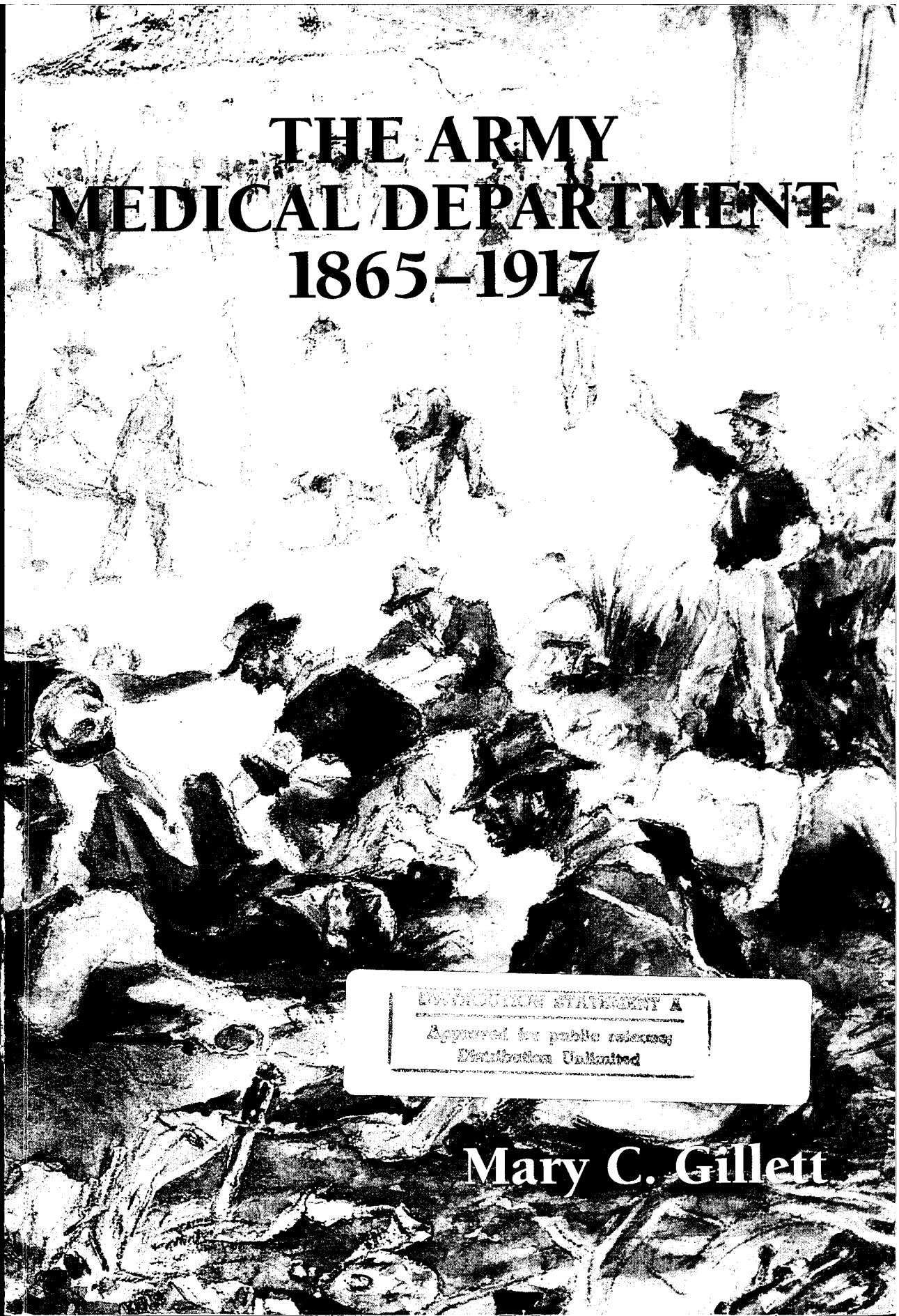


THE ARMY MEDICAL DEPARTMENT 1865–1917

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

Mary C. Gillett

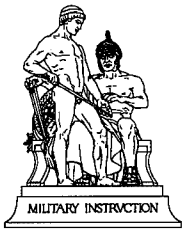
ARMY HISTORICAL SERIES

THE ARMY MEDICAL DEPARTMENT 1865–1917

by

Mary C. Gillett

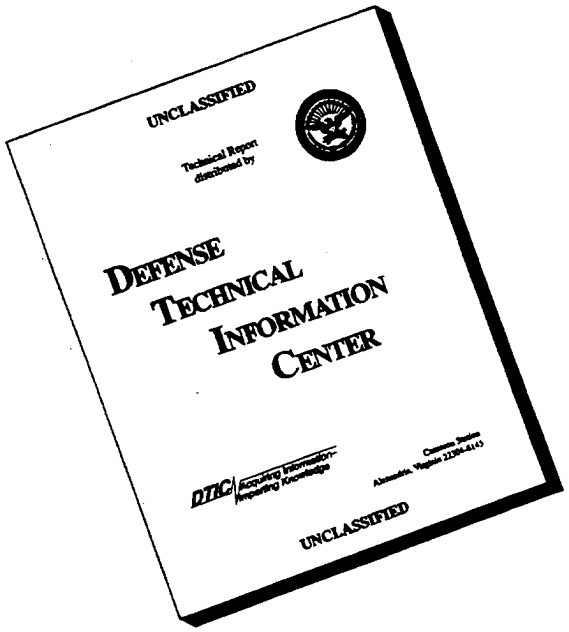
19960621 030



CENTER OF MILITARY HISTORY
UNITED STATES ARMY
WASHINGTON, D.C., 1995

DTIC QUALITY INSPECTED 1

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

Library of Congress Cataloging-in-Publication Data

Gillett, Mary C.
The Army Medical Department, 1865–1917 / by Mary C. Gillett.
p. cm. — (Army historical series)
Includes bibliographical references and index.
1. United States. Army Medical Dept.—History—19th century.
2. United States. Army Medical Dept.—History—20th century.
3. Medicine, Military—United States—History—19th century.
4. Medicine, Military—United States—History—20th century.
5. World War, 1914–1918—Medical care. I. Title II. Series.
UA223.G544 1995
355.3'45'0973—dc20 94–13147
CIP

First Printing—CMH Pub 30–9–1

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

ARMY HISTORICAL SERIES

Jeffrey J. Clarke, General Editor

Advisory Committee

(As of October 1994)

John W. Shy (Chairman)
University of Michigan

Ira D. Gruber
Rice University

Joseph T. Glatthaar
University of Houston

William A. Walker
Archivist of the Army

Brig. Gen. Gerald E. Galloway, Jr.
U.S. Military Academy

Col. John F. Connolly
U.S. Army War College

Brig. Gen. Randall L. Rigby, Jr.
U.S. Army Command and General Staff College

Maj. Gen. John P. Herrling
U.S. Army Training and Doctrine Command

Carlo W. D'Este
New Seabury, Mass.

D. Clayton James
Virginia Military Institute

Rose L. Greaves
University of Kansas

Carol A. Reardon
Pennsylvania State University

Michael J. Kurtz
National Archives and Records Administration

U.S. Army Center of Military History

Brig. Gen. John W. Mountcastle, Chief of Military History

Chief Historian
Chief, Histories Division
Editor in Chief

Jeffrey J. Clarke
Col. William T. Bowers
John W. Elsberg

Foreword

The third in a projected four-volume work that will cover the history of the Army Medical Department from 1775 to 1941, this volume traces the development of the department from its rebirth as a small, scattered organization in the wake of the Civil War, through the trials of the Spanish-American War and the Philippine Insurrection, up to the entrance of the United States into World War I. A time of revolutionary change both in the organization of the U.S. Army and in medicine, the period climaxed with the golden age of Army medicine, when U.S. medical officers played a leading role in research that developed new and effective weapons in the war against epidemic disease.

