Germany.—In Germany every child must be vaccinated in the year following the year of its birth. All scholars in public and private schools must be revaccinated in the twelfth year, if they have not already had the smallpox. When the vaccination and revaccination are not successful, they should be repeated in the two following years.

Only attested physicians may vaccinate. The special control of vaccination is left to the separate States. The public vaccinations are free to all. The cost is paid from the public treasury. Humanized lymph, retrovaccine lymph, and animal lymph may be employed indifferently. Humanized lymph is now scarcely ever used.

Dr. Wernher makes the just comment upon the age limit for vaccination that it is delayed too long for children, since children born in January may become twenty months old before their vaccination is obligatory.

Denmark.—Vaccination was established by law both in Denmark and in the Faroë Islands, at the beginning of the present century. By the laws of Denmark no child can be admitted to school, or present itself for confirmation, until a certificate of vaccination is produced. Revaccination is also enjoined for soldiers, and seamen in the navy.

In *Iceland*, which was subject to devastating epidemics of smallpox in the eighteenth century, one country physician and eight district physicians are appointed for the control of vaccination, and every clergyman, after having received the necessary instruction of these physicians, shall be the vaccinator *ex officio* of his parish and keep a register of those who are vaccinated. The district physicians provide a supply of vaccine virus from Copenhagen.

Sweden.—The law in Sweden prescribes, as a general rule, that children shall be vaccinated before the age of two years, and in case of epidemic smallpox vaccination is recommended in the first months of life. Revaccination is generally *recommended* at the age of fifteen years, and is *prescribed* for recruits in the army and navy.

Japan.—Vaccination was introduced into Japan in 1849 by Dr. Monnik, a Dutch physician at Nagasaki, and vaccinating offices were afterward opened; but the results were not at first satisfactory, in consequence of the want of a regular supply of good lymph and its deterioration, or on account of the imperfect performance of the operation. In June, 1874, a central office was opened for the purpose of collecting vaccine lymph from calves and distributing the same to the local authorities throughout the empire in the spring and autumn, and wherever smallpox should be prevalent.

In December of the same year (1874), vaccination was made compulsory, and regulations were issued for its performance and for the collecting of statistics relative to vaccination and revaccination.

Prof. E. S. Morse, who has been a keen observer of all matters of public interest in Japan, says: "It is gratifying to know that smallpox, which was formerly endemic, is now coming under control by the Government taking active measures to insure vaccination. The frightful scourges of smallpox in past times are seen in the sadly scarred faces of many of the people, and in the number of blind persons one encounters."

United States.—The following résumé contains the essential points of the vaccination laws of the principal States of the Union.

The following order of the Secretary of the Treasury relates to the vaccination of immigrants:

"Steerage passengers and crew, coming from districts where smallpox prevails in epidemic form, or who have been exposed to smallpox, shall be vaccinated before embarkation, unless they show evidence of immunity to smallpox by previous attack or recent successful vaccination."

In Alabama the county health officer is required from time to time to obtain necessary supplies of reliable vaccine matter which, without charge, he must, on application, furnish to the practising physicians of the county; and when prepared, vaccinate without charge all indigent persons of the county applying at his office.

Arkansas has no State law as to vaccination.

In California the law forbids the attendance of unvaccinated children at school, and it is provided that "any practising physicians may certify that the child or person has used due diligence and cannot be vaccinated so as to produce a successful vaccination, whereupon such child or person shall be exempted from the operation of the act" (Law of 1889).

In Colorado the local sanitary authority may provide for vaccination during the prevalence of smallpox, and even then only as an alternative to isolation.

In Connecticut the town boards of health may adopt such measures for the vaccination of the inhabitants of their respective towns as they deem necessary. Every person who refuses to be vaccinated, or prevents any one under his control from being vaccinated, on application of a member of a board of health, or of a physician employed by the board for such purpose (unless in the opinion of another physician it would not be prudent on account of illness), shall forfeit five dollars to the town.

The Board of School Visitors of any town has authority to require every child to be vaccinated before such child is permitted to attend a public school. The expense of vaccination is to be paid from the town treasury, when necessary.

In Delaware the school authorities are required to enforce the vaccination of all school-children, unless they are previously protected either by vaccination or by smallpox. A copy of the law must be posted for two weeks at the door of every school-house.

Florida.—By a law of 1889 the State Board of Health was authorized to make regulations. They made it the duty (by § 11 of the Sanitary Code) of city and town authorities to "provide for the vaccination and revaccination of the citizens residing in their several cities and towns." Every parent or guardian of a child is made responsible for its vaccination; exceptions were made in the case of sparsely settled districts when not threatened with smallpox, and in the case of a certificate from a reputable physician that vaccination would be "dangerous to the health of the person required to be vaccinated."

By §§ 12 and 13 superintendents of schools in towns having more than two thousand people, and owners or managers of factories are not to admit unvaccinated persons.

Illinois has no state law relative to vaccination. The State Board of Health has issued an order excluding unvaccinated children from the public schools and defines what it deems to be a "proper and successful vaccination."

