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THE DEBT OF THE PUBLIC
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BY
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OF PHILADELPHIA.

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THE DEBT OF THE PUBLIC TO THE MEDICAL PROFESSION.

The Oration delivered before the Medical and Chirurgical Faculty of Maryland,
at the Celebration of the Centennial Anniversary of their Foundation,
April 26, 1899.

BY W. W. KEEN, M.D., LL.D.,

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It is a graceful courtesy, which I very highly appreciate, that you should ask a stranger, instead of one of your own members, to address you on this festal occasion. The fact that you have completed an existence of a century as a medical society naturally suggests that the address should be somewhat of a review of the past.

I have, therefore, chosen as my subject "The Debt of the Public to the Medical Profession." I shall endeavor to indicate, in a brief outline, how much the profession has done for the community. The conclusion, therefore, is inevitable that there is an obligation on the part of the public to recognize this debt by affording enlarged facilities to a profession which has given of its time and labor so unselfishly for the good of the public.

In one respect the medical profession differs from all others, in that it is the only profession which is self-destructive. While we live by ministering to the wants of those who are suffering by accident and disease, I glory in the fact that the medical profession is foremost in the endeavor to abate disease and to prevent accident. The profession could not have attained this end by its own efforts alone, but it has been dependent very

largely upon the general intelligent co-operation of the public, and of sanitary engineers, and also of legislators, for the legal means to make effective the measures which the profession has shown to be needful for the public health.

Public hygiene or sanitation has been a very large element in arresting the ravages of disease, which, in former times, swept over entire nations, and even continents; and it is a source of pride to us that among the foremost sanitarians in every community are the doctors. It is a very striking fact that diseases which once assumed the form of veritable pestilences are now, at least in civilized countries, almost unheard-of, and others, though they have not yet disappeared, have had their fangs drawn, so that the public suffers far less than it formerly did. If the voice of the profession were heeded, even the diseases which have been largely abated would almost, if not entirely, disappear.

Let us briefly consider a few of these diseases :

I. THE PLAGUE.—Among the most fearful epidemics which have devastated the world, perhaps the worst has been what is known as the plague. It is represented now by the bubonic plague, of which we have had a memorable instance within the last two years in India, when over 250,000 lives have been lost. But, bad as it has been there, its recent devastation is as nothing compared with its former ravages. Those of you who have read James' novel, entitled "The Fire and the Plague," will recall the vivid and frightful picture of the plague in 1665, during which 70,000 persons perished in the then relatively small city of London alone. Still earlier, in the fourteenth century, the Black Death, as was then its horrible name, swept over Europe, and carried off 25,000,000 people, one-fourth of the entire population of that continent! This frightful destruction, it will be observed, took place in the then most civilized countries

of the world. By contrast, the bubonic plague of the nineteenth century is limited wholly to peoples who are only semi-civilized, among whom sanitary laws are not understood, and the grossest violation of them is a common every-day occurrence. But this terrible mortality, it would seem, is never to be repeated. As a result of laboratory researches, the bacillus of the plague has been discovered, and Haffkine has recently introduced a preventive inoculation with sterilized bouillon-cultures of its bacillus. In India, which is now the home of the plague, Haffkine has shown extraordinarily good results, both in experimental inoculations of animals and of man. For example, of 20 rats from a ship, newly arrived from Europe, 10 were inoculated with the protective serum and 10 were not. Into the cage in which the whole 20 were kept, a rat suffering from the plague was introduced. Of the 10 uninoculated rats, 9 died. Of the 10 rats rendered immune by inoculation, only one contracted the disease. Following upon this and many other experiments, it was deemed right to inoculate human beings, and there are thousands now who owe their lives to this preventive inoculation.

To take but a single instance, in the town of Lower Daumaun, 2,197 persons were inoculated, 6,033 remaining unprotected. Of the latter 1,482 died, almost 25%, whereas only 36 of those who were inoculated succumbed to the disease, less than 1.2%. (Osler's Practice, 3d edition, p. 193.)

Would it be an impertinent question were I to ask whether there could be mentioned a single lawyer who has thus cut off the means of livelihood of his brothers-in-law, or a single merchant who would so destroy his own business and that of his fellow-merchants by pointing out a means by which the community could dispense with his wares?

