scathing terms, against unfair warfare whether practised by friend or foe—for the invective is obviously applicable to all such procedures, no matter in what interest undertaken.

There is this to be said in extenuation of Mr. Milnes, that the fact that he founds his *100* per cent. on ONE case is stated in the table. Mr. Milnes may, therefore, be let off with admonition from Messrs. Young and Wilkinson, not to do it again. But Keller himself seems to stand on the same footing as the writer who drew forth the original condemnation. For the fact that the percentage statement in the latter case referred to *4* deaths in 4 cases, was ascertained by "looking closely at the statistics." So have I, by looking closely at Keller's statistics, discovered that 30 per cent. means *3* deaths in 10 cases, and 14 per cent, *1* death in 7 cases, and so on. In the opinion of Messrs. Wilkinson and Young therefore, Keller is a *percentage swindler*, guilty of "statistical fraud."

If so, what shall be said about any one who published a translation of these percentages, but left the actual figures hidden away from English readers in a Viennese medical journal? Probably Messrs. Young and Wilkinson did not contemplate the possibility of such enormity being perpetrated even by a vaccinator, let alone by a brother in arms. Hence they have used up their strongest objurgations in denouncing the minor offence. So that, perforce, we must

adopt the terms fraud and swindle as being applicable to, though by no means severe enough for, the conduct of the unknown delinquent. Who, then, is he on whom is poured the fiery indignation and scorn of the Secretary and the Vice-President? The news must be broken gently. The judges are two in number, and the condemned are also two. The judges are Dr. Garth Wilkinson and Mr. William Young, and the culprits—for the truth will out—are Mr. William Young and Dr. Garth Wilkinson. In Vaccination Tract No. 1 (1877) they perpetrate the "percentage swindle," and in tracts No. 13 and 14 (1878), they fall foul of their own methods of "statistical fraud."

Before the Select Committee of 1871, Dr. Wilkinson said (Q. 1339), "This vaccination question is a question which looks very cool when it is drawn out in tables of statistics, but it is an intensely hot question, and a great deal of passion goes into the statistics on both sides." Under cross-examination (by Dr. Lyon Playfair), he was referred to a passage in his own writings, in which, speaking of vaccinators as "poisoners," he said, "and whatever arousing of the passions of his commune he (*i.e.*, an anti-vaccinating parent) may cause against his poisoners, the public opinion of the world will justify him, as much as if he shot down a midnight assassin from his wife's and child's bedside." Asked if these were "hot expressions," he replied, "they are hot indignation, not hot statistics." There can be no doubt that, taking Wilkinson's view of what constitutes a "swindle," hot as were Keller's statistics in his own hands, in the hands of Messrs. Wilkinson and Young they reach a temperature so high as to scorch the fingers of these gentlemen as they handle them, and to scorch them more deeply than the skin.

In the above figures Dr. Keller makes a curious omission. He forgets to include the first two years of life. On turning to his appended table, I find that at this age the vaccinated death-rate was 33 per cent. (3 deaths in 9 cases), and the unvaccinated, 38 per cent. (18 deaths in 47 cases), so that, while the numbers are of no moment, the uniformity of the results would have been interfered with had these years been included. The omission is specially suggestive, in view of the great importance he attaches to this age period in his second paper, as shown in the synopsis which I have quoted from Dr. Wallace.

Keller states that five conclusions can be deduced from his statistical table, which had been "drawn up with the greatest care and accuracy." The first conclusion is that, "as a general rule,

more vaccinated than unvaccinated persons take small-pox." If in Austria, as in England, there are 19 vaccinated persons for every one unvaccinated, the statement may be true. But Dr. Keller's paper and table do not contain one jot or tittle of evidence on the point. What the statement does show is the loose method of his own mind. The third conclusion is that "Re-vaccination was of no avail to afford protection from small-pox, or to diminish the general percentage of deaths on the total number of cases of small-pox." This he founds on five deaths, in a population of 55,000 to 60,000, but without any statement of the number of re-vaccinated persons in the community.

The fourth conclusion is that "Neither vaccination nor re-vaccination has had any good effect in diminishing the mortality in cases of small-pox." This is the only one of any consequence, and in this country his writings are used mainly to support this doctrine.

Following Keller in his argument regarding it, we find that the pamphlets contain much self-condemnatory evidence. There are startling differences in the results obtained in different years. It has already been pointed out that while in 1872-3 the mortality of the vaccinated was to that of the unvaccinated as 15 is to 23, in 1874 it was as 14 to 28. But in 1874 itself there are some strange inconsistencies. In the first two age periods the unvaccinated have by far the greater mortality; in the third and fourth periods this is reversed; in the fifth there is another reversal; in the sixth, another; in the seventh, another; and so on.

So also, confining the comparison to children under two years old, in the year 1872, the mortality among the vaccinated was 33 per cent. (3 deaths in 9 cases), and among the unvaccinated, 38 per cent. (18 deaths in 47 cases). But in 1873 the corresponding figures were 57 per cent. (or 46 in 80), and 43 per cent. (or 100 in 231); and in 1874, 32 per cent. (or 13 in 41), and 54 per cent. (or 60 in 112). Thus in 1873, the vaccinated had a much greater mortality than the unvaccinated, and in 1874 the figures are more than reversed.

If, now, we compare localities instead of years, we find similar discrepancies. Only in Keller's second paper are the necessary facts given. There were some places whose experience approaches more or less to that which ordinary English vaccination produces. In Steyerdorf the vaccinated mortality was 5 per cent., and the unvaccinated, 19 per cent. In Szaszka, the corresponding rates were 12 and 22 per cent.; in Oravicza, 14 and 25; and in Brandeisl, 13 and 27. But on the other hand, in Pesth, the vaccinated mortality

was 19 per cent., and the unvaccinated, 16; in Temesvar, 23 and 20; and in Vienna, 18 and 18.*

On the one hand, therefore, we have districts whose unvaccinated mortality is two to four times that of the vaccinated, and on the other, districts in which the latter exceeds or equals the former. Dr. Keller makes no attempt to explain such facts. It never seems to strike him that possibly in one community vaccination may have been fairly done, with sound lymph, while in another the whole operation may have been a pretence. He passes over the discrepancies in silence, though it was precisely to them he should have turned for an understanding of the peculiar behaviour of small-pox among his railway people. So also does Mr. Milnes, who seems to have read the original for himself. While insisting on an analysis of ages, he presents no analysis of localities. Mrs. Hume-Rothery, too, places this part of the paper among the "less immediately important passages," and leaves it untranslated.

Not that Dr. Keller wanted the acumen to observe this difficulty. For in his third paper he levels an exactly parallel criticism against some statistics published by the "Stadtphysikat" of Vienna. It seems that in the 1874 Report of that body a table is given of vaccinated and unvaccinated mortality in various districts in Vienna, and that Keller's own arrangement of ages is there adopted, with results the reverse of his own. And part of Keller's reply is, that in two localities some such difference as the above-mentioned is apparent, and demands explanation. I have failed to obtain the report in question, and have here to trust entirely to statements let fall in Keller's last paper.

But as a basis to the whole argument one naturally desires to find out what sort of vaccination this is that has no power to mitigate small-pox. Dr. Wallace gives no information on the point. He, *suo more*, appears never to have seen Keller's papers. It is questionable if he is aware that Keller ever wrote three papers on the subject. He trusts entirely to a translation of part of the second one, by Mrs. Hume Rothery. The title of the translation is "The Great Per-centage Scarecrow, or the Higher Death Rate of the Unvaccinated Analysed and Disposed of," &c. The very name breathes of anti-vaccination hysterics. It is on this feeble foundation that Dr. Wallace builds his proof. Turning to the translation, I again find

* Taking the 7 populations in the above order, the cases and deaths among the vaccinated were respectively, 185 and 9; 93 and 11; 29 and 4; 177 and 23; 106 and 20; 31 and 7; 232 and 41: and among the unvaccinated they were, 68 and 13; 45 and 10; 12 and 3: 78 and 21; 56 and 9; 15 and 3; 191 and 22.

no information on the point. But Mrs. Rothery omits some passages; one, therefore, falls back on Keller himself, only, however, to be again disappointed, for from beginning to end of his papers he gives no hint of his views as to how vaccination should be performed. He recognises no distinction between the merest scratch of the lancet, and an operation consisting of the production of four or six typical Jennerian vesicles. The enormous importance of this question has already been demonstrated, and falls to be further illustrated. * But while he issues to his eighty medical reporters the most elaborate instructions regarding analysis of ages, he gives them no hint of the need for analysis of quality and quantity of vaccine marks.

Further, the operation is not compulsory in Austria in infancy, and only indirectly at later ages. Such being the case, when an epidemic comes, people will rush in haste to the doctor's with their unprotected children, living in the midst of actual small-pox. Many must have the disease incubating before the operation is performed, and very likely, if the truth were known, this would account for many of the deaths among the "vaccinated" under two years old. But Keller gives no indication of the numbers in whom this occurred.

Nor does he say what sort of lymph was used. Among the crowds hurrying for protection, much inactive and at other times discarded virus may have been inserted. But the author is silent on the point. Except unintentionally, for he sneers at the honesty of medical men who have made profit by vaccination, and "who, perhaps, have more or less traded in vaccine lymph." If fraud is practised in this matter in Austria, and if the disposal of lymph is degraded to the level of a trade, in which more attention is given to profit than to truth, it is easy to understand the resulting statistics.

In brief, then, my view of Keller's papers is that they refer to a condition of things wholly without parallel in this country in the present day. The railway employés, even those held to be vaccinated, were to a very great extent an unvaccinated population. At the same time, the operation could not have been universally farcical, and an unknown number of persons, especially in certain localities, had evidently obtained some protection against the disease. Let us, therefore, examine the affinities of the railway small-pox mortality with other small-pox mortalities, taking a relatively well vaccinated population and an unvaccinated population for the comparison.

The total Austrian railway population was 55,000 to 60,000. To avoid exaggeration of rates, we will take the latter. The small-pox

* See p. 36 and p. 88.

deaths were 84 in 1872, 385 in 1873, and 156 in 1874. The rates per million living were thus 1,400, 6,416, and 2,600 respectively. On the other hand, in 1871, the worst year of the English epidemic, the rate was only 1,024, or less than one-sixth of Keller's rate for 1873. And in the Austrian empire as a whole, even with its imperfect vaccination law, the rate was only 3,230, just half of the railway mortality. As to infant mortality, seeing that there is no age census given, it is necessary to assume that ordinary averages prevail. In the 60,000, there would be 3,000 under two years old. Of these the deaths were (1) 21, (2) 146, and (3) 73 in the three years respectively; the rates per million being 7,000, 48,666, and 24,333! In England and Wales in 1871, the corresponding number is 2,844. The worst English rate is here less than one-seventeenth of the worst Austrian rate! But the Austrian rate at all ages was only six times the English rate. Whence the difference? Can it be doubted that it was because in the population under two years of age the differences between English and Austrian vaccination are at their maximum? Vaccination is compulsory in England at three months, but in Austria there is no such law. Hence, even if Keller's had been as good in quality as English vaccination, there would have been much fewer protected than in England. Moreover, when the English epidemic came, there was little need of that rush and hurry of the infantile community to the vaccinator which must have prevailed in Austria. Panic vaccination is comparatively bad vaccination. Care as to lymph and as to method of performance must be less. And, as I have said, many children may have been vaccinated with the sickness of small-pox already in their blood. The 17 to 1 advantage that English children enjoyed, lends support to the view that the Austrian vaccination was to a great extent no vaccination, or too late vaccination.

Let us turn now to an unvaccinated community. Kilmarnock in the last century is a case in point.* At all ages, the Kilmarnock rate was on an average of the nine epidemic years, 16,400, the Austrian, 6,416, and the English, 1,024. Supposing as before the population under two years to have been one-twentieth of the total, the small-pox death-rate of this class was nearly 35,000 per million, taking epidemic and non-epidemic years together. In epidemic years the rate was over 130,000 per million.† Thus the Kilmarnock

* *Loc. cit.* The population is not known exactly, and the calculations are founded on an estimate, for which the data are given in my paper on the subject.

† In the worst of 36 years in Kilmarnock, the enormous figure of 213,000 per million was reached, under 2 years of age, and at all ages, over 21,000 per million—and this with epidemics occurring every 4¼ years.

mortality is 2·8 times Dr. Keller's, while the latter is 17 times the English mortality.

The conclusion seems unavoidable, that as regards liability to small-pox, the Austrian railway population had more points of resemblance to old Kilmarnock than to modern England.

I have no means of knowing what reception was given to Dr. Keller's papers in his own country. But their influence cannot have been perceptible on the thinking men of Germany. Dr. Koch, indeed, with all the responsibility of his high position, does not hesitate to state that "Keller cannot well be regarded as a very trustworthy statistician," having previously "shown himself very untrustworthy in other similar matters."*

And, as has already been mentioned, Dr. Keller devotes part of his third paper to a critique of a reply that was made to him in his own city, in 1874 by the "Stadtphysikat," of Vienna, the reply consisting of a tabulated statement of 2,479 cases of small-pox, divided into Keller's own age-classes, and giving results entirely contrary to his. Of course in the absence of the Vienna report one cannot gauge either its own value or the value of Keller's remarks on it. I merely note the fact that the Vienna medical men did not accept Keller's statistics, but found that their own experience led them to arrive at opposite conclusions. In 1874, too, the latest and most stringent vaccination law of the German empire was enacted. If it had been believed that small-pox was more fatal among the vaccinated than among unvaccinated children, no such law could have been passed. In Germany, as in England, vaccination properly so-called can teach only one and the same lesson, that by its means both the prevalence of small-pox among the people, and its death-toll among those who are attacked, are alike enormously diminished.

Dr. Keller's statistics have thus been weighed and found wanting. But supposing they had not been found wanting, supposing that his vaccination was as good as ours, and that he is right in his views from beginning to end, the question still remains, do these views explain our English experience? The answer hinges on this statement, that under two years of age "*there are far more unvaccinated than vaccinated children* on the railway lines," &c. But in this country the very reverse is the case. For in England vaccination is compulsory at 3 months, and in Scotland and Ireland at 6 months, and *there are far more vaccinated than unvaccinated children under two years old.* So that, if we granted everything as regards Austria, Dr.

* Report of the German Vaccination Commission p 31.

Wallace and his friends would be no further forward as regards England.*

Dr. Vernon of Southport.—In support of his view that the comparative statistics of small-pox mortality among the vaccinated and unvaccinated would be very largely influenced by a discrimination of age periods, Dr. Wallace adduces as an authority "a doctor of wide experience—Dr. Vernon of Southport," who "has stated that he had never known an infant of one year of age recover from small-pox." But on turning to Dr. Vernon's lecture (*see* p. 41, *ante*), I find that he continues thus :—"I don't say they never do; but my personal experience so far is that if they are well vaccinated they don't have it, and if they have it without being well vaccinated they die. As for the effect of thorough vaccination, I have seen well-vaccinated children at the breast with their mothers plentifully broken out, and the children as well as possible, and still being suckled with perfect impunity." But our author suppresses all this, and works the retained fragment into an argument against vaccination. As usual, however, his friend White was before him in this travesty of quotation. On page 95 of his book on Playfair and Dilke, White quotes Vernon, and cuts short the passage at exactly the same point! Once more, has Dr. Wallace ever read Vernon for himself?

English Small-pox Statistics at Various Age Periods.

Having cited Keller in proof of the necessity for analysis of ages, in order to render valid any comparison of vaccinated and unvaccinated mortality from small-pox, Dr. Wallace goes on to apply the test in question to English statistics. And he finds that the application is utterly destructive of their value. He says (p. 32), "the point in question has been entirely overlooked by every English advocate of vaccination, although it involves an elementary principle of statistical science," and further, "this information (*i.e.*, as to ages) our official returns do not give." As if these general statements were not sufficient, he returns to the point in a footnote to p. 35, where he makes the following detailed assertion :—"It seems incredible, but is nevertheless a fact, that in the whole body of official statistics and reports relating to vaccination, from the elaborate 'History and Practice in Vaccination,' in 1857, containing Mr. Marson's celebrated paper on the Statistics of the London

* Dr. Wallace, in a footnote, refers to the fact that 10 to 15 years ago, in two English small-pox hospitals, there were more unvaccinated than vaccinated children. If he intends to suggest that this represents the state of matters outside hospitals the fallacy is too glaring to need remark. (*See* p. 90.)

Small-pox Hospitals, down to the latest Hospital Statistics quoted by Sir Lyon Playfair, there is no recognition whatever of the necessity of comparing *corresponding ages* in order to obtain *true results* as to the *comparative mortality of the vaccinated and unvaccinated.*"

I have carefully read and re-read these assertions to try if any meaning could be taken out of them other than that which lies on the surface. But in the end I have been forced to accept both the words and the meaning as they stand. And in consequence I have been further forced to the conclusion that, in this matter, when Dr. Wallace says "the point in question has been entirely overlooked," *the statement is a mis-statement;* and that when he says "it is nevertheless a fact," then *it is not a fact.*

Dr. Wallace has already (p. 13) quoted from seven groups of modern hospital statistics (those, namely, which I have given more fully in a preceding table, see p. 61). Five of these groups are contained in Official Reports regarding London Small-pox Hospitals. In each of these five reports there is, regarding the vaccinated and unvaccinated, the amplest evidence as to the percentage of deaths to cases at various age-periods. And the tables relating thereto are only samples of what can be found in other reports regularly issued from all the hospitals of the Metropolitan Asylums Board. Similar information is contained in "Dr. Russell's Glasgow Report," already alluded to. Here are some figures obtained from Table II. of the "Report of the Medical Superintendent of the Deptford Hospital for the year 1881." To avoid dispute I have included among the vaccinated not only those with "imperfect marks," but all who were "said to be vaccinated, but without visible marks."

Age.	Vaccinated.			Unvaccinated.		
	Cases.	Deaths.	Per Cent.†	Cases.	Deaths.	Per Cent.†
0 to 2 years* ..	5	0	0	63	52	83
2 ,, 5 ,, ..	34	6	18	99	59	60
5 ,, 10 ,, ..	255	18	7	149	67	45
10 ,, 15 ,, ..	517	28	5	88	22	25
15 ,, 20 ,, ..	561	43	8	54	15	28
20 ,, 25 ,, ..	448	50	11	19	11	58
25 ,, 30 ,, ..	292	42	14	17	5	29
30 ,, 35 ,, ..	201	24	12	9	2	22
35 ,, 40 ,, ..	119	30	25	14	10	71
40 ,, 50 ,, ..	143	40	18	12	5	42
50+ ,, ..	79	20	25	7	3	43
All ages	2,654	301	11	531	251	47

* The figures for each of the first five years of life are given separately in the Report.
† Fractions are omitted, the nearest integer being taken.

Thus *at each age-period* the mortality of the unvaccinated is much greater than that of the vaccinated.

The repetition of such evidence would be wearisome, but, as bearing on the subject matter in question, I cannot refrain from giving the following very important figures, condensed from a recently published paper by Dr. Gayton.* They are a digest of over 10,000 cases treated in the Metropolitan Hospitals by him, and they show the continuous attention paid there to the ages of the vaccinated and the unvaccinated.

Ages.	Vaccinated. Good Marks.			Vaccinated. Imperfect Marks.			"Vaccinated," but no evidence of Vaccination.			Not Vaccinated.		
Years.	Cases.	Deaths.	Per Cent.	Cases.	Deaths.	Per Cent.	Cases.	Deaths.	Per Cent.	Cases.	Deaths.	Per Cent.
0–2 ..	4	0	0	32	3	9	22	9	41	276	181	66
2–5 ..	57	0	0	150	18	12	96	38	40	401	202	50
5–10 ..	206	2	1	532	27	5	207	40	19	510	180	35
10–15 ..	439	5	1	939	32	3	214	42	20	317	74	23
15–20 ..	606	12	2	1,037	66	6	205	39	19	204	86	42
20–25 ..	389	11	3	843	100	13	167	56	34	174	83	48
25–30 ..	189	12	6	529	80	15	116	35	30	105	56	53
30–40 ..	147	14	10	526	78	15	137	49	36	103	42	41
40–50 ..	29	4	14	186	33	18	85	24	28	49	21	43
50+ ..	19	2	11	80	18	22½	46	20	43	30	13	43
All Ages	2,085	62	3	4,854	455	9	1,295	352	27	2,169	938	43

These figures, besides stating age-periods, illustrate the great difference in effect between good and imperfect vaccination.

Perhaps they do even more. Dr. Keller asserts that small-pox mortality resembles the total mortality from all causes combined in so far that it is high in infancy, falls gradually to its minimum in the fourth quinquennium of life, and then rises as age advances. In his statistics this law is illustrated by the mortality both of vaccinated and unvaccinated. Keller here seems to be confusing the rate of mortality to the population with the rate of mortality to attacks of the disease. And obviously measles, enteric fever, cancer, &c., all have laws of their own in these matters. But the law of natural small-pox is that its fatality is greatest in infancy, decreases steadily to a mininum in the third (Keller found it to be in the fourth) quinquennium of life, and then gradually rises again. Now, if Gayton's table be examined, it will be found that of the four classes into which the cases are divided, the last three—namely, the imperfectly vaccinated, those without evidence of vaccination, and

* "The Value of Vaccination" (London, McCorquodale & Co, 1885).

the admittedly unvaccinated—give a general, though not an absolute support to the doctrine. But if the first division be looked at a striking difference will be observed. For here the minimum is in infancy, and with the exception of the last age-period, the rise is very steady and regular throughout life. An interesting question arises out of this. Is it the case that good vaccination, by the tremendous influence it exerts in mitigation of small-pox, has, during the first few years after its performance, the power of abrogating this natural law of small-pox mortality? Oddly enough, it is its other remarkable power of *preventing* small-pox attacks that leaves the answer doubtful. For of 10,000 small-pox patients only 61 consisted of well-vaccinated children under five years of age, and that number is too small to build a safe conclusion on. But these 10,000 cases form the largest collection stated in sufficient detail to make the necessary facts available. Regarding Keller's vaccination, no similar question can arise. It obviously was powerless. And even the "imperfect" vaccination of Gayton, while lowering the percentage mortality at each age-period as compared with non-vaccination, did not show the power to overcome the deadly influence of small-pox on young children as compared with adolescents. The regular rise in mortality with increasing age exhibited by the well vaccinated, is quite in accord with the views of those who insist on the need of re-vaccination. But as has been indicated, the statistical material is too slender to maintain unaided the thesis thus tentatively advanced.

To complete the comparison with Dr. Keller's figures, the above table may be further summarised as follows :—

Age.	Vaccinated, with Marks Good, Bad, or Indifferent.			"Vaccinated," but no Mark of Vaccination.			Admittedly Not Vaccinated.		
	Cases.	Deaths.	P. Cent.	Cases	Deaths.	P. Cent.	Cases.	Deaths.	P. Cent.
Under 2 years	36	3	8·3	22	9	40·9	276	181	65·6
Over 2 years..	6,903	514	7·4	1,273	343	26·9	1,893	757	39·9

Finally, if the objection be raised that those said to be vaccinated, but entirely without cicatrix, may have been really vaccinated, then let us add the first and second divisions together, as vaccinated, and we get, under 2 years, a mortality of 20 per cent., as against 65 per cent. in the unvaccinated, and over 2 years, 10 per cent. as against about 40 per cent. If this last grouping be admitted, and the classification by age be entirely dropped, we get :—

Total Vaccinated with and without marks	8,234 cases, 869 deaths	= 10·5 per cent.
Total Unvaccinated	2,169 „ 938 „	= 42·3 „

Sir Lyon Playfair, in his brilliant speech in the House of Commons, gave 15 per cent. as the mortality of the vaccinated, and 45 per cent. of the unvaccinated. In so doing he certainly did not overstate the case for vaccination.

The above are the facts as to *deaths* of children under 2 years old. In a total of 6,939 *admissions* of persons with something representing vaccination, only 36 were under two years of age; and in a total of 517 deaths of so-called "vaccinated" persons, only 3 were under that age. Thus, the small minority of unvaccinated children under 2 years yielded to Dr. Gayton 276 cases, while the great vaccinated majority sent him only 36 cases, besides 22 others said to have been vaccinated, but on whom no scar remained. This evidence is confirmed by Dr. Wallace himself. In a footnote to pp. 33, 34, he says that "in a pamphlet entitled 'Plain Facts on Vaccination,' by G. Oliver, about 1872, it was stated that in the Small-pox Hospital, Hampstead, 'the number of the unvaccinated patients, up to the age of 10 years, greatly preponderates over the vaccinated of corresponding ages.' In the Homerton Small-pox Hospital, in the eight years 1871–77, there were 147 unvaccinated patients under 2 years old, to 20 vaccinated, including among these the doubtful cases." (These last figures are also Dr. Gayton's, and are included in the table.)

As has already been pointed out (p. 40), the vaccinated have thus a double chance; (1), they are less likely to be attacked by small-pox; and (2), they are less likely to die when attacked.

The more I read of anti-vaccination literature, the more forcibly is one rule of procedure borne in on me—driven, or hammered, or burned into me—no expression is too strong for the reality. The rule is, *to believe no single word that an anti-vaccinator, as such, says, without obtaining independent evidence of its truth.* No matter what the position or absolute trustworthiness of the person may be in every other relation of life, yet when he comes to write on this subject his every statement demands the most careful scrutiny. On reading the assertion that "our official returns do not give" the information as to age periods, I looked up the evidence to the contrary already adduced, but it certainly did not strike me to refer for more proof to "Marson's celebrated paper," specifically mentioned by Dr. Wallace. And yet, on turning to it for another purpose, I am confronted by full and complete information on the point in question! By comparing Mr. Marson's Tables III. and V.,* I find that under 5 years of age, the vaccinated had a mortality of 28 per

* Simon's "Papers," &c., Appendix F.

cent., and the unvaccinated of 50 per cent. From 5 to 10 years, the corresponding rates were 12 and 27; from 10 to 15 years, 4 and 22; from 15 to 20 years, 5 and 26, and so on.

Finally, "it seems incredible, but is nevertheless a fact," that in the footnote above mentioned Dr. Wallace cites figures obtained from a table giving the age classification of 5,479 cases of small-pox.* Dr. Wallace's distinction as a scientist, and as more than a scientist, is so great and well-earned, and his integrity is so unquestionable, that it is painful to have to point out mistakes so awkward; but they seem to be inherent to the cause whose advocate for the time being he is.

The Mortality per million living among the vaccinated and unvaccinated at various age-periods.—This is a cognate question not raised by Dr. Wallace, but which naturally falls to be mentioned here. The Parliamentary paper, No. 275, Session 1881, has the following by Dr. Buchanan:—

"Comparative small-pox death-rates among Londoners vaccinated and unvaccinated respectively, for the 52 weeks ended 29th May, 1881.

Death Rate of People of subjoined Ages.	Per Million of each Age of the Vaccinated Class.	Per Million of each Age of the Unvaccinated Class.
All ages..	90	3,350
Under 20 years ..	61	4,520
Under 5 years	40½	5,950

Dr. Buchanan, in his Report for 1881, repeats the above, and then goes on to make a special comparison of the vaccinated and unvaccinated under ten years of age, thus:—

"In 1881 the small-pox deaths of London among children under ten turn out to have been: (*a*) 782 deaths among the 55,000 who had not been vaccinated; (*b*) 125 deaths among the 861,000 who had been vaccinated. Upon equal numbers of the two classes, therefore, the mortality from small-pox among the unvaccinated was about a hundred-fold the mortality from small-pox among the vaccinated.

* * * * * *

"If the London children under ten who were unvaccinated had had the protection which the current vaccination gives, not 782 of them, but at the outside *nine*, would have died of small-pox during the year.

"If the 861,000 vaccinated children had died at the rate of the

* Homerton Hospital Report, 1877. Table following p. 47.

55,000 unvaccinated, we should not now be considering 125 small-pox deaths and how they can be reduced, but we should be confronted with an additional 12,000 and more deaths from small-pox, occurring during the year in the London population under ten years of age.

* * * * * *

"The saving of life which I am now recording is a saving of 12,000 lives by vaccination to children under ten years of age in London in 1881."

So also, Dr. Buchanan's Report for 1884 contains two tables, both giving very complete details as to ages. One is a statement of "Deaths by Small-pox in the Metropolis in 1884," and the other, already referred to (p. 72 *ante*), an "Analysis of the Record of a Thousand Consecutive Deaths by small-pox registered during 1884–5." For the details I must refer the reader to the Report in question, issued by the Local Government Board.

CHAPTER V.

RESULTS OF RE-VACCINATION.

(1) In the Army and Navy. (2) Among Small-pox Nurses. (3) Among Post Office Officials. (4) In Prussia.

The Army and Navy—Dr. Wallace's Argument—Unsuccessful and Modified Re-vaccinations—Accidental Omissions—Mr. Burt's Return—The Order in the Navy—An Extraordinary Blunder—Statistics before and after 1871—The Services during the Epidemic—The Home Force—The Civil Population—Its General Mortality Compared with that of the Forces—*Hospital Nurses*—Statistics—Mr. P. A. Taylor—Fever Nurses and Fevers—*London Post Office Officials*—*Prussia*—A Re-vaccinated Nation—The German Commission—Small-pox Charts before and after 1874—The Kingdom, the Large Cities, and the Army—Anti-Vaccinators on the Prussian Law—Boeing *v.* Tebb and Milnes.

Having followed our author through his argument on the mitigation of small-pox, I return to the section which he devotes to small-pox in the Army and Navy. His initial statement is that "Here we have a crucial test of the efficacy or uselessness of vaccination." If the test be properly applied there is no doubt that it is a most valuable one. He continues, "Our soldiers and sailors are vaccinated and re-vaccinated in accordance with the most stringent official regulations. They are exceptionally strong and healthy men, in the prime of life, and if vaccination is of any use, small-pox should be almost unknown among them, and *no soldier or sailor should ever die of it.* They are in fact often spoken of as a 'perfectly protected population.' Now let us see what are the facts."

Founding on a Parliamentary Return obtained in August, 1884, by Mr. Burt (an anti-vaccinator), he points out that from 1860 to 1882 inclusive "there has not been a single year without two or more (small-pox) deaths in the army, and only two years without deaths in the navy," while another Parliamentary paper (No. 433, year 1877) shows that from 1850 till 1872 inclusive "there were many years in which no adult small-pox deaths were recorded for a number of large towns of from 100,000 to 270,000 inhabitants," and that especially "Blackburn and Wolverhampton were each totally without adult small-pox mortality for 11 out of the 23 years!" These cases, however, are, he says, incomparable, in so far as the ages in the army and navy are from 17 to 45 years chiefly, while in the towns the 'adult'

population is aged from 20 years upwards. But the insanitary state of many of these towns, and their comparative freedom from small-pox, leave no room for "the alleged effect of re-vaccination" on soldiers and sailors. He next leaves this comparison in favour of "the best and only reliable test." The mean small-pox mortality in the 23 years embraced in the return was in the army, 82·96, say 83, per million, and in the navy 157 per million. Against this Dr. Wallace says he has ascertained "the small-pox mortality of males in England and Wales, between the years 15 and 55, taken as best representing those of the two services; and the result is a mean small-pox death-rate of 176 per million," which is "little more than the navy mortality, though more than double that of the army."

He continues, "Why is the small-pox mortality in the navy nearly double that of the army? The regulations as to re-vaccination are the same in both, and are in both rigidly enforced, and the men are pretty equal in stamina and general health. The cause must therefore be in the different conditions of life of the two services; and it seems to me a probable supposition that the difference arises chiefly from the less efficient ventilation and isolation which are possible on board ship as compared with army hospitals."

"The general mortality of the navy from disease appears (from the Registrar-General's report, 1882, tables 59 and 65) to be considerably less than that of the army, so that the greater mortality from small-pox must be due to some special conditions. But whatever these are, the conditions of the civil population are certainly much worse. Two-thirds of the families inhabiting Glasgow live in houses of one or two rooms only, and many other towns, including London, are probably not much better. Under such conditions, and with the low vitality induced by insufficient food, overwork, and bad air, we should expect the small-pox mortality of our civil population to be very much greater than that of the picked class of sailors who enjoy ample food, fresh air, and medical attendance. Where, then, is the alleged "full security afforded by re-vaccination?" and how are we to characterise the statements circulated at the expense of the public, that "small-pox is almost unknown in the army and navy?" If we are to draw a legitimate conclusion from the facts, it is that the re-vaccination to which our soldiers and sailors are subjected renders small-pox more fatal when it attacks them, for thus only can we explain the large mortality among picked healthy men under constant medical supervision, and living under far better sanitary conditions than the mass of the civil population."

The Doctor then points out "that even the army small-pox death-

rate is but little better than that of" the adult population of five large towns in the same period, the rates being for Manchester, 131 per million; Leeds, 119; Brighton, 114; Bradford, 104; and Oldham, 89: that of the army being 83. And though "there are many other towns which have a much higher mortality, but very few are much worse than the navy," the worst being Newcastle-on-Tyne, with a rate of 349 per million. This comparison, he says, "amounts to a demonstration of the uselessness of the most complete re-vaccination."