The Army Medical Department, 1865–1917, continues the contributions to the history of military medicine initiated by the preceding volumes.

Washington, D.C.
17 November 1994

JOHN W. MOUNTCASTLE
Brigadier General, USA
Chief of Military History

The Author

Mary C. Gillett received B.A., M.A., and Ph.D. degrees from The American University. She worked for the Naval History Division of the Office of the Chief of Naval Operations from 1966 to 1969 and, beginning in 1972, for The Historical Unit of the U.S. Army Medical Department. She joined the U.S. Army Center of Military History when it absorbed The Historical Unit in 1976. She is now chief of the Conventional War Studies Branch of the Center's Histories Division. She is the author of *The Army Medical Department, 1775–1818*, and *The Army Medical Department, 1818–1865*, and of articles concerning the history of military medicine in the United States.

Preface

In writing *The Army Medical Department, 1865–1917*, I followed several precedents established in the first two volumes. As a result, I made no attempt to provide coverage of military operations beyond that necessary to an understanding of the challenges facing the Medical Department, and I observed the same principle in dealing with developments in the world of civilian medicine and in the armed forces of other major powers in Europe and Asia.

It is impossible to thank by name all the archivists, physicians, and historians from coast to coast whose efforts contributed significantly to this volume. My indebtedness is particularly great, however, to Dorothy Hanks, now retired, and Stephen J. Greenberg of the National Library of Medicine; to William E. Lind, also retired, William Grace, Robert W. Coren, Michael P. Musick, and Michael T. Meier of the National Archives and Records Administration; and to Col. Robert J. T. Joy, MC (USA Ret.), of the Uniformed Services University of the Health Sciences, who offered encouragement and shared his vast knowledge of military medicine both with me and with the peer review panel for the manuscript. John Parascandola, then on the staff of the National Library of Medicine, was kind enough to give the panel the benefit of his expertise, and I was fortunate that John Duffy, whose knowledge of public sanitation in the United States in the period covered by this volume is unequaled, was willing to read the manuscript.

I am also especially grateful to many of my colleagues and former colleagues at the U.S. Army Center of Military History. They include librarian James B. Knight, whose ingenuity and persistence eased my burdens; Brig. Gen. Harold W. Nelson, former chief of military history, who approved the manuscript for publication; and the members of the review panel—Graham A. Cosmas, who repeatedly shared his profound understanding of the history of the Army; Albert E. Cowdrey, now retired as chief of the Conventional War Studies Branch, who patiently reviewed version after version of the manuscript; Jeffrey J. Clarke, the chief historian; Col. Robert H. Sholly (USA Ret.), then the chief of the Histories Division; Lt. Col. William G. Bell (USA Ret.); Judith L. Bellafaire; and John W. Elsberg, the editor in chief. I am appreciative, too, of the support of Lt. Col. Richard O. Perry (USA Ret.), chief of the Histories Division when I started this volume, and Col. William T. Bowers, the present chief.

Among former members of the Center who made this volume possible are Col. William F. Strobridge (USA Ret.), who provided me with photocopies of articles that I would have otherwise missed and helped me to contact a research team studying the casualties of the San Francisco earthquake of 1906; Madeleine

Sapienza, who gave me the benefit of her skill as a tireless and imaginative researcher; and librarian Mary L. Sawyer, who greatly facilitated my research.

The manuscript also profited significantly as it approached publication from the unceasing and thorough work of senior editor Joanne M. Brignolo, from the resourcefulness of Howell C. Brewer and Beth F. MacKenzie in locating photographs, from the cartographic skill of Sherry L. Dowdy in creating the maps, from the eagle-eyed proofreading skills of junior editors W. Scott Janes and Troy D. Wolfington, and from the typography and design expertise of printing specialist Kenneth R. Kidd.

The assistance of two of my colleagues, William M. Hammond and Lt. Col. Adrian G. Traas (USA Ret.), when disaster by computer threatened should not be overlooked. Without their technical knowledge, I might well have rendered the manuscript for this volume as invisible as my expertise with electronic brains.

Finally, I wish to thank my daughter, Blakeney Gillett, who devoted many of her lunch hours to going over the papers of William C. Gorgas and his family at the University of Alabama in Tuscaloosa and to photocopying pertinent documents.

In spite of the advice and assistance of so many, inevitably errors remain. I must ruefully accept the responsibility for each and every one.

Washington, D.C.
17 November 1994

MARY C. GILLETT

Contents

		Page
PROLOGUE: THE RETURN OF PEACE		3
Chapter		
1.	VIEW FROM THE TOP	7
	The Surgeon Generals	7
	Demobilization	11
	The Peacetime Organization	12
	Creation of the Hospital Corps	18
	Problems of Victims of War	21
	State of the Art	25
2.	SUPPORTING THE ARMY	39
	Preventive Medicine	39
	Surgery	49
	Hospitals	51
	Above and Beyond Health Care	52
	Off-duty Pursuits	55
3.	THE INDIAN WARS	63
	Fighting an Unorthodox Enemy	63
	Supporting a Major Expedition	67
	Surgeons and Their Work	78
	Care of Reservation Indians	81
	The Last Battle	84
4.	A NEW DIRECTION	93
	The New Surgeon General	94
	Personnel and Training	96
	Preventive Medicine	102
	Surgery	106
	Domestic Conflict	109

Chapter		Page
5.	PREPARATIONS FOR CONQUESTS OVERSEAS	117
	The Medical Buildup	118
	Readying Supply	124
	Organizing a Hospital System	127
	Launching the Cuban Expedition	129
	Launching the Philippine Expedition	133
6.	SUPPORTING THE INVASION FORCES	141
	In Cuba	141
	In Puerto Rico	160
	In the Philippines	164
7.	DISEASE AND DEATH IN U.S. CAMPS	173
	Camp Thomas	175
	Camps in Florida	178
	Camp Alger	181
	Retreat From Disease: New Camps	183
	Camp Wikoff	186
	The Typhoid Board	191
	The Dodge Commission Investigation	193
8.	CAMPAIGNS OF THE NEW EMPIRE	201
	The Philippine Insurrection	201
	Hospitals and Evacuation	204
	Medical Personnel	213
	Health of the Troops	216
	Supply and Diet	219
	The China Relief Expedition	220
9.	PUBLIC HEALTH IN CUBA	229
	Health of the Troops	230
	Improving Sanitation	232
	Fighting Yellow Fever	234
	The Yellow Fever Board	239
	A Time of Trial and Triumph	246
10.	PUBLIC HEALTH IN OTHER CARIBBEAN AREAS	257
	Puerto Rico	257
	Panama Canal Zone	263
	Gorgas and the Opposition	265

Chapter		Page
	Fighting Disease	269
	The Hospital System	275
	A Worthy Rivalry	276
11.	PUBLIC HEALTH IN THE PHILIPPINES	285
	Research and Disease Boards	285
	Organizing the Campaign	293
	The Campaign	296
	The Most Dangerous Threats	301
	Other Health Problems	305
12.	THE ORGANIZATIONAL REVOLUTION	313
	The Surgeon Generals	314
	The Surgeon General's Office	316
	Medical Officers	318
	Dentists	326
	Nurses	327
	The Hospital Corps	329
	Preparing Medical Personnel for War	332
	General Hospitals	336
	Supply	339
13.	THE MEDICAL SERVICE IN ACTION	347
	Fighting Disease and Disability	347
	Hospitals and Laboratories	361
	Evacuation	362
	Practice for War	363
	Disaster Relief	365
14.	IN THE SHADOW OF WAR	377
	The Surgeon General	380
	Medical Department Personnel	381
	National Guard Medical Personnel	385
	Supply	388
	Hospitals and Laboratories	390
	Training Along the Mexican Border	392
	Lessons Learned From Europe	404
	EPILOGUE: THE YEARS OF CHANGE	413
	BIBLIOGRAPHY	417
	LIST OF ABBREVIATIONS	491
	INDEX	495

Table

Page

Philippine Tropical Disease Board Members 286

Maps

No.