II. CHOLERA.—Another scourge which has been almost throttled in civilized countries is the cholera. It first appeared in Europe in 1832, and in France alone 120,000 people died. In the single city of New York there were 3,500 deaths. Its ravages have been conspicuous very recently in the city of Hamburg, when in three months, in the summer of 1892, there were 18,000 victims, with 7,614 deaths. Engineers and physicians can proudly point to their achievements in this epidemic. The city of Altona, which is physically continuous with Hamburg, drank the water of the Elbe, but, being located nearer the mouth, drank the water with all the added contamination of Hamburg; yet in Altona there were only 516 cases as against 18,000, and many of these were refugees from Hamburg itself. The explanation is a very simple one. Hamburg drank the unfiltered water of the Elbe, whereas the inhabitants of Altona had a filtration plant, which was their efficient bulwark against the disease.

This is taking into account only the question of life, which is, of course, by far the most important. But looking at it also from a commercial point of view, we all remember how the business of Hamburg was for the time ruined. The few millions which would have properly filtered the water of the same river for Hamburg were lost five or ten times over by the merchants of Hamburg as a result of their fatal delay. The voice of the physicians and sanitarians of Hamburg was but a voice crying in the wilderness until emphasized by the hoarse diapason of disease. This is an object-lesson which our own country and many of our own cities would do well to heed.

III. YELLOW FEVER.—Another scourge, similar in its extent and its violence to the plague and the cholera, and one which appeals to the people of this country even more than those two, is the yellow fever. The

fearful epidemic of 1797 is well known to every intelligent American. Not limited to the southern portion of our country, its pathway was strewn with corpses in all the larger cities of the North as well as of the South. Our own immortal Rush has left a monument to his name in his efforts to stem the tide of the disease. By his unselfish bravery and his devotion to duty in the midst of pestilence he has set us an example which the whole country admires, and which, fortunately, will never again be needed. The later freedom of this country from similar widespread and fatal epidemics of yellow fever is due chiefly to intelligent plans for sanitary reform and to our vigilant quarantine regulations, which, as a rule, during the present century have kept it at bay.

We are now about to do better, for having driven the indolent and ignorant Spaniard from Cuba, we shall be able to attack the disease at its fountain-head. The efforts of our officers, especially of General Wood, whom we gladly recognize both as doctor, diplomat, and warrior, will bear the richest harvest of good by exterminating the disease in Cuba itself. Before this we could only erect a defensive wall against the disease; now we can prevent it in its very home.

How much such prevention of disease means commercially is shown by a statement in the newspapers only 10 days ago, that capitalists had \$40,000,000 ready to invest in New Orleans if the sewage question could be solved and epidemics of smallpox and yellow fever prevented.

IV. SCURVY.—Prior to the present century, scurvy was one of the most dreaded diseases, especially on shipboard. Armies were decimated by it and navies rendered useless; sometimes half a ship's crew would be disabled by scurvy. Until the researches of physicians showed that it owed its origin to the lack of fresh vegetables, its ravages were frequent and widespread. In 1795

there were introduced into the British navy the admirable regulations for provisioning ships of war, drawn up by Blane. Since then scurvy has almost disappeared. At the present time it is seen only in exceptional circumstances, such as have recently arisen in the Klondike. Even in the long, lonely voyages to the pole, our means of furnishing the crews with vegetable food in various forms has prevented any outbreak of importance.

V. TYPHUS FEVER.—Another scourge of humanity in past ages has been the dreaded typhus fever. Its various synonyms,—ship-fever, hospital-fever, jail-fever, camp-fever,—reek of filth, overcrowding, and the want of sanitation. “A complete history of typhus,” says Murchison, “would be the history of Europe for the last three and a half centuries.” It was as dreaded as the plague itself. How rare it is now is shown by the fact that in my entire professional life of nearly forty years, I have never known in Philadelphia of more than half a score of cases, and have never in my life personally seen a single one. The modern exemption of armies, ships, jails, and hospitals from typhus is due to our own profession more than any other agency.

VI. TYPHOID FEVER.—I wish I could tell the same story of typhoid fever. Unfortunately the public has not yet listened to the voice of sanitary physicians. Every year a large harvest of deaths is furnished the grim reaper in almost all of our American cities by typhoid fever. And yet typhoid is as preventible a disease as typhus; so much so that an English writer has declared that “for every case of typhoid fever somebody ought to be hung.” The means of its diffusion are well known. Water contaminated by the typhoid bacilli and milk similarly contaminated are the two chief means by which it reaches the gastro-intestinal tract of man. What damage can be done by a single case was well