Indiana has no state law as to vaccination. The State Board of Health has issued certain rules especially applicable to epidemic seasons. It has also ordered that bovine virus should be used for vaccination, with certain exceptions.

In Iowa the attendance of unvaccinated children at school is forbidden.

In Kansas there is no state law as to vaccination.

In Kentucky the law requires that all unvaccinated persons over twenty-one years of age shall procure their own vaccination. Parents and guardians must have their children and wards vaccinated within twelve months after their birth. The secretary of the State Board of Health is required to furnish vaccine virus to local boards of health for the gratuitous vaccination of the poor.

Louisiana has no state law as to vaccination. A city ordinance relative to school attendance is enforced in New Orleans.

In Maine the city or town authorities are required annually, or oftener if they deem it prudent, to provide for "free vaccination with the cowpox" of all inhabitants over two years of age, to be done under the care of skilled practising physicians, under such circumstances and restrictions as the authorities may adopt. School committees may, if they deem it expedient, exclude unvaccinated children from the public schools.

A law was enacted in Maine in 1889 providing for the

exclusion of all unvaccinated persons from paper mills, where domestic or foreign rags are used, under penalty of fifty dollars or less.

In Maryland, a state vaccine agency is established which is required to keep a supply of fresh vaccine virus for the use of physicians. The governor is required to appoint a vaccine agent with prescribed powers and duties. Physicians are authorized to vaccinate children born in their practice. A penalty is provided for the use of virus of bad quality. Parents are charged with the duty of having their children vaccinated within twelve months after their birth. Unvaccinated children are not to be admitted to the public schools. Small fruit-growers, canners, truck farmers, and fish-packers must not employ persons who do not show written proof of vaccination of more recent date than July, 1898. Penalty, $50 to $500 (order of State Board of Health of March 6th, 1899).

In Massachusetts the law provides that parents and guardians shall cause their children and wards to be vaccinated before they attain the age of two years, and revaccinated whenever the town authorities shall, after five years from the last vaccination, require it. The town authorities shall also require and enforce the vaccination and revaccination of all inhabitants when the public health requires it. The penalty for neglecting to comply with these provisions is $5. Towns shall furnish means for vaccination to those who cannot pay for it. Incorporated manufacturing companies and superintendents of public institutions are required to see that the inmates of such institutions are vaccinated. Towns may make further provisions for vaccination, under the direction of the Board of Health, or of a committee chosen for the purpose. School committees are required to exclude unvaccinated children from the public schools, except "any child who presents a certificate signed by a registered physician designated by the parent or guardian, that the physician has at the time of giving the certificate personally examined the child, and that he is of the opinion that the physical condition of the child is such that his health will be endangered by vaccination, shall not, while such condition continues, be subject to the provisions of" the vaccination acts (chap. 190, Mass. Acts of 1902).

In Michigan townships may make suitable provision for the "inoculation of the inhabitants with the cowpox," under the direction of the Board of Health, or of the health officer. The Board of Health of each municipality may at any time direct its health officer or physician to offer vaccination with bovine vaccine virus to every child not previously vaccinated, and to all other persons not vaccinated within the preceding five years. Any health officer is also authorized to order the prompt vaccination or isolation of persons who have been exposed to smallpox.

In Minnesota parents and guardians are charged with the duty of having minors vaccinated.

Missouri has no state law as to vaccination.

In New Hampshire the law is permissive as to the appointment of agents for the vaccination of towns. Unvaccinated children are excluded from the schools.

In New Jersey the school authorities may prohibit the attendance of unvaccinated children who have not had the smallpox, and may decide whether revaccination shall be required when smallpox occurs in any city or district. In the enrollment of children by the school authorities, inquiry must be made as to the fact of vaccination, and if the parents desire, children are to be vaccinated by a regularly licensed physician. The State Board of Health may prohibit the manufacture and sale of impure vaccine virus, antitoxin, or other animal product (Law of 1895).

In New York it is the duty of local boards of health to provide at stated intervals supplies of vaccine virus, of a quality and from a source approved by the State Board of Health. During an epidemic, local boards of health are to obtain fresh supplies of virus, at intervals not exceeding one week, and at all times to provide thorough and safe vaccination for all persons who may need it.

In North Carolina cities, towns, and counties may make rules requiring vaccination (Law of 1893).

In Ohio local boards of health may take measures, supply agents, and afford inducements and facilities for gratuitous vaccination. They may also make and enforce such rules and regulations to secure the vaccination of school-children as in their opinion the safety and interests of the people require.

In Pennsylvania by a law of 1895 the Bureau of Health may issue an order requiring all persons in a city, or any part thereof, to be vaccinated within such time as the Bureau shall prescribe. Penalty, $5 to $20.

Unvaccinated children may be refused admission to school.

In Rhode Island the town councils shall provide annually for the gratuitous vaccination of the inhabitants. They shall also contract with and provide physicians to vaccinate. Such physicians are to record the names and ages of persons vaccinated. Unvaccinated children are excluded from the public schools. The maximum fine for violation of the law is $50, or imprisonment for thirty days.

In South Carolina the State Board of Health may order vaccination (Chap. 77, Laws of 1899).