On the other hand, he says, "the general mortality of our adult population is much greater than that of the army and navy," and he finds, "from the official sources of information already quoted," that "the average mortality of the adult population of England, of the ages 15–55, for the years 1860–2, was about *20,000* per million; while that of the navy "was *11,000* per million from all causes, and only 7,150 from disease; and of the army, at home "*10,300* per million," though abroad, including deaths in various petty wars, it was 19,400.

He argues from this that "the superior physique of our soldiers and sailors, together with the sanitary conditions under which they live, are fully manifested in a mortality from disease only about half that of the adult civil population of comparable ages;" and that "if we make the same allowance for the influence of these causes in the case of small-pox, there remains absolutely nothing for the alleged protective influence of re-vaccination."

Such is the case presented by Dr. Wallace. In its main lines it resembles that of Mr. G. S. Gibbs, before the Select Committee of 1871, an effective reply being afterwards made by Mr. Simon.*

I will begin with the italicised statement that "*no soldier or sailor should ever die of*" small-pox. The assumption here is that re-vaccination is held by its supporters to be an absolutely certain preventive of death by small-pox. It is a false assumption. Small-pox itself, as has already been mentioned, has not this power. And as to repeated small-pox, the idiosyncrasy often also shows itself in the comparative absence of protection from death afforded by the original attack, Mr. Marson experiencing a mortality of 19 per cent.†

But the statement involves another assumption—that re-vaccination is always ultimately successful. This also is false. In 1882, of 19,482 attempts at re-vaccination, 5,030 failed,‡ and in 1883 the re-

* *Op. cit.*, Q. 3,042.

† Reynolds' Medicine, *loc. cit.*

‡ Army Reports, 1882, pp. 17-18. See also Reports for other years.

sults show "very slight" differences. With regard to the re-vaccination of failures, I learn, in reply to an inquiry addressed to the War Office, that "the Medical Regulations direct (para. 1,059) that 'When re-vaccination has failed, the operation will be repeated with lymph from another source when practicable; and, in the event of the operation still proving unsuccessful, the names of the individuals will be recorded, with a view to their being re-vaccinated at some subsequent date." But I also learn that, very unfortunately, "no separate statistics of these re-vaccinations after failures are furnished." It seems certain, however, that, on the ground of failure, an un-re-vaccinated residuum could be found in the army at any given date.

Viewing the services as a great example of the power of re-vaccination, it must also be remembered that there may, at least in some cases, be a difference between the protective power of a "perfect pustule" and that of a "modified pustule." The frequency of the latter (6,733 cases in the year 1882), leaves little doubt that many of our soldiers and sailors, though re-vaccinated, have not acquired the maximum amount of protection which re-vaccination is capable of affording.

A third assumption is, that the arrangements in the Army and Navy are in practice so perfect, that by no chance does any one ever escape the operation. When it is borne in mind that constant changes of station take place; that the difficulties of maintaining supplies of lymph are much greater for re-vaccinations of adults than for primary vaccinations of infants; that in hot climates failure is frequent; that ours is an army of short service, and that in the 23 years 1860–82 there were no less than 643,423 entrants into the Army and Navy, the assumption seems hazardous, as we shall immediately see it to be.

Mr. Tebb suggests another cause of occasional omission to re-vaccinate, namely, deliberate falsehood on the part of soldiers who are also anti-vaccinists in opinion. He instances a sentry who, in answer to one of a series of questions put to him when standing on duty, replied, "Well, when we're asked about it, some of us say what is not true, that we were vaccinated, say two years ago, when they let us alone."* I would not be inclined myself to make any such charge against opponents of vaccination, but certainly Mr. Tebb, the leader of the movement, has a right to his own opinion on the point.

The proverbial use of exceptions is most remarkably exemplified in this very connection. In the Local Government Board Report

* *Op. cit.*, p. 23.

for 1884, Dr. George Buchanan says, referring to a Return obtained by a prominent anti-vaccinator, Mr. Burt, M.P. :—

"As regards small-pox in the navy, the 43 deaths shown by Mr. Burt's return to have occurred in that service in the 11 years following the order of 1871 are found, on reference to the reports of that department, to be made up of 13 persons who were vaccinated once and once only; of 12 persons (including 11 Kroomen) who had never been vaccinated at all; of 12 persons (including 2 foreigners) about whom no information was to be had; and of 6 persons who had presumably been successfully vaccinated and re-vaccinated. These were the small-pox deaths occurring during 11 years, on a mean strength of nearly 60,000 men."

It is unfortunate that similar information regarding exceptions does not exist for the army.

But a fourth assumption remains to be noticed, and it involves one of the most serious of the many errors that disfigure the work under review.

Dr. Wallace takes for granted that revaccination has been compulsory in the army and navy during the whole twenty-three years, 1860-82. This was true of the army, as compulsion began in 1858, but *in the navy the order took effect only on March 7th*, 1871. Doubtless there would be an increasing amount of re-vaccination before this date, especially in the home force, but it was not compulsory. Thus we have Dr. Wallace indulging in ingenious speculations as to the small-pox mortality in the navy being greater than that in the army, and all the while he is placidly unconscious of the fact that he is comparing a community living under a law of enforced re-vaccination with another community in which for one-half of the period no such compulsion prevailed!

Further criticism is almost unnecessary, but the true state of the case deserves the reader's attention.

The theory that the difference between the death-rate of the two services "arises chiefly from the less efficient ventilation and isolation which are possible on board ship as compared with the army hospitals" is unnecessary in view of what has already been said. But I am pleased to learn that Dr. Wallace has faith in isolation and in hospitals. Here, however, he is not in accord with his brother anti-vaccinators. For, as is shown further on,* the "Vaccination Tracts" state that "small-pox hospitals are the culminating mistake in the social treatment of the disease," and that "the true policy with small-pox, *in itself* now an insignificant disease, is to let

* *See* p. 150.

each case lie where it falls, and to treat it there as it ought to be treated."

It is, indeed, unfortunately true that in the navy very often each case must "lie where it falls," and so Her Majesty's ship becomes a real floating hospital. Could any test of re-vaccination be more searching than this exposure of the men to the terrible and far-reaching contagion of small-pox, and could any proof of the value of re-vaccination be stronger than the remarkable way in which this test has been withstood since the Order of 1871 came into effect in the navy? In striking contrast to this immunity, let me note an occurrence narrated by Mr. Ritchie in Parliament (July 22nd, 1887) as these sheets are passing through the press. Small-pox broke out in a German steamship, in which were 312 passengers in quarantine. Of these, 13 had had small-pox previously, of whom 3 were attacked, and none died; 55 had been twice vaccinated, of whom 4 were attacked and none died; 209 had been once vaccinated, of whom 45 were attacked and 3 died; 6 per cent. of the passengers were unvaccinated, and contributed 75 per cent. of the total deaths.

Perhaps it might be better not to speak of the army and navy as "perfectly protected." I have somewhere read or heard of a controversialist so captious that when the division of the human race into two sexes, male and female, was laid down as an axiom, he pointed triumphantly to the existence of a few hermaphrodites, and roundly abused his opponent as a man guilty of bearing false witness. So when one says that every soldier and sailor is re-vaccinated, and that consequently the army and navy are "perfectly protected," Dr. Wallace cites such small-pox deaths as those analysed above for the navy, to show that the whole statement is without foundation.

Life is too short to detail the exceptions to every rule, and when the army or navy is spoken of as "perfectly protected," it is obvious that only the re-vaccinated whole is referred to, and not the unprotected remnant, the result of occasional oversight; to which mainly is due the scant experience that our military and naval surgeons have of the lingering of small-pox in Her Majesty's forces.

Observe next that Dr. Wallace's figures give the *coup de grâce* to one of the statements in that letter of Mr. Taylor's to which he so complacently regrets that he has received "no attempt at a reply." Mr. Taylor says (p. 21) "the average mortality in our universally vaccinated army is, I believe, actually greater than that of the whole, and not entirely vaccinated, civil population of similar age." But Dr. Wallace confesses that the army small-pox mortality is *less than half* that of adult males in England and Wales, the numbers being 83 and

176 per million. Besides, the bare statement of 83 per million for the whole period gives but a meagre conception of the case.

The year 1871 happens to stand out from the others in three ways. It was the year of chief epidemicity; it was the year of the new navy regulations; and it was the middle year of the 23, there being 11 on each side of it. It may therefore be taken separately as in the following table :—

Mean Annual Small-pox Death Rate per Million living.

Years.	1860–70.	1871.	1872–82.
Army	105	210	44
Navy	213	260	62

These figures can be reasonably interpreted only in accordance with a belief in the efficacy of re-vaccination. Thus, between the earlier and the later 11 years a very decided decrease is observable in both services. But in the navy the decrease has been much greater than in the army, because (1) there was greater room for decrease, the absence of compulsion in the navy giving in 1860–70 a mortality more than double that of the army; and (2) there was greater cause for decrease, the compulsory order intervening between the two periods in the former case, and not in the latter. In the 1872–82 period, both being under compulsion, the difference is much less, though the lingering effect of the previous (comparative) laxity is still visible in the navy returns.

In the epidemic year 1871, the rates were, for the army 210 and for the navy 260 per million. In the same year, in England and Wales, the corresponding rate was, for males aged 15 to 55, over 1,000.* But, referring to Mr. Tebb on "Vaccination in the Army,"† I find the extraordinary statement that "the small-pox epidemic of 1870–2 paid no respect whatever to this 'protected population' either at home or abroad!"

"Good wine needs no bush," and good statistics need fear no analysis. While the civil rate in 1871 was nearly five times the army rate, yet in the whole 23 years it was only twice as great, and the facts for the navy correspond. Whence the difference? It was because a great part of both the army and navy is always on foreign

* At the census of 1871 there were in England and Wales 5,819,000 of males aged 15 to 55 years, and the small-pox deaths among them were 5,919.

† *Op. cit.*, p. 27.

service, and not exposed to the infection of an epidemic at home. There is teaching here regarding the non-epidemic years in England. In many of them the army and navy abroad were exposed to foreign epidemics *to which the civil population at home was not exposed*, so that the low death rates especially visible in the past 11 years occurred even while the services were labouring under this great disadvantage. In 1883 there were in the army 11 small-pox deaths, a figure which, except in 1878, had not been even approached in the 9 previous years. But in the home service there was not one death, 9 of the 11 being in India, and 7 in Bengal where the disease was epidemic. And of the 15 deaths in 1878, no less than 13 occurred in India. In Madras there were 4 and in Bengal 7. But in both, small-pox prevailed among the natives. In Madras presidency there were 56,360 deaths from small-pox; and yet only 4 occurred among the troops. Thus it is that to show in full the influence of re-vaccination on the forces, the correct way would be, not to compare them with the civil population of England, but to take each regiment and ship and compare its small-pox rates, year by year, with those of the adult foreign or native community in whose neighbourhood the force happened to be quartered. And obviously this would give a still stronger argument in favour of re-vaccination.

In the home service, unvaccinated Kroomen (p. 163) and other chance cases should be much less frequent than abroad, and the facilities for carrying out the order must be greater. There is, besides, the comparative rarity of small-pox in this country. The army and navy at home ought, therefore, to compare very favourably with the forces in India, &c. But in a foot-note to page 21 Dr. Wallace says the very reverse is the case:—"It will perhaps be objected that the army and navy are in great part stationed abroad, and even in the tropics. But this renders our case all the stronger, because small-pox is *less prevalent* in the tropics. In the Blue Book on vaccination, prepared by the General Board of Health in 1857, it is stated, as the mean result of many years' records, that 'the deaths have been four times as numerous among troops in the United Kingdom as in temperate colonies, and eight times as numerous as in tropical colonies' (p. 11). It follows that had the home force alone been given in the return the small-pox mortality of the re-vaccinated and 'completely protected' troops would probably have been *greater* than that of the civil population of corresponding ages!" Dr. Wallace is very foolish to rely as to re-vaccination *in the present day* on statistics thirty years old, when there was no compulsory rule either for the army or navy, for he is thereby led into

another most egregious blunder. Here are the figures for the navy.*

Table showing the Deaths from Small-pox in the British Navy, distinguishing the Home Force from the Other Forces, from 1859 to 1884 inclusive.

Year.	Home Force.					Other Forces.		
	Mean Strength.	Cases of Small-pox.	Deaths.	Ratio per 10,000 of Strength.		Strength.	Deaths.	Deaths per 10,000 of Strength.
				Cases.	Deaths.			
1859 ...	19,300	51	4	26·4	2·07	50,676	8	1·57
1860 ...	23,500	84	12	35·7	5·10	55,518	14	3·96
1861 ...	22,900	35	1	15·3	0·43	55,214	25	4·53
1862 ...	20,760	8	1	3·8	0·48	53,556	17	3·18
1863 ...	21,570	39	2	18·0	0·92	49,318	16	3·24
1864 ...	19,630	199	9	101·3	4·58	50,401	27	5·35
1865 ...	20,980	18	0	8·6	0·00	46,910	15	3·20
1866 ...	21,200	29	0	13·7	0·00	45,854	9	1·96
1867 ...	21,600	30	0	13·9	0·00	46,909	15	3·20
1868 ...	23,200	16	0	6·9	0·00	43,078	3	0·70
1869 ...	22,100	8	0	3·6	0·00	39,938	5	1·25
1870 ...	21,000	24	0	11·4	0·00	39,017	1	0·25
1871 ...	22,100	67	4	30·3	1·81	38,272	12	3·14
1872 ..	23,000	62	9	26·9	3·91	37,019	3	0·81
1873 ...	22,400	7	0	3·1	0·00	36,932	2	0·54
1874 ...	22,500	2	0	0·9	0·00	36,296	2	0·55
1875 ...	21,600	1	0	0·4	0·00	37,111	1	0·27
1876 ..	20,800	0	0	0·0	0·00	38,602	6	1·55
1877 ...	21,000	2	0	0·9	0·00	38,553	0	0·00
1878 ...	19,000	4	0	2·1	0·00	41,111	0	0·00
1879 ...	18,900	0	0	0·0	0·00	39,625	14	3·53
1880 ...	22,370	0	0	0·0	0·00	35,576	1	0·28
1881 ...	22,140	4	0	1·8	0·00	35,132	3	0·85
1882 ...	19,160	3	1	1·5	0·50	37,907	1	0·26
1883 ...	22,200	1	0	0·4	0·00	34,486	0	0·00
1884 ...	18,570	2	0	1·0	0·00	38,635	0	0·00

In the home force, the deaths in the whole period have been so few as to leave small ground for comparison, but the cases in the first half of the 26 years were 608, against 88 in the second half. The deaths were 33 and 10 respectively, 9 of the 10 being in the epidemic year 1872, before the order of the previous year had had time to operate. Let Dr. Wallace, therefore, observe that while, thirty years ago, in the absence of enforced re-vaccination, the deaths in the force at home were four to eight times as numerous as in that abroad, yet now, the home force being well re-vaccinated, deaths have

* These statistics of the home force, up to 1878, are obtained from p. 75 of "The Truth about Vaccination" by Ernest Hart. For subsequent years they were got from the Director-General of the Navy Medical Department. Those for the other forces are got by deducting the figures for the home force from those for the whole navy as given in Mr. Burt's return.

practically disappeared from it, *there having been only one during the past* 12 *years*, while in the less perfectly re-vaccinated remainder (see table) there were no less than 30 deaths. But the doctor says, regarding the home force, that its "small-pox mortality would probably have been *greater* than that of the civil population of corresponding ages!"

The Civil Population.—In the next place it is necessary to notice a few points regarding the population with which the services are compared, namely, the male civil population of England and Wales between 15 and 55 years.

(1) The civil population is itself vaccinated to nineteen-twentieths of its extent, and a small part of it is also re-vaccinated. The comparison, therefore, is not between re-vaccination and no vaccination, but between re-vaccination and vaccination. This is a fact of primary importance, which is not referred to by our author.

(2) The main contention of Dr. Wallace's treatise is that vaccination has not diminished small-pox. To prove this he uses the statistics of London as the principal groundwork, the remainder of England and Wales being brought in only in confirmation. Of course in London small-pox has been more prevalent by far than in the rest of the country. But when he comes to the question of re-vaccination, the object is to get as a standard a vaccinated population of *low* small-pox mortality by which to measure the re-vaccinated services. So, instead of appealing to London, he now selects Liverpool, Birmingham, Blackburn, &c., avowedly because "there were many years in which no adult small-pox deaths were recorded" He further picks out "five very large towns," in which the small-pox rates were exceptionally low, and compares them with the services. I need hardly ask what the doctor would say, did I, in defence of vaccination, select such populations, and measure them, say with Chester, Boston, or Kilmarnock in the last century,* the rates in these towns being as high as from 13,000 to 22,000 per million living in epidemic years, against *o* per million in Blackburn and Wolverhampton in "11 out of the 23 years" 1860–82! The statistical fallacy is manifest. The average adult small-pox mortality in England being 176 per million, the veriest dunce must see that if some groups of population are considerably below that figure, others must be correspondingly above it, and that the lower the one extreme, the higher the other. What, then, is the use of selecting a few examples of low mortality when the reader knows that these are bound to be neutralised by high mortalities left unmentioned by the writer?

* See also p. 84.

Besides, if the towns in question had had their population divided into groups of 500 or 1,000 persons, scattered all over the world, in the Mediterranean, in India, in Hong Kong, at the Cape, &c. &c., it is obvious that their opportunities of catching the disease would have been much more numerous than in the actually existing circumstances. And if there is anything in sanitary condition, that of our large towns is too often nothing to boast of, but certainly it is infinitely superior to that of the average localities visited by our soldiers and sailors throughout the world.

(3) As to sanitation, Dr. Wallace says "the conditions of the civil population are certainly much worse" than in the navy; and he calls Glasgow to witness. It is certainly, as regards over-crowding, the best case he could have chosen for his purpose. But even here, with two-thirds of the houses containing only one or two apartments, Dr. Russell, in his valuable "Vital Statistics of Glasgow,"* states that the average number of persons per room is 2·040, say 2, and that the average size of a room in the worst part of Glasgow, in houses of one apartment, is 1,163 cubic feet. So that, including children as well as adults, each individual has here an average of 500 to 600 cubic feet of air space. The lowest permissible limit for adults is 300 feet. In this respect, therefore, Glasgow is probably much better off than the navy.

As to "overwork," I apprehend that a sailor has a harder time than an ordinary mechanic, and as regards the men of either service belonging to a "picked class," surely the doctor must know that while there is indeed a useful medical examination of recruits, there are counteracting circumstances (having to do with the general character of the men, the class from which they are drawn, their habits on leave or in port, &c. &c.) which make their average power of resisting disease not greater than that of the male population of like age. Of course, however, all these facts are as nothing, compared with *the* fact of re-vaccination or no vaccination.

(4) *Comparative mortality from all causes, in the services, and in the adult civil population.*—This is Dr. Wallace's last point. He makes the comparison in order to show that the total death rate of the latter is "only about half" that of the former, and that, therefore, the "superior physique" and "sanitary conditions" of the services are sufficient of themselves to account for the low small-pox mortality of the army and navy. The question raised needs to be looked at, for the reasoning seems not without weight.

* "The Vital Statistics of the City of Glasgow," Part II. (Glasgow, Alexander Macdougall, 1886.)

Once more, however, our author exhibits his singular capacity for making blunders as to the very essentials of his argument. He says that the mortality of "the adult population of England, of the ages 15–55, for the years 1860–82, was about 20,000 per million." It might have struck Dr. Wallace that the English mortality at all ages is not much above 20 per 1,000 per annum, so that the healthy periods of life embraced in the ages 15–55 years could hardly have so great a death rate. The figures for the last three decades are given on page cxii. of the registrar's last decennial supplement. The 40 years of life from 15 to 55 are divided into five periods, namely, two periods of 5 years and three of 10 years. And, roughly speaking, the rates per million were 6,000, 8,000, 9,000, 13,000, and 17,000 respectively. What now becomes of the deeply underlined "20,000?"

So ends our scrutiny of the way in which this writer applies his "crucial test of the efficacy or uselessness of vaccination." Reviewing the evidence in all its bearings, one finds in these statistics of the army and navy an argument in favour of re-vaccination as against vaccination, similar in character and in force to the argument in favour of vaccination as against no vaccination.

Small-pox among Hospital Nurses.—Under cover of the smoke raised by the re-vaccination controversy as to the army and navy, Dr. Wallace tries to make good his escape from the similar conflict regarding the nurses of our small-pox hospitals. He says "surely we shall now hear no more of the re-vaccinated nurses in small-pox hospitals (as to whom we have no statistics, but only vague and usually inaccurate assertions)." The statement that there are "no statistics" is untrue. Statistics are given both in Quain's "Dictionary of Medicine" * (p. 1442), and in Mr. Sweeting's "Memorandum on Vaccination," issued from the Fulham Hospital in 1882. In the former work, Dr. Collie says that after successful re-vaccination, small-pox is practically unknown. "During the epidemic of 1871, 110 persons were engaged in the Homerton Fever Hospital in attendance upon the small-pox sick; all these, with two exceptions were re-vaccinated, and all but these exceptions escaped small-pox. The experience of the epidemic 1876–77 was of the same kind, all re-vaccinated attendants having escaped, whilst the only one who had not been vaccinated took the disease and died of it. So, in the epidemic of 1881, of 90 nurses and other attendants of the Atlas Hospital Ship (small-pox) the only person who contracted small-pox was a housemaid, who had not been re-vaccinated." From Dr.

* London, Longmans and Co., 1883.

Sweeting's memorandum I learn further regarding Homerton, that the two small-pox cases above mentioned (neither being re-vaccinated) were all that had occurred "after an activity of 11 years." In Fulham Hospital, the staff from 1877 to 1882 numbered 295, of whom 252 were re-vaccinated, 42 had already had small-pox, and one had escaped re-vaccination. The last-named took small-pox, and of the 252 four took the disease; but Mr. Sweeting informs me that "of the 4 small-pox cases who had been re-vaccinated, in 2 the operation was unsuccessful and not repeated," and that as to the failure or success of the other two no record had been left. Further, he says, "At Deptford Hospital only two cases have occurred amongst the staff since its establishment in 1877, in one of which re-vaccination had been overlooked, and in the other the disease was incubating." The numbers of the Deptford staff are not mentioned for the full period, but "during the last three years" (1879–80–81), they were 265, of whom 20 had had small-pox previously. At Stockwell Hospital, in a staff of 340 (of whom 16 had already suffered from small-pox) there were 4 cases, but no deaths. And among 161 * (including 3 protected by previous small-pox) connected with the "Atlas" and "Endymion," no case had occurred.

Mr. P. A. Taylor † adopts a curious contention regarding the immunity from small-pox of re-vaccinated nurses. He cites various authorities, and among them Dr. Mason Good, who, half a century ago, wrote that, "By a long and gradual exposure to the influence of febrile miasm, the human frame becomes torpid to its action." But among small-pox nurses, where is the "gradual exposure?" They are at once plunged into an atmosphere of the deadly poison at its maximum activity. Mr. Taylor fortifies the argument by stating that nurses and surgeons "should escape the infection of small-pox, just as, for the most part they do, of other fevers for which no vaccination is prescribed." This, of course, is just the opposite of what occurs. As Dr. W. B. Carpenter says,‡ "It is the well-known and long-continued experience of the old Fever Hospital, that not only almost every one of its successive nurses and attendants, but its medical officers, with few or no exceptions, have had fever at one time or another. And that the same is the general fact in the newer Asylums Board fever hospitals is shown only too clearly by the sad list of 109 cases of fever (not including either scarlatina, measles,

* This 161 must include the 90 mentioned by Dr. Collie, and "the staff" in these hospitals includes porters and other servants.

† *Op. cit.*, p. 25. ‡ *Nineteenth Century*, April, 1882, p. 539.

or diphtheria), among which there were 20 deaths (including those of a chaplain and matron), recorded as having occurred among their staff, in the report of the Homerton Hospital for 1880. The same writer quotes Dr. Collie, the medical superintendent, as saying, "The only way in which nurses become seasoned against fever is by taking the disease, which they all do, unless they have had it before." *

All these statistics of nurses, &c., were open to Dr. Wallace; but quite recently, in the "Transactions of the Epidemiological Society" (Vol. V., New Series), there is a report on the subject by a Vaccination Committee, which seems to have gone over the evidence afresh, confining its attention to those "in personal attendance on cases of small-pox," and so excluding porters, kitchen staff, &c. The results are (1) that of 1,500 attendants only 43 contracted small-pox, "and not one of these 43 had been re-vaccinated." In the Metropolitan Board Hospitals, of 734 nurses and attendants, 79 had had previous small-pox, and escaped subsequent infection; 645 had been re-vaccinated just before entering on their duties, and not one of these took small-pox; 10 had escaped re-vaccination, and every one of them contracted small-pox. Thus, again, we have the exceptions proving the rule.

In fact, in reply to the general statement that nurses are all re-vaccinated and do not take small-pox, one or two cases were hunted up by anti-vaccinators themselves, of nurses who *had* taken small-pox. In their disgust at the subsequent discovery that by some oversight such had actually escaped re-vaccination, no resource was left but the suggestion that the statements as to non-re-vaccination were "the reverse" of "the truth," and Mr. P. A. Taylor, ex-M.P. for Leicester,† does not hesitate to stoop to the use of this weapon. Insinuations of this sort are like chickens and curses, they come home to roost. Probably, however, the lowest deep has been sounded by the *Vaccination Inquirer*, where it is asserted that "A nurse, brought into contact with small-pox, either contracts the disease or she does not. If she does, she becomes a patient, and is not reckoned a nurse." ‡ No attempt whatever is made to prove the truth of this outrageous statement, but there it remains to form, for those who trust the *Inquirer*, a handy refuge when hard pressed with

* Mr. Sweeting (*loc. cit.*) quotes Collie as stating that in Homerton, Stockwell, and Liverpool Road Fever Hospitals, in the ten years ending 1881, the number of the staff attacked by the various fevers was 133, of whom 25 died.

† Letter to Dr. Carpenter, p. 26.

‡ November, 1886, p. 128.

CHART II.—AUSTRIA.—DEATHS FROM SMALL-POX PER 100,000 OF THE POPULATION.

CHART I.—PRUSSIA.—DEATHS FROM SMALL-POX PER 100,000 OF THE POPULATION.

the "nurse" argument, and for pro-vaccinators, a convenient example of the absolute disregard for facts which may characterise anti-vaccination literature.

(3) *The London Post Office Officials.*—In confirmation of the effects of re-vaccination in the army and navy, and on the small-pox hospital nurses, I may quote Sir Charles Dilke's statement as to the postal services of the Metropolis. He said, "Then in the case of the persons permanently employed in the postal service in London—averaging 10,504, who are required to undergo vaccination on admission, unless it has been performed within seven years—there has not been a single death from small-pox between 1870 and 1880, which period included the small-pox epidemic, and there have been only ten slight cases of the disease. In the Telegraphic Department, where there is not so complete an enforcement of vaccination, there have only been twelve cases in a staff averaging 1,500 men."*

THE RE-VACCINATION LAW OF PRUSSIA.

There is one thing common to the three examples already given of the influence of re-vaccination, namely, the army and navy, the small-pox nurses, and the Post Office officials. They are populations within populations, groups belonging to a nation, but not thoroughly representative of a nation in so far that they do not embrace all ages, classes, and conditions of humanity. While this does not alter the value of the lesson taught by their experience, it may be as well to examine it by the light of the experience afforded by the great national re-vaccination that has been practised in Prussia since 1874. The results, which are given very fully in the Report of the German Vaccination Commission of 1884, are well summarised in Dr. E. J. Edwardes' paper, read before the Epidemiological Society on Dec. 9th, 1885. The attached diagrams, which appeared in the *British Medical Journal*, and for the use of which I am indebted to the courtesy of the editor, exhibit some of the facts in a very striking manner.†

Charts I. and II. give a comparison of the death rate in Prussia and Austria since 1836. The general resemblance between the mortality of the two countries up till 1874 will be noted, but from that year onwards there is a startling difference. While Austrian

* "Facts about Vaccination" (being speeches by Playfair and Dilke). (London, Jarrold and Sons.)

† These charts originally appeared in the Report of the Commission, and hence do not include some recent years.

CHART III.—PRUSSIAN ARMY.—SMALL-POX CASES AND DEATHS PER 100,000.

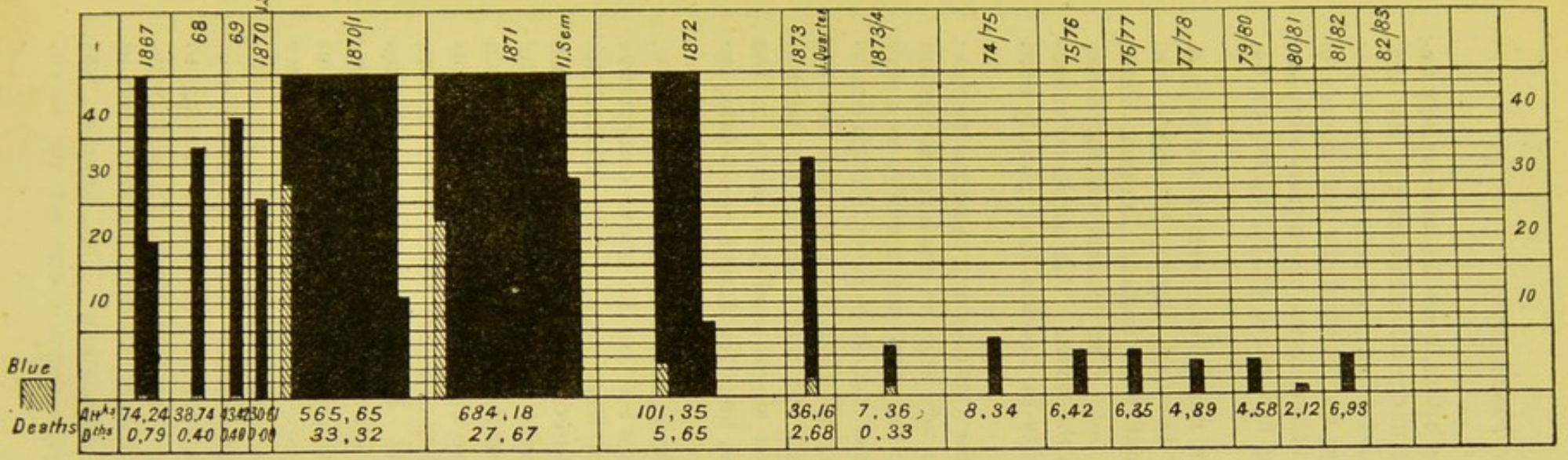
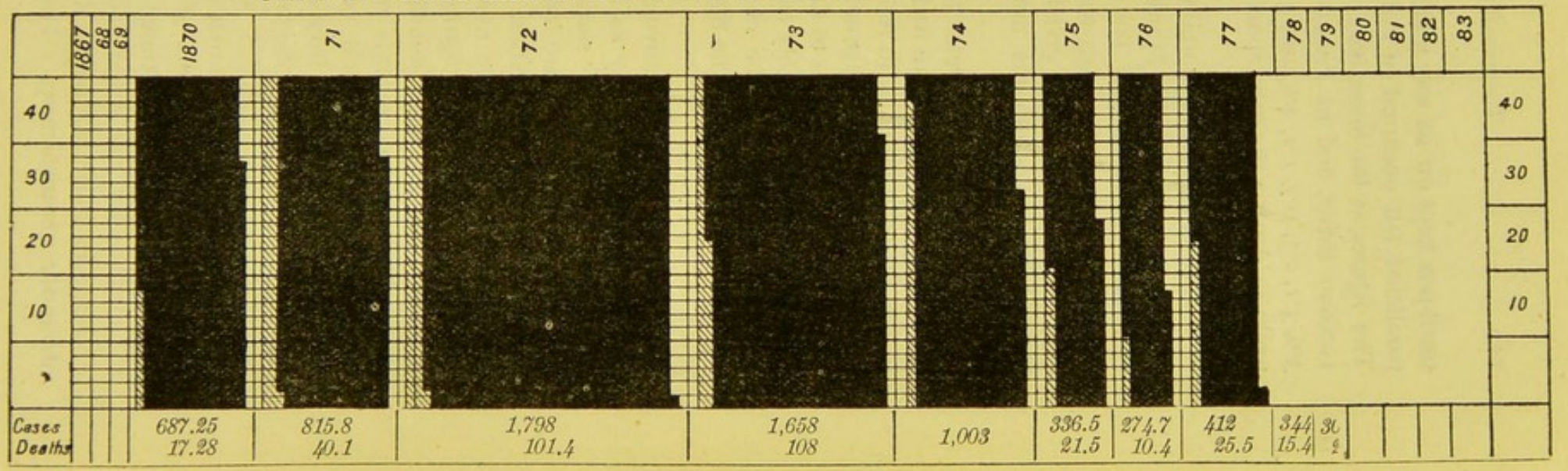


CHART IV.—AUSTRIAN ARMY.—SMALL-POX CASES AND DEATHS PER 100,000.



small-pox kept on its way much as before, a sudden and entirely unparalleled fall occurred in Prussia under the action of the new law. The figures at the lower part of each chart represent the deaths per 100,000 living, and in Prussia the unprecedentedly low figures of 3·6, 3·1, 0·3, 0·7, 1·2, 2·6, and 3·6, belong to the seven years 1875–81, while in Austria the corresponding figures are 57, 39, 53, 60, 50, 64, and 82.