1. Bighorn-Yellowstone Expedition, 1876 68
2. Cuba, 1898 142
3. The Caribbean, 1898 161
4. The Philippines, 1899 203

Illustrations

Joseph K. Barnes 8
Charles H. Crane 8
Robert Murray 9
John Moore 9
Jedediah H. Baxter 10
Charles Sutherland 10
William H. Arthur's Caricature 14
John van R. Hoff 20
Fred C. Ainsworth 24
George M. Sternberg 41
Post Hospital at Jefferson Barracks, Missouri 44
Alfred Alexander Woodhull 48
Daniel Smith Lamb 50
Joseph J. Woodward 50
Elliott Coues 56
Mule Pulling a Travois 65
Holmes O. Paulding 69
James P. Kimball 70
George E. Lord 71
Bennett A. Clements 72
Curtis E. Munn 73
Julius H. Patzki 75
Junius L. Powell 75
Leonard Wood 79
Bernard Semig 80
Peter J. A. Cleary 82
Surgeon General Sternberg 94
Army Medical Museum Classroom 98

	Page
John Shaw Billings	98
Charles Smart	104
Daniel G. Caldwell	110
Nicholas Senn	118
Charles R. Greenleaf	119
Dallas Bache	124
Nurses at Josiah Simpson General Hospital near Fort Monroe	125
General Hospital at Fort Monroe	126
Henry Lippincott	134
Benjamin F. Pope	143
Aaron H. Appel	144
Marshall W. Wood	145
George McCreery	146
Valery Havard	146
Francis J. Ives	151
The Burning of Siboney	153
Louis A. LaGarde	158
Albert Hartsuff	175
Louis M. Maus	179
Medical Care at Jacksonville	180
Alfred C. Girard	181
Sternberg at Camp Wikoff	188
Victor C. Vaughan	191
Second Reserve Hospital, Manila, Philippines	205
Ward on Hospital Ship *Relief*	207
Converted Hospital Facilities at Angeles and Dagupan	211
Medical Officer Caring for a Wounded Filipino Insurgent	215
William B. Banister	221
Walter Reed	236
Aristides Agramonte	239
Jesse W. Lazear	240
James Carroll	240
Carlos Juan Finlay	241
Clara L. Maass	249
Bailey K. Ashford	260
Jefferson R. Kean	263
William C. Gorgas	264
Cartoon by Gorgas	269
Street in Colon, Panama	274
Theodore C. Lyster	276
Richard P. Strong	287
Charles F. Craig	289
Percy M. Ashburn	289
Edward B. Vedder	292

	Page
Weston P. Chamberlain	292
Franklin A. Meacham	297
A Sewage-clogged Drainage Ditch	298
William H. Forwood	315
Robert M. O'Reilly	315
George H. Torney	316
Paul F. Straub	325
Jane A. Delano	329
Company of Instruction Training at Washington Barracks	330
Henry L. Gilchrist	336
Chief Surgeon Girard	337
Letterman General Hospital, Presidio, San Francisco	338
Frederick F. Russell	348
Carl R. Darnall	358
William J. L. Lyster	359
Edward L. Munson	360
San Francisco, April 1906	366
Torney as a Young Officer	368
Robert U. Patterson	369
Surgeon General Gorgas	378
Base Hospital at Fort Sam Houston	392
Field Hospital No. 7 En Route to Mexico	393
Henry P. Birmingham	395
Field Hospital and Its Surgical Ward	396
Animal-drawn and Motor Ambulances	398

Illustrations courtesy of the following sources: pp. 44, 98, 211 (top/bottom), 215, 358, and 359, Armed Forces Institute of Pathology; pp. 153 and 188, *Harper's Weekly*, August 1898 and September 1898; p. 366 (top/bottom), Library of Congress; p. 316, National Archives and Records Administration; and pp. 65, 126, 269, 298, and 330, U.S. Army Center of Military History. All other illustrations are from the files of the National Library of Medicine. Because most of the photographs from the latter collection are undated and without identification beyond the names of the subjects, the captions for the illustrations in this volume do not specify rank.

The work of Charles Johnson Post (1873–1956) depicted on the paperback cover—*Field Hospital Back of the Lines,* Cuba, 1898, watercolor, 14¾″ × 18¾″—is from the Army Art Collection.

THE
ARMY MEDICAL DEPARTMENT
1865–1917

Prologue

THE RETURN OF PEACE



Peace had at last been restored. The Union had been preserved. With the end of the Civil War in April 1865, myriad opportunities beckoned to those with the energy, the enthusiasm, and the determination to take advantage of them. But for the Medical Department of the victorious Union Army, a huge and complex organization designed to care for men massed in large units, the return of peace held little promise. The thousands of physicians who had served during the war were no longer needed now that the Army's only significant adversaries were the Indians. Hospital trains and ships quickly became as irrelevant as the very large and elaborate general hospitals to which they had been evacuating thousands of sick and wounded. Little that had been learned or experienced during the long and bloody conflict proved to be significant once the amateur soldiers who had formed the bulk of the wartime army had returned to civilian life.[1]

The war had not rendered the weapons with which the Army's medical officers fought disease more effective. The conflict had occurred too soon to be of great benefit to medical science, for the instruments and techniques that would make significant increases in understanding possible were only just being developed. Microscopic organisms could not be seen clearly enough to be identified. Both civilian and military physicians feared infection so much that they rarely attempted any but the simplest operations. They were not able to determine what had caused the dysentery that was afflicting thousands of Union soldiers. The inability to identify either the typhoid bacillus or the malaria parasite during the war had even led to the appearance in medical literature of an imaginary disease, typho-malaria, whose symptoms in some ways resembled typhoid fever and in others malaria. And the popularity of the notion that poisonous miasmas—emanations from decaying vegetable or animal matter—were in some way behind the spread of disease and infection endured.[2]

Although the practical experiences of the Civil War confirmed the fact that the toll taken by disease could be lowered by improved sanitation, vaccination against smallpox, a diet rich in fresh fruits and vegetables to reduce the threat of scurvy, and the use of quinine to treat malarial fevers, disease in nearby towns often frustrated the efforts of post surgeons.[3] Immunization against smallpox, mandatory in the U.S. Army since early in the nineteenth century, remained a subject of vigorous debate outside the military. In spite of a growing public health movement, widespread concern in civilian communities about water supplies and the disposal of human wastes and garbage continued to surface chiefly after an epidemic had begun.[4]