In Tennessee the State Board of Health has power to prescribe rules to prevent the introduction of epidemic diseases.

In Vermont, by a law of 1892, the local board of health must provide, whenever it is deemed necessary by the State Board of Health, a suitable supply of vaccine virus of a quality and from a source approved by said State Board of Health; and during the existence of an actual outbreak of smallpox in any town or city, the local board of health shall at all times provide thorough and safe vaccination for all persons within its jurisdiction who may need the same.

In Virginia unvaccinated children are excluded from the public schools. The governor is required to appoint an agent annually, who must furnish, by mail or otherwise, to every citizen of the State who applies for it, genuine vaccine virus, free of charge, with directions how to use it. The agent must advertise that he is ready to furnish such virus. The town and city authorities may cause the inhabitants to be vaccinated, and may enforce obedience by fixing fines and penalties for violation.

West Virginia also had a statute requiring the appointment of a vaccine agent, but this has recently been repealed.

In Wisconsin the following remarkable decision of the courts is published:

"Compulsory vaccination as a condition precedent to school attendance cannot be sustained as an exercise of police powers by the Board of Health in the absence of a statutory provision requiring it.

"If the Board of Health possessed the power to make a rule excluding children from the public schools without a certificate of vaccination, it is void as unreasonable when no epidemic, and but a few scattered cases of smallpox exist in the State where the rule is adopted, and but one case in the city where adopted, and that quarantined" (Adams v. Burdge, 95, 390, Wisconsin).

Antivaccination. — Vaccination, like almost every important discovery which has ever been made, has had its opponents from the very outset.

The literature of antivaccination is quite considerable, and consists of many pamphlets in English, the principal writers being Messrs. Gibbs, Tebb, Taylor, Young, Wilkinson, and Prof. A. R. Wallace. Several journals devoted to the same cause are published in English, the *Vaccination Inquirer* being the organ of the first-named society.

There are also many continental pamphlets upon the same subject, chiefly in French, German, and Swedish.

The most decided resistance to the vaccination acts in England has been for several years in the county of Leicester, where the number of unvaccinated children has

increased during the past few years, until, in the returns for 1896, it appears that the neglect of vaccination amounted to 79 per cent. of the births, and in the city it amounted to 82.1 per cent.

The following figures show the increasing neglect in regard to vaccination, both in London and in the whole country:

PROPORTION NOT FINALLY ACCOUNTED FOR IN REGARD TO VACCINATION.

Year.	London.	Rest of England.	Year.	London.	Rest of England.
1887.....	9.0	6.7	1894.....	20.6	19.0
1888.....	10.3	8.2	1895.....	24.9	19.8
1889.....	11.6	9.6	1896.....	26.4	22.3
1890.....	13.9	10.9	1897.....	29.1	21.6
1891.....	16.4	12.9	1898.....	33.0	19.6
1892.....	18.4	14.3	1899.....	27.7	15.4
1893.....	18.2	15.7			

Dr. Arnould, in his treatise on "Public Hygiene," recognizing the fact that an unvaccinated person is a constant menace to the public safety, reasonably inquires whether the *liberty* of those who do not wish to have the smallpox is not as worthy of respect as the *liberty* of those who do not desire to be vaccinated.

In France, the opponents of compulsory vaccination succeeded in preventing the enactment of the bill proposed by Dr. Liouville, in 1881; and in Switzerland a similar organized opposition secured the repeal of compulsory acts in 1882, the effect of which action very soon became evident in a decided increase of smallpox in that country.

The opposition to vaccination is based mainly upon the following objections:

1. Alleged infringement of personal liberty. Upon this subject, Dr. J. M. Toner, of Washington, makes the following excellent comments:

"The question of the prophylactic power and safety of vaccination is so well settled that the individual who fails to protect himself against variola by it should be looked upon by the community with aversion, and treated as a nuisance (as he really is, so far as the social interests are concerned), and be compelled to submit to vaccination for his own safety and the protection of the public.

"Parents and guardians have no more right to withhold or neglect to provide vaccination for the children under their protection than they have to jeopardize the lives of their helpless infants by not furnishing them with food or clothing. It is criminal to neglect either, as death may be the consequence; but the failure to provide protection against smallpox seems to be more maliciously wicked than to neglect either food or clothing, as the former may not only cause the death of the child, but may be the means of spreading disease and death among many others; while the evil which arises from the latter ceases with the death of the victim."

2. As to the claim that vaccination does not protect from smallpox.

The amount of protection afforded by the process of vaccination, when properly performed, has been quite fully discussed in the earlier portion of this article. At the present day, but very few authorities claim that the protection afforded by a single vaccination is absolute. Not even smallpox itself is protective in all cases against a second attack. The amount of protection afforded is quite well shown by the statistics of epidemics. Dr. Buchanan, medical officer of the Local Government Board of England, showed that the smallpox death rate among adult persons vaccinated was 90 to the million; among the unvaccinated it was 3,350 per million. Among vaccinated children under five years age it was 40.5 per million; among unvaccinated children of the same age it was 5,950 per million.

