attempts be made from time to time to force the introduction of unwise policies and the modification of well-planned organization; these influences may emanate from political centers and sources that are unfortunate. At best such influences delay the progress of scientific investigation and the application of scientific methods, in this instance to the Bureau of Fisheries; at worst they destroy work built up by laborious efforts in the past. We must be awake to the need not only for building an organization and for securing the best so that it can weather the shifting of political results but also for directing the organization parties and of public opinion in politics.

Henry B. Ward

## MEDICINE, A DETERMINING FACTOR IN WAR[1]

The death rate in our Civil War of killed and dying of wounds is given as thirty-three per thousand, the disease death rate as sixty-five. In the Spanish War the death rate from battle is five and the death rate from disease 30.4 per thousand. In the present war, taking the statistics up to March 28, 1919, we find the rate of death from wounds received in action is 14.191 and that of death from disease is 14.797 per thousand. This includes the army on both sides of the ocean. The statistics of the American Expeditionary Forces, with an average strength of 975,716, reveal a rate of death from wounds in action of 31.256 per thousand and a death rate from disease of 11.233. Of those who died of disease, pneumonia claimed 9.146 per thousand.

Studying comparatively the diseases of the American armies during the Civil War, Spanish-American War and the recent war, we find that malaria was one of the chief causes of disability in both the Civil War and the Spanish-American War, though it caused but 6 per cent. of the deaths in the Civil War and but 10 per cent. in the Spanish-American War. But in the recent war malaria has caused such a small number of deaths that it is not given in detail, but is put into the aggregate term of "other diseases." Typhoid fever, with typho-malaria, so called, was one of the chief causes of death from disease in both the Civil War and the Spanish-American War, causing 22.4 per cent. of the deaths of the Civil War, and being the one great uncontrolled epidemic of the Spanish-American War, causing in the fighting period of the latter war 60.5 per cent. of all deaths. But in the recent war only 0.4 per cent. of the deaths are chargeable to this scourge. Pneumonia, on the other hand, causing only 13 per cent. of the deaths during the four years of the Civil War and only 3 per cent. in five months of the Spanish-American War, has become the dreaded epidemic of the recent war, causing in the American army 85 per cent. of all deaths from disease. In the Civil War, meningitis caused 2 per cent. of the deaths, and 2 per cent. of the deaths in the Spanish-American War, and it caused 4 per cent. of the deaths in this war. Smallpox caused 4 per cent. of the deaths in the Civil War; in the Spanish-American War, one man died of this disease; in this war, one man died from smallpox in the United States and five in France. In 1918 and in the first months of 1919, there were 102 patients with smallpox admitted to the hospitals in the United States. These patients came into the various camps from civil life, for the disease developed among the recruits before they could be vaccinated and thus protected, but it has not developed at all among the vaccinated troops in the United States. Dysentery caused 28 per cent. of the deaths in the Civil War, and nearly 30 per cent. (29.3 per cent.) of the 5,600,000 cases of disease reported in that war. In the Spanish-American War it caused 5.6 per cent. of the deaths. But it caused only forty-one deaths out of 48,000 cases, or 0.08 per cent. of the deaths in the recent war. The transmission of yellow fever by mosquitoes does not come into consideration in the recent war, though there were small epidemics of this disease in both the former wars, there being about 1,300 cases in the Civil War and about 1,100 in the Spanish-American War.

There is one achievement by the Medical

[1] From the presidential address of Dr. Alexander Lambert given at the Atlantic City Meeting of the American Medical Association and printed in the *Journal* of the association.

Department of the United States Army after the Civil War which stands as a lasting monument to the industry and genius of the surgeons of that time; it is the "Medical and Surgical History of the War of the Rebellion." This was the first great medical history ever published of any war, and remains still the standard to be attained.

As a result of the scientific medical work during and after the Spanish-American War, the investigations of three American army surgeons, Jesse Lazear, James Carroll and Walter Reed, gave to the world the solution of the problem of the transmission of yellow fever by mosquitoes. With this knowledge, came simultaneously the power to control this dread disease, which for centuries had been the scourge of the West Indies, and had time and again spread in devastating epidemics to this country and even to southern Europe. Lazear and Carroll laid down their lives to gain this knowledge, and paid the ultimate sacrifice in order that thousands, through their work, might be protected and live. The sanitary control of mosquitoes, and thus of tropical malaria and yellow fever, and the wise administration of this knowledge, made possible the building of the Panama Canal. It was an American army surgeon, William C. Gorgas, who seized this great opportunity and transformed a pesthole of tropical diseases into a healthy and safe terrain, that the engineering genius of the United States Army might be free to construct the canal. The French under De Lesseps had failed because of the epidemic and tropical diseases which were at that time uncontrollable. Disease had defied and overcome engineering skill and genius. Preventive medicine controlled and conquered.