Chart V. gives the mortality in nine cities, German and foreign, of which five, namely, Munich, Dresden, Berlin, Hamburg, and Breslau, were under the law; and four, namely, London, Paris, Vienna, and St. Petersburg, were not. The lessons are the same, and the exact figures are given in the chart. The particular causes which have to do with the mortality in London have already been discussed.

Charts III. and IV. refer to the Prussian and Austrian armies; but previous to 1874 there had already been so much re-vaccination in the Prussian army as to reduce the small-pox mortality to a very low rate. Hence the diagrams refer mainly to cases, though deaths are also included; that is to say up till 1874, for since that time the law has been so thoroughly carried out, that there has not been in the years included in the chart a single small-pox death in the whole Prussian army. The figures, both for attacks and deaths, are given in the charts.

The remarks accompanying these statistics are translated by Dr. Edwardes, and are partly as follow:—"In the above comparative tables the principles of statistics have been rigidly adhered to. Collective populations are compared with collective populations, large cities with large cities, armies with armies. Moreover, the subjects of comparison are numerically so vast, that the errors which inevitably attend smaller figures are eliminated." "*In Germany as a whole*, small-pox has diminished to a degree never before known, so far back as any records reach. In all neighbouring countries small-pox is, as usual, still very prevalent." "The *German large cities* suffer scarcely at all from small-pox, which continues to demand its victims in all large foreign cities." "Lastly, the *German army* is almost free from small-pox, while other armies still suffer severely."

It was hardly possible that such evidence could be passed over in silence by the opponents of vaccination, and it is interesting to note on what lines a rebutment has been attempted. To begin with, if I mistake not, one writer pointed feebly to some improvements in drainage in Berlin as being the explanation. This, however, was obviously unsatisfactory. Finally, a defence was set up which,

it must be owned, is not lacking in boldness. It consists in an absolute denial that re-vaccination became compulsory in 1874, it having already been compulsory since 1835! The German Commission consisted of a president and 17 medical men, including "three anti-vaccinators, versed in the subject," Drs. Boeing, Weber, and Betz.* These men sat for seven or eight days debating the subject. The report of their proceedings occupies a large folio volume, which itself has been read and discussed by those interested in all countries. Yet we are asked to believe that the whole world, including Germany and the eighteen commissioners, has been all the while under a great delusion, and that for about forty years prior to 1874 the Prussians, without being aware of it, had been under compulsory re-vaccination, and that finally, after much patience and inquiry, a Vice-President of the English Anti-Vaccination Society, Mr. Alfred Milnes, M.A., has "succeeded in getting hold of that identical law" of 1835!

This "find" was publicly announced and produced at the 1886 annual meeting of the society. It turns out that what he had got hold of was a copy of some old provisions for the prevention of infectious diseases, and that these included regulations as to re-vaccination in some boarding schools, &c., and in the army. Their effect on the army has already been noted. But there was no general law of re-vaccination prior to 1874. Even Messrs. Tebb and Milnes ought to be satisfied on this point by the statement of their brother in arms, Dr. Boeing, who says, on page 39 of the Report: "Before 1874 we had no vaccination law in Prussia . . . therefore the influence of *re-vaccination which we have first from* 1875 . . . ."† It is needless to say that Koch and others could be similarly cited.

* Drs. Boeing and Weber were opposed only to compulsory vaccination, Dr. Betz to vaccination out and out.

† Edwardes, *loc. cit.* As to the vaccination law of Prussia prior to 1874, see also p. 52 *ante.*

CHAPTER VI.

THE ALLEGED EVILS OF VACCINATION.

HISTORICAL—*Small-pox Inoculation*—Religious Opposition—Massey and Maitland—*The First Days of Vaccination*—Rowley, Birch, Moseley—*1850-60*—Verdé de Lisle, John Gibbs, Carnot, &c.—Modern Methods Foreshadowed—A Formula—*1860-70*—The Select Committee of 1871—Collins, Rothery, Pearce, G. S. Gibbs—Cholera and Scarlatina—Pearce's Seven Evils—*1870-80*—*The Hopwood Returns*—A Synopsis—First Return, 14 Diseases—1871 and 1877—Second Return, its Omissions and Additions—Third Return—More Omissions—The Registrar General's Additions.

THE only section of Dr. Wallace's book which now remains for consideration is that entitled "Vaccination itself a cause of disease and death." The doctor devotes a very short space to the allegation. It forms, however, one of the main weapons of the crusade, and it also introduces to us the whole history of the movement. For this question, rather than that of the power of vaccination against small-pox, probably forms the hidden chain which binds together the various generations of anti-vaccinators that have come and gone since the days of Jenner.

The history of the alleged evils of vaccination therefore demands some notice at our hands.

Small-pox Inoculation.—When, from 1721 onwards, Lady Mary Wortley Montague (wife of the English ambassador at Constantinople), and her physician, Mr. Maitland, endeavoured to popularise in England the eastern practice of small-pox inoculation—the forerunner of vaccination—the thunders of theological bigotry raged against the new procedure. In St Andrew's, Holborn, on July 8th, 1722, the Revd. Edmund Massey, M.A., preached a sermon from Job ii. 7, "So went Satan forth from the presence of the Lord, and smote Job with sore boils, from the sole of his foot unto his crown." He argued that Job's disease was small-pox, that Satan was the first inoculator, that therefore inoculation is a "diabolical operation," tending "to anticipate and banish *Providence* out of the world," and to promote "the encrease (*sic*) of *vice* and immorality" (p. 15).

I make a short digression here to comment on the habit of modern anti-vaccinators to decry the dread and horror which

small-pox inspired long ago. White says, "small-pox excited as little dismay then as measles at this day.* But Massey gives no countenance to this view. He says (p. 24), "I believe it will be readily granted me that there is no one thing so universally dreaded as the disease which this *strange method* of *practice* pretends to elude," and he argues that men would rush into lust and intemperance, "did not this providential obstruction (*i.e.* fear of small-pox), like the angel of the Lord to *Balaam*, stop them in the *way*, or keep them at a safe distance, in health, wealth, and innocence." So, too, Dr. Garth Wilkinson is at variance with White on this matter. He, speaking of "the terrible consequences of small-pox in former ages," says, "it was a very frightful disease, and people were always in a chronic panic about it."† This accords with statements which were repeated in various reports of the London Hospitals for Small-pox and for Inoculation in the last century, where it is said "as the disease is so frightful, even in its first appearance, and at the same time contagious, and almost inevitable, families of all degrees are thrown into the utmost confusion when it invades any person amongst them." Further, "It is universally agreed that amongst all distempers. . . . there is none so afflicting, so alarming;" and inoculation is advised because "it delivers people from those apprehensions with which, till they have had the small-pox, they are always haunted."‡

Mr. Maitland replied to Massey with much ability and humour.§ He says, "But there is still a stronger objection against this practice; *that it is unlawful, and first introduced by the Devil, who ingrafted Job of the confluent sort of small-pox.* From useful discoveries there can always be drawn important consequences. *First*, here learn we, that the *small-pox* is an ancient disease; for if it was conveyed to Job by *some such way* as inoculation, the matter must have been taken from some body infected with the distemper. *Secondly*, that *Sydenham* was not the first that began the *cool regimen;* for *Job* sat down upon the ashes in the open air; *his friends saw him afar off. Thirdly*, that his friends were tardy, above three weeks before they came to see him; for in the genuine confluent kind of *small-pox*, it will be that time before they can bear scraping with a potsherd. *Fourthly*, beloved, this confluent sort of *small-pox* were more gentle, to be sure, than the common natural ones; for he seems neither to have had

* On "Playfair and Dilke," p. 138.

† Select Committee's Report, Q. 1420.

‡ From reports in the library of the Highgate Hospital.

§ "Mr. Maitland's Account of Inoculating the Small-pox Vindicated," &c. (London. J. Peele, 1722).

delirium, sore throat, nor shortness of breath; he talked distinctly and good sense.

"Now here a question ariseth, whether an honest man can do that which the Devil has done? I answer in the affirmative; there are three things mentioned; of the Devil's assembling himself (as in this place) with the Sons of God; believing, and quoting of Scripture. All these things a good man may not only do, but is bound to do." Regarding Massey's peroration, Maitland says (p. 48) that it "is equal to any piece of the whole performance, *Let the Atheist and the Scoffer, the Heathen and the Unbeliever, disclaim a Dependence upon Providence:* Let *them* inoculate *and be* inoculated, &c. I think this clinches the whole matter; and this reverend gentleman has furnished us with a new, sensible, and religious test, an Atheist or Infidel can be found out, as a witch, by the marks upon his body: And that, as it has been intimated already, that the Devil was the first *inoculator*, I think, it is not impossible that the next zealous preacher upon this subject may prove the cicatrices of *inoculation* to be the mark of the beast."*

The first days of vaccination.—Such were some of the objections to small-pox inoculation. In these latter days, Massey's mantle seems to have fallen on Mr. John Pickering of Leeds, some of whose remarks I have already (p. 69) had occasion to quote. In the same way, when vaccination was introduced, it was opposed as "contaminating the form of the Creator with the brute creation." Dr. Rowley† said, "the small-pox is a visitation from God; but the cow-pox is produced by presumptuous man: the former was what heaven ordained, the latter is perhaps a daring violation of our holy religion." And John Birch, surgeon to St. Thomas's Hospital, held small-pox to be a "merciful provision on the part of Providence to lessen the burthen of a poor man's family,"‡ and it was asked, by Dr. Rowley, was it not "impious and profane to wrest out of the hands of the Almighty the divine dispensations of Providence?" § To critics of this school, Simon observes "it seemed enough to say that, in this beneficent economy of the world, antidotes are ever scattered side by side with poisons; that not exclusively the latter are of divine

* See also Dr. Fergus's opening address to the Philosophical Society of Glasgow, Session 1879.

† "Cow-pox Inoculation," &c., p. 8 (J. Harris, London, 1805).

‡ "Serious Reasons for Uniformly Objecting to the Practice of Vaccination, &c. (London, Harris, St. Paul's Churchyard, 1806).

§ Simon's Papers (p. 3 *ante*) form a rich storehouse of facts relating to the history of anti-vaccination.

gift; that man's duty concurs with his privilege to struggle against physical as against moral evil."

Side by side with these purely superstitious objections, there were others, the direct forerunners of those cited by Dr. Wallace and his co-workers. In those days, when time had not proved the almost absolute harmlessness of vaccination, and when statistics had not accumulated, the most magnificent field for prophecy lay open before the anti-vaccination seer. Dr. Rowley discovered four bran-new diseases, which had never been known to afflict the unvaccinated human frame. He named them, Cow-pox Mange, Cow-pox Abscess, Cow-pox Ulcer, and Cow-pox Mortification, and he described both symptoms and treatment. Cow-pox abscesses he diagnosed by a *bluish* colour, and by leaving *bluish* cicatrices—so far could a man's opinions influence his eyesight. Of the same sort was Dr. Moseley, author of *Lues Bovilla*, &c., but so utterly abominable is part of his work, that its own filthiness protects it from rehearsal. A record remains of a consultation which took place between these two worthies, over an alleged case of vaccine poisoning. Rowley relates (p. viii), "Dr. Moseley . . . saw this case of the ox-faced boy, by my desire. He observed to me, that the boy's face seemed to be in a state of transforming, and assuming the visage of a cow. He also observed to me that he has frequently seen distortions from that terrible distemper, the yaws, in the African race, where there has been the resemblance of various animals."* It is amusing to find such men as Rowley and Moseley solemnly cited in modern times, by Collins, and (in Rowley's case) by Tebb, as authorities against vaccination.† Their style of criticism is well summarised by Simon.‡ "The nation was unconsciously dying of vaccination. Terrible portents were described. A child at Peckham had its former natural disposition absolutely changed to the brutal, so that it ran upon all fours like a beast, bellowing like a cow, and

* In defence of Rowley, Mr. White ("Story of a Great Delusion," p. 298) points out that an engraving of this case, which forms the frontispiece to Rowley's book, represents "a comely lad with a swelling on the upper part of his left cheek, which was thought to give that side of his face an ox-like expression," and he adds that worse cases are constantly seen in the present day. As to "comeliness," every one must form his own opinion, and so must Mr. White. The engraving, however, has certainly little resemblance to an ox. But surely Mr. White has observed that it is Rowley who applies the name of "cow-poxed, ox-faced boy," and Moseley who agrees with him, and that the proof of the utter craziness of these men on this subject consists in the fact that the boy's countenance, even in Rowley's engraving, does not, to any man in his senses, suggest the face of an ox.

† Dr. W. J. Collins, *op. cit.*; Tebb, *op. cit.*, p. 55.

‡ *Op. cit.*

butting with its head like a bull! Sarah Burley's face was distorted, and began to resemble that of an ox! Master Joules, similarly degenerating, became the ox-faced boy—a proverb and a frontispiece! A lady's daughter coughed like a cow, and had grown hairy all over her body! William Ince, too, had grown patches of hair not resembling his own, but of the same colour, length, and quality as that of a cow! Many had suffered like him; some also squinted as only oxen can squint; others had lost their nails and the ends of their fingers. Eruptions, ulcers, mange, abscesses, scabs, and blotches, glandular tumours and diseased joints and decaying bones, fevers and blindness, and gangrene and convulsions, were multiplying among the victims of Jenner! Deaths, of course, were plentiful. And on what but vaccination could they depend? . . . . A child coughed: to the ears of the vaccinophobist the sound was as of a cow; to his intellect it was the effect of vaccination. A child was ugly or squinting, or it had those skin eruptions which have always been frequent incidents of infancy: at once, to the alarmist, there was *vultus taurinus* or *tinea bovilla*. In a word, the oldest and most familiar diseases were thus re-named, in conformity with a belief that vaccination was causing them: while, in reality, there was no more reason in this belief than if vaccination had been charged with occasioning infants to cut their teeth, or with leading boys to prefer cricket to Cornelius Nepos."

As years passed, and as Gilvray and other caricaturists showed up the folly of such fears, it was found that these sights and sounds and prognostications were only the work of a disordered imagination or a weak brain. The human race did not degenerate: it still walked on two feet, retained its natural voice, and failed to grow horns on its forehead. But with the lapse of time the prophets also had passed away, not living to see the folly of their delirious predictions, nor to feel the ridicule poured on their memory by any stray inquirer who chanced to rake up from a kindly oblivion their long forgotten lucubrations.

The opposition in 1850-60.—These anti-vaccinators flourished eighty years ago. Fifty years later a new generation had arisen. With the combatants the battle-field had also changed. In the main, the earlier absurdities as to quadrupedan sympathies and decay had been given up. But an echo still lingered. M. Verdé de Lisle,* in 1855, held that the human species had degenerated, that the powerful races of former ages had been succeeded by a generation small,

* *See* extracts from his work ("De la Dégénérescence Physique et Morale de l'Espèce Humaine déterminé par le Vaccin") in Simon's Papers.

thin, mean, bald-headed, and shortsighted; without imagination, sad and spiritless. He asserted "the whole cause of this multiple disaster" to be vaccination. In infancy children were feeble and rickety; later on they were a prey to idleness, incapable of exercise, or even of active mischief. A further deplorable result was that they never danced. In all walks of life the consequences were manifest. In literature, Voltaire and Beaumarchais had been followed by a crowd of drivellers capable only of collaboration and criticism. England had no longer a Sheridan nor even a Dryden: her parliamentary eloquence had fallen to the level of Lord Palmerston. So, also, musicians and painters had degenerated—there were no longer Mozarts nor Vandykes. One evil had brought another in its train—"they smoke to have the appearance of thinking." "Of what good," he asks, "is air? The pores of the skin are obliterated, the lungs are tuberculosed." "Of what use is wholesome nourishment? Of what use is it to preserve the economy from pestilential miasms?" It must be borne in mind that this rubbish is only thirty years old.

John Gibbs's Letter.—But by this time more or less complete statistics of mortality had accumulated, and these were now appealed to against vaccination. The chief English publication of the period was a "Letter to the President of the Board of Health,"* by Mr. John Gibbs, an amateur hydropath. It consists largely of extracts from the writings of various British and foreign anti-vaccinators. A French author, Bayard (who held the opinion that while "natural small-pox is more frequently external than internal, it is the contrary among the vaccinated") is quoted as citing extracts from Villermé, Carnot, Noirot, Castel, &c. The first-named has the honour of having evolved perhaps the most whimsical objection ever raised against the practice. He held that "*vaccination only postponed death*"—as if any one had suggested that it could confer immortality! Villermé also believed that vaccination had produced "a new and universal" *constitution médicale*, that it had "deprived small-pox of its ordinary form in depriving it of its cutaneous eruption." Typhus fevers had become more deadly. Cholera had now become both more frequent and more deadly, and among the vaccinated it had become contagious; the season of the year, too, in which it prevailed had been deserted by it in favour of that season in which small-pox had been wont to rage. Further, he said, "dry cholera, without diarrhœa, is become more frequent in summer by the

* Parliamentary Paper, No. 109, Session 1856.

epidemic and contagious element that vaccination has left intact in the human system."

Carnot—described by Bayard as "an eminent actuary," and by Simon* as a "former artillery officer"—developed the curious view that enteric fever is a sort of internal small-pox, and that the bowel-lesions are the small-pox eruption driven inwards, and postponed to adult life by vaccination.

Schiefferdecker, an American hydropath, thought the need for vaccination had disappeared with the introduction of the cold water treatment. Gibbs himself believed in water, but objected to its being cold. Chapman, an English homœopath, had seen eczema, &c., follow vaccination; Dr. Shew, an American, had known convulsions to be brought on by it; a medical botanist had observed glandular disease, syphilis, scrofula, &c.; and so on with various other writers.

Gibbs himself, not satisfied with debiting any one disease or group of diseases to vaccination, lumps them all together, and, with an admirable vagueness as to the sources of his information, says, "I am told that, in a recent Blue Book, it is stated, on the authority of Dr. Farr, that 'there is a constant tendency in the general mortality of the country to an increase.'" And, as to the cause of this increase, he triumphantly asks, "Can it be other than vaccination?"

To the writers of this period may be fairly awarded the merit of foreshadowing the modern method of using mortality statistics against vaccination. From among the diseases contributing to the total death rate they selected those that were believed to be increasing, and blamed the alleged increase on vaccination. On investigation by Drs. Greenhow and Farr it turned out that both scrofula and fever had decreased since pre-vaccination times. But it mattered little; the principle of the argument was grasped, and ever since it has been tenaciously held by the opponents of vaccination. It is simplicity itself. In any given period, any number of causes of death may be divided into two groups, according as the resulting mortality is increasing or decreasing; and as to the former, the cause of the increment shall be set down as vaccination. But the original idea has been improved upon, and the diminishing causes of mortality are also profited by. They are brought in to show that other diseases besides small-pox are lessening their ravages; that the improvement in these cases is not due to vaccination; that thus the decrease in small-pox deaths need not be due to vaccination. One great flaw in the method is, that in one epoch

* *Op. cit.*

the same diseases may show a rise of mortality, which, in another epoch, show a fall. As we have seen, two of the chief maladies which had been pitched on by Mr. Gibbs' contemporaries were cholera and enteric fever. Both these are cases in point. Their decrease in recent years is held to argue against vaccination, just as their increase was supposed to do. Dr. Wallace tries to show that "typhus and typhoid fever have diminished to a much greater extent than small-pox." Milnes asks: "Where is cholera ravaging Britain now? Has it been stamped out by vaccination?"* Thus it is said, in effect, see how enteric fever has decreased without the aid of vaccination, while cancer has increased owing to vaccination. It is obvious that if the words "enteric fever" and "cancer" be cut out, a formula remains suitable for all time, and capable of being filled up anew after each succeeding issue of the Registrar-General's periodical reports.

Regarding fevers in general, it is amusing to find the very figures by which Dr. Farr proved the gross falsity of the assertion that fevers had increased, now used by Mr. White † to show the needlessness of vaccination.

It is obvious that similar reasoning might be applied to show the uselessness of all prophylactic measures. Let us apply it to enteric fever, which we know to prevail most where people breathe air and drink water defiled by excrement. Then we may reason:—In recent years, enteric fever has decreased, but not owing to your imaginary improvements in drainage and water supply. Observe that respiratory diseases have enormously increased; there has been merely a displacement of mortality. And, while fever has lessened, so also have deaths from violence; but these fell independently of improved drainage, and so might fever have fallen. Besides, plague and black death ceased to exist before ever drain-traps and ventilators were heard of, and fever would have done so too. And while, under what you call modern sanitation, the general death rate has fallen only 1 per 1,000 in the last decade, it fell (in London) from about 80 per 1,000 in 1660–79 to 50 per 1,000 in 1771–80.‡ Why, then, waste millions of money in this wild-goose chase after improved health? Why sacrifice your children's bread by casting your hard-earned wages into the latest and most new-fangled drains and cesspools? Why keep up by taxation a body of mercenary and untrustworthy medical men, whose opinion

* *Scottish News*, Dec. 17, 1886.
† "On Playfair and Dilke," p. 60.
‡ See p. 9.

as to the value of sanitation is as much biassed as that of a flourishing publican on the liquor question?—and so on *ad libitum*.

1860–70.—Leaving the decade 1850–60 we come now to the succeeding ten years, and here we find the then current anti-vaccination opinions embodied with much fulness in the evidence given at the close of the period, before the Select Committee of 1871.

In 1868, Dr. W. J. Collins, senr.,* revived a view first promulgated in the beginning of the century by a Dr. Squirrel. Squirrel held that vaccine was simply scrofula. But Collins went further: from the discharge oozing out of a stinking wound in the scrofulous ankle-joint of an unhealthy boy he inoculated that boy repeatedly, and produced "a peculiar cicatrix, somewhat resembling that we see in successful vaccination." He performed a similar experiment of auto-inoculation in the case of an hysterical young lady.

Dr. Collins led the battle in 1871. He was the first medical witness put up before the Select Committee. He complacently introduced himself as "a bedside practitioner, second to none," and as having had "20 years' experience as a public vaccinator." In cross examination it was elicited that this public vaccinatorship extended back into his pupilage, having begun eight years before he became a member of the profession. In spite of the exposure, Dr. Collins is to this day appealed to—by Mr. White, for instance†—as a public vaccinator of twenty years' standing. Here is the list of maladies which this authority laid at the door of vaccination:— Pyæmia, pneumonia, syphilis, eczema, struma, convulsions, axillary abscess, delirium, erysipelas, phagædenic ulcers, and scarlatina. The statement that he had seen these diseases "follow" vaccination brought out the pertinent inquiry, "Would you be kind enough to mention any disease which you have not seen follow it?" and Dr. Collins, not having presence of mind enough to recollect the existence of congenital diseases like spina bifida, replied by claiming "the protection of the chair."

The Rev. W. Hume Rothery, more modest, pinned his faith to two diseases, syphilis and cancer. Part of his evidence will be referred to further on.

Dr. Chas. T. Pearce, at this time the acknowledged head of the movement, was also examined. He held (Q. 706) that "all other diseases than small-pox are more severe and more fatal in the vaccinated than in the unvaccinated, especially scarlatina, measles, whooping cough, diarrhœa, fever, erysipelas, and phthisis;" and

* "Have you been Vaccinated?" &c. (London, H. K. Lewis, 1868).

† "The Story of a Great Delusion," p. 542.

that the "increase in malignity in scarlatina and measles is due to the contamination of the body by vaccination;" also that "chest diseases have increased in proportion to the increase of vaccination." Pearce said too that, the compulsory law having been passed in 1853, among children under 5 years of age in the 13 years 1841–53 the death rate per 1,000 living at all ages per annum was 8·78, and in the next 13 years, 9·19, and he concludes that "the *increase* of vaccination therefore may have led to the untimely death of upwards of 100,000 children in 13 years." Mr. G. S. Gibbs, a cousin of Mr. John Gibbs, resembled his relative in the all-embracing character of his charges against vaccination. In answer to Q. 1631—"You wish to show that the general mortality and also the infant mortality has increased since vaccination was introduced," he said "Yes, especially infant mortality"; and (Q. 1636) "I estimate the total loss of infant life from the practice of vaccination to be 28,500 per annum in England and Wales." This refers to the *first* year of life. At the same time he said that "the increase of the general mortality of children under *five* years of age is 7,240 per annum." This of course includes the first year. Thus 7,240 includes 28,500, and the total loss during the first year alone is four times that during the first five years! For the astounding manner in which he defends this astounding proposition that a part is greater than the whole I must refer the reader to the Report of the Committee.

Dr. Bakewell, Vaccinator General of Trinidad, was also examined, and expressed the opinion that vaccination might convey leprosy. As regards this country the question is of no practical importance, but it happens that Professor W. T. Gairdner has quite recently (*Brit. Med. Journal*, June 11th, 1887) called attention to it, apparently again in connection with Trinidad. As before, however, it matters little to the anti-vaccinator what the facts may be, for a few days before the publication of Dr. Gairdner's paper there appeared in the London *Echo* a communication from two anti-vaccinators, George Hoggan, M.B., and Mrs. Hoggan, M.D., pointing out that leprosy had entirely disappeared from this country without the aid of any such means as vaccination. Thus, if vaccination can spread leprosy, so much the worse for vaccination; and if vaccination cannot spread leprosy, again, so much the worse for vaccination, because the extinction of leprosy has taken place without any such artificial assistance.

Taking a general view of the above evidence, we see that in 1871 there was laid to the charge of vaccination an enormously greater list of evils than in 1855. Cholera, it will be observed, had been

dropped. In fact, its death rate having diminished since 1855, it had been more than dropped. Dr. Pearce, in making his comparison of the infant mortality in the periods before and after 1855, succeeds in showing an increase, and blames it on vaccination. But here is how he accomplishes this. He says (Q. 706), "Let us take infant mortality *deducting cholera!*" The italics are his own. So that this disease, which had formerly been held to owe its increase, and its very infectivity, to vaccination, was, now that it had decreased, ignominiously dismissed, and the *total* infantile mortality was calculated without its assistance! Cholera was the only disease that was thus omitted, and it is wholly by this omission that Pearce arrives at the conclusion that vaccination had caused over 100,000 deaths. Its practical disappearance from this country, in spite of the compulsory enforcement of its alleged cause, is a striking reply to the anti-vaccination doctrine as held in 1855.

Its history might well have acted as a deterrent to the soothsayers of 1871. But they would not be warned. Pearce, for example, while treating cholera so scurvily, takes under his care several new evils; chief among which are scarlatina and measles. He had "no hesitation in saying that this increase of malignity in scarlatina and measles is due to the contamination of the body by vaccination." Collins (Q. 653) held a somewhat similar opinion. But in recent years it happens that scarlatina has become distinctly less fatal in England and Wales, and let us again note how the fact is made use of. In the *Vaccination Inquirer* of March, 1887, I find the following:—"Scarlet fever is declining, and why? . . . Neither Jenner nor Pasteur, nor the magic they represent, can have credit for the result. . . . As it is now plain that the ordinary methods of cleanly living suffice to check the malady, may it not be argued that the like methods may be trusted to check small-pox?"

Thus White (as editor of the *Inquirer*) disposes of Pearce's specially chosen scarlatina just as Pearce had disposed of cholera, so largely dwelt on in Gibbs's letter in 1855. And twenty years after this, some successor of White's will point triumphantly to a decrease in some of those ailments which that writer now himself attributes to vaccination. Surely now it must be borne in on the most prejudiced Jennerite that all conceivable alterations that can take place in the incidence of diseases are alike condemnatory of cow-pox inoculation. When scarlet fever increases, is it not due to that cause? when it decreases does it not show the needlessness of Jenner's prophylactic?

It happens that of the seven diseases mentioned by Dr. Pearce

(see p. 172) as "especially" rendered "more severe and more fatal" by vaccination, all but one* (namely, whooping cough, which was practically stationary), show a very decided diminution in recent years. Comparing the decades 1861–70 and 1871–80, the rates per million were: for scarlatina, 972 and 716; measles, 440 and 378; Diarrhœal diseases, 1,076 and 935; fever, 885 and 484; phthisis, 2,475 and 2,116; and since the quinquennium 1871–5 erysipelas has also largely diminished. It is singular that Pearce should have been so unlucky in his speculations.

Nor has he been more fortunate as to infantile mortality in general. His sweeping assertion that to vaccination was due the increment of 100,000 deaths under 5 years old in the 13 years 1854–66, receives its reply in the fact that, in the decade of enforced vaccination, 1871–80, with 95 per cent. of the population vaccinated, the deaths at this age were less by 170,000 than if the rates of 1861–70 had continued to prevail.†

The main diseases mentioned by Collins and Rothery fall to be discussed further on.

1871–80.—For this decade the Hopwood Parliamentary Returns form the most convenient sources of information regarding the constant changes in the anti-vaccination creed. In 1877 it seems to have been recognised that the diverse charges brought against vaccination by the diverse witnesses in 1871 needed consolidation and emendation, and that this could best be done by obtaining through Parliament, with all the authority of the Registry Office, a statement of the mortality of diseases which anti-vaccinators believed to be on the increase. Within the last few years therefore, several such returns have been moved for by Mr. C. H. Hopwood, now ex-M.P. Thus the argument has been corrected up to date, the ebb and flow of mortality being noted, and decreasing causes erased from the list of those attributable to vaccination. In 1877 the first attempt was made,‡ but, owing apparently, at least in part, to some relic of confidence in the evidence of 1871, and even in Gibbs's letter of 1855, the result was not exactly what had been anticipated. The deaths from 14 diseases (besides small-pox) were obtained for three periods: 1847–53, or prior to the Vaccination Act; 1854–67, when vaccination was obligatory; and 1868–75, when vaccination was enforced imperfectly by the law of 1867, and more effectively

* Registrar-General's supplement 1871-80 p. cxii.-cxiv., &c.

† The Registrar-General's supplement for 1871-80 gives (pp. 2, 3,) the mean population under 5 years old, and (p. 4) the corresponding death rates in the two decades.

‡ Parliamentary Paper, No. 433, Session 1877.

by the law of 1871.* The diseases were (1) atrophy and debility, (2) tabes mesenterica, (3) convulsions, (4) cholera, (5) diarrhœa, (6) diphtheria, (7) bronchitis, (8) pneumonia, (9) whooping cough, (10) erysipelas, (11) pyæmia, (12) skin disease, (13) scrofula, and (14) syphilis.

It was found, however, that several of these maladies testified the wrong way. The following figures are calculated from the return :—

A Synopsis of the Fifteen Diseases included in Mr. Hopwood's First Return.

	Average Annual Deaths per Million living.		
	1847–53.	1854–67.	1868–75.
I. Small-pox	302	189	297
II. Diseases whose mortality showed an increase :—			
(*a*) Tabes Mesenterica	252	277	310
(*b*) Diarrhœa	785	824	1037
(*c*) Bronchitis	934	1546	2101
(*d*) Pyæmia..	—	10	19
(*e*) Skin Disease	10	16	19
(*f*) Syphilis..	33	61	83
III. Diseases whose mortality was irregular :—			
(*a*) Atrophy and Debility (including Premature Birth) ..	1612	1796	1774
(*b*) Whooping Cough	483	531	498
(*c*) Erysipelas	120	92	102
(*d*) Scrofula	143	150	122
IV. Diseases whose mortality was decreasing :—			
(*a*) Convulsions	1333	1275	1148
(*b*) Cholera	508	158	38
(*c*) Diphtheria	—	254	124
(*d*) Pneumonia	1230	1196	1034

It will be observed that of the "evils" relied on in 1871 seven are not contained in this table, namely, phthisis, measles, scarlatina, cancer, axillary abscess, phagædenic ulcers, and delirium. The three last find no place in the Registrar's tables, and the three first were decreasing, but, for some inexplicable cause, cancer was excluded, though increasing. That has now been rectified, however, and it will be found in Dr. Wallace's own list. I have arranged the above table to show how unsatisfactory the return must have been to Mr. Hopwood and his friends. Of course small-pox itself showed

* See p. 12.

an increase in the last period. But that was so transparently the result of weighting it with the 1870-3 epidemic, that the fact was of little service. And, on the other hand, only six of the fourteen diseases showed a steady increase, four being irregular in their course, and four unequivocally decreasing.