3. As to the claim that vaccination introduces other diseases besides vaccinia. As has already been stated, the fact that such cases have occurred is not denied. It is also true that cases of such injury are exceedingly rare. So far as the introduction of diseases of human origin is concerned, this objection is entirely overcome by the employment of bovine virus; and with reference to the possibility of introducing any of the diseases common to the cow and to man, the question has been sufficiently answered by the quotations already given.

With reference to the various incidents which occasionally follow vaccination, very much has been attributed to the operation which does not belong to it, on the entirely erroneous principle of *post hoc, ergo propter hoc.* The mortality from all causes among children is large, and in a large number of annual vaccinations, as for example, among the two millions or more of the German Government, it is not remarkable that a considerable number of deaths should occur within a short period of vaccination, and cases of harm are attributed to the operation which actually have no connection with it, in the line of cause and effect.

4. A singular argument often urged by the opponents of vaccination is, that smallpox is not caused by contagion, but by filth, and hence its proper preventive treatment should be accomplished simply by sanitary measures, without vaccination. Undoubtedly, filth and bad hygienic conditions promote the spread of smallpox, but that they directly cause the disease in the absence of a previous case of smallpox has never been proven. On the other hand, the disease has been shown to be contagious and inoculable in the highest degree.

With reference to the theory of the origin of smallpox from filth, Dr. Carpenter says: "As regards smallpox, there is not any difference of opinion on this point. It certainly requires the introduction from without of some form of particulate contagion (a germ or living organism), however much meteorological states and personal diet may promote its growth; and if the contagion be absent, smallpox cannot arise."

5. Displacement of mortality (Carnot's doctrine). This theory was proposed by M. Carnot, a French artillery officer. He alleged that, while certain diseases, such as smallpox, measles, convulsions, and croup, were decreasing, other diseases, such as cholera, typhoid fever, and dysentery, were increasing; that the births were tending to become less in number than the deaths; that the depopulation of France was an imminent danger; and that vaccination was the cause of all this disturbance. Mr. Simon comments upon this remarkable theory as follows: "Supposing Carnot's statistics to be correct, does he give any sufficient reason for ascribing to vaccination that deteriorated state of adult life which he professes to have discovered? So little does he this, that in any of the sentences where damnatory conclusions are drawn, if there were substituted at hazard for his word *vaccination*, the mention of any other historical event belonging to about the same period of time as Jenner's discovery, M. Carnot's logic would scarcely suffer by the change, or his new conclusion be less warrantable than his first. *Post ergo propter* was never more whimsically illustrated. For the argument goes simply to claim as the *effect* of vaccination whatever evils have occurred since its discovery; and M. Carnot's moderation may be praised, that, with the infinite resources of this proof, he did not also convict Jenner of causing last year's inundation of the Rhone."

M. Charles Dupin, in 1848, and Dr. Bertillon, in 1854, also exposed the fallacy of Carnot's proposition. It was shown that, whether his arithmetic were right or wrong, his medical conclusions were wholly untenable. His evidence was purely local and applied to France, in which there were, it is true, certain facts of an unfavorable character relative to the growth or movement of the population; and yet these same observations were not applicable to England, nor to Sweden, nor to Russia, nor to any other countries in which vaccination was practised as well as in France.

Has Vaccination Increased the Liability to Other Diseases, and has it Increased the General Death Rate?—

Both of these propositions have been advanced by the opponents of vaccination. Let it first be inquired what is meant by these propositions.

"A child whose liability to smallpox has just been extinguished by well-performed vaccination," says Simon, "may to-morrow, like an unvaccinated child, be run over, or be drowned, or become sick of measles, or suffer with teething, or be struck with any other of the numberless shafts of death. And the vaccinated subject, advancing to adolescence, to middle life, or to old age, must encounter, like the unvaccinated, the several risks of each period of life. And obviously, if vaccination on a given day, in England, secures a thousand lives from death by smallpox, sooner or later those lives will be subject to the inevitable lot; sooner or later the thousand deaths will be written against the names of other diseases than smallpox; and such diseases may then be said to have been rendered more frequent by vaccination. In the same sense every life that is snatched from fire, or flood, or poison counts at last as a death from some other cause; and to say *in this sense* that such causes are more fatal than before vaccination, is but another form of saying, what Jenner would most have wished to hear, that smallpox is less fatal than it was."

Dr. W. Channing relates a case of a young mother who desired to have her child vaccinated, but hesitated and declined to have it performed. In a few days the child was covered with a loathsome eruption. Had vaccination been performed, the disease would undoubtedly have been attributed to the operation (*Boston Medical and Surgical Journal*, March 1st, 1860).