When disease or infection defeated their primitive attempts at prevention, both military doctors and their civilian counterparts were as helpless in 1865 as they had been in 1861. "The treatment of disease is the weak spot in our profession," a physician noted several years after the end of the Civil War. Another reported that "the history of medical progress [was still] a history of men groping in the darkness. . . ." And Charles W. Eliot, president of Harvard, despaired at "the ignorance and incompetence of most American doctors who have graduated at American Schools. They poison, maim, and do men to death in various ways, and are unable to save life or preserve health." [5]

Understandably finding it difficult to stand by their patients without making an attempt to help them, neither military nor civilian physicians abandoned the type of treatment that Eliot deplored. They purged and even bled regardless of the specific disease or condition involved. The use of opiates was flourishing by the end of the war—veterans afflicted with chronic dysentery continued to use the opiates initially prescribed to them by Army doctors, joining the growing number of men and women who turned to these drugs to relieve whatever it was that ailed them. The popularity of medicinal alcohol, internally applied, persisted, and the use of aspirin and chemically similar drugs became more common because of the side effects or the cost of other drugs that reduced fever.[6]

Because the Civil War had emphasized on a large scale the basic helplessness of Army physicians against the inroads of disease and infection, the average line officer remained unimpressed by their recommendations about preventive health measures on post. Their position was further undermined by the fact that the exact implications of their formal rank, granted in 1847, had never been clarified; they continued to be referred to by a descriptive title, such as surgeon or assistant surgeon, rather than by rank. The surgeon general, himself a brigadier general, endured, however, as one of the Army's powerful bureau chiefs with direct access to the secretary of war. Thus, while medical officers as individuals often had little influence, the Medical Department of 1865 retained its semi-independent status.

The war had also failed to relieve the inadequacies of existing modes of transportation in the West, which handicapped both the Medical Department and the Army as a whole. Only in 1880 did railroads extend far enough to assist significantly in moving men and their supplies and equipment, making it possible for troops to move with such speed to any location that a multitude of small and often inconveniently located forts became unnecessary. Until then, military cargo was moved by water, where possible, and posts located any distance from a major waterway relied on wagon trains that could be delayed by weather, terrain, and the enemy.[7]

The post surgeons' difficulties in obtaining supplies were further exacerbated by the fact that their needs continued to be met by a number of agencies. Although the Medical Department's purveyors purchased medical and hospital supplies as well as special items of diet for the sick, the Subsistence Department furnished routine hospital rations. The Ordnance Department dispensed equipment for horses, small arms, and such items as mess kits and spurs. The Quartermaster's Department provided the storehouses at the Medical Department's supply depots, which were established in a few strategically located cities; transported supplies;

purchased clothing, mules, horses, and forage for the Army's animals; and, for five years after the end of the Civil War, built and repaired hospitals. It also procured ambulances built to Medical Department specifications.[8]

Despite the devastation, the huge armies, and the hordes of men suffering and dying from disease, wounds, and infection, the Civil War seemed for many years almost like an aberration in the history of the Medical Department. In April 1865 the wartime organization awaited dissolution, its medical officers a return to the conditions under which they had served before Confederate guns first opened fire on Fort Sumter, South Carolina, and the surgeon general the resumption of his struggle with a Congress congenitally unable to understand why guarding the health of a multitude of scattered units required the services of a multitude of physicians.

NOTES

1. Unless otherwise indicated, overall coverage of the Civil War in this volume is based on Mary C. Gillett, *The Army Medical Department, 1818–1865*; of the history of the Army on Russell F. Weigley, *History of the United States Army*, enl. ed., and Maurice Matloff, ed., *American Military History*, pp. 281–99; of medicomilitary history on Percy M. Ashburn, *A History of the Medical Department of the United States Army*; and of legislation on Raphael P. Thian, comp., *Legislative History of the General Staff of the Army of the United States . . . From 1775 to 1901*. For manuscript sources and works not listed in the bibliography, full details are given in the respective footnote entry. See the bibliographical essay for specific guidance.

2. Erwin H. Ackerknecht, *A Short History of Medicine*, p. 171; War Department, Surgeon General's Office, *Medical and Surgical History of the War of the Rebellion*, consisting of two three-part volumes that detail the struggles of the Union Army's medical officers to deal with diseases and infections whose causes they did not fully understand.

3. Since the earliest days of the Medical Department, the term *surgeon* was used to refer to all medical officers. It was a generic term and did not connote specialization.

4. John Duffy, *The Sanitarians*, pp. 93, 96, 99–102, 107–08, 114, 118–19; Richard H. Shryock, *The Development of Modern Medicine*, p. 256; Wesley W. Spink, *Infectious Diseases*, pp. 35–36; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, pp. 11–12, 21.

5. First quotation by William W. Wellington, "Modern Medicine," pp. 142–43; second quotation by H. C. Wood, cited in William G. Rothstein, *American Physicians in the Nineteenth Century*, p. 183 (see also pp. 186, 196–97); third quotation cited in John S. Haller, Jr., *American Medicine in Transition, 1840–1910*, pp. 218–19; Ackerknecht, *Short History*, p. 209; Lester S. King, "Medical Education," pp. 2457–58.

6. Rothstein, *American Physicians*, pp. 181–84, 187, 191, 194–95; Leon S. Bryan, Jr., "Blood-letting in American Medicine, 1830–1892," p. 520; David T. Courtwright, *Dark Paradise*, pp. 45–47, 54–55; H. Wayne Morgan, ed., *Yesterday's Addicts*, pp. 6–7, 12, 37; Mark A. Quinones, "Drug Abuse During the Civil War (1861–1865)," pp. 1008–10.

7. Erna Risch, *Quartermaster Support of the Army*, pp. 395, 476–78; War Department, *[Annual] Report of the Secretary of War*, 1869, 1:213 (hereafter cited as WD, *ARofSW*, date); Darlis A. Miller, *Soldiers and Settlers*, pp. 288–89.

8. WD, *ARofSW*, 1869, 1:223–24, and 1876, 1:112–13; Risch, *Quartermaster Support*, pp. 486–87; War Department, Surgeon General's Office, *Manual for the Medical Department, 1900*, p. 47; idem, *The Surgeon General's Office*, p. 117; Miller, *Soldiers and Settlers*, pp. 287–88. Because of the various organizations involved in supplying the Army, obtaining ambulances of a new design required the cooperation of the Quartermaster's Department and the Ordnance Department to facilitate the process of preparing the blueprints, constructing the vehicles, and purchasing the harnesses for the draft animals. For a detailed picture of this cooperation, see James W. Wengert, "The 1878 Ambulance Board," pp. 8–23.