shown in the town of Plymouth, Pennsylvania, in 1885. "A portion of the water of the town was derived from a reservoir supplied by a mountain stream some distance above. A man ill with enteric fever occupied a house near the bank of this stream, during January, February, and March. Upon the ground, frozen and covered with snow, the copious dejections of this patient were thrown without disinfection. Toward the end of March a thaw, accompanied by rain, took place. About the 10th of April, an extraordinary epidemic of enteric fever developed in the town, chiefly among those receiving water from the reservoir. In a population of 8,000 people, about 1,200 cases occurred." The remedy, as some of us in Philadelphia have tried to point out as forcibly as we could, is clear. Purify the water-supply and provide good sewerage and typhoid fever almost disappears. In Vienna the typhoid rate of 12.5 deaths per 10,000 inhabitants fell to 1.1 after a pure water-supply was obtained; in Dantzic it fell from 10 per 10,000 to 1.5; in Munich, from 21 per 10,000 to 6.3; in Boston from 17.4 per 10,000 to 5.6. These are but cold figures. If we could transfigure them and let them represent broken hearts and desolated homes, and measure them by anguish and sorrow, they would speak more eloquently than mere percentages.

All of the diseases thus far considered have been those which have disappeared either wholly or very largely (at least in civilized countries) as a result of improved sanitation, and I can, therefore, well claim that the public owes their disappearance or limitation to the efforts of the medical profession aided by engineers, by intelligent legislators, by improved methods of food-supply, and by the general intelligence of the entire community. But the greatest preacher of righteousness has been the doctor.

VII. SMALLPOX.—The next disease to which I ask

your attention is one which owes its abolition wholly to the physician. In these days, a century after Edward Jenner's memorable inoculation of James Phipps on May 14, 1796, we can hardly appreciate what smallpox was. A few facts, however, will show its dreadful ravages. Dinsdale, who went to St. Petersburg to inoculate the Empress Catharine, says that 2,000,000 people died in a single year in the Russian Empire from smallpox. In 1707, in Iceland, out of a population of 50,000, 18,000 died,—36% ! In Mexico in the 16th century, 3,500,000 people died, leaving, in some places, scarcely enough alive to bury the dead. At the end of the 18th century, Gilbert Blane estimated that “an adult person who had not had smallpox was scarcely met with or heard of in the United Kingdom.” When servants were advertised for, it was common to specify “that they must have had smallpox in the natural way.” In 1688, in an advertisement for a counterfeiter, it was noted as a means of his identification that he was “without pock-holes.” At the Institution for the Indigent Blind, two-thirds of the applicants were made blind by the smallpox.

It attacked the high as well as the humble. In the family of William III of England, his Queen, Mary, his father, his mother, his uncle and two cousins, children of James I, all died of the smallpox and the king himself barely escaped with his life. During the 18th century, one Emperor and two Empresses of Austria, six archdukes and archduchesses, an elector of Saxony, an elector of Bohemia, a Dauphin and a King of France, a King of Sweden, and a Czar of Russia where all numbered among its victims. So fearful were its ravages, that Bernouilli estimated that 60,000,000 persons died from smallpox in the century the close of which saw the foundation of this very Faculty. Well might Macaulay say: “The havoc of the plague had been far more rapid, but the plague visited our shores only

once or twice within living memory. But the smallpox was always present, filling the churchyard with corpses, leaving on those whose lives it spares the hideous traces of its power, turning the babe into a changling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to her lover." It was "the most terrible of all the ministers of death."

But in 1796 arose the medical David who was to smite this Goliath. From that time till the present smallpox has been shorn of all its terrors. Very recently, in Jenner's own country, attempts have been made to show that vaccination was useless; that it drove out of the system one vile disorder by introducing another, that it disseminated instead of preventing disease. Were we to grant all that is falsely alleged as to the introduction of tuberculosis and syphilis, even then the benefits it has conferred would outnumber the evils ten-thousand-fold. But, as a matter of fact, the cases in which evil results have followed are few and far between, and by the use of animal virus instead of the humanized and by the proper antiseptic care in vaccination, which is really a minor surgical operation, all of these ill effects can be avoided.

A few statistics will show the benefits vaccination has conferred. In Sweden, before vaccination, the deaths per million were 2045. Since compulsory vaccination was introduced they have fallen to 155. In England during the eighteenth century, the average deaths per million were about 2000. Since the epidemic of 1871-2 and the enforcement of the law for vaccination, the deaths have fallen to 53 per million, and in Scotland they have fallen to 8. In Prussia, before compulsory vaccination, there were 309 deaths per million; in the last 10 years only 7. In Austria, without compulsory vaccination, in the last ten years the average has been 458 deaths per million, and in Belgium without compulsory vaccination from 1875 to 1884, there were 441

deaths per million. In the Sheffield epidemic of 1887-8 of the unvaccinated population, 1 in 20 died; of those who were vaccinated, 1 in 1300.