In spite of these shortcomings, the return has not been entirely useless for anti-vaccinating purposes. For the selection of diseases had not been so very bad as to prevent them showing an increase *on the aggregate.* So that the balance of increase can be stated as the result of fifteen diseases caused or made worse by vaccination. I say fifteen, because small-pox itself is included in the list. Of course, details are suppressed and the impression left is that, as all the fifteen were said to be influenced by vaccination, so the total increase is the sum of fifteen increments, instead of the balance between six increasing, four decreasing, and four irregular. Mr. White says * the "return gave the number of deaths from fifteen specified diseases which are inoculable or intensified by vaccination," and then he gives some figures showing increase on the whole. Thus he actually holds that cholera is a malady "inoculable or intensified by vaccination," while, as a matter of fact, its mortality fell from 508 to 158, and 38 per million, in the three selected periods.. So too with diphtheria, convulsions, and pneumonia: all are decreasing, and yet in some unknown manner their diminution enlarges "the harvest of death."

A new and improved return was obtained in February, 1880.† There was an utter absence of affinity between the 14 ailments pitchforked together in the first return. Some were zymotic diseases—namely, cholera, diarrhœa, diphtheria, whooping cough, erysipelas, and syphilis. Two were "constitutional," scrofula and tabes mesenterica. Atrophy, &c. (including premature birth), comes under the heading "developmental." Skin disease, pneumonia, and bronchitis, are "local" diseases. Convulsions is not a disease at all, but only a symptom of most diverse ailments. And pyæmia is a term of varied meaning. But as the original hustling into one lot of these maladies was in itself scientifically meaningless, so also was the arbitrary rejection of some, and retention of others, in the return of 1880. From the zymotics are dropped cholera, diphtheria, and whooping cough, while diarrhœa, syphilis, and erysipelas are retained. Still more unnatural is the newly-enforced severance of pneumonia and bronchitis. They are most intimately connected, especially in

* "On Playfair and Dilke," p. 20.

† Parliamentary Paper, No. 76, year 1880.

childhood, and both are inflammatory diseases of the respiratory system. But one is taken and the other left: bronchitis was increasing and pneumonia was decreasing. In fact, if we lay aside the natural orders of disease used by the Registrar-General, and look for a moment at the classification in the above table, the mystery is solved. With one exception, all the members of Class II., diseases that had been seen by the very Return of 1877 to have an increasing mortality, are retained, and all the members of Class IV., diseases with decreasing mortality—are rejected. And the exception in Class II. was unavoidable: it was pyæmia, the figures for which were not recorded separately till 1862. Of the irregular diseases—Class III., one is omitted, and the other three are included.

This second return consisted mainly of a comparison between the two years 1847 and 1877, at two ages, namely, under one year and from one to five years. The diseases were (1) syphilis, (2) scrofula, (3) tabes mesenterica, (4) skin disease, (5) erysipelas, (6) bronchitis, (7) diarrhœa, (8) atrophy and debility. All these causes of death (except the last-named, which had got somewhat rebellious since the first Return) showed under one year an increase doubtless most gratifying to the mover of the Return. But, between one and five years, erysipelas, diarrhœa, and atrophy gave a decided decrease—of over 50 per cent. in the first-named case. And the truth-hiding nature of the whole procedure is evidenced by the fact that, *in September of the same year a new Return was obtained, and the second age period was entirely omitted.*

Another curious phenomenon is observable as to the February paper. A table had been asked for, giving information as to small-pox mortality (1) in 1847–53, prior to the Compulsory Act, and (2) in 1868–77, following the law of 1867. It was only natural to suppose that the latter period, embracing the great epidemic, should have had a higher mortality than the former, when there was no epidemic. But so trifling had been the death rate in the non-epidemic years of the latter period that at all ages the rates were only 261 per million, against 305 in the earlier period, while the proportion of small-pox deaths contributed by children under five years old had fallen from 70 per cent to 33 per cent. And, without being requested to do so, the Registrar-General had unkindly added the statement, that in the twelve available years prior to vaccination the rate at all ages had been 420 per million; while in the 25 subsequent years, notwithstanding the epidemic, it had been only 216 per million. This line of inquiry was also dropped in September.

At last, therefore, perfection should have been attained. Pyæmia,

with its infinitesimal mortality, was reinstated in the list, and buttressed by the addition to it of the even hazier term Phlegmon, from which it had been separated by the Registrar-General in 1862. Another alteration was that, instead of comparing only the two years 1847 and 1877, the figures were now given for all the intermediate years. This seemed an improvement, but it brought to light another curious fact. If there is any disease which might plausibly be held connected with vaccination, it is erysipelas. I apprehend that in nine cases out of ten where vaccination is blamed it is in regard to this malady. And yet erysipelas showed a positive decrease under the most recent Vaccination Act. The mean of the annual rates per million in 1847–53 was 817, and subsequent to the law of 1871 it was only 728. In the intermediate years it had pursued an irregular course. The maximum had been reached in 1874, when the figure was 1,002, but afterwards it fell rapidly, the series for the last five years of the return (which now included 1878) being 1,002, 978, 812, 780, and 692.

But, worst of all, the Registrar-General again interfered. He added a statement of the annual mortality per million at the same age from "all other causes" than those mentioned. And under this heading was brought out an immense and steady diminution of deaths, far more than counter-balancing the increase from the 9 causes. The one group had risen from 55,000 in 1847 to 81,000 in 1878, whilst the other had fallen from 108,000 to 71,000; and this though the latter list now contained various diseases which, a few years earlier, had been held to owe their changes to the baneful influence of vaccination. So that, of a million infants alleged to be undergoing a wholesale poisoning by vaccination in 1878, there were at the end of the year 11,000 more survivors than in 1847, in the halcyon days, when vaccination laws were unknown.

Here ends the story of the Hopwood papers. The inevitable conclusion is that a more bare-faced and hollow manipulation of facts and figures has rarely been attempted than is contained in these pretentious and oft-quoted "Returns to an Order of the Honourable the House of Commons."

CHAPTER VII.

THE ALLEGED EVILS OF VACCINATION (*continued*).—THE PRESENT DAY DOCTRINE.

Dr. Wallace's "Blood Diseases"—Ten Vaccinal Diseases—Cancer—Syphilis—Scrofula—Tabes Mesenterica—Pyæmia and Phlegmon—Skin Disease—Erysipelas—Bronchitis—Atrophy and Debility—Diarrhœa—The Immunity of Leicester from Small-pox—Leicester Protected by Vaccination—The Anti-Vaccination Creed as to Hospitals and Isolation— Unspecified Deaths—Decline in General Mortality at All Ages—A Mis-statement—Vaccinal Diseases of the Future.

AT last we return to Dr. Wallace. His list of vaccinal diseases is as follows :—

ANNUAL DEATHS IN ENGLAND PER MILLION LIVING.

Average of Five Years.	1850–4.	1855–9.	1860–4.	1865–9.	1870–4.	1875–9.	1878–80.
Small-pox	279	199	191	148	433	82	40
Syphilis	37	51	64	82	81	86	84
Cancer	302	327	369	404	442	493	510
Tabes Mesenterica	265	261	272	316	299	330	341
Pyæmia, &c.	20	18	24	23	29	39	40
Skin Disease	12	15	16	17	18	23	22
Total	636	672	745	842	869	971	997
Progressive increase ..	0	36	109	206	233	335	361

Dr. Wallace has thus given another turn to the anti-vaccination kaleidoscope, and, in consequence, scrofula, bronchitis, diarrhœa, and atrophy have gone out of sight, while cancer has reappeared. He endeavours to give his five diseases an appearance of mutual relationship by saying that they are all "blood-diseases." We need not wait to discuss the exact meaning of the term, or its applicability to some of the maladies in question. For the attempted grouping only lands the doctor in another difficulty, as, in order to maintain the relevancy of his argument, he finds it necessary to state as being "very noteworthy," that, "in the long list of maladies" (contained in table 34 of the report for 1880), no other diseases (except bronchitis) "show any such striking and continuous increase." This at once sends us to table 34. And there we find that Dr. Wallace is

wrong again. For "heart disease, &c.," has steadily increased from 651 per million in 1850–4 to 1,335 per million in 1875–9; Bright's disease has gone up from 32 to 182, nephritis from 11 to 40, rheumatism from 102 to 147, gout from 12 to 26, want of breast milk from 33 to 63, and so on. Of course part of these increments is only apparent, but in the mean time the question is why Dr. Wallace makes the error of statement—that such figures are not to be found in the table. It is true that our author is loth to part with bronchitis: he says it "often follows vaccination, though not probably transmitted by it." And as the whole nine contained in Mr. Hopwood's last return are along with cancer still extensively relied on, it would be unfair to take advantage of Dr. Wallace's scruples.

We may then accept the following ten items as representing for the nonce the constantly changing doctrine of vaccinal diseases:—cancer, syphilis, scrofula, tabes mesenterica, pyaemia, skin disease, erysipelas, bronchitis, atrophy and debility, diarrhœa.

Each of these demands more or less notice at our hands.

Cancer.—This is a disease capable of attacking very many bodily organs, but, as has long been known, it has a special predilection for such as are in a state of functional decay, notably the womb and breasts of women advancing in years. It is confined almost wholly to adults, and especially to old people. In the decade 1851–60 the mortality at all ages was 317 per million. But in the first five years of life it was only 22 per million living at that age, while over 75 years it was fully 2,000 per million. Mr. Covington, secretary to the Northampton Anti-Vaccination League, said before the Select Committee of 1871 (Q. 2,196), "If a child was vaccinated and remained well after vaccination, and then was taken ill of a disease twelve months afterwards, I should not be so foolish as to conclude that vaccination had anything to do with it." Common sense would echo this; but we cannot put cancer aside on this ground alone.

The malady is undoubtedly on the increase. While the death rate in 1851–60 was 317 per million, in 1871–80 it was 473 per million. In regard to syphilis, as we shall shortly see, great stress is laid on the fact that its main increase has been among infants: that point is held to prove its connection with vaccination. But if we turn to cancer we find that in the periods in question the mortality under five years of age *has diminished by* 40 *per cent*—namely, from 22 per million to 13 per million. In the second and third quinquenniads of life there has also been a decrease. It is only after we pass 25 years

of age that the mortality begins to rise. As age advances, and the influence of vaccination on the system lessens, the rise in cancer mortality becomes more and more pronounced. Between 45 and 55 years of age the increase from 1851–60 to 1871–80 is from 860 to 1,263 per million; between 55 and 65 it is 1,410 to 2,214; between 65 and 75 it is 1,960 to 3,116; and over 75 years the mortality rose from 2,083 to 3,333 per million. *

There is another very notable fact. The Registrar-General says,† "The increase of mortality from cancer has been much greater among males than among females; the rate for males having risen 62 per cent in twenty years, while the rate for females has only risen 43 per cent."

These are the main points in the history of the cancer increase. At the age when vaccination is most powerful cancer has decreased 40 per cent., and in the last period of life, when vaccination has its least effect, cancer has increased 60 per cent. Moreover, those belonging to this period of life, namely over 75 years, and who died in the last decade, were born in the beginning of the century, when only a small percentage of the people were vaccinated at all, many having been inoculated, and many having had natural small-pox. And yet it is among this very class that cancer shows its greatest increase. Again, while vaccination has spread alike among males and females, cancer has spread much more largely among males than among females.

The cause of the growing number of deaths registered as due to cancer is not difficult to find. In the words of the Registrar-General, "There can be very little doubt that a considerable part in this apparent increase is simply due to improved diagnosis and more careful statement of cause on the part of medical men. Year by year the number of deaths ascribed to tumour, abdominal disease, or other similarly imperfectly stated causes, has been undergoing diminution, and there has been of course a corresponding addition to the mortality under the more definite headings." As to the greater increase among males than among females, he says, "the cancerous affections of males are in much larger proportion internal or inaccessible than are those of females, and consequently are more difficult of recognition, so that any improvement in medical diagnosis would add more to the male than to the female reckoning." Whether in addition to this there has been any real increase owing

* Registrar-General's Supplement, 1871-80 p. cxiv.

† *Op. cit.*, p. xiv.

to the worry and wear of modern life, or to the more frequent prolongation of life into ages more susceptible of cancer, is a point that does not fall to be discussed here.

Syphilis.—The death rate from this disease is only a fraction of that from cancer. In 1878–80, for every 510 deaths from the latter there were only 84 from the former; and these 84 would be the total contribution of syphilis to about 20,700 deaths from all causes in each million of the population. The two diseases resemble each other in showing an increased registration in recent years. But they differ in some respects.

It may safely be said that for the last sixteen years there has been hardly a case of syphilis supposed to be due to English vaccination about which Mr. Jonathan Hutchinson has not been consulted. His authority has been wanted to settle the nature of the disease, and even his belief as to its connection with vaccination has been accepted as conclusive. He has in this way met with about six instances in this country of children from whose arms vaccine lymph has been taken, with the result, as he believed, of yielding at the same time syphilitic virus to the operator's lancet, the consequence being that syphilis has been conveyed to about twenty-six persons. Two other single cases have also been published. Among a sea of falsehoods regarding vaccinal dangers this one drop of truth has at last been found.

But the facts were not brought to light by opponents of vaccination. They owe their elucidation to its friends and supporters. Mr. Hutchinson states that he is "a firm advocate of compulsory vaccination," and he complains bitterly of misquotation and unfairness at the hands of anti-vaccinators.* The surgeon in whose practice the first group occurred was sent to him by the late Dr. Seaton, one of the medical officers to the Privy Council, and author of the well-known "Handbook of Vaccination." Mr. Hutchinson distinctly avers that it was in this way, through a Government medical official, that the case came to his knowledge, and it was sent to him as "an independent medical practitioner," to avoid all chance of official bias. These facts are taken from the Report of the Select Committee of 1871 (Q. 4991–5036), and even at this advanced stage of my examination of anti-vaccination literature I confess that I was fairly staggered by the way in which they have been served up for public consumption by Mr. Alfred Milnes, M.A. He says, "Now these cases Mr. Hutchinson states were brought under the notice of the

* "Illustrations of Clinical Surgery," Fasciculus VI. (London, Churchill, 1875).

medical officers of the Privy Council, and Dr. Seaton was requested to investigate them. Wherefore you see the value of the statement in Mr. Ernest Hart's "Truth about Vaccination," that "no case of syphilis caused by vaccination has ever been discovered by the Medical Department. When Mr. Hutchinson clearly brings these cases before them they imitate Nelson: they put their blind eye to the telescope and declare that they cannot see."* I make no comment on this, but proceed to point out that, taking the cases as a whole, of the twenty-six infected persons, only two appear to have reached Mr. Hutchinson through his own extensive practice, all the others having been sent to him specially for investigation; and in no case is it recorded that death resulted. Nor were the cases concealed. They were read and discussed before the medical societies, and published in the journals of the period. And yet the medical profession is constantly taunted by Dr. Wallace and his friends with suppression of such facts.

But there is one culminating proof of the eagerness of doctors to learn "the truth, the whole truth, and nothing but the truth" about vaccination, its drawbacks as well as its advantages. I refer to "Dr. Cory's experiments in vaccinating himself from syphilitic children," published in Dr. Buchanan's Report for 1882. Dr. Cory is public vaccinator at Surrey Chapel. He was aware that syphilis did not occur in the practice of English public vaccinators. But he wanted to know whether this was due to the care with which he and his brethren were in the habit of operating or to an inherent impossibility of transmitting syphilis by lymph not visibly mixed with blood. Accordingly, he inoculated himself from an "emaciated child, unquestionably syphilitic," but yet without active symptoms at the time of the experiment. The attempt failed: there was no production of syphilis. Next he took a child with some active symptoms, and again he failed. Another similar experiment had a similar result. At last he selected one which was suffering, and for weeks had been suffering, from a syphilitic skin eruption, and which had two open syphilitic sores; and in three weeks symptoms of the disease began to manifest themselves on Dr. Cory. Whether any vaccinator could by any chance have selected the first child as a vaccinifer is very doubtful; but had he done so he would have done no harm. But as to the other three, the reporting committee

* "Is Vaccination Desirable?" p. 24. The extract given from Hart does not occur anywhere in that author's excellent little work, but on page 29 it is stated, and stated truly, that among public vaccinations (of which the Medical Department has charge) no case of invaccination of syphilis has ever been discovered.

(including Mr. Hutchinson) say that they were "in such a condition of obvious syphilitic disease as would certainly have precluded their use as vaccinifers by even an inconsiderate and reckless vaccinator." Dr. Cory's experiments go to show that even where there are active symptoms of syphilis the chances of danger are problematical. To obtain success he had to abandon entirely the primary rule (to take no vaccinifer not obviously healthy) which had years before been laid down by the Local Government Board; and his belief that vaccination, as practised according to the rules of the Board, cannot convey syphilis, was amply confirmed by the need for resort to such extreme measures as he ultimately adopted. And, as before, the case was not concealed. It was reported on and published by that very Medical Department which Mr. Milnes, by a singular mis-use of facts, accuses of shutting its eyes to such occurrences.

Mr. Tebb and Dr. Wallace mention that 478 cases have been recorded; 478 being the number alleged to have been affected, not the number of children who conveyed the disease. But with the great bulk of these cases we have nothing to do, except as they furnish examples of how vaccination ought not to be done. With the exception of the above cases, they all occurred abroad, and the distinction is much more than a geographical one. The number that took place in obscure Italian villages is very remarkable. The grave doubt that exists as to the connection of vaccine lymph with many of the cases is shown by Dr. Ballard in his prize essay on vaccination (published 1868), where a full detail is given of the "disasters" alleged up to that time.* Two well recognised rules are to take lymph on the day week after vaccination, and then only the lymph which at first freely oozes from a vesicle. And it has been shown that in almost all the few cases where mischief did occur those first vaccinated escaped, only the later children being attacked. But continental practice seems to have paid no heed to this. In one instance 46 children were operated on from one vaccinifer, and that on the *tenth* day. In another example there were 56 children,

* Anti-vaccinators follow each other like sheep over a wall. Dr. Ballard's Prize Essay was a masterly exposition of the value of vaccination, but it is now somewhat out of date, and its place has been taken by various more modern works on the subject. Some anti-vaccinator, however, took it into his head to suggest that the book contained serious charges against vaccination, that in consequence it was as far as possible suppressed, and that, as a bribe to silence, Dr. Ballard was appointed Medical Inspector to the Local Government Board! This cuckoo cry has been taken up and repeated, so that one can hardly find Ballard mentioned without the suggestion that "his present lucrative position" is the reward of his supposed venality. (See White's "Great Delusion," pp. 547-9; Tebb, *loc. cit.*, p. 15, etc.)

and in the second of Mr. Hutchinson's groups, no less than 26 infants, an unusually large number for this country, were vaccinated (and nearly one half of them syphilised) from one child. Of such examples are the 478 cases mainly made up, and it is to be observed that these were cases, not deaths. The question as to how many, or rather, how few of them were really due to the insertion of lymph, and not of blood or blood serum, and the question as to how very few were infected from children not glaringly unfit to be vaccinifers, need not detain us, for the fact may be at once admitted that vaccino-syphilis is not quite an absolute impossibility.

The point is, to what extent do such accidents prevail? On the one hand we have syphilographers, like Mr. Henry Lee of St. George's Hospital, and Mr. Timothy Holmes, stating that in their vast experience they have never seen such occurrences; so that Mr. Hutchinson's cases (all but two sent specially to him for inquiry), seem to represent almost the whole English acquaintance with the subject. Mr. Hutchinson himself states (see Parliamentary Reports for August 23rd, 1887) that, "though he has been diligently on the look-out for similar cases during the ten years' interval, he has failed to meet with any." On the other hand we have, as in the old days of prophecy regarding brutal transformations and proclivities, a great vista of terrors opened up before the anti-vaccinating seer, who in every case of hereditary disease, or of skin eruption not hereditary at all, perceives the handicraft of the public blood-poisoner. It is sometimes asserted that when a child is presented as a possible vaccinifer the operator is as likely as not to be deceived regarding the existence of congenital syphilis. But Diday,* "collected 158 observations in which the date of the first appearance of the symptoms has been carefully noted." In these the disease showed itself during the first month of life in 86, in the second month 45, in the third, 15, at four months 7, and 1 each at five months, six months, eight months, one year, and two years. And as the *Lancet* says (Feb. 1st, 1873), the vaccinal communication of syphilis "can only take place when all the following conditions are simultaneously present:—(1) A syphilitic vaccinifer; (2) an active condition of the syphilitic element of the vaccinifer's blood; but at the same time (3) an absence of such external symptoms of syphilis as would deter any commonly upright surgeon from using the subject of them as a vaccinifer; (4) the gross imprudence committed of employing

* Quoted by Dr. Hugh Thomson in a paper read before the Glasgow Medico-Chirurgical Society, in 1879. See also New Sydenham Society's Translation, 1859.

either blood or the serum obtained after the emptying of the vesicle."*

A Syphilitic "Disaster."—Before the Select Committee of 1871, where it may be assumed that the opponents of vaccination adduced their strongest evidence, there was given a typical instance of a trumped-up "disaster." The story was retailed by the Revd. W. Hume Rothery, on the authority of the father, James Horrox, silk dyer, Middleton, it having been attested before a magistrate, the parents being known also to Mr. Rothery, who said of them, "better people I do not think I could find. They are religious people, and are, I believe, incapable of falsehood." Horrox's assertion was that a child of his had been fatally poisoned by a syphilitic vaccinifer. He also said, "six other children were vaccinated from the same child as mine. Not one of those survived vaccination."

There was here something tangible to investigate, and Dr. Seaton went to Middleton to probe the story to the bottom. He discovered that "it was all moonshine; neither the vaccinifer, nor any of the children, had any syphilis," only other five had been vaccinated from the same source, and they had all died long after vaccination, the causes being respectively, measles, convulsions, hereditary consumption, typhoid fever, and teething. Thus there was "not the smallest reason for believing that the deaths of any of those children resulted directly or indirectly from the effects of vaccination."

There is one simple test by which a great many such cases can have their bogus character exposed. Before the committee, Mr. Covington placed the following narrative in the van of his evidence (Q. 2110):—"Mr. Wiggins, of Bradshaw Street, Northampton, had a daughter vaccinated when twelve months old; she was quite well at the time of vaccination, but *five days afterwards*, syphilitic appearances presented themselves." The italics are my own, and they indicate the weak point in the case. For primary syphilis, as is well known to every medical man, has an incubation period very much longer than five days. It is usually about 28 days, the extremes being 18 and 35 days (Bristowe's "Practice of Medicine"). This case, therefore, could not have been vaccinal. Then again, if the first symptoms consist of skin eruptions, "snuffles," &c., the disease cannot be primary at all, but must be congenital, as of course in a primary case the initial lesion never varies in its essential features.

Coming now to the statistical aspect of the case, I refer to Dr.

* But Dr. Cory's last experiment showed that, with such a vaccinifer as he employed, neither blood nor blood-serum is essential.

Wallace's table already quoted, to show the increase that has occurred in the registration of syphilis as a cause of death in recent years. As regards cancer I was able to point out that infantile deaths therefrom had largely decreased. Not so with syphilis. Pearce speaks as follows* :—

"It will be seen that there died of syphilis in the

	Under One Year Old.	Of All Ages.
Five years, 1860-1-2-3-4 ..	4,504 ..	6,425
„ 1870-1-2-3-4 ..	7,009 ..	9,271

In the first period, therefore, nearly two-thirds of the whole number were under one year old (the year of vaccination), while in the second period, when the number of vaccinations had greatly increased, no less than seven-ninths of the whole number of deaths were of infants not a year old." †

This looks plausible, but the plausibility is only on the surface. For while the first year of life is indeed "the year of vaccination," the sophism consists in the unstated inference that the syphilis deaths occurred *after* vaccination, and possibly, therefore, *owing* to vaccination. But in England the vaccination age is three months, and in Scotland six months. This divergence of practice permits of some interesting comparisons.

In the first place, what percentage of deaths from syphilis take place before the vaccination age? The mortality tables of the Scotch Registrar-General furnish statistics for the ages, 0–3 months, 3–6 months, and 6–12 months, as well as for subsequent complete years of life. Here are the figures for three recent years :—

Deaths from Syphilis in Scotland at Certain Ages.

Year.	0-3 Months.	3-6 Months.	6-12 Months.	1-2 Years.	All Ages.
1882	109	44	39	16	244
1883	107	51	23	16	240
1884	117	57	26	14	276
Totals ..	333	152	88	46	760
Percentage ..	43·8	21·3	11·6	6	100

In Scotland, therefore, no less than 65 per cent. of the deaths from syphilis at all ages take place before the age for vaccination. And

* Vaccination Tract No. 8, p. 5.

† Pearce describes 75½ per cent. as "no less than seven-ninths," and 70 per cent. as "nearly two-thirds!"

in the second half-year of life, when the infantile community ought to be decimated by the ravages of vaccinal syphilis, the deaths fall to 11·6 per cent., or less than *one-fifth* of those in the pre-vaccination half-year.

But as vaccination takes place three months earlier in England than in Scotland there should occur during the first six months of life in England a much greater proportion of the total syphilitic mortality. The published records do not supply the facts, but through the courtesy of the Registrar-General I am enabled to give them for the same three years. The following table shows that in England 64½ per cent. of the deaths at all ages from this disease took place in the first half-year. Thus—the Scotch figures being practically the same—the earlier English vaccination has had no effect whatever in raising the syphilitic mortality of infants. And if it be suggested that the fatal influence ought to be exhibited in the returns for the second half-year, we find that in England again the mortality is not greater than in Scotland, the percentages being 11·3 and 11·6 for the two kingdoms. In the second year of life the rates are again similar, being 6 per cent. in both cases.

Deaths from Syphilis in England and Wales at Certain Ages.*

Year.	0–3 Months.	3–6 Months.	6–12 Months.	1–2 Years.	All Ages.
1882	893	529	244	125	2,227
1883	980	518	275	139	2,313
1884	994	487	252	152	2,280
Total ..	2,867	1,534	771	416	6,820
Percentage ..	42	22·5	11·3	6·1	100

* From the English Registrar-General, in reply to a request.

The great similarity of the percentages of these two tables is very remarkable. The differences are such as might readily occur between any two short periods of time in either of the countries separately. And they demonstrate beyond the possibility of reasonable doubt that the earlier performance of vaccination in England than in Scotland has no effect whatever on the comparative infantile mortality from syphilis in the two nations.

But the utter powerlessness of our home vaccination as a propagator of syphilis may be proved even more clearly by means of another comparison. Dr. Pearce has pointed out that the mortality has increased somewhat more rapidly under one year of age than at all ages combined. The question is, In what part of the first year

of life has the main increment taken place? The Scotch Registrar's tables again supply the answer, which is all the more pointed as vaccination is not compulsory until the middle of the year. The Scotch Registration Acts took effect in 1855, and the vaccination law was passed in 1863.

Deaths from Syphilis in Scotland, 1855–9, 1880–4.

Five Years.		Under One Year of Age.			All Other Ages.	All Ages.
		0–3 Months.	3–6 Months.	6–12 Months.		
1855–9	Deaths ..	142	81	42	116	381
	Per cent. ..	37·3	21·3	11	30·4	100
1880–4	Deaths ..	540	242	147	284	1,213
	Per cent. ..	44·5	20	12·1	23·4	100

Thus the deaths from syphilis have grown from 381 to 1,213, an increase much more rapid than that of the population. Further, the population over one year old used to contribute 30 per cent. of the syphilis deaths, and now it contributes only 23 per cent. Seven per cent. has thus been transferred to children under one year—"the year of vaccination." But, on looking at the figures it will be seen that *the whole 7 per cent is accounted for by infants under three months of age—the three months of non-vaccination.* In the other nine months the percentages are practically the same as those of 25 years ago.

Thus vanishes the last shred of the statistical argument that vaccination is a cause of syphilis.

As regards all the diseases in his table, Dr. Wallace says that vaccination is a "*vera causa.*" At this advanced stage of our review surprise at inconsistency on the doctor's part has deadened into expectation. Otherwise one would feel astonished at the fact that in the early part of his book he labours to show that vaccinations have considerably decreased, and that now he holds up this decreasing vaccination as a *vera causa* for rapidly increasing syphilis and cancer. I have already shown that the percentage of vaccinated in the infant population has been nearly unaltered since 1872 (see p. 31), and yet syphilis has continued to increase; and the utter folly of suggesting the one as a *vera causa* of the other is thereby exhibited. In fact the steady (absolute) rise in infantile syphilitic mortality, under circumstances of stationary infantile vaccination, is another proof that the latter bears no causal relation to the former.

What then is the meaning of the increased registration of syphilis as a cause of death? In elucidation of this question I have to point out that there is one other period of life besides infancy in which deaths from syphilis show a great proportional increase. That period is advancing age. If we divide life into three epochs (1) childhood, (2) adult life up to 55 years, and (3) all ages over 55, we find that while in the last period the total syphilitic mortality is much smaller than in the others, yet, in the last, as in the first period, deaths from syphilis have considerably increased. Obviously vaccination can have nothing to do with this. And there is only one answer that will satisfy all the facts of the case—namely, that the change to a very large extent depends on *improved knowledge of the disease by medical men.* It is again a question of diagnosis. The symptoms of primary and secondary syphilis in young adults were about as well known thirty years ago as they are now; not so the manifestations of congenital syphilis in children and the obscure tertiary affections of later life. One of the commonest results of congenital syphilis is premature birth. That fact is better understood than formerly, and some fraction of the enormous decrease (from 1,043 per million in 1850–4, to 476 per million in 1875–9) in deaths registered from this cause is doubtless due to the substitution of the term syphilis. So, too, congenital syphilis may cause brain disease, ending in convulsions, and here again part of the diminution consists of a transference of deaths from convulsions to syphilis. These views are in exact accord with what we have already discovered, that it is in the first three months of life that the great bulk of increase has appeared.

Syphilitic infection is the great modern bugbear that has succeeded to the bestial tendencies and quadrupedan sympathies of Moseley and Rowley, and to the phthisis and enteric fever of Carnot. All alike they possess the one grand and essential power of appealing to the imagination. In Moseley's time who could deny that by-and-by men would degenerate and develop all sorts of animal proclivities and appearances? Thirty years ago how could any one presume to say that those of the species who might escape the ravages of enteric fever—the internal small-pox—would not be ultimately destroyed by phthisis? And in the present day, what with cancer, syphilis, tabes, &c., is it not practically certain that after Europe is by these means depopulated there will not even be a Maori left—unless, indeed, he be unvaccinated—to fulfil the London Bridge prediction of Lord Macaulay?

Scrofula and *Tabes Mesenterica* are the next diseases on our list. The latter only is given by Dr. Wallace. Both belong to the group of tubercular diseases, of which the other members are phthisis and hydrocephalus. The inclusion of tabes is rational in so far that it is a disease of infancy, but here the rationality ceases, for it is irrational in this, that while *infantile* vaccination in this country has been for fifteen years practically stationary at 95 per cent., this infantile tubercular affection has been increasing, as shown by the annexed table. The inclusion of this affection alone is also irrational, in that there is another form of tubercular malady considerably more prevalent in childhood. The facts are as before; *hydrocephalus*, the rejected disease, shows a fall, and *tabes*, the selected disease, shows a rise. The diseases often co-exist. In the 30 years 1850–79 the mean of the annual rates of mortality per million was from tabes 290, and from hydrocephalus 363, the sum being 653. In the 5 years 1875–9, the former rose to 330, and the latter fell to 323, so that the sum of the two was again 653. The exactitude of these totals is of course largely accidental, and is not maintained in the other quinquenniads, but it is obvious that the change in nomenclature has much to do with the result. And, as Dr. Buchanan remarks,* "As well might an increase of 'intemperance' be ascribed to vaccination, because *4* deaths per million certified as due to this cause in 1850–54 had increased to *7* deaths in 1875–9, while *7* deaths per million living certified as due to 'delirium tremens' in 1850–4 had decreased to *4* deaths in 1875–9." The term phthisis, too, is sometimes applied to abdominal as well as to pulmonary tubercle, and a small fraction of its decrease is probably due to a better defining of the site of disease. As to scrofula, the same remarks apply, with this addition, that the course of its mortality shows irregularities which have no possible connection with the prevalence of vaccination. The grand and important fact is that tubercle as a cause of death is now on the decrease, and that it matters little what interchange of names there may be between the various groups of symptoms to which it gives rise. Who but an anti-vaccinator would think of selecting the one name under which an increase appears, without reference to the others (of vastly greater dimensions), that are continuously decreasing? For convenience of reference I give the figures bearing on the subject, taken from the Registrar-General's Report for 1880 (p. lxxix.), with the last quinquennium added.

* *Loc. cit.*, p. xi.

Deaths per Million per Annum at All Ages.