Chapter 1

VIEW FROM THE TOP

The Civil War's chief legacy to the Medical Department was an increase in the traditional peacetime burdens of the Surgeon General's Office. In the years that followed the surrender at Appomattox, the office would be asked to create both a medical museum and a medical history, using specimens and case histories gathered during the conflict; in response to a congressional mandate, to provide Civil War veterans with prostheses and the information needed for pension applications; and, for a brief period, to manage the medical care of freed slaves. As a result, for decades after the end of the conflict, the Army's surgeon generals dealt with war-related challenges while carrying out the department's historic mission of guarding the Army's health.[1]

The Surgeon Generals

All seven of the officers who headed the Medical Department from 1865 to 1893 were Civil War veterans. Six of them had also served in the prewar Army and thus were familiar with many of the difficulties their subordinates would face after the war. With their roots firmly embedded in a period when germs were not recognized as the cause of disease and infection, all were to varying degrees unsure of the significance of the medical revolution then beginning to gather force across the Atlantic. They left the task of leading their organization to a prominent position in the era of modern medicine to the man who would become surgeon general in 1893.[2]

The first postwar surgeon general, Brig. Gen. Joseph K. Barnes, came to office in August 1864.[3] A man of diplomacy and determination, Barnes was known for his good judgment, hard work, and insight into the problems and personalities he encountered. Assigned to Washington in May 1862, he had quickly formed a strong friendship with Secretary of War Edwin M. Stanton. Until his resignation from office in May 1868 as part of the power struggle that led to President Andrew Johnson's impeachment, Stanton supported Barnes in all his undertakings, even when they involved activating projects he had previously disapproved. After holding office for almost eighteen years, Barnes was the first surgeon general to whom a new law mandating retirement at sixty-four applied. Already in poor health when he left the department in June 1882, he died a year later.[4]

Death or mandatory retirement because of age curtailed the time in office of the next six men to serve as surgeon general. Barnes' immediate successor, Brig. Gen. Charles H. Crane, was head of the department for only fifteen months. An obvious choice, the 57-year-old Crane had worked



JOSEPH K. BARNES



CHARLES H. CRANE

closely with Barnes, functioning as his assistant surgeon general. Crane was highly regarded because of his experience and skill as an administrator, for his good judgment, and for his encouragement of competent subordinates. Unfortunately, he never realized his full potential. A sudden hemorrhage from a malignant growth that appeared in his mouth soon after taking office proved fatal in October 1883.[5]

The short terms served by Crane's successors precluded any significant easing of the rivalry that existed among the Medical Department's senior officers. Prominent in the jostling that followed Crane's death was the bright and very ambitious Col. Jedediah H. Baxter, who as the chief medical purveyor bore the ultimate responsibility for obtaining Medical Department supplies. President Andrew Johnson's appointment of this highly controversial Civil War volunteer medical officer to the department as a lieutenant colonel in 1867 without the examination that was required of all others had aroused much resentment. It may have been responsible for his exclusion in 1881 from the bedside of the dying James A. Garfield, despite the fact that the president had for a time after his election been Baxter's patient. His ambition was thwarted after Crane's death when, once again, an assistant surgeon general was promoted to the Medical Department's leading position.[6]

In November 1883 Brig. Gen. Robert Murray began his tenure as surgeon general. At the time of his appointment Murray, then the department's senior officer, was only three years short of mandatory retirement. Although he had at one time served under Baxter, his selection was not inappropriate. His military career had begun in 1846, long before Baxter entered the Army, and he had been so successful that mem-



ROBERT MURRAY



JOHN MOORE

bers of the department pronounced him to be "in every respect a most estimable gentleman" who, like Crane, possessed "exceptional administrative capacity."[7]

The fact that Murray would have to leave the Army in three years was known at the time of his appointment. Nevertheless, when that day came in August 1886, no decision had been made concerning his successor. Baxter was again a strong contender; he was now the department's senior surgeon, given his time in rank, and was serving as acting surgeon general until the position of surgeon general was filled. Both Baxter and his chief rival, Col. Charles Sutherland, who had served fifteen years longer in the Medical Department than Baxter and was eight years older, lost out when President Grover S. Cleveland appointed an officer who was "politically of the same faith as" himself. The new surgeon general was Brig. Gen. John Moore, who had been Sherman's medical director in the last months of the Civil War. Compared to Baxter, Moore was eleven years older and had been a member of the department fourteen years longer. At sixty he was only four years short of retirement.[8]

When Moore retired in August 1890, however, Cleveland was no longer in office. Baxter benefited from the fact that the new president, Benjamin Harrison, was both a friend and a patient; thus he triumphed over Sutherland, his long-time rival for the position of surgeon general. In becoming head of the Medical Department and attaining the rank of brigadier general, Baxter reached a goal long and energetically sought, possibly ever since he first gained favorable attention during the Civil War as a result of his assignment as chief medical officer in the Provost Marshal General's Office in 1862. Except for a few months in 1861, his responsibilities



JEDEDIAH H. BAXTER



CHARLES SUTHERLAND

during the Civil War kept him in Washington, where his accomplishments included compiling the highly regarded *Medical Statistics of the Provost Marshal General's Bureau*. While fulfilling his military duties after his appointment to the Medical Department in 1867, he cultivated important friendships. He also acquired a law degree and amassed a collection of photographs of department officers so complete that he could eventually greet each member of the department by name.[9]

Unlike Murray and Moore, at fifty-three Baxter was still a relatively young man who could reasonably expect to serve many years as surgeon general. In the late summer of 1890 his plans for the department apparently included encouraging promising medical officers in their scientific pursuits, even though when serving as the department's chief medical purveyor, he had shown a significant lack of enthusiasm for supplying such men with microscopes. His greatest achievement as surgeon general may well have been assigning young Capt. Walter Reed to Baltimore long enough for Reed to take a seven-month postgraduate course in bacteriology and pathology at Johns Hopkins. Once ensconced as surgeon general, Baxter also reportedly began to occupy himself with taking revenge upon those who had annoyed him before he reached the top in the Medical Department. Among the unfortunates on his list was at least one medical officer whose only apparent crime had been insisting upon being provided with a microscope. Baxter's relative youth, his ambition, and the controversy in which he had already been involved suggest that he would have been a memorable and colorful surgeon general, but his health was no longer robust. On 2 December he suffered a stroke, and on the

fourth, after less than four months in office, Jedediah Baxter was dead.[10]

On 23 December 1890 Charles Sutherland at last became surgeon general, thus attaining also the rank of brigadier general. No reason for his failure to reach this position earlier is evident, other than his apparent lack of powerful political friends. He was highly regarded both as a medical officer and as "a most delightful companion," of "a most amiable disposition." As surgeon general he was considered by some to be "poor, weak, [and] old," but he apparently was a capable administrator. His age made his retirement mandatory in May 1893, after forty-two years in the department but less than three as surgeon general. With Sutherland's retirement an era came to an end. Unlike his predecessors in the immediate post-Civil War period, the next surgeon general would not be content merely to observe the medical revolution from afar.[11]

Demobilization

For both the Army and the Medical Department, the return to peacetime size was rapid. Although the demands of Reconstruction and the need to discourage the spread of French ambitions in Mexico delayed total demobilization for a few months, the million wartime volunteers of May 1865 had become 11,000 by November 1866. Few even of that number remained after the fall of 1867. Since the war left much of the nation convinced that large-scale conflict was for the United States a thing of the past, Congress reduced the number of regular troops as well, from 54,000 in 1867 to 26,000 in the late 1870s, when Reconstruction came to an end.[12]

During the year after the Civil War ended, much of the Medical Department's time was devoted to processing departing medical personnel, to settling their accounts, and to closing facilities. Most of the doctors leaving the Army by the end of 1866 were volunteers, who were mustered out on an individual basis as soon as their services were no longer needed. The department reduced the number of contract surgeons to 1,997 by July 1865, to 262 a year later, and to 187 by 1870. Twelve regulars resigned soon after the end of the war, and six more died within the year. The hospital chaplains attached to wartime hospitals were dismissed as these facilities were closed. With the departure of the victims of that conflict, the department closed all general hospitals. The office of superintendent of women nurses was also abolished in the fall of 1865, when all female nurses were discharged.[13]