Another illustration of what havoc a single mild case may work was seen by the epidemic in Montreal fourteen years ago. Among the French Canadians, there was the greatest prejudice against vaccination, so much so that there were even vaccination riots. As a consequence of this prejudice a large unprotected population grew up and the materials were ready for an extensive epidemic. The soil had been prepared and it only needed the introduction of the seed, which in due time came in a Pullman-car conductor from Chicago, February 28, 1885. Within the next 10 months thousands of persons were stricken with the disease and 3164 died in a city of only 185,000 inhabitants—*i. e.*, one person in every 58 died, besides all those whose lives were blighted by its disgusting relics. Perhaps no more striking proof could be given of the value of compulsory vaccination and re-vaccination than the experience of Germany and France in the Franco-Prussian war. In the German army there were but 261 cases, while in the French army, which was not similarly protected, there were 23,469. Again our Philadelphia Welch (*N. Y. Med. Jl.*, March 17, 1894) has shown that among 5000 cases of smallpox, of 1412 cases with good vaccination marks, the death-rate was 8.78%; whereas among 1759 cases unvaccinated, the death-rate was 58.38%.

And yet, in the face of these well-established facts there are people who declaim against vaccination. Happily, in view of the well-known and almost universally recognized protective power of vaccination, the good sense of the American people will never allow us to go back to the old days of death and disfigurement. Well may Prof. Whittaker say "the most consummate cynic must admit that, up to the

present time, Edward Jenner has been the greatest benefactor that the world has ever known." Even the untutored Indians declared "we shall not fail to teach our children to speak the name of Jenner and to thank the Great Spirit for bestowing upon him so much wisdom and benevolence."

VIII. TUBERCULOSIS.—The most noteworthy feature in modern medicine is the introduction of laboratory methods in the study of various diseases. We are only really at the beginning of this method, but it has yielded results of such inestimable value that its future is certain to reward the diligent searcher after truth with a rich harvest.

Among other diseases which have been investigated with very fruitful results is tuberculosis, a disease which ranks with alcoholism and syphilis as the three most disastrous to the human race, and, in the case of tuberculosis, to animals as well as man. To Robert Koch, of Berlin, a physician, belongs the credit of discovering and of proving absolutely its cause, namely, the bacillus tuberculosis. While it is perfectly true that this has not yet led to the hoped-for results in the cure of the disease, yet all must admit that the discovery of the cause of any disorder is the first step toward its cure. Moreover, the results, even from a diagnostic and therapeutic standpoint, have been by no means insignificant.

First of all it has enabled us to determine positively the existence of tuberculosis of the lungs and the intestines with absolute certainty, and at a much earlier stage than was before possible. Hence even the ordinary treatment at our disposal, change of climate and the administration of remedies, is instituted at a much earlier period than formerly, and so leads to cure in cases which, under the older uncertain methods, would have run on until they had become practically incurable. Secondly, although the tuberculin treatment of Koch has not realized all that was hoped for, yet by

better methods and improved tuberculin, a number of cures have resulted. Even had Koch's researches proved of no value to the human race, its value in the early and certain diagnosis of tubercle in the lower animals has been of the greatest possible service to our dairy-men and butchers in the preservation of their herds, and to the community in preventing the use of tuberculous meat and milk as articles of food, a use which is fraught with the greatest danger to human beings. The reaction which follows the use of tuberculin in animals is acknowledged by all veterinary surgeons as practically of the greatest use in weeding out tuberculous animals from herds of cattle. It is not too much to hope that further researches may yield a healing serum which will yield far better results than anything thus far produced. Even the present results have justified all the labor and expense which have been involved in the discovery of the cause of tuberculosis.

IX. DIPHTHERIA.—The laboratory has given us a proof of its value, however, in another direction, in which we are treading on much firmer ground. Diphtheria is one of those diseases which does not yield to improved sanitation. Whether it show itself in sporadic cases, or as an endemic or epidemic, its death-rate has been appalling. Until a few years ago, its mortality was placed at about 40% of all the cases attacked. But laboratory researches and experiments upon animals have robbed it of more than half its terrors. Perhaps the three most important papers thus far published are those of your own Professor William H. Welch (*Johns Hopkins Bulletin* for 1895) and the collective investigations of the American Pediatric Society of 1896 and 1897. Welch investigated 7166 cases from 80 different sources. Among this large number of cases, 1239, or only 17.3%, died, a diminution in the mortality, as a result of the use of the antitoxin, of 55.8%. It is very striking, also, to observe the different results of the treat-

ment according to the day on which it was begun. The following table shows the regularly increasing mortality according to the day on which the treatment was begun, from the first to the eighth days :

Day	Mortality, %
1.....	18.3
2.....	22.7
3.....	38.1
4.....	53.6
5.....	67.0
6.....	67.4
7.....	72.5
8.....	81.6

Could figures be more eloquent, or call more loudly for the earliest possible use of the remedy ?