	1850–79.	1850–4.	1855–9.	1860–4.	1865–9.	1870–4.	1875–9.	1880–4.
Phthisis	2,491	2,811	2,648	2,566	2,528	2,279	2,117	1,846
Scrofula	141	145	153	160	136	118	134	154
Hydrocephalus ..	363	434	386	369	347	318	323	279
Tabes Mesenterica ..	291	265	261	272	316	299	330	313
Total.. ..	3,286	3,655	3,448	3,367	3,327	3,014	2,904	2,592

As having a more immediate bearing on the subject of vaccination, I give the following table of tubercular mortality among children. It will be seen here, too, that over all there is an important decrease, consisting of the preponderance which the fall in phthisis and hydrocephalus, under five years of age, has over the rise in tabes and scrofula combined.

Deaths per Million per Annum under Five Years of Age.*

	1851–60.	1861–70.	1871–80.
Phthisis	1,305	968	767
Hydrocephalus	2,539	2,213	1,800
Tabes and Scrofula	1,920	2,267	2,550
Total	5,764	5,448	5,217

* Registrar-General's Supplement, 1871–80.

Pyæmia, etc. (including *Phlegmon*).—Among infants, pyæmia, etc., cannot be said to be increasing, though, as Dr. Wallace's table shows, its mortality is rising at all ages combined. The rise, therefore, must be taking place at those ages which are remote from vaccination. Mr. Hopwood's returns show that in the seven years previous to the first Vaccination Act the mean of the annual rates of mortality from phlegmon and pyæmia, under one year of age, per million births, was 207; that from 1853 till 1867 it was 241; but that from 1867 till 1878 it was only 180. The figures from year to year show very great irregularity, rising and falling in a manner obviously unconnected with vaccination.

The Registrar-General, and the Committee of the Royal College of Physicians in charge of the official publication, "The Nomenclature of Diseases," seem to have had much difficulty with pyæmia. Before 1862 it had no place at all, its deaths being included under the head of phlegmon. Now the two terms have been entirely divorced,

phlegmon being retained as an alternative to cellulitis in integumentary diseases, while pyæmia has been joined to septicæmia, which twenty years ago was a term hardly at all used. And in the latest edition of the "Nomenclature" it is advised that the term "puerperal fever" be abolished, and that "puerperal pyæmia, septicæmia, erysipelas, etc.," be used instead where suitable. Anti-vaccinators, therefore, should be on the alert, for, under the sanction of the college the deaths registered from these causes will probably show a new increase, which of course can at once be set down to vaccination.

Skin Disease completes Dr. Wallace's own list. The frequency with which various skin eruptions affect the infantile community has rendered them a favourite charge against Jenner's discovery. Of course, long before his days they were as common as now. Dr. Turner* said in 1714, "Among diseases of infants and young children scarce any attends more frequently than pustular or scabby eruptions in several parts of their bodies, as in the breech, but more especially their forehead, brows, and other parts of the face, which we oftentimes find overrun with a dry, crusty scab."

In 1885, in September I think, I was asked by a parent, a very intelligent man, to vaccinate his fifth child. I was to be specially careful as to lymph, because after the vaccination of the fourth child by a practitioner in another town ill-health had ensued, including ophthalmia. I fixed a date, and called for the purpose of operating, but for some reason of convenience the matter was delayed for a fortnight. On calling at the fortnight's end I found the child's head covered with a skin eruption, which ultimately extended over the brow, and was tedious in healing. The delay saved my reputation and that of vaccination. The father frankly owned that, had the child been vaccinated as originally arranged he would have had no hesitation in setting the skin disease down to the operation.† Probably most vaccinators could tell a similar story.

Dr. Wallace has written "Skin Disease" instead of "Skin Disease, &c.," and the omitted "&c." shows that we have again to deal with one of those indefinite groups, like "Pyæmia, &c.," to whose variations no tangible meaning can be attached. The whole order, as given by the Registrar-General, now includes (1) carbuncle, (2) phlegmon or cellulitis, (3) lupus, (4) ulcer and bedsore, (5) eczema, (6) pemphigus, (7) other diseases of the integumentary system. Dr.

* Quoted by Sir Lyon Playfair; Select Committee's Report, 1871, Q. 514-15.

† I have permission to furnish privately the name and address of the parent to any one who wishes it.

Wallace has given phlegmon under "Pyæmia, &c.," and in the table he quotes from ulcer is the only other member differentiated, so that "Skin Disease, &c.," seems to include all the rest. There is no visible bond between them, except that they attack the skin. No one has ever suggested that lupus has the same causes as carbuncle, or carbuncle as eczema, but the suggestion is that vaccination may produce them all. If there was any one of the above seven with which, with any show of reason, vaccination might have been deemed to be connected, that one would be ulcer. In the literature of "the cause" there is frequent mention of ulcers, "running sores," "excavated sores," &c.; but of the three specially named by the Registrar in the table in question (1) phlegmon, (2) ulcer, (3) skin disease, &c., ulcer is the only one which shows a tendency to decrease. In the 30 years 1850–79 the mean rate was 18·1, in the 5 years 1875–79 it was 17·2, and in the three years 1878–79–80, it was 17, 16, and 15 respectively. But ulcer, even aided by "bedsore," and skin disease, even buttressed by "&c.," occupy so very small a space in the mortality tables that no importance can be attached to the microscopic changes that may occur in their death statistics, whether due to actual alterations in the diseases, or merely to alterations in registration.

Erysipelas is one of the diseases not given by Dr. Wallace, though included in all Mr. Hopwood's returns. In the beginning of the century the word erysipelas was applied to conditions of the skin which are now represented by the word erythema. Hence, referring to the fact that on or about the ninth day the normal vaccine vesicle becomes surrounded by an erythematous areola—the pearl on the rose-leaf Jenner lovingly termed the resulting appearance—he held that "erysipelas" was an essential element in successful cow-pox inoculation. Taking advantage of this old use of the word, some opponents of vaccination are never tired of pointing out (1) that Jenner held cow-pox without erysipelas to be valueless, and (2) that erysipelas itself is a contagious, dangerous, and often fatal malady. In fact, so angry do they get over the subject, that they go the length of nicknaming the disease. Dr. Garth Wilkinson and Mr. Young abuse it as "This low rot, erysipelas." *

But let us consider erysipelas as we nowadays understand the word; admittedly a serious malady. It is of course well known that in certain conditions of body, especially if combined with certain unwholesome conditions of environment, any scratch or abrasion may be followed by erysipelas, and that in such circumstances the affection may

* Vaccination Tract No. 13, p. 16.

arise even in the absence of any lesion of the surface. Hence, very rarely, vaccination really is followed by erysipelas. Putting this fact along with Jenner's statement, the result is, as I have already mentioned (p. 127) that probably in nine cases out of ten where vaccination is blamed at all it is blamed for setting up erysipelas. In the five years 1881–85, 3,800,000 children were registered as successfully vaccinated, and during the same period 271 deaths under one year (besides 12 over that age) were registered as having some connection with vaccination or cowpox. Now 271 in 3,800,000 is 1 death in over 14,000 infants. In natural small-pox in England in the last century—and to pass through life then without small-pox was as rare as to pass through it now without measles—of patients treated outside of hospitals, one died in 5 or 6; and in inoculated small-pox one died in from 100 to 300. Taking the figures as they stand, nowadays one dies from vaccination in 14,000; but the Registrar-General points out that in nearly every one of the 271 cases there is a secondary cause of death, and that by far the most common secondary cause is erysipelas.* In the same five years there were registered from erysipelas, as the primary cause, 11,056 deaths. And there is every likelihood that in the 271, if vaccination had not been performed, the next accidental scratch or abrasion of the skin would have taken its place as the exciting agent of the same disease, or it would have arisen independently of such accident, and the deaths would have been simply added to the 11,056. Thus, instead of vaccination having killed more than 271 in 3,800,000 children, the probability is that it killed only the merest fraction of that number, and that in the great bulk of the cases it was simply the precursor of an illness that would have occurred quite independently of the operation.

But I have already pointed out that Hopwood's last return shows in the quinquennium beginning 1874 a steady annual decrease of erysipelas among the infantile population. Nor, if we take deaths at all ages, do we find any evidence of increase, but rather the reverse, though the figures show some irregularity. In the six quinquenniads beginning 1850–54 the annual deaths per million living were 112, 105, 87, 84, 101, and 92; and in the five years 1880–84 they have been 80, 89, 92, 81, and 79. At once, therefore, it may be replied to Mr. Hopwood, that under the vaccination laws erysipelas is decreasing both among infants and adults.

In Vaccination Tract No. 9 Pearce points out "the lamentable fact" that one-third of all deaths from this cause were in the first year of life, while, comparing 1860-4 with 1870-4, the total erysipelas

* See Parliamentary Reports for February 17th, 1887.

mortality had increased faster than the population. As in the case of syphilis, so here it may be worth noting in the Scotch returns, the relative proportions borne by the two halves of the first year of life, in periods preceding and succeeding the Scotch Vaccination Act of 1863.

Total Deaths from Erysipelas in Scotland at Certain Ages.

			0–3 Months.	3–6 Months.	6–12 Months.	1–2 Years.	All Ages.
Population (1857), 2,992,293	1855–59	Deaths	304	68	68	50	1,335
		Per cent. of total..	22·8	5·0	5·0	3·7	100
Population (1879), 3,665,443	1877–81	Deaths	385	63	90	29	1,524
		Per cent. of total..	25·3	4·1	5·9	1·9	100

It will thus be seen that under the Scotch act, while the population increased 22 per cent., the total erysipelas deaths at all ages increased only 15 per cent. The disease, therefore, is decreasing. But of the erysipelas deaths at all ages, the percentage which occurred under one year was in the first period 32·8 per cent., and in the second period 35·3 per cent. Somebody may say that this tells against vaccination. But the whole excess here—2·5 per cent.—is exactly accounted for by the mortality in the *first three months of life*, when vaccination is practically unknown, while the proportion contributed by the remaining nine months of the year is exactly the same, 10 per cent., in both periods. The truth is, that vaccination being a practically harmless operation, statistics, if carefully looked at, cannot show it to be otherwise.

Bronchitis.—As has been already noticed, Mr. Hopwood's first return included both bronchitis and pneumonia. His own statistics showed that pneumonia had decreased, so it is no longer inquired for, but bronchitis is kept, in his later motions for statistical returns. The annual deaths under one year from bronchitis, per million births, in 1854–67, were 919, and in 1868–75, they were 1,350 an increase of 431. The corresponding figures for pneumonia were 1,250 and 877, a decrease of 373. Now infantile pneumonia and infantile bronchitis are in every-day practice interchangeable terms, and the utter absurdity of retaining the one and relinquishing the other, as results of vaccination, needs no pointing out. And so pungent was Sir Lyon Playfair's remark that vaccination has no more to do with bronchitis than Tenterden steeple with the Goodwin Sands that anti-vaccinators are now evacuating this stronghold just as in succession they have had to retire from cow-pox

mange, cow-pox ulcer, cow-pox abscess, cow-pox mortification, cholera, enteric fever, measles, scarlatina, &c. &c.

Atrophy and Debility (*including Premature Birth*).—It is evident at a glance that this is merely a convenient receptacle for some ill-defined and ill-diagnosed causes of death. The Registrar-General (Report for 1885, p. xxiii) speaks of debility as "a condition accompanying most fatal diseases, and probably meaning, when given by itself as a cause of death, that the medical attendant had not ascertained what was the real malady." The two terms are not now classed with premature birth at all, but are set down along with dropsy, tumour, &c., as "ill-defined and not specified causes," while premature birth is classed with developmental diseases. And as to it, I don't suppose the keenest anti-vaccinist would suggest that the mere prospect of having to undergo the "rite" at the age of three months would cause a child precipitately to leave its mother's womb before the regular period of gestation was complete. As a matter of fact the group as given by Mr. Hopwood has shown little tendency to increase in mortality under vaccination law. Among infants, the highest point was reached in 1867, when the rate was 41,857 per million births, and then a gradual but irregular fall took place to 36,030 in 1878, the last year in the return. It would be as reasonable to attribute the decrease since 1867 to the legislation of that year as to hold the act of 1853 responsible for the previous increase.

Diarrhœa comes last of all. In Hopwood's three periods there was a steady rise, especially among children. But diarrhœal diseases are again decreasing. Here are some figures from the last issued report of the Registrar-General (for 1885).

Annual Death Rates per Million Living, at All Ages.

	1858–60.	1861–5.	1866–70.	1871–5.	1876–80.	1880–5.
Diarrhœa, Dysentery ..	778·0	874·6	1,063·6	1,001·0	833·6	652·8

The rates under one year of age are not stated, but under 5 years they seem also to have begun to decline, as in the decade 1871–80 the figures were 5,728 per million living at that age, against 5,985 in the previous decade (1861–70), both of these, however, being above 1851–60, which had a rate of 5,263 per million. These statistics are inclusive of dysentery, which is not now stated separately, but its rates are so small as to have little effect on the total.

Let us, however, take the most unfavourable series of figures, and see if they weigh anything against vaccination. These are 11,627, 13,364, and 17,807, being the averages of the annual rates

per million births, in children under one year, in the three periods 1847–53, 1854–67, and 1868–78. Here we have a rise of over 50 per cent. The question is, did vaccination cause this addition of one-third, or any great part thereof, to the diarrhœal mortality of infants? If so, in no vaccinated community should the rate in recent years be much less than one-third of the average rate for the whole country, even if such community were entirely free from diarrhœa to begin with. In England and Wales there are now 630 registration districts. The mean annual rate under 5 years old was, as has just been said, 5,728 per million in the last decade. But the rate was as low as 310 in one well-vaccinated district, and as high as 17,810 in another very ill-vaccinated district, the latter rate being 57 times the former. In 17 districts it was over 10,000, and in 33 it was under 1,000. In 6 it was 500, or less. The *vera causa* argument tells the wrong way here. A nearly uniform amount of vaccination could not produce such extraordinary differences. The true causes must be found in some agencies whose incidence varies somewhat in correspondence with the prevalence of diarrhœa. A reference to the districts with highest and lowest mortality may throw a little light on the subject. In the decade 1871–80 the highest mortality was experienced in Leicester, Preston, Yarmouth, Liverpool, Salford, Leeds, Birmingham, Manchester, Wigan, &c., the rates among children under 5 years varying from 17,810 per million in Leicester to 11,230 in Wigan. In the twelve districts with lowest rates the mortality ranged from 310 (in Tregaron) to 610 per million, and nine of the twelve were sparsely populated rural districts in Wales.

The districts with highest mortality consist of large towns, densely populated. Further, a number of the large towns resemble each other in that they employ a great amount of female labour, in cotton mills, &c. So that here the important question of the effect of artificial feeding comes into view. Again, the immunity of the Welsh populations raises the question as to the influence of soil, climate, race, habits, &c. And if Mr. Hopwood's last return be looked at, very striking irregularities in the death rate will be observed from year to year. This suggests another element in the case, namely variation of season, temperature, humidity, &c. In his report for 1885 the Registrar-General notes that "in the 25 years 1861–85 there were 8 years with a mean summer temperature below the 100 years' average; the mean of the annual diarrhœa rates in these 8 years was 659 per million living at all ages, while the mean of the rates in the remaining 17 years was 992 per million.

The general correspondences between density and diarrhœa, and between temperature and diarrhœa, while not of themselves excluding vaccination as a cause, are very striking, and if any approach to such correspondence existed between vaccination and diarrhœa, or any other disease, there can be no doubt that the point would be seized on, and the *vera causa* argument driven home with redoubled energy. But the facts give no countenance to such a supposition : Leicester is the headquarters of the opposition to vaccination, and the immunity from diarrhœa which ought to be enjoyed by the unvaccinated 25 per cent. (now over 40 per cent.), should have an appreciable influence on the total mortality from that cause. But the fact is that Leicester has a higher mortality from diarrhœa than any other population in the whole kingdom. (Here is the characteristically candid way in which anti-vaccinators state this fact :—"It is true that Leicester has as yet not wholly lost its infantile diarrhœa."*) In his report for 1884 the medical officer of health says, "Very few children in Leicester, and particularly of those living in the lower lying districts of the town, reach the age of twelve months without being attacked with the complaint in some form or other," and he believes it depends chiefly on the "putrefactive decomposition of animal refuse matter." Thus the irony of fate has willed that here, where vaccination is at low water, this "vaccinal disease," diarrhœa, is at flood tide. And it would be as rational to attribute the prevalence of diarrhœa in Leicester to the want of vaccination as to attribute its prevalence in Birmingham to the abundance of vaccination there.

The mention of Leicester suggests a digression which the reader will pardon me for making.

The "Immunity of Leicester from Small-pox" is an every-day subject of anti-vaccinating gratulation. If we set against this the maximum prevalence among unvaccinated infants of a vaccinal disease like diarrhœa the account seems almost square as regards the vaccination question. But Mr. Ritchie pointed out in Parliament (Feb. 28th, 1887) that in the nineteen great provincial towns there had been "practically no epidemic small-pox worth mentioning in the last ten years." It seems, too, that nearly all small-pox deaths belonging to Leicester occurred in the borough hospital outside Leicester, so that under existing circumstances, in no case will it be possible to get, in the death register of the town, almost any evidence of an outbreak. But if these outside deaths, few though they be,

* "Some Leading Arguments against Compulsory Vaccination" (E. W. Allen, 1887).

be counted against Leicester, they make a higher mortality than occurred in Portsmouth, Norwich, Plymouth, Bristol, and Bradford. Thus Leicester's immunity is by no means unparalleled, though its diarrhœa death rate is. It is true, however, that the anti-vaccinators of Leicester, having to a great extent thrown off the armour of vaccination, are waging a desperate and gallant, though misguided conflict, from behind all sorts of breastworks, against the enemy. But after all, what is the main defence against small-pox in Leicester? The reply is, that it is *vaccination.* When a case of small-pox occurs it is at once removed by a vaccinated and re-vaccinated escort outside the town to an isolation hospital,* managed by a staff of vaccinated and re-vaccinated nurses, matron, medical attendants, porters, &c. Thus, as the *Lancet* has it, a complete *cordon* of vaccination is formed round the patient. All who have lived with the sick person are also vaccinated or re-vaccinated, isolated, and placed under observation. There is no law by which this last procedure can be enforced; but strong pressure through employers of labour, for example, is unhesitatingly applied, so that, as the *Lancet's* commissioner says, "Leicester has no compunctions in restricting personal liberty, except in the matter of vaccination." The house is disinfected, the clothing, bedding, &c., are disinfected or destroyed, and all other possible precautions are adopted. These are, in their way, most admirable measures, forming an excellent supplement to, but a most unsafe substitute for, vaccination. But there is another feature in the case. Leicester is a town surrounded by a vaccinated kingdom. Not only is there a *cordon* of vaccination round each case that arises, but there is another and wider *cordon* of vaccinated millions round the town. And it is only the children in Leicester who have so little vaccination among them. The agitators themselves were born at a time when Leicester was as well vaccinated as the rest of the country. But of the children! In Leicester, when its time arrives, we shall not fail to see a repetition of last century experiences, and certainly there will afterwards be fewer children left to die of diarrhœa. It is to be hoped that when the catastrophe does come the Government will see that its teachings are duly studied and recorded. For, as opponents of vaccination frequently assert, small-pox is an epidemic disease. Throughout the country there has been nothing approaching an epidemic since 1870–73, and Leicester has had little chance of getting its "immunity" tested. When another great outbreak occurs among the susceptible population

* See *Lancet*, June 5th, 12th, and 26th, 1886.

of England it will be time enough then to see how Leicester comports itself under the ordeal.* Already the probability is being discounted, and statements are being recorded that can be usefully referred to when the disease does come, as showing that it is only what anti-vaccinists have always prophesied and expected. Mr. White says,† "We do not say Leicester is secure from small-pox; far from it." So that immunity is not security, and while boastings of victory go on in one page, in another a bridge of retreat is being constructed, to be used when the proper time comes. It will then be urged, "We never said Leicester was secure from small-pox; on the contrary, all we held was that 'there would be no massacre.'"

Finally, as I have said elsewhere,‡ omitting entirely the question of the value of the vaccination *cordon*, the isolation of small-pox cases pursued at Leicester is as much opposed to the anti-vaccination doctrine as is vaccination itself. Vaccination Tract No. 12, published by the secretary of the Society, concludes by laying down seven "positions," which seem to form a kind of creed. The second contains the following statement as to small-pox:—"It is one of the least contagious of diseases. . . . and its contagion is easily prevented by known means." The sixth "position" is:—"Small-pox hospitals are the culminating mistake in the social treatment of the disease. They are sewers of death to their inmates. . . . The true policy with small-pox, *in itself* now an insignificant disease, is to let each case lie where it falls, and to treat it there as it ought to be treated." If therefore the immunity of Leicester from small-pox proves anything, it proves the value of what anti-vaccinators hold to be "the culminating mistake in the social treatment of the disease."

Deaths from Unknown Causes.—Regarding the nomenclature of diseases in general, there is one cause of change that may be worth calling attention to, namely, the steady decrease in the number of deaths from ill-defined and unspecified causes. In the five years 1860–64 they numbered 226,000, and in the five years 1881–85 only 151,000. Here, therefore, are 75,000 extra deaths now distributed among the various well-defined maladies, and adding to that extent to their mortality. Or taking annual rates per million living in the same periods, we find a reduction of over 1,000 per million (from 2,191 to 1,133), in these ill-defined and unspecified diseases.

* This is what Mr. White would call "invoking small-pox."

† *Vaccination Inquirer*, November 1st, 1886.

‡ *Lancet*, June 26th, 1886.

Alterations in General Mortality.—As to the bad effect of vaccination on the general death rate, it may be well to cite the following figures of the Registrar-General, giving the mean annual mortality per million living from all causes in various periods.

1858–60.	1861–5.	1866–70.	1871–5.	1876–80.	1881–5.
22,240	22,595	22,436	21,975	20,817	19,310

The last three periods are those affected by the present vaccination law, and they show no evidence of any malign influence. There has been an enormous saving of life during these epochs.

In infants, to whom the anti-vaccination argument mainly applies, the saving is still greater. The following series of numbers gives the deaths from all causes in children under one year, per 1,000 births, in each year from 1870 till 1885 inclusive, in England and Wales :— 160, 158, 150, 149, 151, 158, 146, 136, 152, 135, 153, 130, 141, 137, 147, 138. The Registrar-General points out that according to the new English life table (1871–80) the children born in England in any one year have now divided amongst them "nearly two million years of life" more than would have been the case 35 years ago. The dire results of vaccination are nowhere visible in these figures. They show that in spite of what is represented as a wholesale blood-poisoning, recent infantile death rates are the lowest that have ever been registered in this country, and these unbeaten records have been achieved by that section of the community which is most of all under the influence of the supposed poison.

There is a striking difference in the amount of proof required by some people to show, first, that vaccination causes other diseases, and second, that vaccination prevents small-pox. As to the first, if a disease is increasing, the cause must be vaccination. Even decreasing vaccination adequately accounts for increasing disease. But as to the second, the enormous decline in small-pox since last century under increasing vaccination is scornfully rejected. When it is pointed out that vaccinated nations differ in small-pox mortality according to the quantity and quality of their vaccination ; that the more recent the vaccination the greater is the protection, as in infants ; that vaccinated infants suckle in safety from mothers ill with small-pox; that in hospitals, vaccinated patients recover where unvaccinated patients die, and that the chances of recovery increase with the quality of the vaccination ; that re-vaccinated populations – the army and navy, the post-office servants, and the whole German nation—have less small-pox than any other populations in the world; and that re-vaccinated nurses inhale in safety an atmosphere loaded with small-pox

poison; all these facts are of no avail. No amount of evidence is sufficient to produce the conviction that vaccination is a power against small-pox; and on the other hand, an utter absence of all evidence is insufficient to prevent the conviction that vaccination inflicts cholera, scarlatina, diarrhœa, premature birth, cancer, or whatever diseases happen for a time to be in the ascendent.

The Vaccinal Diseases of the Future.—We have now completed the discussion of what may be held to be the list of vaccinal diseases at present in vogue. But they change as rapidly as the fashions, and I have little doubt that in a very short time part of these criticisms will be out of date, as referring to abandoned doctrines. It has been already observed that the gradual dropping of puerperal fever from the list of death-causes will add considerably to the numbers attributed to some other maladies, whose consequent increase will be followed by the usual outcry. Already, in fact, there is a searching after other ills. In the somewhat unpromising field of the cadaveric alkaloids—a good mouth-filling expression for an orator who challenges the known world to a talking-match—Mr. Milnes and Dr. A. M. Brown* are groping in the dark for fresh examples. And, after the manner of blindfolded people, they are clutching at all sorts of objects that happen to be stumbled against in the course of their wanderings, each new find being proclaimed as the desired evil. Thus Dr. Brown talks of the "terrible increase (according to the Registrar-General's reports) of infantile mortality, attributed to cerebral meningitis in its idiopathic and more obscure forms, sympathetic or irritative convulsions, tetanus, and the like," and Mr. Milnes has fallen in with what Dr. Cless of Wurtemburg is said to have recorded as the 'apparent lethal termination of a case of vaccination,' of which the diagnosis given was "endomyocarditis, with formation of thrombi."

Thus vaccinal diseases come and go, while anti-vaccinators themselves "go on for ever."

* See Mr. Milnes' speech at the annual meeting of the society, April 14th., 1886.

CHAPTER VIII.

SOME NOTES ON SMALL-POX IN THE EIGHTEENTH CENTURY.

The Prevalence of Small-pox in the Eighteenth Century—Jurin's Calculation—Lettsom—London, Manchester, Glasgow, Boston, Kilmarnock, and Chester—Nineteen Continental Populations—White's Bogus Discrepancy: 3,000 per million—*The Influence of Inoculation*—Farr, Blane, Gregory, and Guy—Uninoculated Populations: Sweden and Copenhagen—Was Inoculation Advisable?—*The Influence of Small-pox on the General Mortality*—A Strange Doctrine—Mr. Taylor's Statistics: A Gross Mis-statement—Mr. White's Statistics—Modern and Ancient Epidemics—White *versus* Cocker—Sweden, Copenhagen, London—Small-pox Years Unhealthy Years — Small-pox Mortality an Addition to the General Mortality—CONCLUSION.

THOUGH Dr. Wallace has covered most of the ground usually gone over in anti-vaccination writings, there are some points to which he has made no reference, and the principal of these happen to be most conveniently considered in connection with the small-pox statistics of the last century. They are as follow :—

(1) The prevalence of small-pox in the eighteenth century.

(2) The influence of inoculation on the prevalence of small-pox.

(3) The influence of small-pox on the general mortality.

(1) *The Prevalence of Small-pox in the Eighteenth Century.*—The fatality of small-pox in the last century has already (pp. 57–9) been discussed, and some reference has been made to the lessons derivable from the London chart inserted at page 6.

What we have now to consider is, not the ratio of deaths to attacks of the disease, nor of small-pox deaths to the total deaths from all causes, but only the ratio of deaths to the living population. In no single epidemic in England in former centuries was it possible to see small-pox at its worst, for epidemics came so often that the field in which each new outbreak had to find its victims was comparatively limited. At any given date the great bulk of the people had already had small-pox, and it was only among a fraction that there was room for the disease to spread. Yet it was among such fractions of the population that small-pox every few years slew its thousands in London alone; but the full power of the disease over a susceptible community can be seen only in isolated countries rarely exposed to infection, and there were some such places, in Europe and elsewhere,

in past centuries. Iceland and Greenland were far from ordinary routes of traffic, and for long periods of time, almost for a generation in some instances, the disease was unknown, so that when it did come it found the population entirely defenceless, and the consequence was that sometimes, when the disease got a footing, its ravages were terrible. In Iceland in 1707–9, after an absence of nearly forty years, it killed 18,000 persons in a total population of 50,000. "As late as 1734, Greenland suffered its first epidemic of small-pox, when nearly two-thirds of the inhabitants were swept away," and Crantz says, "in one island they found only one girl with the small-pox upon her, and her three little brothers; the father, having first buried all the people in the place, had laid himself and his smallest sick child in a grave raised with stone, and ordered the girl to cover him." In Quito in 1563 (according to De la Condamine) "it destroyed upwards of 100,000 Indians;" &c. &c.*

But it is mainly with our own country that we have to do, where the (comparative) mildness of epidemics was made up for by their frequency.

In 1723 Dr. Jurin calculated that "upwards of 7 per cent., or somewhat more than a fourteenth part of mankind, die of small-pox."† The immediate basis of this statement is found in the London bills of mortality. But in the same work he refers to the havoc made by the disease "in other parts of the kingdom." He evidently believed that London small-pox gave a fair indication of the ordinary incidence of the malady in other localities. In the beginning of the century Dr. Lettsom mentioned that about 3,000 a year died of small-pox in London and its environs, in a population of about a million; so that this gave a total annual small-pox mortality of "about 36,000 in Great Britain and Ireland." Thus again Lettsom assumed that the disease prevailed about equally in London and the provinces. This is now denied, and not without some show of reason.

Fortunately, however, some useful though scanty materials exist for forming an opinion regarding provincial small-pox in the last century. In Manchester, according to Percival, in the six years 1769–74, there were 589 deaths from small-pox. The deaths in Salford do not appear to be included here, and in 1773 the population of Manchester was 22,481, so that the small-pox mortality per million would be 4,359; but if Salford be included the population was 27,246 and the rate per million 3,597.‡ In Glasgow, in the 18

* Simon, *loc. cit.* † *Op. cit.*, p. 11.

‡ Essays by Thomas Percival, M.D. (London, Joseph Johnson, 1776).

years 1783–1800, the mean annual deaths from small-pox were 331. In 1801 the population was fully 77,000, but it had increased very rapidly, so that if we take the mean population of the 18 years as 70,000 we are probably over-stating it considerably. But even this gives a small-pox death rate of over 4,700 per million.* Next, in Boston, Lincolnshire, in the 54 years 1749–1802, there were 505 small-pox deaths in a mean population (as calculated by the Rev. Samuel Partridge, vicar, from censuses taken in 1767 and 1801) of 4,120, the rate being 2,718 per million. And the vicar thinks it "highly probable that the proportion of deaths by this disorder throughout Great Britain and Ireland (and perhaps other countries) is not less, but greater, than within the parish of Boston."† In Kilmarnock, the rate must have been at least 4,000 per million.‡ In Chester—which, according to Haygarth, was a town of "almost incredible" healthiness—the average small-pox mortality in a population of 14,173 was at the rate of 3,300 per million. And in 1775 it contained, as Paget notes, only 1,060 persons, or 1 out of every 14, who had not contracted small-pox.§

Moreover, Jurin and Lettsom may probably be trusted. The former was secretary to the Royal Society, and is likely to have had a fair knowledge of the incidence of small-pox in Europe when he made the statement in question. And in England he was in constant communication with medical men throughout the kingdom regarding this very subject of small-pox, as is shown by his annual reports on the mortality from that affection. Fortunately, too, other countries were not so barren of mortality statistics as Britain was in the last century. The table which I have given on page 3 contains a statement of the small-pox death rate in nineteen continental populations during the latter part of the eighteenth century. While great divergencies are observable, including possibly both over-statements and under-statements (which would have a tendency to mutual correction), the facts as a whole bear out very remarkably the estimate made by Lettsom. For the mean of the nineteen rates corresponds very closely to 3,000 per million, the exact figures being 2,995.

Regarding London itself, White says (p. 29): "Dr. Lettsom

* Appendix to Dr. Robert Watt's Treatise on Chincough (Glasgow, 1813).

† I cannot vouch for the accuracy of the Boston figures, as they are taken at second hand from a paper by Mr. White (on Kilmarnock Small-pox) in the *Vaccination Inquirer* of July 1st, 1887. I have failed to get a copy of the original Report.

‡ *Loc. cit.*

§ See paper by Mr. C. E. Paget in Trans. Epidem. Socy., 1883-4.

said the London small-pox death rate was 3,000 per million; Dr. Farr said it had fallen to 1,740 before vaccination was introduced; whilst Sir Lyon Playfair says it was 4,000." Here seems an invitation to see how "doctors differ." So the reader may as well know that the 3,000 and 4,000 are *rates per million*, calculated from the Bills of mortality, the lower figure relating to a particular period, the higher to "the metropolis before vaccination," and that the figure 1,740 is not a rate at all, but a mere annual average of *actual deaths* occurring within a certain twenty years in a population much less than a million. To compare the three figures one with another is an imposition. This 1,740 furnishes another example of statistical evolution. Dr. Farr states plainly that the 1,740 refers to actual deaths. And while White leads his readers astray by comparing it with rates per million he protects himself by giving the quotation from Farr in the context. But Milnes, again, gives the finishing touch. He boldly asserts that the mortality in question "is given by Dr. Farr as 1,740 per million"!* Then he (who devotes a pamphlet to Keller's argument on the importance of strict age comparisons) goes on to compare this rate, which refers to all ages and includes non-epidemic as well as epidemic years, with the rate among unvaccinated children in the single severe year 1881, and this he does in order to show that the latter rate is so much above the former as to be "untrue, because impossible." Finally, the evolution being thus completed, not only the original mis-statement, but Milnes' sophistries founded thereon, are accepted, and, in a condensed form, officially published by the Anti-Vaccination Society, expressly to influence a vaccination vote in the House of Commons.†

Dr. Farr gives a table‡ in which the small-pox death rate per million living in London, in 1629–35, was 1,890; in 1660–79, 4,170; in 1728–57, 4,260; and in 1771–80, 5,020. We see, therefore, that the calculation of 3,000 per million for the kingdom as a whole allows a very considerable difference between London and the provinces. And, reviewing all the evidence, there can be no reasonable doubt that this rate is rather an under-estimate than an over-estimate of the prevalence of small-pox in this country in pre-vaccination times.