Of the 65,000 patients in general hospitals in June 1865, only 97 remained a year later. The rapid decrease in the number of patients led to a corresponding decrease in the amount of medicines and supplies needed for their care and in the number of facilities designed to shelter them. Surgeon General Barnes was called upon to disband the ambulance corps; to close supply depots; and to sell or otherwise dispose of hospital transports, hospital trains, and general hospitals. Some institutions were turned over to individual states for use as homes for wounded veterans, and others were returned to their original owners. By the end of the fiscal year 1866 the Medical Department had received more than four million dollars from the "sales of old or surplus medical and hospital Property." By the summer of 1866 only the depots at New York, Philadelphia,

St. Louis, New Orleans, San Francisco, and Washington, D.C., remained open.[14]

The Peacetime Organization

In 1866, with the worst of the demobilization problems resolved, Congress moved to officially establish a peacetime Medical Department. At the outset the new organization closely resembled the old in structure, size, and function. The new law retained the position of surgeon general with its rank of brigadier general and that of the assistant surgeon general with its rank of colonel. It also made custom into law by requiring that the surgeon general be appointed from within the Medical Department. But the responsibility for managing the purchase and distribution of the department's supplies was no longer one that the surgeon general could assign to any medical officer he chose. Medical purveyors were now to be appointed by the president, subject to the Senate's approval. They would, as in the past, be ordered to post bond. Congress also required them to remain available for work as surgeons should the need for their services arise. The chief medical purveyor would hold the rank of lieutenant colonel, as would his four assistants. The wartime positions of medical inspector general and medical inspectors were eliminated.

Congress continued at this time to classify all other Army physicians as either surgeons, who were ranked as majors, or assistant surgeons, who were lieutenants or captains. The legislature kept at 60 the number who could hold the rank of major and limited the number of assistant surgeons to 150. The total of 217 regular medical officers in the department, while inadequate given the number of posts that needed coverage, was an increase of 28 over the number of regulars in the Army at the end of the Civil War. Congress required the Medical Department to give preference in choosing new assistant surgeons to those who had served with the Union Army as volunteers, excepting them from the usual age limit of twenty-eight by permitting them to subtract the number of years served in the Civil War from their actual age. The time they had served in the Civil War was also credited to them in determining their rank. Like all other applicants, they had to pass an entrance examination. Five medical storekeepers—who were shortly thereafter given the official rank of captain—remained in the department.[15]

Under the new organization, Army surgeons continued to serve both in the field and in Washington. In 1872, according to a medical officer working in the Surgeon General's Office, 3 medical officers, including Crane, worked with Barnes in the Surgeon General's Office, with 15 or so civilian clerks and perhaps 100 hospital stewards. In the wake of the Civil War Barnes began officially delegating some of the responsibilities of his office to his subordinates, establishing first a finance division—the exact date of the establishment of this division is unclear, although the records remaining from it date from 1873—and, in 1874, a property division, with Baxter, as chief medical purveyor, at its head.[16]

Most of the professional staff were assigned to positions outside Washington, D.C. A few medical officers functioned as medical purveyors at medical depots, and the senior surgeon of each command was its medical director, managing medical personnel, hiring and firing contract surgeons and hospital stewards, and granting leave to subordinates. The commanding officer of each military department deter-

mined how many physicians were needed at each post and until 1892, when this responsibility was given to the secretary of war, gave them their assignments. Those in charge of general hospitals would, should such facilities ever be established, order supplies through the surgeon general. Otherwise, Army surgeons sent their requisitions through their medical directors to the medical purveyor at the designated supply depot. Veterans also sent their requests for artificial limbs through the nearest medical director. As necessary, medical directors were also called upon to inspect sanitation at the various posts. Basically, however, the Medical Department was no exception to the rule that in this period "the most minute details" of matters "in the smallest and most distant garrisons were regulated and handled" by the Army's bureaus from Washington.[17]

During Reconstruction the organization of the Department of the South into five military districts required the naming of five district medical directors. These officers apparently reported directly to not only the surgeon general but also the medical director for the Department of the South at Atlanta. Each district director was initially responsible for the care provided the garrisons at both temporary and permanent posts. He also had to send physicians with units leaving the South as the occupation force was gradually reassigned.[18]

By 1868 the Medical Department was expected to cover 289 garrisons, and many detachments also needed medical attendance, among them those sent to watch over the polls in the South at election time. To meet the challenge imposed by this requirement, Barnes supplemented a small but elite corps of medical officers with contract physicians (also referred to as acting assistant surgeons) as needed.[19]

To guarantee that this elite corps remained elite, the Medical Department held the regular surgeons and assistant surgeons who remained in the Army to high standards. Meeting this goal proved difficult. Although a Medical Department position might appear to be a better alternative to a young physician without prospects of joining a lucrative city practice, the slow advancement and low pay that characterized the peacetime Army had serious effects upon morale. A medical journal suggested that regular medical officers—who, unlike their civilian counterparts, had had to pass extensive examinations to establish and reestablish their competence—"could surely do much better" as far as pay was concerned "in civil practice." Many medical officers apparently agreed with the article, for while the number taking the entrance examinations was considerable, resignations were frequent—forty-eight medical officers resigned from 1865 to 1874.[20]

These exams weeded out those who did not meet the department's standards, but for those who did pass, they also laid out the path to be taken for improvement. In theory, at least, they required proficiency in scientific and medical topics and in literature and history as well. Candidates might be asked the cube and cube root of 3.6; the capitals of such political entities as Saxony, Bavaria, and Switzerland; the principal Roman deities, giving also the corresponding names used by the Greeks; or Newton's first law of motion. Other questions might involve the chemistry of glassmaking, the differences between gastric and pancreatic digestion, the pathology of uremia, or the effects of exercise on the lungs. Weaknesses in any of the areas of questioning were brought to the attention of those passing, who were expected to remedy them. The proportion of those taking the examina-



WILLIAM H. ARTHUR'S CARICATURE *of an examining board in action. Arthur immortalized himself as the candidate in the hands of the inquisitors.*

tions who passed varied widely, from as few as one-twelfth to as many as one-third, with perhaps a fifth or more failing to qualify for physical reasons. At least one medical officer whose military career was successful questioned the validity of the examinations. Brig. Gen. William H. Arthur commented years after passing his tests that many of those who did well on them did not make good Army surgeons.[21]

Since no knowledge of the way in which medicine was practiced in the Army was required to pass these exams, Surgeon General Barnes decided that a newly commissioned assistant surgeon should initially be assigned to one of the few posts large enough to need the services of more than one medical officer. Here an experienced surgeon could teach the neophyte the fundamentals of military medicine and Army routines. On some occasions, when no opening was immediately available, the successful candidate would be hired on contract and in that capacity sent to work with a senior surgeon until there was an opening for him. When he became eligible for promotion after three years, he was tested again to determine whether the required remedial study had been done and whether he had been keeping up with the latest developments in his profession. Those who failed this promotion exam might, if the surgeon general believed there were extenuating circumstances, be permitted another try, but a second failure brought a request for resignation, with a threat of dire but unspecified steps to be taken if it were not immediately forthcoming. Some doubt existed whether the department could legally drop an assistant surgeon merely because he did not pass his promotion exam, but apparently none of

those who failed this test ever challenged the department's position. In new legislation concerning the Army in 1878, Congress ruled that those seeking to be promoted to the position of surgeon, or major, must also pass an examination.[22]