Ten years ago the practical application of the knowledge gained from the study of the epidemic of typhoid fever of the Spanish-American War brought about the compulsory inoculation against typhoid in the United States Army. It had been shown by the Vaughan and Shakespeare Board that nearly 65 per cent. of the typhoid fever of that war was transmitted by contact of man with man, and was not water borne. Hence sanitation could only reduce typhoid to a certain level and not eradicate it. The introduction of compulsory typhoid inoculation in the army has practically eradicated the disease. Following the work of the English medical corps in the Boer War, a United States Army surgeon, F. F. Russell, made possible the practical application of this method in the U. S. Army and proved conclusively that typhoid fever could be completely controlled. The American Army Medical Corps has, in the recent war, discovered the transmissibility of trench fever by body lice, and thus has shown the means of prevention of this new disease which, while killing no one, rendered thousands of men useless for weeks and ineffective for fighting. This discovery came to save thousands of men for the fighting lines at a time when they were urgently needed.

Medical science has to-day, therefore, within its grasp the power to control the diseases which, in former times, decimated warring armies and spread out from these armies among the non-combatant populations. Formerly, when war broke out, it was almost inevitably followed by some dread pestilence among the civil populations of the countries in which the war was waged. By proper sanitation and preventive inoculation, dysentery and cholera can be abolished; by vaccination armies can be protected against smallpox. Body lice disseminate typhus, recurrent fever, and trench fever, and by proper disinfection of these vermin these diseases cease to occur. Through sanitation and preventive inoculation, typhoid fever, the scourge of the two previous wars, is absolutely controlled, and this includes also paratyphoid, which has been recognized as a separate entity only since the Spanish-American War. In the Spanish-American War, 60.5 per cent. of all deaths were caused by typhoid, and in the present war 85 per cent. were caused by pneumonia. The typhoid of the Spanish-American War was due to local causes and local epidemics. The pneumonia of this war was beyond control, and was part of a world-wide epidemic that swept over both hemispheres, and the morbidity and mortality of some of the cities

of this country exceeded those of the camps. Subtracting the death rate caused by pneumonia from the total death rate by disease in the recent war we have 2.2 per thousand for the entire army on both sides of the water, which is practically a peace-time death rate. Meningitis has caused, in this war, ten times as many deaths as typhoid fever; pneumonia has caused two hundred times as many. Mumps and scarlet fever, of the infectious diseases of the young men, remain as yet to be controlled, but they are not of great import in the armies in war. The disabling type of disease coming under the head of venereal disease has, in this war, been so controlled that the number of cases brought from civil life was greater than the number occurring in the American Expeditionary Forces in France, which was reduced to twenty-two per thousand per year, a rate only one eighth as high as the incidence among recruits coming from civil life, and only one third as high as the best that ever had been accomplished in the army before.

Influenza, measles and pneumonia, in the respiratory group, still stand as baffling problems, and their control has not been accomplished. Measles appeared and spread until it no longer had material on which to spread, as one attack confers immunity to a second. Pneumonia, following influenza or originating as a primary disease, still eludes control. But the knowledge which we have gained in this war of the methods of its spread, of the various infectious organisms which produce it, and their various types and varying virulence, of its occurrence as a secondary complication to measles and influenza, has enormously increased. The value of the facts thus learned are incalculable, and belief is justified that the problem is better understood than ever before, and that we soon shall see the solution of these problems.

The occurrence in the camps of meningitis, another disease of the respiratory group, as far as its portal of infection is concerned, has been forty-five times as frequent in the army as its occurrence in civil life among the same age group. This has been due to overcrowding and the diminution of air space allowed the individual soldier in badly ventilated barracks. The responsibility for these sanitary sins rests on the General Staff and not on the Medical Corps.