(2) *The Influence of Inoculation on the Prevalence of Small-pox.*—It is an opinion of many supporters of vaccination, and of all its opponents, that small-pox in England in the last century owed part of its spread to the practice of variolous inoculation, the inoculated

* *Vaccination Inquirer*, Nov. 1, 1886, p. 123.

† "Some Leading Arguments," pp. 14-15 and 25.

‡ "Vital Statistics," p. 304.

acting as centres of infection. On this belief anti-vaccinators found the view that the improvements which took place in the early decades of this century were due not to the spread of vaccination, but to the cessation of inoculation, which was ultimately made illegal in 1840. And, an analogy being drawn between the medical support given to inoculation and to vaccination, it is said that as doctors in the last century upheld a murderous custom which had finally to be abolished by law, so in the present they advocate another murderous practice which should meet a similar fate.

It is a fact that small-pox did decline very rapidly during the early years of vaccination, probably because the practice spread through Europe very rapidly, and because all vaccinations were necessarily *recent*, so that lapse of time had not diminished the protection afforded.

Whether inoculation caused more deaths than it prevented is a very difficult question, and not to be dogmatised on. A comparison of London small-pox in the seventeenth and eighteenth centuries tends to the view that it did so. For while in the former small-pox contributed 57 deaths to every 1,000 from all causes, in the latter it contributed 84. And in Sweden and Copenhagen, where inoculation was rarely practised, the mortality averaged about 2,000 and 3,000 per million respectively, against, say, 3,000 in England, and 4,000 in Glasgow and Manchester. If, indeed, as anti-vaccinators say, 3,000 is a gross exaggeration of the English rate, then inoculation could have had little or no effect, as the mortality here, under inoculation, would have been, perhaps, no greater than in Sweden, without inoculation.

Farr, in his earlier years, when he was writing for McCulloch's "Statistical Account," noted the sequence, that "small-pox attained its maximum mortality after inoculation was introduced." His own statistics, however, show that a very decided rise had previously set in; a rise, namely, from 1,890 per million in 1629–35, to 4,170 in 1660–79. Sir Gilbert Blane held even more strongly that there was a causal connection between them.* Dr. Gregory, on the other hand, and Dr. Guy, both advance reasons for a contrary belief. And I need hardly say that all four agree in their support of vaccination. Gregory (quoted by Guy)† gave three equal periods, (1) ending 1740, (2) ending 1770, and (3) ending 1800, and he said these were distinguished (1) by no inoculation, (2) by increasing inoculation, and (3) by almost universal inoculation. Guy points out that the first period had some

* Heberden held a similar opinion (*op. cit.*, p. 35).

† *Op. cit.*

inoculation, though not enough to invalidate the grouping. The small-pox deaths in the three epochs were, roughly speaking, 60,000, 60,000, and 55,000. Thus there was a saving of life in the last period when inoculation was at its maximum, and this in spite of the increase in the population of London. The question is, however, a difficult one. But it is to be noted that while in the three periods between 1710 and 1800 small-pox fell only from 60,000 to 55,000, yet in the thirty years following vaccination less than 30,000 deaths occurred. There is no continuity between these figures. In the longer pre-vaccination period there was a decrease of less than 9 per cent, and in the shorter post-vaccination period the fall was 47 per cent., or at a rate more than five times as great as in the earlier epoch. And in the latter half of these 30 years, the vaccinated population being greater, only 10,700 deaths took place, the other 18,500 being in the earlier half. If in London we take the deaths contributed by small-pox to every 1,000 deaths from all causes, we find that in the seven decades, 1730—1799, the figures were, 67·2, 76·1, 93·8, 102·3, 100·7, 87·8, and 91·4. But here again the anti-vaccinator tends to contradict himself. For while he holds very strongly that to inoculation was due much of our last century small-pox, he urges with equal vehemence that small-pox had begun to decline during the latter part of last century —that is to say, during the period when inoculation was most prevalent. My London diagram, and the above figures, show the facts as to the Metropolis. But if we take the figures for the second half of the last thirty years of the eighteenth century we find a rising rather than a falling mortality, for in the three quinquenniads comprising the fifteen years 1786–1800 the total small-pox deaths were (1) 8,423, (2) 8,650, and (3) 9,227, respectively. These figures, however, take no account of increased population.

In Boston, White shows a decided decline, and in Glasgow there was a very slight tendency in the same direction. But, on the other hand, in Copenhagen, as shown below, there was a steady rise in small-pox mortality during the last thirty years of the century.

On the whole, the evidence as to the influence of inoculation on small-pox is not such as to permit of any safe conclusion. But it does seem difficult to hold both that inoculation increased small-pox and that small-pox declined when inoculation most prevailed.

Uninoculated Populations.—For us, however, the essential question here is, Did small-pox decline independently of the cessation of inoculation?

Fortunately for the settlement of this question, there were

populations in Europe in which inoculation never took root nor became popular. This was the case in Sweden and in Copenhagen, and regarding both these it happens that full statistics are in existence. Mr. Simon's "Papers" contain the figures as furnished by the Swedish Government, including population, births, deaths from all causes, and deaths from small-pox, and Mr. Haile made the necessary calculations per million living, from 1749 to 1855. But up till 1773 measles and small-pox are given jointly, so that the figures cannot be used. Beginning in 1774, we get the following:

Mean of Annual Small-pox Mortality per Million Living in Sweden.

Five Years.	Mortality.	Five Years.	Mortality.
1774–88 ..	1,302	1804–8 ..	662
1779–83 ..	2,497	1809–13 ..	407
1784–88 ..	2,327	1814–18 ..	162
1789–93 ..	1,822	1819–23 ..	30
1794–98 ..	1,602	1824–28 ..	240
1799–1803 ..	2,111	1829–33 ..	173

These figures are essentially similar to those of London in this respect, that while they show some irregularity of rise and fall up till about the introduction of vaccination, there is then a sudden and well-maintained decline. So that in Sweden, *without inoculation as a disturbing cause*, the same phenomenon occurred at about the same time as in London, where inoculation had been almost universal.

Similarly, in Copenhagen, inoculation never became popular, and was little practised. Its statistics,* also official, tell the same tale. Here is a synopsis of the thirty years preceding and succeeding Jenner's discovery.

Decade.	Deaths from All Causes.	Deaths from Small-pox.	Percentage of Small-pox Deaths to total Deaths.
1770–9	31,607	1,288	4·1
1780–9	35,286	2,068	5·8
1790–9	31,328	2,651	8·4
1800–9	38,522	675	1·7
1810–19	31,609	4	0·012
1820–29	33,159	116	0·34

* Simon, *op. cit.*

The table given in Chapter I. shows that the mortality in Copenhagen in the second half of the last century was equal to 3,128 per million, and that in the first half of this century it was only 286.

Regarding all such figures White keeps repeating one objection. He says, as to London and Copenhagen for instance, that when the small-pox decline took place not more than ten per cent of the population were vaccinated, and he asks how could this protection prevent the other nine-tenths from taking small-pox. Then he complacently laughs at the belief in "vicarious vaccination," which he holds to be thus revealed. But surely the reply is not difficult.

It was only a fraction of the population that needed vaccination, or that was capable of being vaccinated. For the great majority of the people had already either suffered from natural small-pox by infection, or artificial small-pox by inoculation. The adults were protected. It was the children mainly who contributed, by the thousand, these small-pox deaths to the old registers of mortality. In Chester, in 1775, there was a population of 14,713, of whom only 1,060 had not had small-pox. So that if vaccination had been then introduced, only 7 per cent would have been open to the operation.

It is hardly necessary to ask the question—was a London medical man of the last century right in advising those of his patients who had not had small-pox to be inoculated for their own safety. There can be no doubt that he would have seriously failed in his duty had he omitted such advice, especially if accompanied by orders for isolation. For, as in every fourteen children born, one died of small-pox, and as only one in from 90 to 300 of those inoculated died from the resulting disease, it is manifest that the chances were immensely in favour of the artificial malady. And even if we admit that inoculation, by spreading small-pox, killed more than it preserved, the reason must clearly have been that the practice was not universally carried out. Had all the unprotected been inoculated, small-pox would have been almost stamped out. And while the operation is now illegal, it is so merely on account of the greater merits of vaccination, which is non-infectious, and almost entirely void of danger to the individual.

(3.) *The Influence of Small-pox on the General Mortality.*

A Strange Doctrine.—One of the statements most frequently found in anti-vaccination literature is, that small-pox epidemics do not increase the total deaths from all causes. In fact some even go

the length of asserting the opposite, namely, that small-pox *decreases* the general death rate. Before the Select Committee of 1871, Dr. Pearce said (Q. 703): "as small-pox increases, infant mortality diminishes, and the general mortality sinks below the average always." Professor F. W. Newman * holds "that the more active is small-pox, the less is the total mortality of any year; and conversely, the less active the small-pox, the greater is the total mortality;" and he adds that "this is the only form of statistics worth attending to." Sir Thomas Chambers said †—"There may be no small-pox, but the disappearance of small-pox is by no means equivalent to a reduction of mortality." And, as we shall see immediately, Mr. P. A. Taylor and Mr. White are of the same opinion. In looking for the grounds on which their extraordinary belief is founded I find that the only evidence Pearce adduces is the mortality of a certain selected *five weeks* in London in 1871, in which the movements in general mortality did not correspond with the movements in small-pox mortality. This basis is so ridiculously small for a superstructure so large that we turn to other writers for evidence more commensurate with the subject.

Two statements in support of the proposition have been made, (1.) by Mr. P. A. Taylor, Ex-M.P., and (2.) by Mr. Wm. White.‡

Mr. P. A. Taylor's Statistics.—This gentleman, writing to the late Dr. W. B. Carpenter, mentions § the "fallacy," "of supposing that the deaths by small-pox were a simple addition to the general average mortality, whereas, as you are of course aware, the years distinguished by large small-pox mortality are by no means generally of the largest *general* mortality. Thus, take (in London) the forty years 1841–80, and we find the following curious result :—

* Quoted in White's "Story of a Great Delusion," p. 546.

† *Ibid.*, p. 439.

‡ In addition, White refers to Dr. Watt's experience in Glasgow in the beginning of the century. In a letter (dated May 17th 1886,) to the *Glasgow Herald*, White says :—"In Glasgow, between 1783 and 1800, the deaths from small-pox formed nearly 20 per cent of the total mortality. In the subsequent twelve years, 1801–12, they fell to 6 per cent; but the general death rate was unaffected." In rejoinder to which, the present writer said: —"But, writing in the *Glasgow Herald*, I do not need to point out that there was here a great counteracting influence at work—the rapid increase of population and of overcrowding. Mr. White well knows the intimate connection between death rate and density of population, and it is a strong argument in favour of vaccination that the fall in the small-pox death rate prevented filth and overcrowding from having their normal effect on the total mortality." As to Watt's statistics see also White's "Story," &c., Chap. XXXIV.

§ *Loc. cit.* p. 9–10.

	Small-pox Deaths.			General Death Rate per 1,000.
Three lowest years ..	1841	..	1,053	24·2
	1851	..	1.062	23·4
	1855	..	1,039	24·3
Average ..	..	..	1,051	23·9
Three highest years ..	1863	..	1,996	24·5
	1871	..	7,912	24·6
	1877	..	2,551	21·9
Average	..	..	4,153	23·6

So far Taylor. There is an appearance of candour about these figures, which, by the way, are adopted in full (but without any reference to their source) by Mr. White in his review of Playfair and Dilke. They are given "with a circumstance," and they seem distinguished by fair dealing. Taking "the forty years 1841–80," the "three lowest" are compared with the "three highest." So that, in the words of Dr. Wallace, there seems here "no manipulation of them, by taking certain years for comparison," for of course Mr. Taylor is bound to accept whatever "general death rate" these years show. In puzzling out the answer to the argument involved, let us once more apply the rule * so often found of service in these pages—"to believe no single word that an anti-vaccinator, as such, says, without obtaining independent evidence of its truth." This sends us to the Registrar's London reports. There, indeed,† we find that, as Mr. Taylor says, the three highest years were 1863, 1871, and 1877.‡ But on looking for the "three lowest" of "the forty years 1841–80" we find—what?

I will let the figures speak for themselves. Mr. Taylor gives as the "three lowest years," 1841, 1851, and 1855, the small-pox deaths being 1,053, 1,062, and 1,039 respectively. But in 1875 there were only 46 small-pox deaths; in 1874, 57; in 1873, 113; in 1857, 156; in 1853, 211; in 1858, 242; in 1846, 257; and so on. In fact, in the whole 40 years there are only 10 with a higher mortality than the so-called lowest years! Here are the figures for the three *really* lowest years, taken from the Summary for 1886:—

* See p. 90.

† "Annual Summary of Births, Deaths, and Causes of Death in London and other Large Cities, 1880," p xx–xxi.

‡ These years had indeed the most deaths, though, rateably to the living population, 1844 and 1848 were above 1863; but let that pass.

Year.	Small-pox Deaths.	General Death Rate per 1,000.
1873	113	22·4
1874	57	22·4
1875	46	23·5
Average	72	22·76

Thus Mr. Taylor's "three lowest years" have nearly three thousand (2,938) more small-pox deaths than, or 14 times as many as, the Registrar-General's three lowest years. But worse remains. For —and here we reach the heart of the whole comparison—while Mr. Taylor's lowest years have an average mortality of 23·96 per 1,000, the Registrar-General's have only 22·76. And this difference of 1·2 per 1,000 per annum means, in a population of $3\frac{1}{2}$ millions, a difference of 12,600 deaths in the three years.

Let us carry the calculation a little farther. The actual difference in general mortality between the highest and the lowest (genuine, not bogus) three years, was 0·9 per 1,000 per annum. Taking the London population as in 1874 (the second of the three low years) this 0·9 would give 9,253 deaths less, from all causes, than in the high years. But the total small-pox deaths in the latter were 12,459, and in the former, 216, so that the difference is 12,243. Thus, fully three-fourths of the small-pox deaths were an actual addition to the general mortality.

These figures happen to contain a sufficient answer to this part of Mr. Taylor's "unanswered because unanswerable" letter, of which 200,000 copies, each containing this gross mis-statement, have been issued. But after all, very little importance can be attached to such statistics. For in modern times, so great has been the influence of vaccination that the ebb and flow of small-pox mortality seldom exert an appreciable influence on the general death rate. When it is considered that in 1871—the heaviest year but one of the century—out of every 1,000 deaths, only 44 were from small-pox, it becomes clear that variations in other diseases will readily neutralise the influence of this or any other cause contributing so small pro portion of the total mortality. And yet in regard to any other such causes—measles, for instance—who would ever dream of suggesting that, because it happened to prevail in an otherwise healthy year, it did not add to the death rate? As regards small-pox, this is still more the case in other years than 1871, for even in London, with a higher rate by far than the rest of the country, the average

small-pox contribution to every 1,000 deaths in the decade 1872–81 was only 13. Thus it is that in England in 1871 the small-pox mortality being 1·01 per 1,000 living—the general mortality was barely 22·6; while in 1875 the corresponding figures were 0·35 and 22·7. The fact is that, loudly as anti-vaccinists declaim against the small-pox epidemics of the vaccination era, these are so comparatively insignificant that while they do, *pro rata*,* affect the death rate, yet the ordinary irregularities of other causes are sufficient to render imperceptible their effect on the half million or more deaths that annually occur in England and Wales. But if we go to the last century, what do we find? That in London, in 35 years out of the 100, the small-pox deaths were more in proportion to the total than in London in 1871. So that, if we take the modern standard for the measurement of last century, then every third year was an epidemic year.

The proper period, therefore, in which to search for the effect of small-pox on the general mortality is in former centuries, when the malady, unchecked by vaccination, flourished in all its original vigour and virulence.

Mr. White's Statistics.—As a matter of fact, anti-vaccinators have provided us with the necessary figures bearing on the present subject. Mr. William White, in his "Story of a Great Delusion" (p. 409) gives a table of Swedish statistics, in which he says, "we see," as to small-pox, "how indifferent was its influence on the general mortality, much small-pox not raising the death-rate, nor little small-pox lowering it."

Again applying to these statistics the rule of conduct already (p. 90) laid down, I turn to their source, in Simon's "Papers," and find that Mr. White has extracted them quite correctly, figure for figure. But here the correctness stops short. For Mr. White's statement as to what "we see" in these figures is a defiance of the laws of arithmetic. We discover this by simply separating the 18 years into two equal groups, distinguished by the number of small-pox deaths.

Here "we see" that in the nine years of much small-pox there were 106,000 more deaths from all causes than in the nine years of less small-pox. But the difference between the small-pox deaths in the two series is less than 92,000. So that here, over and above

* It must be noted that had small-pox been absent in 1871 the 23,000 who died of it would have had among them the mortality that naturally belongs to a population similar in numbers and in ages. Thus, if their ages resembled those of an ordinary town of 23,000 inhabitants, the deaths might have amounted to 500 or thereby.

the extra mortality from small-pox, there were more than 14,000 extra deaths from other causes. And yet by careful selection of exceptional years an opposite result might be brought out. For in one bad small-pox year (1752) there were less than 50,000 deaths, while in the year of least small-pox (1786) there were nearly 56,000.* But Mr. White doesn't even make the best of his own case, for, of the 105,000 deaths in 1773, 20,000 were due to fever—a very exceptional number. And up to 1774 measles and small-pox were stated jointly, so that there was here another element of error.

Years with much Small-pox.			Years with little Small-pox.		
Year.	Total Deaths.	From Small-pox.	Year.	Total Deaths.	From Small-pox.
1752	49,467	10,302	1775	49,949	1,275
1757	55,829	10,241	1776	45,692	1,503
1763	64,180	11,662	1777	51,096	2,943
1768	54,751	10,650	1781	54,313	1,485
1769	54,991	10,215	1786	55,951	671
1773	105,139	12,130	1787	51,998	1,771
1778	55,028	16,607	1792	52,958	1,939
1784	63,792	12,453	1797	55,036	1,733
1800	73,928	12,032	1798	53,862	1,357
Total ..	577,105	106,292	Total ..	470,855	14,677

If, then, we take the 29 years 1774–1802 † (both included) we find that the middle year, as regards small-pox prevalence, was 1780, when 3,374 deaths were registered from that malady. There were 14 years with less than this number of small-pox deaths, and 14 years with more. In the former the total deaths from all causes were 739,929, and in the latter, 857,520. There were thus, in the higher small-pox years, 117,591 deaths more than in the low small-pox years. But in the former, the total *small-pox* deaths were 98,325, and in the latter, 24,961. Thus the difference between the small-pox mortality of the two periods was only 73,364, and there were, therefore, over 44,000 extra deaths from other causes.

If we turn now to Copenhagen ‡ we find a similar experience. In the 51 years ending 1800 there were 23 with over 150 small-pox deaths, and 28 with less than that number. In the former the average annual deaths from all causes were 3,666, and in the latter

* See also correspondence in *Glasgow Herald*, already referred to.

† Simon's "Papers," &c.

‡ Simon, *loc. cit.*

3,170. But the average small-pox deaths were 456 and 65 respectively. Deducting these, the mortality from all other causes was, in the years of much small-pox, 3,212, and in the others, 3,106 on an average. Thus the lesson that Sweden teaches is reiterated by Copenhagen.

Finally, let us go back to our own country, and consult the London bills of mortality on the subject. Taking the hundred years beginning 1701, let us divide them into two half-centuries, one of least small-pox, and one of most small-pox. Then we find that in the former the total mortality was 1,088,001, and in the latter, 1,202,143, a difference of 114,142 deaths between the two periods. But the total small-pox deaths were, in the low years, 65,762, and in the high years 130,653. The difference here is only 64,891. Thus the fifty years which, roughly speaking, had 65,000 deaths extra from small-pox had 50,000 deaths extra from other causes.

Here again the lesson is driven in that, taking long periods of time in the last century, when small-pox was uncontrolled by vaccination, the deaths that resulted from the disease were *added on* to the mortality from other causes. For when small-pox fell the total mortality fell, and when small-pox rose the total mortality rose. Yet Mr. White would have us believe that "much small-pox does not raise the death rate, nor little small-pox lower it."

It is worth noting that even from these most unpromising materials ingenuity can extract an argument against vaccination. Mr. Taylor accomplishes this. For just after giving that remarkable table quoted on page 162 he adds, "or to give another not less striking illustration, the deaths by small-pox in London in 1796 (the highest of that decade), were 3,548, and the whole number of deaths was 19,288. In 1792, the small-pox deaths were 1,568 and the total mortality 20,213." We thus see that by reckless application of the rack and thumbscrew some of these years can be made to deny the truth which unitedly they convey.

Since writing the above I have met with some statistics on the same subject by Mr. Alexander Wheeler,* whose best known figures have already (p. 57) been analysed. To point out sophistry after sophistry becomes monotonous, but as Mr. Wheeler's method in his first table differs somewhat from anything that has been already mentioned it deserves a moment's notice.

As representing the 17th century, he takes the available period 1629 to 1686, but instead of giving the whole statistics he selects the ten years of most small-pox and the ten years of least small-pox, and

* *Op. cit.*, p. 9.

shows that in the latter the average deaths from all causes were 21,119, against only 16,636 in the former. But it happens that in the ten years of least small-pox, 97,000, or nearly one half of the total, deaths occurred in the single year 1665.

And on turning to Heberden* (p. 62) I find that in this year there were 68,596 deaths from the plague! Thus Wheeler uses the plague to swamp the small-pox. If we omit the year we get an average of only 12, 654 deaths from all causes, or 4,000 per annum less than in the bad small-pox years. Mr. Wheeler's second table is incomprehensible.† It is headed "London—1773 to 1784—Representing the 18th Century." Why this particular group of years should represent the century does not appear, but as a matter of fact, in his "Ten Years of Least Small-pox" he includes several years prior to 1773, and excludes several others which have a lower mortality than those included. But above all, why does he not include the whole century? I have already done so, with a result very different from that which he obtains from his selected years. Mr. Wheeler's other tables refer to the 19th century, but the fallacies inherent in all attempts to gauge from present day statistics the effect of small-pox on the general mortality have already been dealt with.

In looking back on what I have written I find that various illustrations of anti-vaccination tactics and fallacies have been omitted, but the principles on which a reply may be made have been indicated, and it will not be difficult to apply them to each new example as it arises. Above all, let the reader remember the main rule, to begin in every case by sifting out the facts, and to accept nothing as a fact until it is proved to be so.

Conclusion.

Nigh nine decades have come and gone since Jenner published to the world, as the matured result of over twenty years' quiet and patient study, the undreamt-of possibility for good that was contained in the connection which he had found to exist between human small-pox and the *Variolæ Vaccinæ*. Well has the event justified his hope of a great outcome to the thought that had so long occupied his mind, for in these 90 years vaccination has been the direct means of saving more lives and preventing more misery than any single discovery that has ever been made in the history of humanity.

* *Op. cit.*

† So also are his statistics of the London Small-pox Hospital, on p. 16 of his pamphlet.

That this nation which gave birth to Jenner should, even for a time, seek to deprive itself of any portion of the boon which was conferred on mankind through him, seems at first sight a proposition so unreasonable as to be incapable of serious discussion; but the fact is that, from the beginning, the very nature of vaccination has been such that its own success has contained within itself the possibility of its own partial and temporary discontinuance.

As regards the adoption of the practice, the main difficulty with which our predecessors had to contend was that public apathy which has ever been an enemy, as well to sanitation as to vaccination, and which in both cases, except by compulsory laws, has been for a time overcome only by such events as epidemics of cholera or of small-pox. For, after the first few years of struggle, there was little active opposition to the preventive means. Previous generations indeed needed no book-learning on the subject. Early in the century there was the all too vivid recollection of the terrible epidemics that had swept the country in pre-Jennerian times. Later on, the relics of these outbreaks were manifest in the scarred and blinded victims forming so large a proportion of the individuals whom a man would meet in an hour's walk along a public thoroughfare; but so great has been the power of vaccination that these evidences are fast dying out, and the very efficiency of the marvellous discovery of Jenner is the only real element of danger to the maintenance of its application. For nowadays the people have to be educated in this matter, not by their eyesight, but by the teachings of history.

And probably it was a mistake in the English Vaccination Acts to treat the question of the efficacy of vaccination as settled for all time; and treating it thus, to forbid for ever, and under all circumstances, any intentional exposure to small-pox, or inoculation with small-pox. Had the law allowed, it might have been possible to obtain from amongst anti-vaccinators a group of unvaccinated persons so firm in their faith as to be willing to become the subjects of what would undoubtedly be for them a terrible experiment—the experiment, namely, of living for a time in a small-pox hospital, exposed to the small-pox poison, along with an equal number of vaccinated or re-vaccinated persons, alike in age, social conditions, and in every respect but vaccination. Or the old experiment of small-pox inoculation might be practised on two such groups as these, and people who are unable to understand large masses of statistics, and who are content to ascribe to chance or what not every observed difference in the small-pox of great communities, might perhaps be convinced of the advantages of vaccination if they could see for themselves the

different results obtained in the vaccinated and unvaccinated of the two groups of individuals. But § xxxii. of the Act of 1867 bars the way to such experiment.

Meanwhile, I would plead with those who know the value of vaccination not to leave the people utterly uninstructed on the subject, and at the mercy of those who issue placards of policemen, skeletons, and shuddering mothers. Such people there have been since vaccination existed, and such there will probably always be. In the absence of popular knowledge these folk are able to take what they call "censuses" of vaccination, and it is no wonder that a great majority of the population, who probably do not know what vaccination is done for, who have no conception of what small-pox is, and who naturally do not like to see sores on their children's arms, should declare themselves "opposed to" vaccination. But to what possible purpose is a census of their "opinions?" One might expect these people to form a majority, and a very great majority, of an uninformed population; and that they are not 99 per cent. of any given community is due to their common sense in assuming that, just as a chemist knows about chemistry and a botanist about botany, so a doctor knows about matters relating to medicine and surgery.

For among medical men there is, as has been well said, no vaccination question. They know the truth, and in the course of their practice they act on and advise regarding it, but they do not organise leagues in defence of it. "Why should they?" they reason. "The law has settled the matter alike for believers and disbelievers." Or, "As well organise a league to convince people that the earth is round; if they choose to believe that it is flat, let them believe it." But these are scarcely reasons for not endeavouring to instruct the people in the truth about vaccination. Nowadays the enforcement of laws is largely a matter for populations themselves; and, as to the proposal to let communities abide by whatever belief they please, it must be remembered that the so-called "opinion" of the uneducated in this subject operates to the detriment, not of those who choose to be credulous or incredulous, but of helpless children who have no choice in the beliefs of their seniors. So that it becomes the duty of those who know the value of vaccination, who understand the danger against which it protects, and who are satisfied of the all but complete harmlessness of the operation as practised in England, to teach their ignorant and misinformed neighbours what is in fact the truth about vaccination—the truth as demonstrated to Parliament, the truth as learned by ever-growing experience of men who give their lives to learning it, the truth about a duty which cannot be neglected except

at the price of indefinite suffering and loss of life. Again I plead, therefore, for instruction of the people in the matter of vaccination; instruction by the teachings of history, if that will suffice; otherwise, by the removal of obstacles to direct experiment which may convince the sceptical, if they are able to be convinced; but surely not, if our best endeavours can prevent it, by leaving helpless children to die by thousands from small-pox, as assuredly they will die if a large unvaccinated community of them be permitted to grow up in our midst.

It is with the object of aiding those who themselves may be willing to aid in promulgating the lessons of experience about vaccination and vaccination laws, that I have written the present work, using Dr. Wallace as the best representative of those who have agitated against vaccination, and whose repute in other departments of knowledge has led some few, even among thinking people, to suppose that there must be some ground for his contentions.

INDEX.

PRINTED BY CASSELL & COMPANY, LIMITED, LA BELLE SAUVAGE, LONDON, E.C.

Illustrated, Fine Art, and other Volumes.

Abbeys and Churches of England and Wales, The: Descriptive, Historical, Pictorial. 21s.

After London; or, Wild England. By the late RICHARD JEFFERIES. *Cheap Edition*, 3s. 6d.

Along Alaska's Great River. By Lieut. SCHWATKA. Illustrated. 12s. 6d.

American Penman, An. By JULIAN HAWTHORNE. 3s. 6d.

American Yachts and Yachting. Illustrated. 6s.

Animal Painting in Water Colours. With Eighteen Coloured Plates by FREDERICK TAYLER. 5s.

Arabian Nights Entertainments (Cassell's). With about 400 Illustrations. 10s. 6d.

Architectural Drawing. By PHENÉ SPIERS. Illustrated. 10s. 6d.

Art, The Magazine of. Yearly Volume. With several hundred Engravings, and Twelve Etchings, Photogravures, &c. 16s.

Behind Time. By G. P. LATHROP. Illustrated. 2s. 6d.

Bimetallism, The Theory of. By D. BARBOUR. 6s.

Bismarck, Prince. By C. LOWE, M.A. Two Vols. *Cheap Edition.* 10s. 6d.

British Ballads. 275 Original Illustrations. Two Vols. Cloth, 7s. 6d. each.

British Battles on Land and Sea. By the late JAMES GRANT. With about 600 Illustrations. Three Vols., 4to, £1 7s.; Library Edition, £1 10s.

British Battles, Recent. Illustrated. 4to, 9s. Library Edition, 10s.

British Empire, The. By SIR GEORGE CAMPBELL. 3s.

Browning, An Introduction to the Study of. By ARTHUR SYMONS. 2s. 6d.

Butterflies and Moths, European. By W. F. KIRBY. With 61 Coloured Plates. Demy 4to, 35s.

Canaries and Cage-Birds, The Illustrated Book of. By W. A. BLAKSTON, W. SWAYSLAND, and A. F. WIENER. With 56 Fac-simile Coloured Plates, 35s.

Cannibals and Convicts. By JULIAN THOMAS ("The Vagabond"). *Cheap Edition*, 5s.

Captain Trafalgar. By WESTALL and LAURIE. Illustrated. 5s.

Cassell's Family Magazine. Yearly Vol. Illustrated. 9s.

Cathedral Churches of England and Wales. Descriptive, Historical, and Pictorial. With 150 Illustrations. 21s.

Celebrities of the Century: Being a Dictionary of Men and Women of the Nineteenth Century. 21s.; roxburgh, 25s.

Changing Year, The. With Illustrations. 7s. 6d.

Chess Problem, The. With Illustrations by C. PLANCK and others. 7s. 6d.

Children of the Cold, The. By Lieut. SCHWATKA. 2s. 6d.

China Painting. By FLORENCE LEWIS. With Sixteen Coloured Plates, and a selection of Wood Engravings. With full Instructions. 5s.

Choice Dishes at Small Cost. By A. G. PAYNE. *Cheap Edition*, 1s.

Christmas in the Olden Time. By Sir WALTER SCOTT. With charming Original Illustrations. 7s. 6d.

Cities of the World. Three Vols. Illustrated. 7s. 6d. each.

Civil Service, Guide to Employment in the. *New and Enlarged Edition.* 3s. 6d.

Civil Service.—Guide to Female Employment in Government Offices. Cloth, 1s.

Clinical Manuals for Practitioners and Students of Medicine. (*A List of Volumes forwarded post free on application to the Publishers.*)

Clothing, The Influence of, on Health. By FREDERICK TREVES, F.R.C.S. 2s.

Cobden Club, Works published for the:—

Writings of Richard Cobden. 6s.
Local Government and Taxation in the United Kingdom. 5s.
Displacement of Labour and Capital. 3d.
The Three Panics. 1s.
Free Trade versus Fair Trade. 5s.
Free Trade and English Commerce. By A. Mongredien. 6d.
The Trade Depression. 6d.
Crown Colonies. 1s.
Our Land Laws of the Past. 3d.
Popular Fallacies Regarding Trade. 6d.
Western Farmer of America. 3d.
Transfer of Land by Registration. 6d.
Reform of the English Land System. 3d.
Fair Trade Unmasked. By G. W. Medley. 6d.
Technical Education. By F. C. Montague, M.A. 6d.

Colonies and India, Our: How we Got Them, and Why we Keep Them. By Prof. C. RANSOME. 1s.

Colour. By Prof. A. H. CHURCH. *New and Enlarged Edition*, with Coloured Plates. 3s. 6d.

Columbus, Christopher, The Life and Voyages of. By WASHINGTON IRVING. Three Vols. 7s. 6d.