The quality of the Army's contract surgeons, on the other hand, was not so easily controlled. These physicians did not have to take examinations, being required only to be graduates of reputable medical schools, of good character, and in good health. Their contracts, usually arranged by a local medical director on an annual basis and calling for a year of service, brought them as a rule $1,200 to $1,500 a year, at a time when the average civilian doctor was earning $1,000 a year. Because the agreement could be canceled whenever the department determined that their services were no longer needed, contract surgeons might be hired for the duration of a campaign or expedition. If their work or habits proved unsatisfactory, they need not be rehired. In the South, physicians eligible for contracts were difficult to find because few could take the required oath that they had never voluntarily borne arms against the government. Nevertheless, the disadvantages involved in hiring civilian physicians who might have no military experience were counterbalanced by the great flexibility the system gave Barnes in meeting the Army's needs.[23]

The passage of time did not improve Congress' appreciation either of the Army in general or of the caliber of the Army's regular medical officer and the nature of the demands placed upon the Medical Department. Thus the problems engendered by low rank and inadequate numbers remained unresolved. In 1869, when only 168 medical officers were serving in the Army and 239 posts and innumerable detachments needed medical attendants, the legislature, with its enthusiasm for using the Army as a police force in the South waning, included the Medical Department among those organizations in which no more vacancies were to be filled at any level and no promotions made. As a result, by 1871 the department had 54 vacancies, one of which was the position of chief medical purveyor. The number of posts to be served had also dropped from the 1869 level, but only by 33. In reporting to the secretary of war on these problems, Barnes pointed out that naval medical officers held higher rank than Army surgeons, even though, in his opinion, they performed less arduous duties.[24]

When Congress reorganized the staff corps of the Army in June 1874, it was still of a mind to reduce expenses. Having forbidden recruiting beyond 25,000 men, the legislature went on to cut the budgets of departments supporting the Army. Although other departments also suffered because of the economy drive, no other bureau chief, with the possible exception of the quartermaster general, reported to the secretary of war as serious misgivings about its effect upon personnel as did the surgeon general. New legislation reduced the number of lieutenant colonel slots in the Medical Department from 5 to 2 and that of majors from 60 to 50, thus effectively preventing promotions for years to come. Congress did remove the restriction on filling vacancies within the department and increased the rank of the chief medical purveyor to colonel. Reductions in rank were to take place through attrition only. The legislators also refused to allow hiring more than 75 contract surgeons and abolished vacant positions at the grades of surgeon, medical storekeeper, and assistant medical purveyor. The only way in which Surgeon Gen-

eral Barnes could now meet the need for medical officers was by paying private physicians on a fee-for-visit basis to care for those patients who would otherwise receive no medical care. Six months later Congress suspended the limitation on the number of contract surgeons to be hired, but the legislators remained unhappy with the department's use of so many.[25]

Civilian colleagues reacted with outrage to the treatment accorded the Army's medical officers. The editors of the *Medical Record* exclaimed that they were "in fact, astonished at [the bill's] provisions, and thoroughly disgusted at the fact of its final passage." The American Medical Association, to whose meetings the Army had been sending a representative since 1850, stressed in an 1874 petition to Congress that 1 in 18 officers in the Ordnance Department was a colonel; in the Engineers, 1 in 16; and in both the Commissary and Quartermaster's Departments, 1 in 13. But in the Medical Department only 1 in 102 was a colonel, and an officer might serve thirty to forty years without rising above the rank of major. In support of its argument that the U.S. Army surgeon deserved better treatment, the petition quoted from an address given by the famous German pathologist Rudolph Virchow that same year: "Whoever takes in hand and examines the comprehensive publications of the American Army Medical Staff will continually have his astonishment excited anew by the riches of the experience which is there recorded." The American Medical Association also emphasized that the ratio of 1 medical officer to every 200 or so men contrasted unfavorably with the 2 to 120 ratio characteristic of the British Army.[26]

In 1876 Congress relented somewhat concerning promotions for medical officers, doubling the number of positions for lieutenant colonels and adding 3 more for colonels. But it reduced the number of openings for assistant surgeons from 150 to 125 and even slashed the department's appropriation for the fiscal year ending 30 June 1877, forcing drastic cuts in the number of contract surgeons and hospital stewards. When the original number of positions was restored the following March, the department's troubles were not at an end. After several years of dwindling appropriations, funds for the Army for the following fiscal year were not voted until November 1877. This failure, which forced soldiers to go for many months without pay, can be blamed at least in part on the desire of southern congressmen to encourage the complete removal of the Army from their states. The persistent uncertainty forced Barnes to reduce the number of contract surgeons hired. In February 1877 he urged each medical director to annul contracts whenever he could, relying instead upon "local physicians . . . employed by the visit." He also ordered that no leave be granted regular medical officers. Although the usual appropriation was finally voted, difficulties caused by the shortage of physicians remained, Barnes' pleas for more assistant surgeons having been made in vain.[27]

Undaunted, Barnes continued his efforts in behalf of the department, taking advantage, as was his custom, of the familiarity with the ways of Washington that his years of service and his position as long-term bureau chief had given him. In attempts to head off new measures he considered harmful, he approached congressional leaders concerned with the affairs of the Medical Department. Nevertheless, when age forced Barnes' retirement in June 1882, the basic problem remained: 185 of the Army's posts were large enough to re-

quire the services of at least one physician, but only 183 of the 192 positions for regular medical officers in the department were filled.[28]

Congress made a few minor adjustments in the organization of the Medical Department after Barnes' departure, in 1883 downgrading the position of assistant surgeon general. The physician filling this slot, once the only medical officer with the rank of colonel, no longer served as the second in command in the department, but became "simply one of the colonels in the Medical Corps." In 1892 another change gave all colonels the title of assistant surgeon general and all lieutenant colonels that of deputy surgeon general. Although Congress enacted no law at this time to change the way in which medical officers were addressed, from 1890 onward the surgeon general's annual report referred to regular medical officers by rank rather than as surgeon or assistant surgeon.[29]

Such changes had no effect on the chronic shortage of medical officers. The effects of a legal limitation on the number of Army officers who could be retired for disability were felt more intensely with the passage of time as the retention of an increasing number of disabled surgeons on the active duty list blocked the appointment of replacements. By 1890 fifteen medical officers, one of whom had been disabled for thirteen years, could not perform their duties. Seven more were in such poor health that their usefulness to the department was limited. Fortunately, because of the constant expansion of the railroad network in the West and the confinement of Indians to reservations, the concentration of troops at a few large posts—the Army closed 25 percent of its posts in the period 1890–1891—was gradually reducing the demand for post surgeons. New needs developed as requests for advice and assistance from the National Guard increased and as medical officers were given such added duties as teaching military hygiene at the new U.S. Infantry and Cavalry School at Fort Leavenworth, Kansas. This latter assignment was particularly significant because of the opportunity to impress line officers with the importance of taking medical advice seriously.[30]

In February 1891 Congress finally removed from the limited retirement list—which contained the names of officers retired for disability or length of service rather than age—all who were more than sixty-four years old. Because of the new openings on the limited list that resulted, six disabled medical officers could retire almost immediately, and two more left the department in midsummer. Surgeon General Sutherland's first annual report recorded that only two medical officers who were permanently unable to perform their duties remained in the department.[31]