In the first collective report of the American Pediatric Society, there were nearly 6000 cases in the practice of 615 physicians. The large number of physicians from all over this country and Canada eliminates accidental variations due to climate, to the personal equation of any one physician, etc. The mortality was 12.3%, or, deducting the 218 cases which were moribund at the time when the treatment was begun, a mortality of only 8.8%, instead of 40% ! In over 4000 cases, in which the treatment was begun during the first three days, the mortality was only 4.8%. The results of this treatment are still more striking in the laryngeal cases, which require intubation or tracheotomy. In 5546 such cases reported by 242 physicians before the introduction of the serum, the mortality was 69.5%. In 533 cases in which the serum was used, the mortality was but 25.9%. In the report of 1897, it is stated that before the introduction of the serum treatment, 90% of the cases of laryngeal diphtheria required operation; after its introduction, only 39.2%. Before the serum treatment was introduced, recovery took place in 27%, and death in 73%; after the serum treatment was introduced the figures were precisely reversed; recovery took place in 73% and death in 27%.

In the PHILADELPHIA MEDICAL JOURNAL for April 1, 1899, p. 631, is given the still more recent results in Chicago. In ten years of the pre-antitoxin period the annual average of deaths was 1417. In the three years after the antitoxin treatment was introduced, though the city's population was larger both by natural increase and by annexation, the annual average was only 851 deaths, a direct saving of 600 lives a year, and a 40% reduction of the previous mortality. The closing remarks of Professor Welch are eminently in point: "The discovery of the healing serum is entirely the result of laboratory work. It is an outcome of the studies of immunity. In no sense was the discovery an accidental one. Every step leading to it can be traced, and every step was taken with a definite purpose and to solve a definite problem. These studies and the resulting discoveries mark an epoch in the history of medicine. It should be forcibly brought home to those whose philozoic sentiments outweigh sentiments of true philanthropy, that these discoveries which have led to the saving of untold thousands of human lives have been gained by the sacrifice of the lives of thousands of animals, and by no possibility could have been made without experimentation upon animals." Each year, for all future time, will add thousands of human lives thus saved by the laboratory.

X. HYDROPHOBIA.—Another direct result of laboratory research is the splendid achievement of Pasteur in the cure of hydrophobia. Prior to his researches about 14% of those bitten by animals believed to be rabid were attacked by hydrophobia, and of the persons so attacked everyone died, a mortality of 100%. There is no authentic case reported of recovery after the development of hydrophobia. But in 1893 the mortality in St. Petersburg, in cases submitted to Pasteur's treatment, was only 0.84%; in Turin, in 1894, the mortality for ten years was only 0.95%; and in Paris, in 1897, in 1060 per-

sons bitten by animals, proved experimentally or diagnosed by a veterinary examination to have been rabid, the mortality was only 0.56%. Instead of 141 deaths from a horrible and formerly irremediable disease there were only 6 deaths!

Figures such as these can leave no doubt in the minds of reasonable persons that this gift of the laboratory has been of the greatest possible value.

XI. TRICHINOSIS.—Another direct result of laboratory research has been the discovery of the trichina worm. When studying in Berlin in the winter of 1865-66 I well remember the demonstration, among the first that had then been made, of the cause of a dreadful epidemic of trichinosis. In the little town of Hedersleben, in Saxony, a butcher killed three hogs and made them into sausages. They were eaten by a large number of the inhabitants of the little town. Several hundred persons fell desperately ill and I think over 100 died. Professor Virchow sent one of his assistants to the town to discover the cause of the trouble, and all of the students in the Pathological Institute in Berlin were intensely interested in the discovery that the epidemic was due to the fact that one of these hogs had been infested with the trichina. A portion of the infected pork was brought to Berlin and fed to some of the lower animals and the life history of the trichina was studied with the minutest care. As a result of this and of similar studies, the means of prevention of the disease was very soon discovered. Heat kills the worm and so renders it innocuous. The epidemic in Hedersleben was due to the fact that the inhabitants had eaten insufficiently cooked sausages in which the parasites were still alive. Digestion dissolved the capsule in which they lay and freed them for their future devastating work. Cooking would have entirely prevented the epidemic. Since these studies, all civilized countries have made obligatory by law the microscopic

investigation of several portions of the carcasses of all hogs which have been killed for food, and all of our meats derived from the hog now are perfectly innocuous by having eliminated all of the infected carcasses.