THE BRITISH PARLIAMENTARY COMMISSION OF 1889.—From the very beginning of the introduction of vaccination opposition has been manifested to its practice, the degree of resistance differing much in different countries. In England several parliamentary inquiries have been held upon the subject, the general result of which has been a confirmation and strengthening of existing laws upon vaccination. The last Parliamentary Commission appointed to consider this subject was that of 1889. The commission consisted of fifteen members, of which Lord Herschel was chairman. Several voluminous reports of this Commission were published containing an enormous amount of evidence together with many appendices containing valuable information, covering about 3,300 folio pages of closely printed matter. Many witnesses were examined by this commission, including such noted experts as Sir John Simon, Dr. Ogle, of the Registrar-General's Office, Dr. Buchanan, Dr. Thorne Thorne, Dr. Cory, Dr. Barry, and other officials of the Local Government Board of England. The principal advocates of repeal of the compulsory laws were Alfred Russell Wallace, LL.D., Messrs. Alexander Wheeler, William Tebb, and others.

The points which this commission was charged to consider were the following:

1. The effect of vaccination in reducing the prevalence of, and mortality from, smallpox.

2. What means, other than vaccination, can be used for diminishing the prevalence of smallpox, and how far such means could be relied on in place of vaccination.

3. The objections made to vaccination on the ground of injurious effects alleged to result therefrom; and the nature and extent of any injurious effects which do, in fact, so result.

4. Whether any, and if so, what means should be adopted for preventing or lessening the ill effects, if any, resulting from vaccination; and whether, and if so, by what means, vaccination with animal vaccine should be further facilitated as a part of public vaccination.

5. Whether any alterations should be made in the arrangements and proceedings for securing the performance of vaccination, and, in particular, in the provisions of the Vaccination Acts with respect to prosecutions for non-compliance with the law.

The commission made an interim report April 21st, 1892, at which time it had held ninety meetings and examined one hundred and thirty-five witnesses. The final report was not made until 1896. The two recommendations which the commission made in its interim report were substantially as follows:

1. It appears that the courts had so construed the laws as to warrant repeated orders in respect to the non-vaccination of a child and the imposition of a penalty for the disobedience of each of such orders, notwithstanding that previous penalties have been inflicted. The commission agreed that the imposition of repeated penalties in respect to the non-vaccination of the same child should no longer be possible. They arrived at this conclusion independently of the question whether vaccination should continue to be compulsorily enforced.

Those who favored the view that vaccination ought not to be compulsory were naturally opposed to repeated convictions; while those who inclined to the opposite view believed that any advantage which could arise from the tendency of repeated convictions to increase the number of the vaccinated, is more than counterbalanced by the resentment and active opposition to vaccination which they engender.

2. The question having arisen whether a person committed to prison on account of failure to pay the penalty imposed under the Vaccination Laws, should be treated as a criminal or not, the commission expressed its opinion that such persons "should no longer be subjected to the same treatment as criminals. Many of the victims of such imprisonment regard the practice of vaccination as likely to be injurious to the health of their children, and are well-conducted and in other respects law-abiding citizens. Even those who consider that the course which such persons adopt is a mistaken one may nevertheless well be of the opinion that they ought not, during their imprisonment, to be subjected to the treatment awarded to criminals, such a proceding not being calculated to secure obedience to the law or to add to the numbers of the vaccinated."

Dr. Alfred Russell Wallace appeared before the Royal Vaccination Commission, in 1890, as a convert to the principles of anti-vaccination, and was hailed by the opponents of vaccination with great triumph. Dr. Wallace confidently expected to demolish the arguments in favor of vaccination upon scientific principles, and appeared before the commission with a long array of tables of statistics and diagrams which fill many pages in the third report of the commission. The principal part of these statistics relates to vaccination in the departments of France for a period of about twenty years. The data presented for each department are the number of births, number of vaccinations, and number of deaths from smallpox for each year, the object being to show that vaccination increases smallpox.

These tables were taken up and carefully considered by the commission, and, so far as Dr. Wallace's hasty conclusions were concerned, they were found to be worthless. This witness finally admitted, after retreating step by step, that his tables were "not perfect," that "the imperfection is very great and irregular." He also admitted that, if his entry of "no deaths" often meant nothing more than that there had been "no returns" (which was actually the case), "then, of course, the whole thing is imperfect," and that in view of such a defect, which was vitally important, "the whole thing is valueless."

Criticism followed upon criticism, and at last Dr. Wallace asked that he might make a few personal concluding remarks, the pith of which had to do with suggestions from the commission that he must have "taken up this subject and written upon it without full and accurate information befitting a man of science." And, in making the personal explanation, the previous declarations as to the absolute need for a scientific accuracy such as had controlled the labors of Darwin seems to have been forgotten, and in their place came the frank admission, "My answer is that I did not take it up as a question of pure science."

Thus ended the "absolute test and demonstration" held out at the previous session of the commission, and

the result is that the opponents of vaccination still lack a scientific statistician as an exponent of their views (editorial in *Practitioner*, 1891, vol. xlvi., p. 465).

The smallpox statistics of Prussia, which Dr. Wallace presented to the commission, were brought down to the year 1874, and there discontinued. The compulsory law of Prussia was enacted in 1874, and Dr. Wallace admitted that "he had heard of it," but had not seen any evidence that it made any important difference.

On the contrary, there are nowhere to be found any statistics so absolutely conclusive of the value of vaccination as the comparative statistics of Prussia for the two periods before and after the enactment of the compulsory vaccination law of 1874.