Cookery, Cassell's Dictionary of. Containing about Nine Thousand Recipes. 7s. 6d.; roxburgh, 10s. 6d.

Cookery, A Year's. By PHYLLIS BROWNE. Cloth gilt or oiled cloth, 3s. 6d.

Cook Book, Catherine Owen's New. 4s.

Co-operators, Working Men: What They have Done, and What They are Doing. By A. H. DYKE-ACLAND, M.P., and B. JONES. 1s.

Countries of the World, The. By ROBERT BROWN, M.A., Ph.D., &c. Complete in Six Vols., with about 750 Illustrations. 4to, 7s. 6d. each.

Cromwell, Oliver: The Man and his Mission. By J. ALLANSON PICTON, M.P. Cloth, 7s. 6d.; morocco, cloth sides, 9s.

Cyclopædia, Cassell's Concise. With 12,000 subjects, brought down to the latest date. With about 600 Illustrations, 15s.; roxburgh, 18s.

Dairy Farming. By Prof. J. P. SHELDON. With 25 Fac-simile Coloured Plates, and numerous Wood Engravings. Cloth, 31s. 6d.; half-morocco, 42s.

Dead Man's Rock. A Romance. By Q. 5s.

Decisive Events in History. By THOMAS ARCHER. With Sixteen Illustrations. Boards, 3s. 6d.; cloth, 5s.

Decorative Design, Principles of. By CHRISTOPHER DRESSER, Ph.D. Illustrated. 5s.

Deserted Village Series, The. Consisting of *Éditions de luxe* of favourite poems by Standard Authors. Illustrated. Cloth gilt, 2s. 6d.; or Japanese morocco, 5s. each.

Goldsmith's Deserted Village.
Milton's L'Allegro and Il Penseroso.
Songs from Shakespeare.
Wordsworth's Ode on Immortality, and Lines on Tintern Abbey.

Dickens, Character Sketches from. FIRST, SECOND, and THIRD SERIES. With Six Original Drawings in each, by FREDERICK BARNARD. In Portfolio, 21s. each.

Diary of Two Parliaments. By H. W. LUCY. The Disraeli Parliament, 12s. The Gladstone Parliament, 12s.

Dog, The. By IDSTONE. Illustrated. 2s. 6d.

Dog, Illustrated Book of the. By VERO SHAW, B.A. With 28 Coloured Plates. Cloth bevelled, 35s.; half-morocco, 45s.

Dog Stories and Dog Lore. By Col. THOS. W. KNOX. 6s.

Domestic Dictionary, The. An Encyclopædia for the Household. Cloth, 7s. 6d.

Doré's Adventures of Munchausen. Illustrated by GUSTAVE DORÉ. 5s.

Doré's Dante's Inferno. Illustrated by GUSTAVE DORÉ. *Popular Edition*, 21s.

Doré's Dante's Purgatorio and Paradiso. Illustrated by GUSTAVE DORÉ. *Popular Edition*. 21s.

Doré's Fairy Tales Told Again. With 24 Full-page Engravings by DORÉ. 5s.

Doré Gallery, The. With 250 Illustrations by GUSTAVE DORÉ. 4to, 42s.

Doré's Milton's Paradise Lost. With Full-page Drawings by GUSTAVE DORÉ. 4to, 21s.

Earth, Our, and its Story. By Dr. ROBERT BROWN, F.L.S. Vol. I., with Coloured Plates and numerous Wood Engravings. 9s.

Edinburgh, Old and New, Cassell's. With 600 Illustrations. Three Vols., 9s. each; library binding, £1 10s. the set.

Egypt: Descriptive, Historical, and Picturesque. By Prof. G. EBERS. Translated by CLARA BELL, with Notes by SAMUEL BIRCH, LL.D., &c. *Popular Edition*, in Two Vols., 42s.

Electricity, Age of, from Amber Soul to Telephone. By PARK BENJAMIN, Ph.D. 7s. 6d.

Electricity, Practical. By Prof. W. E. AYRTON. Illustrated. 7s. 6d.

Electricity in the Service of Man. With nearly 850 Illustrations. 21s.

Encyclopædic Dictionary, The. A New and Original Work of Reference to all the Words in the English Language. Twelve Divisional Vols. now ready, 10s. 6d. each; or the Double Divisional Vols., half-morocco, 21s. each.

England, Cassell's Illustrated History of. With 2,000 Illustrations. Ten Vols., 4to, 9s. each. *New and Revised Edition.* Vol. I., 9s.

English History, The Dictionary of. Cloth, 21s. ; roxburgh, 25s.

English Literature, Library of. By Prof. HENRY MORLEY. Complete in 5 vols., 7s. 6d. each.

VOL. I.—SHORTER ENGLISH POEMS.
VOL. II.—ILLUSTRATIONS OF ENGLISH RELIGION.
VOL. III.—ENGLISH PLAYS.
VOL. IV.—SHORTER WORKS IN ENGLISH PROSE.
VOL. V.—SKETCHES OF LONGER WORKS IN ENGLISH VERSE AND PROSE.

English Literature, Morley's First Sketch of. *Revised Edition*, 7s. 6d.

English Literature, The Dictionary of. By W. DAVENPORT ADAMS. *Cheap Edition*, 7s. 6d. ; roxburgh, 10s. 6d.

English Literature, The Story of. By ANNA BUCKLAND. *New and Cheap Edition*. 3s. 6d.

English Poetesses. By ERIC S. ROBERTSON, M.A. 5s.

English Writers. An attempt towards a History of English Literature. By HENRY MORLEY, LL.D., Professor of English Literature, University College, London. Vols. I. and II., each 5s.

Æsop's Fables. With about 150 Illustrations by E. GRISET. *Cheap Edition*, cloth, 3s. 6d. ; bevelled boards, gilt edges, 5s.

Etching: Its Technical Processes, with Remarks on Collections and Collecting. By S. K. KOEHLER. Illustrated with 30 Full-page Plates. Price £4 4s.

Etiquette of Good Society. 1s. ; cloth, 1s. 6d.

Eye, Ear, and Throat, The Management of the. 3s. 6d.

False Hopes. By Prof. GOLDWIN SMITH, M.A., LL.D., D.C.L. 6d.

Family Physician, The. By Eminent PHYSICIANS and SURGEONS. *New and Revised Edition*. Cloth, 21s. ; roxburgh, 25s.

Fenn, G. Manville, Works by. *Popular Editions.* Cloth boards, 2s. each.

Sweet Maee.
Dutch the Diver; or, a Man's Mistake.
My Patients.
The Vicar's People.
The Parson o' Dumford.
Poverty Corner.

Ferns, European. By JAMES BRITTEN, F.L.S. With 30 Fac-simile Coloured Plates by D. BLAIR, F.L.S. 21s.

Field Naturalist's Handbook, The. By the Rev. J. G. WOOD and THEODORE WOOD. 5s.

Figuier's Popular Scientific Works. With Several Hundred Illustrations in each. 3s. 6d. each.

The Human Race.
World Before the Deluge.
Reptiles and Birds.
Mammalia.
The Ocean World.
The Vegetable World.
The Insect World.

Figure Painting in Water Colours. With 16 Coloured Plates by BLANCHE MACARTHUR and JENNIE MOORE. With full Instructions. 7s. 6d.

Fine-Art Library, The. Edited by JOHN SPARKES, Principal of the South Kensington Art Schools. Each Book contains about 100 Illustrations. 5s. each.

Tapestry. By Eugène Müntz. Translated by Miss L. J. Davis.
Engraving. By Le Vicomte Henri Delaborde. Translated by R. A. M. Stevenson.
The English School of Painting. By E. Chesneau. Translated by L. N. Etherington. With an Introduction by Prof. Ruskin.
The Flemish School of Painting. By A. J. Wauters. Translated by Mrs. Henry Rossel.
The Education of the Artist. By Ernest Chesneau. Translated by Clara Bell. Non-illustrated.
Greek Archæology. By Maxime Collignon. Translated by Dr. J. H. Wright.
Artistic Anatomy. By Prof. Duval. Translated by F. E. Fenton.
The Dutch School of Painting. By Henry Havard. Translated by G. Powell.

Five Pound Note, The, and other Stories. By G. S. JEALOUS. 1s.

Flower Painting in Water Colours. First and Second Series. With 20 Fac-simile Coloured Plates in each by F. E. HULME, F.L.S., F.S.A. With Instructions by the Artist. Interleaved. 5s. each.

Flower Painting, Elementary. With Eight Coloured Plates. 3s.

Flowers, and How to Paint Them. By MAUD NAFTEL. With Coloured Plates. 5s.

Forging of the Anchor, The. A Poem. By the late Sir SAMUEL FERGUSON, LL.D. With 20 Original Illustrations. Gilt edges, 5s.

Fossil Reptiles, A History of British. By Sir RICHARD OWEN, K.C.B., F.R.S., &c. With 268 Plates. In Four Vols., £12 12s.

Franco-German War, Cassell's History of the. Two Vols. With 500 Illustrations. 9s. each.

Fresh-Water Fishes of Europe, The. By Prof. H. G. SEELEY, F.R.S. *Cheap Edition.* 7s. 6d.

Garden Flowers, Familiar. By SHIRLEY HIBBERD. With Coloured Plates by F. E. HULME, F.L.S. Complete in Five Series. Cloth gilt, 12s. 6d. each.

Gardening, Cassell's Popular. Illustrated. Complete in 4 Vols., 5s. each.

Geometrical Drawing for Army Candidates. By H. T. LILLEY, M.A. 2s.

Geometry, Practical Solid. By Major ROSS. 2s.

Gladstone, Life of the Rt. Hon. W. E. By G. BARNETT SMITH. With Portrait. 3s.6d.

Gleanings from Popular Authors. Two Vols. With Original Illustrations. 4to, 9s. each. Two Vols. in One, 15s.

Gold to Grey, From. Being Poems and Pictures of Life and Nature. By MARY D. BRINE. Illustrated. 7s. 6d.

Great Bank Robbery, The. A Novel. By JULIAN HAWTHORNE. 3s. 6d.

Great Industries of Great Britain. With 400 Illustrations. 3 Vols., 7s. 6d. each.

Great Northern Railway, The Official Illustrated Guide to the. 1s.; cloth, 2s.

Great Western Railway, The Official Illustrated Guide to the. 1s.; cloth, 2s.

Great Painters of Christendom, The, from Cimabue to Wilkie. By JOHN FORBES-ROBERTSON. Illustrated throughout. *Popular Edition*, cloth gilt, 12s. 6d.

Gulliver's Travels. With 88 Engravings by MORTEN. *Cheap Edition.* Cloth, 3s. 6d.; cloth gilt, 5s.

Gum Boughs and Wattle Bloom. By DONALD MACDONALD. 5s.

Gun and its Development, The. By W. W. GREENER. Illustrated. 10s. 6d.

Health at School. By CLEMENT DUKES, M.D., B.S. 7s. 6d.

Health, The Book of. By Eminent Physicians and Surgeons. Cloth, 21s.; roxburgh, 25s.

Health, The Influence of Clothing on. By F. TREVES, F.R.C.S. 2s.

Heavens, The Story of the. By Sir ROBERT STAWELL BALL, LL.D., F.R.S., Royal Astronomer of Ireland. Coloured Plates and Wood Engravings. 31s. 6d.

Heroes of Britain in Peace and War. In Two Vols., with 300 Original Illustrations. 5s. each; or One Vol., library binding, 10s. 6d.

Holy Land and the Bible, The. By the Rev. CUNNINGHAM GEIKIE, D.D. With Map. Two Vols. 24s.

Homes, Our, and How to Make them Healthy. By Eminent Authorities. Illustrated. 15s.; roxburgh, 18s.

Horse-Keeper, The Practical. By GEORGE FLEMING, LL.D., F.R.C.V.S. Illustrated. Crown 8vo, cloth, 7s. 6d.

Horse, The Book of the. By SAMUEL SIDNEY. With 28 *fac-simile* Coloured Plates. Demy 4to, 35s.; half-morocco, £2 5s.

Horses, The Simple Ailments of. By W. F. Illustrated. 5s.

Household Guide, Cassell's. With Illustrations and Coloured Plates. *New and Revised Edition*, complete in Four Vols., 20s.

How Dante Climbed the Mountain. By ROSE EMILY SELFE. With Eight Full-page Engravings by GUSTAVE DORÉ. 2s.

How Women may Earn a Living. By MERCY GROGAN. 1s.

Imperial White Books. In Quarterly Vols. 10s. 6d. per annum, post free; to subscribers separately, 3s. 6d. each.

India, Cassell's History of. By the late JAMES GRANT. With 400 Illustrations. 15s.

India: the Land and the People. By Sir JAMES CAIRD, K.C.B. 10s. 6d.

In-door Amusements, Card Games, and Fireside Fun, Cassell's. 3s. 6d.

Industrial Remuneration Conference. The Report of. 2s. 6d.

Insect Variety: its Propagation and Distribution. By A. H. SWINTON. 7s. 6d.

Irish Parliament, The, What it Was, and What it Did. By J. G. SWIFT MCNEILL, M.A., M.P. 1s.

John Parmelee's Curse. By JULIAN HAWTHORNE. 2s. 6d.

Kennel Guide, Practical. By Dr. GORDON STABLES. Illustrated. *Cheap Edition.* 1s.

Kidnapped. By R. L. STEVENSON. *Illustrated Edition.* 5s.

King Solomon's Mines. By H. RIDER HAGGARD. *Illustrated Edition.* 5s.

Khiva, A Ride to. By Col. FRED BURNABY. 1s. 6d.

Ladies' Physician, The. By a London Physician. 6s.

Lady's World, The. An Illustrated Magazine of Fashion and Society. Yearly Vol. 18s.

Land Question, The. By Prof. J. ELLIOT, M.R.A.C. Including the Land Scare and Production of Cereals. 3s. 6d.

Landscape Painting in Oils, A Course of Lessons in. By A. F. GRACE. With Nine Reproductions in Colour. *Cheap Edition*, 25s.

Law, About Going to. By A. J. WILLIAMS, M.P. 2s. 6d.

Letts's Diaries and other Time-saving Publications are now published exclusively by CASSELL & COMPANY. (*A List sent post free on application.*)

Local Dual Standards. By JOHN HENRY NORMAN. Gold and Silver Standard Currencies. 1s.

London and North Western Railway, The Official Illustrated Guide to the. 1s.; cloth, 2s.

London and South Western Railway, The Official Illustrated Guide to the. 1s.; cloth, 2s.

London, Greater. By EDWARD WALFORD. Two Vols. With about 400 Illustrations. 9s. each. *Library Edition.* Two Vols. £1 the set.

London, Old and New. By WALTER THORNBURY and EDWARD WALFORD. Six Vols., each containing about 200 Illustrations and Maps. Cloth, 9s. each. *Library Edition.* Imitation roxburgh, £3.

Longfellow, H. W., Choice Poems by. Illustrated by his Son, ERNEST W. LONGFELLOW. 6s.

Longfellow's Poetical Works. *Fine-Art Edition.* Illustrated throughout with Original Engravings. Royal 4to, cloth gilt, £3 3s. *Popular Edition.* 16s.

Luther, Martin: the Man and his Work. By PETER BAYNE, LL.D. Two Vols., 24s.

Mechanics, The Practical Dictionary of. Containing 15,000 Drawings. Four Vols. 21s. each.

Medicine, Manuals for Students of. (*A List forwarded post free on application.*)

Midland Railway, The Official Illustrated Guide to the. *New and Revised Edition.* 1s.; cloth, 2s.

Modern Europe, A History of. By C. A. FYFFE, M.A. Vol. I. From 1792 to 1814. 12s. Vol. II. From 1814 to 1848. 12s.

Music, Illustrated History of. By EMIL NAUMANN. Edited by the Rev. Sir F. A. GORE OUSELEY, Bart. Illustrated. Two Vols. 31s. 6d.

National Library, Cassell's. In Weekly Volumes, each containing about 192 pages. Paper covers, 3d.; cloth, 6d. (*A List of the Volumes already published sent post free on application.*)

Natural History, Cassell's Concise. By E. PERCEVAL WRIGHT, M.A., M.D., F.L.S. With several Hundred Illustrations. 7s. 6d.; roxburgh, 10s. 6d.

Natural History, Cassell's New. Edited by Prof. P. MARTIN DUNCAN, M.B., F.R.S., F.G.S. With Contributions by Eminent Scientific Writers. Complete in Six Vols. With about 2,000 high-class Illustrations. Extra crown 4to, cloth, 9s. each.

Nature, Short Studies from. Illustrated. *Cheap Edition.* 2s. 6d.

Neutral Tint, A Course of Painting in. With Twenty-four Plates by R. P. LEITCH. With full Instructions to the Pupil. 5s.

Nimrod in the North; or, Hunting and Fishing Adventures in the Arctic Regions. By Lieut. SCHWATKA. Illustrated. 7s. 6d.

Nursing for the Home and for the Hospital, A Handbook of. By CATHERINE J. WOOD. *Cheap Edition.* 1s. 6d.; cloth, 2s.

Oil Painting, A Manual of. By Hon. JOHN COLLIER. Cloth, 2s. 6d.

On the Equator. By H. DE W. Illustrated with Photos. 3s. 6d.

Our Own Country. Six Vols. With 1,200 Illustrations. Cloth, 7s. 6d. each.

Outdoor Sports and Indoor Amusements, Cassell's Book of. With about 900 Illustrations. *New and Revised Edition.* Cloth, gilt edges, 9s.

Paris, Cassell's Illustrated Guide to. 1s.; cloth, 2s.

Parliaments, A Diary of Two. By H. W. LUCY. The Disraeli Parliament, 1874—1880. 12s. The Gladstone Parliament, 1881—1886. 12s.

Paxton's Flower Garden. By Sir JOSEPH PAXTON and Prof. LINDLEY. Revised by THOMAS BAINES, F.R.H.S. Three Vols. With 100 Coloured Plates. £1 1s. each.

Peoples of the World, The. By Dr. ROBERT BROWN. Complete in Six Volumes. With Illustrations. 7s. 6d. each.

Phantom City, The. By W. WESTALL. 5s.

Photography for Amateurs. By T. C. HEPWORTH. Illustrated, 1s.; or cloth, 1s. 6d.

Phrase and Fable, Dictionary of. By the Rev. Dr. BREWER. *Cheap Edition, Enlarged*, cloth, 3s. 6d.; or with leather back, 4s. 6d.

Picturesque America. Complete in Four Vols., with 48 Exquisite Steel Plates, and about 800 Original Wood Engravings. £2 2s. each.

Picturesque Canada. With about 600 Original Illustrations. Two Vols., £3 3s. each.

Picturesque Europe. Complete in Five Vols. Each containing 13 Exquisite Steel Plates, from Original Drawings, and nearly 200 Original Illustrations. £10 10s.; half-morocco, £15 15s.; morocco gilt, £26 5s. The POPULAR EDITION is now complete in Five Vols., 18s. each.

Pigeon Keeper, The Practical. By LEWIS WRIGHT. Illustrated. 3s. 6d.

Pigeons, The Book of. By ROBERT FULTON. Edited by LEWIS WRIGHT. With 50 Coloured Plates and numerous Wood Engravings. 31s. 6d.; half-morocco, £2 2s.

Pocket Guide to Europe (Cassell's). Size 5⅛ in. × 3¾ in. Leather, 6s.

Poems, Representative of Living Poets, American and English. Selected by the Poets themselves. 15s.

Poets, Cassell's Miniature Library of the:—

Burns. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Byron. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Hood. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Longfellow. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Milton. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Scott. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Sheridan and Goldsmith. 2 Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Wordsworth. Two Vols. Cloth, 1s. each; or cloth, gilt edges, 2s. 6d. the set.
Shakespeare. Twelve Vols., half cloth, in box, 12s.

Popular Library, Cassell's. A Series of New and Original Works. Cloth, 1s. each.

The Russian Empire.
The Religious Revolution in the Sixteenth Century.
English Journalism.
Our Colonial Empire.
The Young Man in the Battle of Life.
John Wesley.
The Story of the English Jacobins.
Domestic Folk Lore.
The Rev. Rowland Hill.
Boswell and Johnson.
History of the Free-Trade Movement in England.

Post Office of Fifty Years Ago, The. 1s.

Poultry Keeper, The Practical. By LEWIS WRIGHT. With Coloured Plates and Illustrations. 3s. 6d.

Poultry, The Book of. By LEWIS WRIGHT. *Popular Edition.* With Illustrations on Wood, 10s. 6d.

Poultry, The Illustrated Book of. By LEWIS WRIGHT. With Fifty Exquisite Coloured Plates, and numerous Wood Engravings. Cloth, 31s. 6d.; half-morocco, £2 2s.

Pre-Raphælites (The Italian) in the National Gallery. By COSMO MONKHOUSE. Illustrated. 1s.

Queen Victoria, The Life and Times of. By ROBERT WILSON. With numerous Illustrations, representing the Chief Events in the Life of the Queen, and Portraits of the Leading Celebrities of her Reign. VOLUME I., extra crown 4to, cloth gilt, 9s.

Queer Race, A. By W. WESTALL. 5s.

Rabbit-Keeper, The Practical. By CUNICULUS. Illustrated. 3s. 6d.

Red Library of English and American Classics, The. Stiff covers, 1s. each; cloth, 2s. each; or half-calf, marbled edges, 5s. each.

Ivanhoe.
Oliver Twist.
Selections from Hood's Works.
Longfellow's Prose Works.
Sense and Sensibility.
Lytton's Plays.
Tales, Poems, and Sketches (Bret Harte).
Martin Chuzzlewit. Two Vols.
The Prince of the House of David.
Sheridan's Plays.
Uncle Tom's Cabin.
Deerslayer.
Eugene Aram.
Jack Hinton, the Guardsman.
Rome and the Early Christians.
The Trials of Margaret Lyndsay.
Edgar Allan Poe. Prose and Poetry, Selections from.
Old Mortality.
The Hour and the Man.
Washington Irving's Sketch-Book.
Last Days of Palmyra.
Tales of the Borders.
Pride and Prejudice.
Last of the Mohicans.
Heart of Midlothian.
Last Days of Pompeii.
Yellowplush Papers.
Handy Andy.
Selected Plays.
American Humour.
Sketches by Boz.
Macaulay's Lays and Selected Essays.
Harry Lorrequer.
Old Curiosity Shop.
Rienzi.
The Talisman.
Pickwick (Two Vols.)
Scarlet Letter.

Royal River, The: The Thames, from Source to Sea. With Descriptive Text and a Series of beautiful Engravings. £2 2s.

Russia. By Sir DONALD MACKENZIE WALLACE, M.A. 5s.

Russo-Turkish War, Cassell's History of. With about 500 Illustrations. Two Vols., 9s. each; library binding, One Vol., 15s.

Saturday Journal, Cassell's. Half-Yearly Vols., in paper cover, 2s. 6d. each.

Science for All. Edited by Dr. ROBERT BROWN, M.A., F.L.S., &c. With 1,500 Illustrations. Five Vols., 9s. each.

Sea, The: Its Stirring Story of Adventure, Peril, and Heroism. By F. WHYMPER. With 400 Illustrations. Four Vols., 7s. 6d. each.

Sent Back by the Angels. And other Ballads of Home and Homely Life. By FREDERICK LANGBRIDGE, M.A. 4s. 6d.

Sepia Painting, A Course of. Two Vols., with Twelve Coloured Plates in each, and numerous Engravings. Each, 3s. Also in One Volume, 5s.

Shaftesbury, The Seventh Earl of, K.G., The Life and Work of. By EDWIN HODDER. With Portraits. Three Vols., 36s. *Popular Edition*, in One Vol., 7s. 6d.

Shakspere, The International. *Édition de luxe.*
"King Henry IV." Illustrated by Herr EDUARD GRÜTZNER. £3 10s.
"As You Like It." Illustrated by Mons. EMILE BAYARD. £3 10s.
"Romeo and Juliet." Illustrated by FRANK DICKSEE, A.R.A. £5 5s.

Shakspere, The Leopold. With 400 Illustrations, and an Introduction by F. J. FURNIVALL. Small 4to, cloth gilt, 7s. 6d.; half-morocco, 10s. 6d.; full morocco, £1 1s. *Cheap Edition*, 3s. 6d.

Shakspere, The Royal. With Exquisite Steel Plates and Wood Engravings. Three Vols. 15s. each.

Shakespeare, Cassell's Quarto Edition. Edited by CHARLES and MARY COWDEN CLARKE, and containing about 600 Illustrations by H. C. SELOUS. Complete in Three Vols., cloth gilt, £3 3s.—Also published in Three separate Volumes, in cloth, viz.:—The COMEDIES, 21s.; The HISTORICAL PLAYS, 18s. 6d.; The TRAGEDIES, 25s.

Shakespeare, Miniature. Illustrated. In Twelve Vols., in box, 12s.; or in Red Paste Grain (box to match), with spring catch, lettered in gold, 21s.

Shakespearean Scenes and Characters. Illustrative of Thirty Plays of Shakespeare. With Thirty Steel Plates and Ten Wood Engravings. The Text written by AUSTIN BRERETON. Royal 4to, 21s.

Sketching from Nature in Water Colours. By AARON PENLEY. With Illustrations in Chromo-Lithography. 15s.

Skin and Hair, The Management of the. By MALCOLM MORRIS, F.R.C.S. 2s.

Sonnets and Quatorzains. By CHRYS, M.A. (Oxon). 5s.

Sports and Pastimes, Cassell's Book of. *New and Revised Edition.* With about 800 Illustrations. Cloth, gilt edges, 7s. 6d.

Standards, Local Dual. By JOHN HENRY NORMAN. 1s.

Steam Engine, The Theory and Action of the: for Practical Men. By W. H. NORTHCOTT, C.E. 3s. 6d.

Stock Exchange Year-Book, The. By THOMAS SKINNER. 10s. 6d.

Stones of London, The. By E. F. FLOWER. 6d.

Sunlight and Shade. With numerous Exquisite Engravings. 7s. 6d.

Surgery, Memorials of the Craft of, in England. With an Introduction by Sir JAMES PAGET. 21s.

Thackeray, Character Sketches from. Six New and Original Drawings by FREDERICK BARNARD, reproduced in Photogravure. 21s.

Thorah, The Yoke of the. A Novel. By SIDNEY LUSKA. 3s. 6d.

Three and Sixpenny Library of Standard Tales, &c. All Illustrated and bound in cloth gilt. Crown 8vo. 3s. 6d. each.

Jane Austen and her Works.
Mission Life in Greece and Palestine.
The Romance of Trade.
The Three Homes.
School Girls.
Deepdale Vicarage.
In Duty Bound.
The Half Sisters.
Peggy Oglivie's Inheritance.
The Family Honour.
Esther West.
Working to Win.
Krilof and his Fables. By W. R. S. Ralston, M.A.
Fairy Tales. By Prof. Morley.

Tot Book for all Public Examinations. By W. S. THOMSON, M.A. 1s.

Tragedy of Brinkwater, The. A Novel. By MARTHA L. MOODEY. 3s. 6d.

Tragic Mystery, A. A Novel. By JULIAN HAWTHORNE. 3s. 6d.

Transformations of Insects, The. By Prof. P. MARTIN DUNCAN, M.B., F.R.S. With 240 Illustrations. Morocco, cloth sides, full gilt, 9s.

Treasure Island. By R. L. STEVENSON. Illustrated. 5s.

Treatment, The Year-Book of. A Critical Review for Practitioners of Medicine and Surgery. 5s.

Tree Painting in Water Colours. By W. H. J. BOOT. With Eighteen Coloured Plates, and valuable instructions by the Artist. 5s.

Trees, Familiar. First Series. By G. S. BOULGER, F.L.S., F.G.S. With Forty full-page Coloured Plates, from Original Paintings by W. H. J. BOOT. 12s. 6d.

Twenty Photogravures of Pictures in the Salon of 1885, by the leading French Artists. In Portfolio. Only a limited number of copies have been produced, terms for which can be obtained of all Booksellers.

"Unicode": The Universal Telegraphic Phrase Book. Pocket and Desk Editions. 2s. 6d. each.

United States, Cassell's History of the. By the late EDMUND OLLIER. With 600 Illustrations. Three Vols. 9s. each.

United States, The Youth's History of. By EDWARD S. ELLIS. Illustrated. Four Vols. 36s.

Universal History, Cassell's Illustrated. With nearly ONE THOUSAND ILLUSTRATIONS. Vol. I. Early and Greek History.—Vol. II. The Roman Period.—Vol. III. The Middle Ages.—Vol. IV. Modern History. 9s. each.

Vaccination Vindicated. An Answer to the leading Anti-Vaccinators. By JOHN C. MCVAIL, M.D., D.P.H. Camb. 5s.

Vicar of Wakefield and other Works by OLIVER GOLDSMITH. Illustrated. 3s. 6d. ; cloth, gilt edges, 5s.

Water-Colour Painting, A Course of. With Twenty-four Coloured Plates by R. P. LEITCH, and full Instructions to the Pupil. 5s.

What Girls Can Do. By PHYLLIS BROWNE. 2s. 6d.

Who is John Noman? A Novel. By CHARLES HENRY BECKETT. 3s. 6d.

Wild Birds, Familiar. First, Second, and Third Series. By W. SWAYSLAND. With 40 Coloured Plates in each. 12s. 6d. each.

Wild Flowers, Familiar. By F. E. HULME, F.L.S., F.S.A. Five Series. With 40 Coloured Plates in each. 12s. 6d. each.

Wise Woman, The. By GEORGE MACDONALD. 2s. 6d.

World of the Sea. Translated from the French of MOQUIN TANDON, by the Very Rev. H. MARTYN HART, M.A. Illustrated. Morocco, cloth sides, 9s.

World of Wit and Humour, The. With 400 Illustrations. Cloth, 7s. 6d. ; cloth gilt, gilt edges, 10s. 6d.

World of Wonders, The. Two Vols. With 400 Illustrations. 7s. 6d. each.

World's Lumber Room, The. By SELINA GAYE. Illustrated. 2s. 6d.

Yule Tide. CASSELL'S CHRISTMAS ANNUAL. 1s.

ILLUSTRATED MAGAZINES.

***The Quiver,** for Sunday and General Reading.* Monthly, 6d.
Cassell's Family Magazine. Monthly, 7d.
"Little Folks" Magazine. Monthly, 6d.
The Magazine of Art. Monthly, 1s.
The Woman's World. Monthly, 1s.
Cassell's Saturday Journal. Weekly, 1d. ; Monthly, 6d.

*** *Full particulars of* CASSELL & COMPANY'S **Monthly Serial Publications** *will be found in* CASSELL & COMPANY'S COMPLETE CATALOGUE.

Catalogues of CASSELL & COMPANY'S PUBLICATIONS, which may be had at all Booksellers', or will be sent post free on application to the Publishers :—

CASSELL'S COMPLETE CATALOGUE, containing particulars of One Thousand Volumes.

CASSELL'S CLASSIFIED CATALOGUE, in which their Works are arranged according to price, from *Threepence to Twenty-five Guineas.*

CASSELL'S EDUCATIONAL CATALOGUE, containing particulars of CASSELL & COMPANY'S Educational Works and Students' Manuals.

CASSELL & COMPANY, LIMITED, *Ludgate Hill, London.*

Bibles and Religious Works.

Bible, The Crown Illustrated. With about 1,000 Original Illustrations. With References, &c. 1,248 pages, crown 4to, cloth, 7s. 6d.

Bible, Cassell's Illustrated Family. With 900 Illustrations. Leather, gilt edges, £2 10s.; full morocco, £3 10s.

Bible Dictionary, Cassell's. With nearly 600 Illustrations. 7s. 6d.; roxburgh, 10s. 6d.

Bible Educator, The. Edited by the Very Rev. Dean PLUMPTRE, D.D. With Illustrations, Maps, &c. Four Vols., cloth, 6s. each.

Bible Work at Home and Abroad. Yearly Volume, 3s.

Bible Talks about Bible Pictures. Illustrated by GUSTAVE DORÉ and others. Large 4to, 5s.

Bunyan's Pilgrim's Progress (Cassell's Illustrated). 4to. 7s. 6d.

Bunyan's Pilgrim's Progress. With Illustrations. *Popular Edition*, 3s. 6d.

Child's Life of Christ, The. Complete in One Handsome Volume, with about 200 Original Illustrations. Demy 4to, gilt edges, 21s.

Child's Bible, The. With 200 Illustrations. Demy 4to, 830 pp. 145*th Thousand.* *Cheap Edition*, 7s. 6d.

Commentary, The New Testament, for English Readers. Edited by the Rt. Rev. C. J. ELLICOTT, D.D., Lord Bishop of Gloucester and Bristol. In Three Volumes, 21s. each.

Vol. I.—The Four Gospels.
Vol. II.—The Acts, Romans, Corinthians, Galatians.
Vol. III.—The remaining Books of the New Testament.

Commentary, The Old Testament, for English Readers. Edited by the Rt. Rev. C. J. ELLICOTT, D.D., Lord Bishop of Gloucester and Bristol. Complete in 5 Vols., 21s. each.