XII. ANIMAL DISEASES.—Had I the time and were I as familiar with the facts in veterinary medicine as in human medicine, I should be able to point out to you the laboratory studies which have been undertaken abroad and in this country by our admirable Bureau of Animal Industry as to anthrax (wool-sorters' disease), the cattle plague, chicken cholera, swine fever, hog cholera, and lumpy jaw or actinomycosis, and show you that not only is the human race a debtor to the laboratory, but how much animals themselves owe to it. The commercial value of these researches in a country like ours, which exports immense quantities of meat, can hardly be over-estimated. It is within the mark when I say that many millions of dollars are saved annually in our flocks and herds as a direct result of such laboratory investigations. Inasmuch, also, as a number of these diseases are capable of infecting the human subject (and the number of cases of anthrax and of actinomycosis is large), they are as important to the human race as to animals.

Let us now leave medicine proper and turn to surgery. Before doing so, I must point out the fact that all the diseases so far considered are medical and not surgical. I often hear it said that while surgery has made such giant strides of late, medicine has lagged behind. It is but just to the physicians to call attention to the fact that the statements already made show that medicine has made equal or even greater progress. The saving of life in diphtheria is less dramatic, less striking to the average mind, but it is none the less real or less beneficent.

XIII. ANESTHESIA.—We come now to two of the epoch-making discoveries in the history of medicine,

both of which have been made in the last half-century—the discovery of anesthesia and of antiseptics. Though Long, of Georgia, had used ether prior to 1846, practically the introduction of anesthesia dates from October 16, 1846, when, for the first time since Adam parted with his precious rib, Dr. John C. Warren, in the Massachusetts General Hospital, performed a major surgical operation without inflicting the slightest pain. The news went like wild-fire, and anesthesia was soon introduced into every clinic and at almost every operation throughout the civilized world. Prior to that time, a surgical operation was attended with horrors which those who live in these days cannot appreciate. He was the best surgeon who could perform any operation in the least possible time. The whole object of new methods of operating was to shorten the period of frightful agony which every patient had to endure. Every second of suffering saved was an incalculable boon. To submit to any operation required then a heroism and endurance which are almost incomprehensible to us now. All of the more modern, deliberate, careful, painstaking operations involving minute dissection, amid nerves and bloodvessels, when life or death depends on the accuracy of almost every touch of the knife, were absolutely impossible. It was beyond human endurance to submit one's self for an hour, for an hour and a half, for even two hours or longer, to such physical agony.

It is a striking commentary on the immediate results of anesthesia to learn that, in the five years before the introduction of ether, only 184 persons were willing to submit themselves to such a dreadful ordeal in the Massachusetts General Hospital, an average of 37 operations per annum, or 3 per month. In the five years immediately succeeding its introduction, although the old horror could not at once be overcome, 487 operations, or almost 100 annually, were performed in the

same hospital. During the last year in the same hospital, a Mecca for every surgeon the world over, over 3700 operations were performed. It is not an uncommon thing at the present day for any one of the more active surgeons of this country to do as many as 400 to 500 operations in a year. I have known as many as 19 operations to be done in the Jefferson College Hospital in a single day—equalling six months' work in Boston before the introduction of ether.

Such a boon, the direct gift of the profession to a suffering world, has placed the public under a debt which can never be sufficiently appreciated, still less be repaid. Every sufferer may well bless the names of Morton and Warren, to which should be added certainly the name of that giant of surgery, Sir James Y. Simpson, who discovered the anesthetic use of chloroform in 1847.

Both anesthetics have their dangers, and the profession will never be satisfied so long as there is the slightest danger in the use of any such drug. Our researches are still directed toward the discovery of the ideal anesthetic. This will not be, in my opinion, an anesthetic like cocaïn, which abolishes pain without abolishing consciousness, but, rather, one which, without danger to life, will bring unconsciousness to everything, including pain, for this reason: Very frequently during an operation emergencies occur (especially hemorrhage) which, although the surgeon is perfectly capable of coping with them, yet would greatly alarm the patient and might defeat the object of the surgeon, were they known to him at the time. That such an ideal anesthetic will be discovered is as certain as that the twentieth century will soon dawn upon us. Happy will be the surgeons who can operate without the least fear of their anesthetic, and yet be certain that the patient is relieved from all suffering and free from all danger of shock or other after-consequences.