The London *Lancet*, in commenting upon the testimony of this witness, says that Dr. Wallace's theory was based upon "blunders that would hardly be expected of a school boy," and in a concluding paragraph upon the same subject affirms, "if this is all that science can do for the antivaccinationists, the scientific value of vaccination stands more than ever confirmed." But, notwithstanding the exposure of his errors, the philosopher obstinately adheres to his position that "vaccination is a delusion" ("The Wonderful Century," New York, 1899). In this paper he quotes largely from the experience of English towns in which vaccination is only partially enforced, and utterly ignores the greatest and best example of modern times—the German nation. He also quoted the experience of Leicester, England, but takes special pains to omit all reference to the difference between the smallpox mortality of the vaccinated and the unvaccinated in that city, as shown so clearly by its medical officer, Dr. Priestly, in his report of the epidemic of 1892–93. Out of a total of twenty-one deaths from smallpox in that city nineteen were those of unvaccinated persons, one had been vaccinated and the facts in regard to the remaining one were unknown.

The principal modern opponents of vaccination who have published their views upon the subject are Prof. E. M. Crookshank, Dr. Charles Creighton, Professor Wallace, Mr. William Tebb, Prof. A. Vogt, of Berne, and Lorinser, of Vienna.

The final outcome of this legislative farce was the enactment of the "conscientious objector" clause already quoted. The practical operation of such a law is sufficiently illustrated in the following report of the first case which came to trial January 27th, 1899:

THE FIRST APPEAL UNDER THE VACCINATION ACT, 1899. REGINA V. WELBY, EX-PARTE BIRD, JANUARY 27TH, 1899.—The absurdity of the provisions of § 2 (1) of the Vaccination Act, 1898, which require that the parents or person responsible for having a child vaccinated must "satisfy" the magistrate before whom he is brought, that he "conscientiously believes that vaccination would be prejudicial to the health of the child," in order to escape liability to a penalty under § 29 or § 30 of the Vaccination Act, 1867, was fully demonstrated in the above case, which formed the ground of the first appeal under the section.

One Walter Bird had endeavored to "satisfy" the stipendiary magistrate of Sheffield as to his child, as required by § 2 (1) of the Act, but failed to do so. Being convinced that the stipendiary ought to have been "satisfied," he applied for and obtained a rule from the court of Queen's Bench (the Lord Chief Justice and Mr. Justice Wills), calling on the stipendiary to show cause why a *mandamus* should not issue directing him to hear and determine the case, as he had declined to grant exemption to the child on the ground that he did not believe that Bird conscientiously believed that vaccination would be injurious to the child.

In granting the rule the Lord Chief Justice said, *inter alia*:

"The section clearly said that the magistrate was to be satisfied, not in his opinion that vaccination would be prejudicial to the health of the child, but satisfied that the applicant conscientiously believed that vaccination would be prejudicial to the child."

When the case came on for hearing before the Divisional Court (Lawrence and Channell, J. J.), after the affidavits of the parents had been read and explained by counsel, who stated that the parents had been prosecuted and had suffered great inconvenience, Channell, J., said: "The magistrate said in his affidavit, 'A certificate was not given because I was not satisfied that he believed that vaccination would be prejudicial to the health of the child.' They could not grant a *mandamus* to compel him to be satisfied. . . . He has to satisfy the magistrate of his belief, and he has not done so. Even if the magistrate is wrong, we cannot make him be satisfied."

The rule was discharged (Himes' "Handy Guide to the Public Health Acts," London, 1901).

Dr. Creighton's views upon vaccination are sufficiently set forth in his article in the twenty-fourth volume of the "Encyclopædia Britannica," and in his book entitled "Cowpox and Vaccinal Syphilis." In the former he takes the ground that there is neither identity nor even affinity between vaccinia and variola. He also asserts his belief that the diminished activity of variola is due to epidemiological laws, and not to vaccination. In his exceedingly superficial statement of the practical working of vaccination laws, like Dr. Wallace, he omits reference to the convincing experience of Prussia since the enactment of more efficient laws in 1874, although a dozen years or more had elapsed from that date to the publication of his article in the "British Encyclopædia."

The various publications issued by the opponents of vaccination are characterized mainly by the absence of facts and the presentation of an abundance of theory. For example, a recent work by Mr. William Tebb, intended to prove the "synchronicity between the spread of leprosy and vaccination," introduces many arguments in support of an alleged connection between the one and the other. But leprosy produced its most disastrous effects in the twelfth, thirteenth, and fourteenth centuries, when vaccination was unknown. There were then nineteen thousand lazarettos in Europe. Now that the human race is much more widely distributed over the globe, leprosy is far more rare, and exists to its greatest extent in countries where vaccination is but little practised. In the United States, where probably more than three-fourths of the population is vaccinated, leprosy is confined chiefly to a very small number, among whom the disease was introduced directly from other and infected countries.

Leprosy has for many years been prevalent in Bombay, but since the introduction of vaccination there, by the British Government, the ratio of lepers has gradually diminished.