What then are the lessons that we can draw for future action? There is no question but that the salvage of human beings, the protection of troops from disease in an army, renews and saves the fighting forces. Until recently, until medical science could control disease during war time, armies had been more decimated and injured by disease than through battle casualties. Now that, except for epidemic spread of respiratory diseases, the communicable and epidemic spreading diseases can practically be controlled, the medical corps of an army has become an essential part of the fighting organization. Whole nations must now go to war. No longer can they mobilize a selected portion of volunteers and send them to fight the war and defend the nation. Since all the youth of the nation must mobilize and turn to war, it becomes the duty of a general staff to save its man power and to salvage it to the greatest extent possible. The history of the Crimean War, of our Spanish-American War, and our experience in the recent war have clearly shown that only through proper representation on the general staff by those men trained in such salvage, and by experts in such knowledge of sanitation, can this duty be performed. When the General Staff of the United States Army comes to realize this fully, one can not conceive that it will fail to give proper representation in its councils and organization to the Medical Department. The practical necessity for this was finally recognized in the A. E. F. by General Pershing and three medical officers were detailed at General Headquarters as substantive members of the General Staff. Responsibility and authority can not be separated, and only by such organization can adequate authority equal the inevitable responsibilities.

In the mobilization of the industrial forces of the nation by the Council of National Defense, the health of the nation and the protection of both nation and its armies was regarded of such importance that it demanded

direct representation of the medical profession on this board. This is also true of the navy, for its Medical Department is represented on the General Board. Oddly enough, the anachronism still exists that in the General Staff of the United States Army the Medical Department is regarded as an outsider. The safeguarding of the health and fighting vigor of an army, the salvage of its wounded, the saving of man power through protection from disease are still regarded as foreign to staff organization. The medical and sanitary formations are still regarded as non-combatants, although those serving with the troops often go forward and mingle with them in the combats, that the morale of the men may be better sustained. Duty demands it, and they have shown themselves willing, in this war, to be unarmed combatants, not non-combatants. The ratio of the medical officers killed and dying of wounds has been exceeded only by that of the infantry and artillery, which branches necessarily bear the brunt of the battles. The pro rata death rate of the medical officers has exceeded that of aviators and of engineers.

This subject is a matter for congressional action, but the profession of this country, while the experiences of this war are still vivid in its mind, must turn to the Congress, must make an intelligent exposition of these facts, and must bring about, by legal enactment, an adequate representation of the Medical Department on the General Staff of the army.

I desire to draw but one more deduction from the medical lessons of this great war, and that in reality is the climax toward which everything points. That is, if this nation, through its present medical knowledge, has within its grasp the power to control communicable, and hence preventable, diseases, there must be established a nation-wide controlling organization for this purpose a National Department of Health. Over 33 per cent. of our younger men were disqualified from the draft for physical defects. There is need of wider supervision of our growing boys and girls to build up a more robust nation, and it is especially urgent in rural districts. If we are to have some form of universal military service, the very necessity of its universality demands some general supervision of the health of the youth of the nation, through protection against the transmissible diseases, and direction over the giving of health to the people as we now give education. This war has taught that there remains economic value in the maimed and wounded, and it is our duty to develop this value to its fullest extent. The maiming and injury of our workers, in the every-day work of industry, far exceeds each year the battle casualties of this war, and there is an economic necessity and duty to be performed in the salvage and reconstruction of the industrially injured.

Malaria still prevents the use of large areas of our southern states, and saps the energy of a large portion of the population. Typhoid fever still rests as a blot on the rural hygiene of this country. The control of epidemics between states is already in the hands of the Public Health Service, and within states, if state authorities request aid. Quarantine from outside infection is also under federal control. There are many other federal activities partially supervising health and disease through the various departments of the federal government. But it all lacks the efficient power of central correlation, and there remain many public health activities that should be undertaken by central action, from some of the problems of infant mortality to the problems of the increase of degenerative diseases of late middle life. It is the duty of the American Medical Association, and of each member of each state association, to urge on Congress the establishment of a National Department of Health.

## WALTER GOULD DAVIS

THE meteorological service of the Argentine Republic will be the enduring monument of Walter Gould Davis, whose death on April 30, at his old homestead in Danville, Vt., removed one of the world's best-known and most highly respected meteorologists.

As a young man Mr. Davis went to Argentina to serve as assistant to Dr. Benjamin