XIV. ANTISEPSIS.—Even the introduction of anesthesia, however, did not rid surgery of all its terrors. The acute pain of the operation was abolished, but the after-suffering, as I knew only too well in my early surgical days, was something dreadful to see. The parched lips of the poor sufferer, tossing uneasily during sleepless nights, wounds reeking with pus, and patients dying by scores from blood-poisoning, from erysipelas, from tetanus, from gangrene, were only too familiar sights in the pre-antiseptic days. Then, again, there arose one of these deliverers of the human race whose name can never be forgotten and whose fame will last so long as time shall endure. Jenner, Warren, and Lister are a triumvirate of names of which any profession may well be proud. Thank God, they all sprang from virile Anglo-Saxon loins! No praise, no reward, no fame is too great for them. That Lord Lister still lives to see the triumph of his marvellous services to humanity is a joy to all of us. And when the profession arose en masse, within the last few years, at the International Congress of Berlin and at the meeting of the British Medical Association in Montreal, and welcomed him with cheer after cheer, it was but a feeble expression of gratitude for benefits which no words can express.

Before Lister's day, erysipelas, tetanus, gangrene, and blood-poisoning in its various phases were the constant attendant of every surgeon. They were dreaded guests at almost any operation; and when in rare cases we obtained primary union without a drop of pus, without fever and with but little suffering, it was a marvellous achievement. Now it is precisely reversed. The surgeon who does not get primary union without a drop of pus, with no fever, and with little suffering, asks himself—what was the fault in my technic? To open the head, the abdomen, or the chest 30 years ago, was almost equivalent to

signing the death-warrant of a patient. The early mortality of ovariectomy was about 60% ; two out of three died. Now many a surgeon can point to a series of 100 abdominal operations with a fatality of only 2% or 3%. When Sir Spencer Wells recorded his first 1000 cases of ovariectomy, it was calculated that after deducting the years which the patients who died from the operation would have lived had no operation been done, the net result of the thousand cases was an addition of 20,000 years to human life. One thousand ovariectomies under antiseptic precautions at the present would certainly add at least 30,000 years to human life. Would not such a guerdon be enough for any man?

This, too, is a direct result of laborious laboratory researches, beginning with the investigations of Liebig and Pasteur on fermentation. Lister went still further. Even before the discovery of the bacteria of suppuration, of tetanus, and of erysipelas, he showed us experimentally how, by surgical cleanliness, we could avoid all infection and so banish these pests from our hospitals and bring life and health to many who otherwise would have perished from operations which are now perfectly safe.

The mortality of compound fractures in the pre-antiseptic days was about 60%. It was one of the most dreaded of all accidents. Its mortality now is perhaps not over 3%, and the mortality from sepsis after such a fracture, in the hands of well-instructed surgeons, is almost nil. Prior to Lister's day, the mortality of major amputations varied from 50 to 63%. Now, it is from 10 to 20%. And so I might go on with operation after operation and show how they have become so safe that one need not dread any, saving exceptional cases.

These two modern discoveries, anesthesia and antiseptics, have utterly revolutionized modern surgery. They have made possible operations which, by reason of

their length and pain and danger, were utterly unjustifiable in former days, but are now the daily occupation of a busy surgeon. And, far better than this, they have enabled us to bring to homes and hearts, which otherwise would have been broken up and wrung with sorrow, the comfort of life restored to dear ones upon whom depended the happiness and support of the families. Translate figures into happy hearts and prosperous homes if you can, and then you can tell me what Warren and Lister have done for humanity!

XV. BRAVERY OF THE PROFESSION.—But it is not only by its achievement in specific diseases that the profession has brought the community into its debt. Quite as much by his character has the physician pointed the way to the noblest development that human nature can attain. Not only has he diminished the horrors of war, but he has shared in its perils and has shown a disregard of danger and fearlessness in the performance of his duty which is worthy of all praise. During the Civil War 40 Northern medical officers lost their lives in battle and 73 were wounded, a number “proportionately larger than that of any other staff corps.” The heroism of Gibbs, who perished in Cuba, is known to you all. In the navy, Dr. John F. Bransford had resigned his commission as surgeon in 1890, but immediately volunteered for service in the war with Spain. During the battle of July 3, off Santiago, he dropped his scalpel and bravely took charge of a gun, fighting gallantly throughout the engagement, his services as surgeon not being called upon until the wounded prisoners were brought on board. Like the mother of the Gracchi, we may proudly point to such and say, “these are our jewels.”

But while gallantry in action justly merits our highest admiration, there is a quiet, unostentatious bravery in the midst of pestilence, which is no less heroic, though less dramatic.