Vol. I.—Genesis to Numbers.
Vol. II.—Deuteronomy to Samuel II.
Vol. III.—Kings I. to Esther.
Vol. IV.—Job to Isaiah.
Vol. V.—Jeremiah to Malachi.

Dictionary of Religion, The. An Encyclopædia of Christian and other Religious Doctrines, Denominations, Sects, Heresies, Ecclesiastical Terms, History, Biography, &c. &c. By the Rev. WILLIAM BENHAM, B.D. Cloth, 21s.; roxburgh, 25s.

Doré Bible. With 230 Illustrations by GUSTAVE DORÉ. *Original Edition.* Two Vols., cloth, £8; best morocco, gilt edges, £15.

Early Days of Christianity, The. By the Ven. Archdeacon FARRAR, D.D., F.R.S.

LIBRARY EDITION. Two Vols., 24s.; morocco, £2 2s.
POPULAR EDITION. Complete in One Volume, cloth, 6s.; cloth, gilt edges, 7s. 6d.; Persian morocco, 10s. 6d.; tree-calf, 15s.

Family Prayer-Book, The. Edited by Rev. Canon GARBETT, M.A., and Rev. S. MARTIN. Extra crown 4to, cloth, 5s.; morocco, 18s.

Geikie, Cunningham, D.D., Works by:—

The Holy Land and the Bible. A Book of Scripture Illustrations gathered in Palestine With Map. Two Vols. 24s.
Hours with the Bible. Six Vols. 6s. each.
Entering on Life. 3s. 6d.
The Precious Promises. 2s. 6d.
The English Reformation. 5s.
Old Testament Characters. 6s.
The Life and Words of Christ. Illustrated. Two Vols., cloth, 30s. *Library Edition*, Two Vols., cloth, 30s. *Students' Edition*, Two Vols., 16s. *Cheap Edition*, in One Vol. 7s. 6d.

Glories of the Man of Sorrows, The. Sermons preached at St. James's, Piccadilly. By the Rev. H. G. BONAVIA HUNT, Mus.D., F.R.S.Edin. 2s. 6d.

Gospel of Grace, The. By a LINDESIE. Cloth, 2s. 6d.

Helps to Belief. A Series of Helpful Manuals on the Religious Difficulties of the Day. Edited by the Rev. TEIGNMOUTH SHORE, M.A., Chaplain in Ordinary to the Queen. Cloth, 1s. each.

CREATION. By the Lord Bishop of Carlisle.
MIRACLES. By the Rev. Brownlow Maitland, M.A.
PRAYER. By the Rev. T. Teignmouth Shore, M.A.
THE MORALITY OF THE OLD TESTAMENT. By the Rev. Newman Smyth, D.D.
THE DIVINITY OF OUR LORD. By the Lord Bishop of Derry.
THE ATONEMENT. By the Lord Bishop of Peterborough.

"Heart Chords." A Series of Works by Eminent Divines. Bound in cloth, red edges, 1s. each.

My Father. By the Right Rev. Ashton Oxenden, late Bishop of Montreal.
My Bible. By the Rt. Rev. W. Boyd Carpenter, Bishop of Ripon.
My Work for God. By the Right Rev. Bishop Cotterill.
My Object in Life. By the Ven. Archdeacon Farrar, D.D.
My Aspirations. By the Rev. G. Matheson, D.D.
My Emotional Life. By the Rev. Preb. Chadwick, D.D.
My Body. By the Rev. Prof. W. G. Blaikie, D.D.
My Soul. By the Rev. P. B. Power, M.A.
My Growth in Divine Life. By the Rev. Prebendary Reynolds, M.A.
My Hereafter. By the Very Rev. Dean Bickersteth.
My Walk with God. By the Very Rev. Dean Montgomery.
My Aids to the Divine Life. By the Very Rev. Dean Boyle.
My Sources of Strength. By the Rev. E. E. Jenkins, M.A., Secretary of the Wesleyan Missionary Society.

Holy Land and the Bible, The. A Book of Scripture Illustrations gathered in Palestine. By the Rev. CUNNINGHAM GEIKIE, D.D. Two Vols., demy 8vo, 1,120 pages, with Map. Price 24s.

Life of Christ, The. By the Ven. Archdeacon FARRAR, D.D., F.R.S., Chaplain in Ordinary to the Queen.

ILLUSTRATED EDITION, with about 300 Original Illustrations. Extra crown 4to, cloth, gilt edges, 21s. ; morocco antique, 42s.

LIBRARY EDITION. Two Vols. Cloth, 24s. ; morocco, 42s.

POPULAR EDITION, in One Vol. 8vo, cloth, 6s. ; cloth, gilt edges, 7s. 6d. ; Persian morocco, gilt edges, 10s. 6d. ; tree-calf, 15s.

Luther, Martin: his Life and Times. By PETER BAYNE, LL.D. Two Vols., demy 8vo, 1,040 pages, cloth, 24s.

Marriage Ring, The. By WILLIAM LANDELS, D.D. Bound in white leatherette, gilt edges, in box, 6s. ; French morocco, 8s. 6d.

Moses and Geology; or, The Harmony of the Bible with Science. By the Rev. SAMUEL KINNS, Ph.D., F.R.A.S. Illustrated. *Cheap Edition.* 6s.

Protestantism, The History of. By the Rev. J. A. WYLIE, LL.D. Containing upwards of 600 Original Illustrations. Three Vols., 27s. ; Library Edition, 30s.

Quiver Yearly Volume, The. With 250 high-class Illustrations. 7s. 6d. Also Monthly, 6d.

St. George for England; and other Sermons preached to Children. *Fifth Edition.* By the Rev. T. TEIGNMOUTH SHORE, M.A. 5s.

St. Paul, The Life and Work of. By the Ven. Archdeacon FARRAR, D.D., F.R.S., Chaplain in Ordinary to the Queen.

LIBRARY EDITION. Two Vols., cloth, 24s. ; calf, 42s.

ILLUSTRATED EDITION, complete in One Volume, with about 300 Illustrations, £1 1s. ; morocco, £2 2s.

POPULAR EDITION. One Volume, 8vo, cloth, 6s. ; cloth, gilt edges, 7s. 6d. ; Persian morocco, 10s. 6d. ; tree-calf, 15s.

Secular Life, The Gospel of the. Sermons preached at Oxford. By the Hon. W. H. FREMANTLE, Canon of Canterbury. 5s.

Shall We Know One Another? By the Rt. Rev. J. C. RYLE, D.D., Bishop of Liverpool. *New and Enlarged Edition.* Cloth limp, 1s.

Twilight of Life, The. Words of Counsel and Comfort for the Aged. By JOHN ELLERTON, M.A. 1s. 6d.

Voice of Time, The. By JOHN STROUD. Cloth gilt, 1s.

Educational Works and Students' Manuals.

Alphabet, Cassell's Pictorial. Size, 35 inches by 42½ inches. Mounted on Linen, with rollers. 3s. 6d.

Algebra, The Elements of. By Prof. WALLACE, M.A. 1s.

Arithmetics, The Modern School. By GEORGE RICKS, B.Sc. Lond. With Test Cards. (*List on application.*)

Book-Keeping. By THEODORE JONES. FOR SCHOOLS, 2s.; or cloth, 3s. FOR THE MILLION, 2s.; or cloth, 3s. Books for Jones's System, Ruled Sets of, 2s.

Chemistry, The Public School. By J. H. ANDERSON, M.A. 2s. 6d.

Commentary, The New Testament. Edited by Bishop ELLICOTT. Handy Volume Edition. Suitable for School and general use.

St. Matthew. 3s. 6d.
St. Mark. 3s.
St. Luke. 3s. 6d.
St. John. 3s. 6d.
The Acts of the Apostles. 3s. 6d.
Romans. 2s. 6d.
Corinthians I. and II. 3s.
Galatians, Ephesians, and Philippians. 3s.
Colossians, Thessalonians, and Timothy. 3s.
Titus, Philemon, Hebrews, and James. 3s.
Peter, Jude, and John. 3s.
The Revelation. 3s.
An Introduction to the New Testament. 2s. 6d.

Commentary, Old Testament. Edited by Bishop ELLICOTT. Handy Volume Edition. Suitable for School and general use.

Genesis. 3s. 6d.
Exodus. 3s.
Leviticus. 3s.
Numbers. 2s. 6d.
Deuteronomy. 2s. 6d.

Copy-Books, Cassell's Graduated. Complete in 18 Books. 2d. each.

Copy-Books, The Modern School. Complete in 12 Books. 2d. each.

Drawing Copies, Cassell's "New Standard."

Books A to F, for Standards I. to IV. .. .. 2d. each.
,, G, H, K, L, M, N, O, for Standards V. to VII. .. .. 3d. each.
,, P, for Standard VII. .. .. 4d. each.

Drawing Copies, Cassell's Modern School Freehand. First Grade, 1s.; Second Grade 2s.

Electricity, Practical. By Prof. W. E. AYRTON. 7s. 6d.

Energy and Motion: A Text-Book of Elementary Mechanics. By WILLIAM PAICE, M.A. Illustrated. 1s. 6d.

English Literature, A First Sketch of, from the Earliest Period to the Present Time. By Prof. HENRY MORLEY. 7s. 6d.

Euclid, Cassell's. Edited by Prof. WALLACE, M.A. 1s.

Euclid, The First Four Books of. In paper, 6d.; cloth, 9d.

French Reader, Cassell's Public School. By GUILLAUME S. CONRAD. 2s. 6d.

French, Cassell's Lessons in. *New and Revised Edition.* Parts I. and II., each 2s. 6d.; complete, 4s. 6d. Key, 1s. 6d.

French-English and English-French Dictionary. *Entirely New and Enlarged Edition.* 1,150 pages, 8vo, cloth, 3s. 6d.

Galbraith and Haughton's Scientific Manuals. By the Rev. Prof. GALBRAITH, M.A., and the Rev. Prof. HAUGHTON, M.D., D.C.L.

Arithmetic. 3s. 6d.
Plane Trigonometry. 2s. 6d.
Euclid. Books I., II., III. 2s. 6d. Books IV., V., VI. 2s. 6d.
Mathematical Tables. 3s. 6d.
Mechanics. 3s. 6d.
Natural Philosophy. 3s. 6d.
Optics. 2s. 6d.
Hydrostatics. 3s. 6d.
Astronomy. 5s.
Steam Engine. 3s. 6d.
Algebra. Part I., cloth, 2s. 6d. Complete, 7s. 6d.
Tides and Tidal Currents, with Tidal Cards, 3s.

Geometry, Practical Solid. By Major ROSS, R.E. 2s.

German of To-Day. By Dr. HEINEMANN. 1s. 6d.

German-English and English-German Dictionary. 3s. 6d.

German Reading, First Lessons in. By A. JAGST. Illustrated. 1s.

Handbook of New Code of Regulations. By JOHN F. MOSS. 1s.; cloth, 2s.

Historical Course for Schools, Cassell's. Illustrated throughout. I.—Stories from English History, 1s. II.—The Simple Outline of English History, 1s. 3d. III.—The Class History of England, 2s. 6d.

Latin-English Dictionary, Cassell's. Thoroughly revised and corrected, and in part re-written by J. R. V. MARCHANT, M.A. 3s. 6d.

Latin-English and English-Latin Dictionary. By J. R. BEARD, D.D., and C. BEARD, B.A. Crown 8vo, 914 pp., 3s. 6d.

Lay Texts for the Young, in English and French. By Mrs. RICHARD STRACHEY. 2s. 6d.

Little Folks' History of England. By ISA CRAIG-KNOX. With 30 Illustrations. 1s. 6d.

Making of the Home, The: A Book of Domestic Economy for School and Home Use. By Mrs. SAMUEL A. BARNETT. 1s. 6d.

Marlborough Books.

Arithmetic Examples. 3s.
Arithmetic Rules. 1s. 6d.
French Exercises. 3s. 6d.
French Grammar. 2s. 6d.
German Grammar. 3s. 6d.

Music, An Elementary Manual of. By HENRY LESLIE. 1s.

Popular Educator, Cassell's. *New and Thoroughly Revised Edition.* Illustrated throughout. Complete in Six Vols., 5s. each; or in Three Vols., half calf, 42s. the set.

Readers, Cassell's Readable. Carefully graduated, extremely interesting, and illustrated throughout. (*List on application.*)

Readers, Cassell's Historical. Illustrated throughout, printed on superior paper, and strongly bound in cloth. (*List on application.*)

Readers for Infant Schools, Coloured. Three Books. Each containing 48 pages, including 8 pages in colours. 4d. each.

Reader, The Citizen. By H. O. ARNOLD-FORSTER. With Preface by the late Rt. Hon. W. E. FORSTER, M.P. 1s. 6d.

Readers, The Modern Geographical. Illustrated throughout, and strongly bound in cloth. (*List on application.*)

Readers, The Modern School. Illustrated. (*List on application.*)

Reading and Spelling Book, Cassell's Illustrated. 1s.

School Bank Manual, A. By AGNES LAMBERT. 6d.

Shakspere Reading Book, The. By H. COURTHOPE BOWEN, M.A. Illustrated. 3s. 6d. Also issued in Three Books, 1s. each.

Shakspere's Plays for School Use. 5 Books. Illustrated. 6d. each.

Spelling, A Complete Manual of. By J. D. MORELL, LL.D. 1s.

Technical Manuals, Cassell's. Illustrated throughout:—

Handrailing and Staircasing. 3s. 6d.
Bricklayers, Drawing for. 3s.
Building Construction. 2s.
Cabinet-Makers, Drawing for. 3s.
Carpenters & Joiners, Drawing for. 3s. 6d.
Gothic Stonework. 3s.
Linear Drawing & Practical Geometry. 2s.
Linear Drawing and Projection. The Two Vols. in One, 3s. 6d.
Metal-Plate Workers, Drawing for. 3s.
Machinists & Engineers, Drawing for. 4s. 6d.
Model Drawing. 3s.
Orthographical and Isometrical Projection. 2s.
Practical Perspective. 3s.
Stonemasons, Drawing for. 3s.
Applied Mechanics. By Sir R. S. Ball, LL.D. 2s.
Systematic Drawing and Shading. By Charles Ryan. 2s.

Technical Educator, Cassell's. Illustrated throughout. Popular Edition. Four Vols., 5s. each.

Technology, Manuals of. Edited by Prof. AYRTON, F.R.S., and RICHARD WORMELL, D.Sc., M.A. Illustrated throughout.

The Dyeing of Textile Fabrics. By Prof. Hummel. 5s.
Watch and Clock Making. By D. Glasgow. 4s. 6d.
Steel and Iron. By W. H. Greenwood, F.C.S. M.I.C.E., &c. 5s.
Spinning Woollen and Worsted. By W. S. Bright McLaren. 4s. 6d.
Design in Textile Fabrics. By T. R. Ashenhurst. 4s. 6d.
Practical Mechanics. By Prof. Perry, M.E. 3s. 6d.
Cutting Tools Worked by Hand and Machine. By Prof. Smith. 3s. 6d.

A Prospectus on application.

Test Cards, Cassell's Combination. In sets, 1s. each.

Modern School Test Cards, Cassell's. In sets, 1s. each.

A Copy of Cassell and Company's Complete Catalogue will be forwarded post free on application.

Books for Young People.

"Little Folks" Half-Yearly Volume. With 200 Illustrations, with Pictures in Colour. Boards, 3s. 6d.; or cloth gilt, 5s.

Bo-Peep. A Book for the Little Ones. With Original Stories and Verses. Illustrated throughout. Yearly Volume. Boards, 2s. 6d.; cloth gilt, 3s. 6d.

Legends for Lionel. New Picture Book by WALTER CRANE. 5s.

The New Children's Album. Fcap. 4to, 320 pages. Illustrated throughout. 3s. 6d.

The Tales of the Sixty Mandarins. By P. V. RAMASWAMI RAJU. With an Introduction by Prof. HENRY MORLEY. Illustrated. 5s.

Sunday School Reward Books. By Popular Authors. With Four Original Illustrations in each. Cloth gilt, 1s. 6d. each.

Seeking a City.
Rhoda's Reward; or, "If Wishes were Horses."
Jack Marston's Anchor.
Frank's Life-Battle; or, The Three Friends.
Rags and Rainbows: a Story of Thanksgiving.
Uncle William's Charge; or, The Broken Trust.
Pretty Pink's Purpose; or, The Little Street Merchants.

"Golden Mottoes" Series, The. Each Book containing 208 pages, with Four full-page Original Illustrations. Crown 8vo, cloth gilt, 2s. each.

"Nil Desperandum." By the Rev. F. Langbridge, M.A.
"Bear and Forbear." By Sarah Pitt.
"Foremost if I Can." By Helen Atteridge.
"Honour is my Guide." By Jeanie Hering (Mrs. Adams-Acton).
"Aim at a Sure End." By Emily Searchfield.
"He Conquers who Endures." By the Author of "May Cunningham's Trial," &c.

The "Proverbs" Series. Consisting of a New and Original Series of Stories by Popular Authors, founded on and illustrating well-known Proverbs. With Four Illustrations in each Book, printed on a tint. Crown 8vo, 160 pages, cloth, 1s. 6d. each.

Fritters; or, "It's a Long Lane that has no Turning." By Sarah Pitt.
Trixy; or, "Those who Live in Glass Houses shouldn't throw Stones." By Maggie Symington.
The Two Hardcastles; or, "A Friend in Need is a Friend Indeed." By Madeline Bonavia Hunt.
Major Monk's Motto; or, "Look Before you Leap." By the Rev. F. Langbridge.
Tim Thomson's Trial; or, "All is not Gold that Glitters." By George Weatherly.
Ursula's Stumbling-Block; or, "Pride comes before a Fall." By Julia Goddard.
Ruth's Life-Work; or, "No Pains, no Gains." By the Rev. Joseph Johnson.

The "Cross and Crown" Series. Consisting of Stories founded on ncidents which occurred during Religious Persecutions of Past Days. With Illustrations in each Book. 2s. 6d. each.

By Fire and Sword: a Story of the Huguenots. By Thomas Archer.
Adam Hepburn's Vow: a Tale of Kirk and Covenant. By Annie S. Swan.
No. XIII; or, The Story of the Lost Vestal. A Tale of Early Christian Days. By Emma Marshall.
Strong to Suffer: A Story of the Jews. By E. Wynne.
Heroes of the Indian Empire; or, Stories of Valour and Victory. By Ernest Foster.
In Letters of Flame: A Story of the Waldenses. By C. L. Matéaux.
Through Trial to Triumph. By Madeline B. Hunt.

The World's Workers. A Series of New and Original Volumes by Popular Authors. With Portraits printed on a tint as Frontispiece. 1s. each.

The Earl of Shaftesbury. By Henry Frith.
Sarah Robinson, Agnes Weston, and Mrs. Meredith. By E. M. Tomkinson.
Thomas A. Edison and Samuel F. B. Morse. By Dr. Denslow and J. Marsh Parker.
Mrs. Somerville and Mary Carpenter. By Phyllis Browne.
General Gordon. By the Rev S. A Swaine.
Charles Dickens. By his Eldest Daughter.
Sir Titus Salt and George Moore. By J. Burnley.
Florence Nightingale, Catherine Marsh, Frances Ridley Havergal, Mrs. Ranyard ("L. N. R.") By Lizzie Alldridge.
Dr. Guthrie, Father Mathew, Elihu Burritt, Joseph Livesey. By the Rev. J. W. Kirton.
Sir Henry Havelock and Colin Campbell, Lord Clyde. By E. C. Phillips.
Abraham Lincoln. By Ernest Foster.
David Livingstone. By Robert Smiles.
George Muller and Andrew Reed. By E. R. Pitman.
Richard Cobden. By R. Gowing.
Benjamin Franklin. By E. M. Tomkinson.
Handel. By Eliza Clarke.
Turner the Artist. By the Rev. S. A. Swaine.
George and Robert Stephenson. By C. L. Matéaux.

Five Shilling Books for Young People. With Original Illustrations. Cloth gilt, 5s. each.

The Palace Beautiful. By L. T. Meade.
"Follow my Leader;" or, the Boys of Templeton. By Talbot Baines Reed.
For Fortune and Glory: a Story of the Soudan War. By Lewis Hough.
Under Bayard's Banner. By Henry Frith.
The Champion of Odin; or, Viking Life in the Days of Old. By J. Fred. Hodgetts.
Bound by a Spell; or, the Hunted Witch of the Forest. By the Hon. Mrs. Greene.
The King's Command. A Story for Girls. By Maggie Symington.
The Romance of Invention. By Jas. Burnley.

Three and Sixpenny Books for Young People. With Original Illustrations. Cloth gilt, 3s. 6d. each.

The Cost of a Mistake. By Sarah Pitt.
A World of Girls: A Story of a School. By L. T. Meade.
On Board the "Esmeralda;" or, Martin Leigh's Log. By John C. Hutcheson.
Lost among White Africans: A Boy's Adventures on the Upper Congo. By David Ker.
In Quest of Gold; or, Under the Whanga Falls. By Alfred St. Johnston.
For Queen and King; or, the Loyal 'Prentice. By Henry Frith.
Perils Afloat and Brigands Ashore. By Alfred Elwes.
Freedom's Sword: A Story of the Days of Wallace and Bruce. By Annie S. Swan.

The "Boy Pioneer" Series. By EDWARD S. ELLIS. With Four Full-page Illustrations in each Book. Crown 8vo, cloth, 2s. 6d. each.

Ned in the Woods. A Tale of Early Days in the West.
Ned on the River. A Tale of Indian River Warfare.
Ned in the Block House. A Story of Pioneer Life in Kentucky.

The "Log Cabin" Series. By EDWARD S. ELLIS. With Four Full-page Illustrations in each. Crown 8vo, cloth, 2s. 6d. each.

The Lost Trail.
Camp-Fire and Wigwam.
Footprints in the Forest.

The "Great River" Series. (Uniform with the "Log Cabin" Series.) By EDWARD S. ELLIS. Illustrated. Crown 8vo, cloth, bevelled boards, 2s. 6d. each.

Down the Mississippi.
Lost in the Wilds.
Up the Tapajos: or, Adventures in Brazil.

The "Chimes" Series. Each containing 64 pages, with Illustrations on every page, and handsomely bound in cloth, 1s.

Bible Chimes. Contains Bible Verses for Every Day in the Month.
Daily Chimes. Verses from the Poets for Every Day in the Month.
Holy Chimes. Verses for Every Sunday in the Year.
Old World Chimes. Verses from old writers for Every Day in the Month.

Sixpenny Story Books. All Illustrated, and containing Interesting Stories by well-known Writers.

Little Content.
The Smuggler's Cave.
Little Lizzie.
The Boot on the Wrong Foot.
Luke Barnicott.
Little Bird.
Little Pickles.
The Elchester College Boys.
My First Cruise.
The Little Peacemaker.
The Delft Jug.
Helpful Nellie; and other Stories.

Illustrated Books for the Little Ones. Containing interesting Stories. All Illustrated. 1s. each.

Indoors and Out.
Some Farm Friends.
Those Golden Sands.
Little Mothers and their Children.
Our Pretty Pets.
Our Schoolday Hours.
Creatures Tame.
Creatures Wild.
Up and Down the Garden.
All Sorts of Adventures.
Our Sunday Stories.
Our Holiday Hours.

Shilling Story Books. All Illustrated, and containing Interesting Stories.

Thorns and Tangles.
The Cuckoo in the Robin's Nest.
John's Mistake.
Diamonds in the Sand.
Surly Bob.
The History of Five Little Pitchers.
The Giant's Cradle.
Shag and Doll.
Aunt Lucia's Locket.
The Magic Mirror.
The Cost of Revenge.
Clever Frank.
Among the Redskins.
The Ferryman of Brill.
Harry Maxwell.
A Banished Monarch.

Cassell's Children's Treasuries. Each Volume contains Stories or Poetry, and is profusely Illustrated. Cloth, 1s. each.

Cock Robin, and other Nursery Rhymes.
The Queen of Hearts.
Old Mother Hubbard.
Tuneful Lays for Merry Days.
Cheerful Songs for Young Folks.
Pretty Poems for Young People.
The Children's Joy.
Pretty Pictures and Pleasant Stories.
Our Picture Book.
Tales for the Little Ones.
My Sunday Book of Pictures.
Sunday Garland of Pictures and Stories.
Sunday Readings for Little Folks.

"Little Folks" Painting Books. With Text, and Outline Illustrations for Water-Colour Painting. 1s. each.

Fruits and Blossoms for "Little Folks" to Paint.
The "Little Folks" Illuminating Book. Pictures toPaint.
The "Little Folks" Proverb Painting Book.

Eighteenpenny Story Books. All Illustrated throughout.

Three Wee Ulster Lassies.
Little Queen Mab.
Up the Ladder.
Dick's Hero; and other Stories.
The Chip Boy.
Raggles, Baggles, and the Emperor.
Roses from Thorns.
Faith's Father.
By Land and Sea.
The Young Berringtons.
Jeff and Leff.
Tom Morris's Error.
Worth more than Gold.
"Through Flood—Through Fire;" and other Stories.
The Girl with the Golden Locks.
Stories of the Olden Time.

The "Cosy Corner" Series. Story Books for Children. Each containing nearly One Hundred Pictures. 1s. 6d. each.

See-Saw Stories.
Little Chimes for All Times.
Wee Willie Winkie.
Pet's Posy of Pictures and Stories.
Dot's Story Book.
Story Flowers for Rainy Hours.
Little Talks with Little People.
Chats for Small Chatterers.

The "World in Pictures" Series. Illustrated throughout. 2s. 6d. each.

A Ramble Round France.
All the Russias.
Chats about Germany.
The Land of the Pyramids (Egypt).
Peeps into China.
The Eastern Wonderland (Japan).
Glimpses of South America.
Round Africa.
The Land of Temples (India).
The Isles of the Pacific.

Two-Shilling Story Books. All Illustrated.

Stories of the Tower.
Mr. Burke's Nieces.
May Cunningham's Trial.
The Top of the Ladder: How to Reach it.
Little Flotsam.
Madge and her Friends.
The Children of the Court.
A Moonbeam Tangle.
Maid Marjory.
The Four Cats of the Tippertons.
Marion's Two Homes.
Little Folks' Sunday Book.
The Magic Flower Pot.
Two Fourpenny Bits.
Poor Nelly.
Tom Heriot.
Aunt Tabitha's Waifs.
In Mischief Again.
Through Peril to Fortune.
Peggy, and other Tales.

Half-Crown Books.

Little Hinges.
Margaret's Enemy.
Pen's Perplexities.
Notable Shipwrecks.
Golden Days.
Wonders of Common Things.
Little Empress Joan.
At the South Pole.
Truth will Out.
Pictures of School Life and Boyhood.
The Young Man in the Battle of Life. By the Rev. Dr. Landels.
The True Glory of Woman. By the Rev. Dr. Landels.
The Wise Woman. By George Macdonald.
Soldier and Patriot (George Washington).

Picture Teaching Series. Each book Illustrated throughout. Fcap. 4to, cloth gilt, coloured edges, 2s. 6d. each.

Through Picture-Land.
Picture Teaching for Young and Old.
Picture Natural History.
Scraps of Knowledge for the Little Ones.
Great Lessons from Little Things.
Woodland Romances.
Stories of Girlhood.
Frisk and his Flock.
Pussy Tip-Toes' Family.
The Boy Joiner and Model Maker.
The Children of Holy Scripture.

Library of Wonders. Illustrated Gift-books for Boys. 2s. 6d. each.

Wonders of Architecture.
Wonders of Acoustics.
Wonders of Water.
Wonderful Escapes.
Bodily Strength and Skill.
Wonderful Balloon Ascents.

The "Home Chat" Series. All Illustrated throughout. Fcap. 4to. Boards, 3s. 6d. each; cloth, gilt edges, 5s. each.

Home Chat.
Peeps Abroad or Folks at Home.
Around and About Old England.
Half-Hours with Early Explorers.
Paws and Claws.

Books for the Little Ones. Fully Illustrated.

A Dozen and One; or, The Boys and Girls of Polly's Ring. By Mary D. Brine. Full of Illustrations. 5s.
The Merry-go-Round. Poems for Children. Illustrated throughout. 5s.
Rhymes for the Young Folk. By William Allingham. Beautifully Illustrated. 3s. 6d.
The Little Doings of some Little Folks. By Chatty Cheerful. Illustrated. 5s.
The Sunday Scrap Book. With One Thousand Scripture Pictures. Boards, 5s.; cloth, 7s. 6d.
Daisy Dimple's Scrap Book. Containing about 1,000 Pictures. Boards, 5s.; cloth gilt, 7s. 6d.
The History Scrap Book. With nearly 1,000 Engravings. 5s.; cloth, 7s. 6d.
The Little Folks' Out and About Book. By Chatty Cheerful. Illustrated. 5s.
Myself and my Friends. By Olive Patch. With numerous Illustrations. Crown 4to. 5s.
A Parcel of Children. By Olive Patch. With numerous Illustrations. Crown 4to. 5s.
Little Folks' Picture Album. With 168 Large Pictures. 5s.
Little Folks' Picture Gallery. With 150 Illustrations. 5s.
The Old Fairy Tales. With Original Illustrations. Boards, 1s.; cloth, 1s. 6d.
My Diary. With Twelve Coloured Plates and 366 Woodcuts. 1s.
Happy Little People. By Olive Patch. With Illustrations. 5s.
"Little Folks" Album of Music, The. Illustrated. 3s. 6d.
Cheerful Clatter. Nearly One Hundred Full-page Pictures. 3s. 6d.
Twilight Fancies. Full of charming Pictures. Boards, 2s. 6d.
Happy Go Lucky. 2s.
Daisy Blue Eyes. 2s.
Good Times. 1s. 6d.
Jolly Little Stories. 1s. 6d.
Our Little Friends. 1s. 6d.
Daisy Dell's Stories. 1s. 6d.
Little Toddlers. 1s. 6d.
Wee Little Rhymes. 1s. 6d.
Little One's Welcome. 1s. 6d.
Little Gossips. 1s. 6d.
Ding Dong Bell. 1s. 6d.
The Story of Robin Hood. With Coloured Illustrations. 2s. 6d.
The Pilgrim's Progress. With Coloured Illustrations. 2s. 6d.

Books for Boys.

Dead Man's Rock. A Romance. By Q. 5s.
A Queer Race. By W. Westall. 5s.
Captain Trafalgar. A Story of the Mexican Gulf. By W. Westall. Illustrated. 5s.
Kidnapped. By R. L. Stevenson. Illustrated. 5s.
King Solomon's Mines. By H. Rider Haggard. 5s.
Treasure Island. By R. L. Stevenson. With Full-page Illustrations. 5s.
The Phantom City. By W. Westall. 5s.
Ships, Sailors, and the Sea. By R. J. Cornewall-Jones. Illustrated. 5s.
Famous Sailors of Former Times, History of the Sea Fathers. By Clements Markham. Illustrated. 2s. 6d.
Modern Explorers. By Thomas Frost. Illustrated. 5s.
Wild Adventures in Wild Places. By Dr. Gordon Stables, M.D., R.N. Illustrated. 5s.
Jungle, Peak, and Plain. By Dr. Gordon Stables, R.N. Illustrated. 5s.
O'er Many Lands, on Many Seas. By Gordon Stables, R.N. Illustrated. 5s.
At the South Pole. By W. H. G. Kingston. *New Edition.* Illustrated. 2s. 6d.

Books for all Children.

Cassell's Robinson Crusoe. With 100 striking Illustrations. Cloth, 3s. 6d.; gilt edges, 5s.
Cassell's Swiss Family Robinson. Illustrated. Cloth, 3s. 6d.; gilt edges, 5s.
Sunny Spain: Its People and Places, with Glimpses of its History. By Olive Patch. Illustrated. 5s.
Rambles Round London Town. By C. L. Matéaux. Illustrated. 5s.
Favorite Album of Fun and Fancy, The. Illustrated. 3s. 6d.
Familiar Friends. By Olive Patch. Illustrated. Cloth gilt, 5s.
Odd Folks at Home. By C. L. Matéaux. With nearly 150 Illustrations. 5s.
Field Friends and Forest Foes. By Olive Patch. Profusely Illustrated. 5s.
Silver Wings and Golden Scales. Illustrated. 5s.
Little Folks' Holiday Album. Illustrated. 3s. 6d.
Tiny Houses and their Builders. Illustrated. 5s.
Children of all Nations. Their Homes, their Schools, their Playgrounds. Illustrated. 5s.
Tim Trumble's "Little Mother." By C. L. Matéaux. Illustrated. 5s.

CASSELL & COMPANY, Limited, Ludgate Hill, London, Paris, New York & Melbourne.

Thorne Thorne in his
Rubron lecture on College of Physicians
found out by Statistics that
the incidence of Diphtheria was
~~Grate~~ greater actually & relatively
~~to~~ the population than it was
in non Paralytic Bulbar cases