Much importance has been attached by the opponents of vaccination to certain statistics which were published in 1872–73 by Dr. Keller, the chief physician of the Austrian State Railway, who was himself an opponent of vaccination. These statistics were quoted largely by Lorinser of Vienna, Vogt of Berne, and by Reichsperger, all of whom were antivaccinationists. Körösi recently investigated the sources of these statistics, and ascertained that Keller was dead, and that the original documents could not be found. He then corresponded with all of the physicians who had contributed material to these statistics, who were still living and could be found, and learned that not only had Keller suppressed important data, but had actually altered the returns to suit his own views. One of the physicians who contributed to the returns confessed that "the data were prepared in conformity to the taste of their chief, whom he knew to be opposed to vaccination."

The committee of the Ninth International Medical Congress who examined the proofs of these statements reported that they were "forced to declare that the statistics of Dr. Keller were found to be false; that they are an unpardonable effort to mislead public and scientific opinion, and that henceforth no weight should be attached to them, having been proved by us to be entirely incorrect."

Samuel W. Abbott.

BIBLIOGRAPHICAL REFERENCES.

[1] Ziemssen's Cyclopædia, American edition, vol. ii., p. 401.
[2] Journal of the Gynecological Society, Boston, vol. vi., 1872, p. 289.
[3] Crookshank: The History and Pathology of Vaccination, 2 vols., 1889.
[4] Gerstäcker: Deutsche Vierteljahrsschrift f. öff. Gesundheitspflege, vol. xx., p. 87, 1888.
[5] Robert Cory: Lectures on the Theory and Practice of Vaccination, 1898, p. 73.
[6] Twenty-seventh Annual Report of the Chief Medical Officer of the Local Government Board, London, 1898, p. viii.
[7] Twenty-eighth Annual Report of the Chief Medical Officer of the Local Government Board, London, 1899.
[8] Die Ergebnisse des Impfgeschäfts im Deutschen Reiche für das Jahr 1900, Berlin, 1902.
[9] Reports of the Central Sanitary Bureau of Japan.
[10] Ergebnisse der amtlichen Pockentodesfallstatistik im Deutschen Reiche vom Jahre 1896.
[11] Blattern und Schutzpockenimpfung, Berlin, 1896.
[12] Copeman, S. M.: Vaccination: Its Natural History and Pathology, London, 1899.
[13] Fourth Annual Report of State Board of Health of Connecticut. (Report on vaccine lymph.)
[14] The Medical Times, vol. xxi., 1850.
[15] Gazette des Hôpitaux, December 5th, 1892.
[16] Public Health, London, July, 1901, pp. 660–670.
[17] Quarterly Journal of Microscopical Science, April, 1863, and July, 1866.
[18] Virchow's Archiv, 1867.
[19] Virchow's Archiv, 1868.
[20] Organismen in der Pocken-Lymphe, 1872.
[21] Comptes Rendus, 68, 1868.
[22] Twelfth Report of the Medical Officer to the Privy Council, 1870.
[23] Medical Times, May 19th, 1866.
[24] Transactions International Congress of Hygiene, 1891.
[25] Annales de Dermatologie, 1881, pp. 9 and 10.
[26] Centralblatt f. Bakt. u. Parasitenkunde, August 25th, 1894.
[27] British Medical Journal, June 30th, 1894.
[28] Die Protozoen als Krankheitserreger, Jena, 1894.
[29] Centralblatt f. Bakt. u. Paras., 18, 1895.
[30] Medical Press and Circular, July 25th, 1894.
[31] La Riforma medica, 1893, 2, p. 602.
[32] Annales de l'Institut Pasteur, April, 1897.
[33] Proceedings of the Royal Society, 58, March, 1895.
[34] Report of Medical Officer to Local Government Board, London, 1892–93.
[35] Annales de l'Institut Pasteur, January, 1896.
[36] Borne, G.: Vaccinations et Revaccinations obligatoires, Paris, 1902.
[37] The Sanitary Record, October 15th, 1891.

BIBLIOGRAPHY.