“ In 1832, that most dreaded of all scourges, Asiatic cholera, for the first time broke out all over this country with the greatest virulence. Easton was only eighty miles from New York, and the citizens, in terror lest the dread disease would reach their own town, appointed a young, intrepid surgeon to visit New York and learn what he could for their benefit. When others were fleeing in frightened thousands from the pestilence, Gross bravely went directly into the very midst of it, reaching New York when the epidemic was at its very height. In that then small and half-depopulated town 385 persons died on the very day of his arrival—and he stayed there a week in a hot July, visiting only its hospitals and its charnel-houses. What call you that but the highest type of bravery?—a bravery which Norfolk and Mobile and Memphis have since seen repeated by scores of courageous physicians ready to sacrifice their lives for their fellow-men, with no blare of trumpets, no roar of cannon, no cheer of troops, no plaudits of the press! No battlefield ever saw greater heroes; no country braver men!”

And Gross was not alone in this bravery. Amid arctic snows and surrounded with desolation, Kane and Hayes have shown what steady courage could do in arctic exploration; while the revered Livingstone, in the midst of the wilds of Africa, surrounded by savage beasts and still more savage men, exposed to the dangers of fever and miasm on every hand, showed what the doctor could do amid torrid heats in the performance of his duty in exploring an unknown continent and in exterminating the traffic in human life. At this moment in India, Burma, China, Africa, 268 brave medical missionaries, of whom 64 are no less brave women, are endeavoring to bring the blessings of modern medicine and of Christianity to the natives of those benighted lands. “ We can imagine,” says the *Lancet*, “ no career more lofty or honorable than that of a well-informed, capable, and courageous medical missionary.” Their efforts especially in bringing health to the downtrodden women of heathen lands, in their efforts to abolish child-marriage with all of its attendant horrors, and in their ministrations to the sick of body and of soul have been fruitful of the highest good to millions of the human race.

XVI. GENEROSITY OF THE PROFESSION.—Moreover, there is no profession which gives so freely for the good of the human race. Where is the doctor whose ear is deaf to the cry of suffering humanity in cases of accident, or during the pangs of maternity, who will not deprive himself of well-earned sleep and needed recreation, to minister to his suffering fellow-creatures without ever a thought of any pecuniary benefit to himself?

I am sure that the public does not appreciate the amount of time and the value of the services given to the poor by the rank and file of the profession. Take a single example with which I am familiar. In the Jefferson Medical College Hospital the last report shows 129 medical men on the staff of the hospital. As nearly as I can estimate, they give every year about 60,000 hours of their time to the poor, which, at 8 hours per diem, amounts to 20 years of labor of one man, year after year, and their services, were they paid for at a very moderate rate, make an annual gift to the poor of over \$500,000. This, mark you, is from a single hospital in a single city. Were we to take account of all the hospitals in every city and town in this country, you can easily see how many millions of dollars' worth of gratuitous services and how many decades of time are given to humanity every year by the medical profession. It is only by such vast aggregates that we can appreciate how much there is of generous giving on the part of the profession which we do well to love and honor.

How shall the public pay this great debt? "Freely ye have received, freely give." We do not ask dollar for dollar, but may we not expect a Scriptural tenth? Not for our own pockets, but for our hospitals; not to minister to our own ease and enjoyment, but to equip our libraries and laboratories for larger and more fruitful work; not for our own homes, but for our colleges

to furnish us the means for better teaching ; in a word, not for ourselves, but for humanity, to whose service our lives are dedicated.

In Mr. John Wanamaker's gallery is one of the most striking pictures I have ever seen. On a large canvas by Fritel, in the center of the picture, advancing directly toward the spectator, is a large cavalcade of warriors arrayed in corselet and casque. Their stately march at once arrests the eye. The leader is Julius Cæsar. He is flanked by Napoleon and Alexander the Great and followed by Attila, Semiramis, and a lengthening host of those whom the world counts among its greatest conquerors. They advance between two long rows of rigid, ghastly corpses all stretched at right angles to their line of march. Spectral mountains in the distance hedge in a desolate plain given over to the vulture, the bat, and silence.

I would that some artist might paint a companion picture of the "conquerors in medicine," instead of the "conquerors in war." Instead of spectral hills and a barren waste, the scene should be laid in a happy, smiling valley, bounded by the Delectable Mountains and kissed by a fertile sun. The stately procession should be led by Edward Jenner. He should be flanked by Joseph Lister and John C. Warren, and followed by Simpson, Billroth, Livingstone, Ambroise Paré, Virchow, John Hunter, and many a modest but unknown hero who has yielded up his spirit in the performance of his duty. Instead of treading their way between lines of corpses, they should march between lines of grateful men and women and a host of God's little children who, on bended knee and with clasped hands, would reverently invoke Heaven's richest benediction upon their deliverers.

Thus should humanity recognize its debt to the medical profession.

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