Bousquet: Nouveau traité de vaccine.
Ceeley, Robert: Transactions Provincial Med. and Surg. Assn., vols. viii. and x.
Chauveau: Nature des Virus. Gazette hebd., March 13th, 1868.
Ciaudo: Du vaccin de Génisse, Paris, 1879.
Cory, R.: Report of a Committee Appointed to Investigate Dr. Cory's Experiments in Vaccinating Himself from Syphilitic Children, London, 1883.
Decanteleu, J. E. B. D.: Monographie des Cicatrices de la Vaccine, Paris, 1837.
Delobel and Cozette: Vaccine et vaccination, Paris, 1897.
England: Reports of the Local Government Board, 1872–1900. Reports of Royal Commissions on Vaccination, 1871 and 1889.
Gerstäcker, R.: Die historische Entwicklung und hygienische Bedeutung der Revaccination. Vierteljahrsschrift f. öff. Gesund., 20, 1, 1888.
Germany: Arbeiten aus dem Kaiserlichen Gesundheitsamte, 1. 2. Band, Berlin, 1885–1886.—Die allgemeine Einführung der animalen Vaccination im Deutschen Reiche. Vierteljahrsschrift f. öff. Ges., 17, 1885.
Jenner, Edward: An Inquiry into the Causes and Effects of the Variola Vaccinæ, London, 1798.—Baron's Life of Jenner, London, 1838.
Körösi, J.: Kritik der Vaccinations-Statistik und neue Beiträge zur Frage des Impfschutzes. Ninth International Medical Congress, Washington, D. C., 1887.
Layet, D. A.: Les sources naturelles du vaccin. Rev. d'Hygiène, July, 1888.
Martin, H. A.: Animal Vaccination, Boston, 1878.
McVail, J. C.: An Inquiry into the Prevalence of Smallpox in Kilmarnock in the Eighteenth Century. Report Local Government Board, Medical Officer, 1884.—Vaccination Vindicated, London, 1887.
Menard, Chambon, and Strauss: La vaccine animale. Journal de Méd. et de Chirurgie pratique, January 19th, 1899.
Sacco: Trattato di Vaccinazione, Milan, 1800.
Sclavo, A.: Della conservazione dei Virus in Glicerina, Rome, 1892.
Seaton: Handbook of Vaccination, London, 1868.—Article in Reynolds' System of Medicine, vol. i., 1876.
Titeca: Étude sur la pratique de la vaccine. Bulletin de l'Acad. r. de Méd. de Belgique, 3 series, 19, 6, 1885.
Vaccination Facts and Problems. British Medical Association, 1902.
Vaccination Inquirer and Health Review. The Organ of the London Society for the Abolition of Compulsory Vaccination, 1879–1888.
Vaillard, L.: Manuel pratique de la vaccination animale technique. Procédés de Conservation du Vaccin, Paris, 1886.
Warlomont, E.: Traité de la vaccine et de la vaccination humaine et animale, Paris, 1883.

VAGINA, ANATOMY OF. See *Sexual Organs, Female.*

VAGINA, CONGENITAL MALFORMATIONS OF THE.—DEVELOPMENT OF THE VAGINA.—A knowledge of the mode in which the vagina is developed is essential to a proper understanding of its congenital malformations.

The lower portions of the two Müllerian ducts coalesce to form the vagina, and by the ninth week of embryonal life the intervening septum disappears, and this union is complete, although the appearance of the cervix and the differentiation of the genital passage into uterus and vagina cannot be said to take place before the fifteenth or sixteenth week. In the nineteenth week of fœtal existence a slight projection of mucous membrane makes its appearance on the posterior wall of the entrance to the genitalia, just above the point of union of the vagina with the urogenital sinus, and a little later a smaller projection at a slightly higher level may be seen on the anterior wall. These elevations subsequently unite laterally, and thus form the hymen, which, by the twentieth week, is fully developed.

VARIETIES OF CONGENITAL MALFORMATIONS.—The vagina may be entirely absent; it may be more or less completely closed by a transverse, or divided by a longitudinal, septum; though not seriously misshapen it may still be too short or too narrow; or it may communicate with cavities from which it should properly be separated. There are yet other errors in development, which are, however, of less import.

A. *Absence of the Vagina.*—When there is total failure in development of the lower portions of the ducts of Müller the vagina is entirely absent, and only a thin septum intervenes between the bladder and the rectum, in which some little connective tissue, but no muscular elements, are discoverable. A fibrous strand or cord may, however, indicate the situation which should be occupied by the vaginal tube. When the Müllerian ducts are developed, except at their very lowest extremities, or are not prolonged downward far enough to open into the aditus urogenitalis, then only the most inferior portion of the vagina is wanting.

Absence of the vagina is usually associated with some other marked maldevelopment, such as absence or a rudimentary condition of the uterus. The condition of the uterus will determine the existence or non-existence of retained fluids.

In absence of the vagina the urethra is found to be abnormally relaxed.

If there is hæmatometra, an operation designed to create a passage where the vagina should be located is imperative; and even when only a very rudimentary uterus can be discovered, and there is no retention, the general health of the individual is often markedly improved after operative interference is instituted, and the uterus has been known to take on active growth.

When there is sufficient space between the bladder and rectum, a vagina can be made by stretching and tearing the intervening tissues with the finger, aided by the use of blunt-pointed scissors, if great resistance is encountered.

A sound in the urethra, and the finger of the operator or of an assistant in the rectum, are useful guides. The operation should be completed at one sitting, and the passage should be made larger than it is thought desirable to have it subsequently remain. Undue contraction is prevented by the use of a vaginal plug of glass, and the cicatricial tissue which forms over it is said to resemble very closely normal mucous membrane.

When the uterus is well developed, and there is retention, but no vaginal passage can be formed, Battey's operation may be indicated.

B. *Atresia of the Simple Vagina.*—In this condition the occlusion of the vagina is absolute. The obstruction may be seated at the hymen—atresia hymenalis, or at some point within the vagina proper—atresia vaginalis.

Atresia Hymenalis.—Atresia hymenalis is the most common variety of vaginal atresia. The duplicature of mucous membrane constituting the hymen here forms an obstruction, which, although thinner and more elastic than the atresias situated above in the vagina, yet may