The openings produced by the new retirements seemed especially desirable to young physicians who had just completed their professional education. As civilians beginning their careers, few could hope to match the Army's $1,500 a year starting salary and the 75 percent of active-duty pay medical officers could expect when retired, whether for disability or age. Although the department did not suffer from a shortage of applicants, traditionally many who passed the exam were recent and untried graduates of medical school. The opening of many positions in the department only exacerbated a problem that had existed for decades. Barnes' approach to the problem, an informal apprenticeship system for fledgling assistant surgeons, was expanded by his successors to include

those who were serving as contract surgeons while awaiting assignment. Surgeon General Moore attempted to reduce the magnitude of the problem by ordering that those with experience "in hospital and dispensary practice" be taken into the department first.[32]

The pleas for more openings for regulars proved fruitless. Consequently, the need for large numbers of contract surgeons, whether or not they had passed the department's examination, did not abate. Crane pointed out that because the Army's demands fluctuated, the surgeon general should determine the number of contract surgeons to be employed. Nevertheless, Congress insisted on setting the limit, renewing in 1883 the reduction of the number of contract surgeons from 125 to 75 that had been suspended nine years earlier. From this time onward, new contract opportunities for doctors other than those awaiting openings in the regular staff were rare, especially as the trend toward employing larger garrisons lowered the need for medical officers of any category. When Congress cut back the department's budget in 1886, and further economies were necessary, the number of contract surgeons was once again reduced. Surgeon General Moore adopted an informal policy of limiting new contracts to those who had passed the department's entrance examination, thus guaranteeing the Army superior contract surgeons and offering valuable experience to future regulars. In drawing up the budget for fiscal 1893, however, Congress voted no funds for new contracts, forcing the department to rely once again on fee-for-visit hiring. Some scientists working for the department lost their positions as acting assistant surgeons and continued their work as civilian employees.[33]

Creation of the Hospital Corps

The one significant change in the Medical Department in the period 1865–1893 involved the effort to obtain and retain competent enlisted men to assist medical officers in the performance of their duties. The problem was as old as the U.S. Army itself. The tradition of detailing the dregs of a unit to assist surgeons in their work had lasted until five years before the start of the Civil War, when Congress made hospital stewards permanent members of the Medical Department. After the war as before, the legislature persisted in ignoring the argument that placing stewards in a permanent corps would make it possible to use them more effectively.

Female nurses were not part of the solution to this problem. No formal nursing schools existed in the United States until 1873, and the qualifications of women willing to care for the Army's sick and injured were not particularly high. Thus the Army, having no real reason to hire women as nurses, employed none between the end of the Civil War and the beginning of the Spanish American War more than thirty years later, even though the law permitted them to be engaged at 40 cents a day for work in general hospitals, whenever they might be established. The law also permitted women to work in hospitals as matrons (that is, civilian housekeepers), whose chief duties were those of laundresses, for a monthly salary of $10. Matrons were few in number, 169 being in service as of 30 September 1887, and were hired only at the larger posts and recruiting depots.[34]

By 1865 most stewards were competent men whose assistance to surgeons included working as pharmacists, performing minor surgery and simple dentistry,

keeping records, and managing the post hospital. Some were themselves physicians, and at least one functioned as a full-time dentist. Nevertheless, their pay was less than half that paid their counterparts in the U.S. Navy, and, as enlisted men, they never received the respect to which their professional attainments might otherwise have entitled them.[35]

In 1874, eight years after voting to allow the appointment of as many hospital stewards as the surgeon general believed were needed, Congress voted to limit the number to 200. To his dismay Surgeon General Barnes discovered that the adjutant general, who controlled personnel procurement for the Army, could be a greater problem than the legislature. Ignoring the law, the adjutant general limited the number the department could hire to a significantly lower figure. In its 1878 legislation concerning stewards, Congress divided them into three classes, with the first to be paid $30 a month; the second, $22; and the third, $20. It also made them eligible for the same small salary increases that other enlisted men received as rewards for length of service or reenlistment and forbade appointing any civilian as first-class hospital steward unless he had previously served in that position. This new systematization in the management of Medical Department enlisted men gained many admirers in Europe.[36]

Nevertheless, problems were many. Stewards were scattered among the posts and never practiced together, and thus the Army was still unable to train teams to move wounded from the battlefield until hostilities started. As a result, if a war should break out, able-bodied combatant soldiers would leave the battlefield to escort wounded comrades, just as they had in the Civil War, possibly never to return to the conflict. Nurses would have to be gathered and instructed in the care of the wounded after the first of the injured had started pouring into hospitals. First-class stewards, often capable and intelligent, were so few in number that in 1886 Surgeon General Murray had to place restrictions on their leave. Department spokesmen continued to urge the creation of a permanent body of "able-bodied and intelligent men," to number approximately 2 percent of the fighting strength and to be thoroughly trained to work as nurses, cooks, and ambulance attendants.[37]

At this juncture the dwindling likelihood of further hostilities with the Indians was, according to military historian Russell F. Weigley, encouraging "a few preparations for possible foreign war." An entire regiment gathered to train as a unit in 1887, and the belief that the Army should be readied for war, rather than for the work of a constabulary, was beginning to grow. With it grew the belief that in such a force, a permanent corps of enlisted men with centralized and systematic organization and training should serve each staff bureau. When he became surgeon general in November 1883, Murray began urging in his annual reports to the secretary of war that some way be found to create such a corps for the Medical Department so that the department's enlisted men could be trained together in the performance of their duties. His goal was an organization of men who "shall be thoroughly instructed and trained in all the details of hospital service, . . . thus preparing the Department for any emergency of peace, war or epidemic."[38]

A few months after Murray's retirement in August 1886, the legislature passed a law creating the Hospital Corps, an organization of men who could be systematically trained to function as hospital attendants. The new corps was to be composed of hos-



JOHN VAN R. HOFF

pital stewards, acting hospital stewards, and privates, their exact numbers to be determined by the secretary of war. First-class stewards would now be designated hospital stewards and those of the second class, acting hospital stewards (the category of third-class hospital steward had been abandoned in 1885). Soldiers who were not members of the Hospital Corps could no longer be detailed to serve as nurses. Corpsmen would perform all "hospital services in garrison and in the field" and in wartime would manage the ambulance service as well. They would serve as wardmasters, nurses, cooks, and assistants to others serving in these capacities, and also as orderlies who accompanied surgeons during marches and in battle.[39]

In implementing the new law, the Army tried to establish a regular upward path for those who demonstrated an aptitude for Hospital Corps work. The plan called for four men in each company to be selected as litter-bearers, with possible transfer to the Hospital Corps in mind. While remaining in the line, these men would be trained in first aid and the duties of the litter-bearer for at least four hours a month. After a minimum of a year's experience, they could take an examination that would make them eligible for selection as Hospital Corps privates. After a year of service and upon the recommendation of his command's senior medical officer, a corps private could be detailed by the surgeon general to serve as an acting hospital steward. After a year's satisfactory service in this probationary capacity and the passage of yet another examination, he could become a hospital steward. Previous service in a similar capacity counted in the computation of the time required for promotions.[40]

Medical officers tended to regard this plan with some skepticism. The lot of the enlisted man had started to improve in the 1880s, but his character was still not highly regarded. The assumption that the opportunity to transfer to the Hospital Corps would prove attractive to litter-bearers was "a proposition scarcely worth discussing," according to assistant surgeon Capt. John van R. Hoff, who believed that the new organization offered "no inducement to the average soldier to transfer—the sanitary soldier if required to do his full duty must work harder than any line soldier—and there is nothing a soldier abhors more than work, except it be drill—hence it is that the detail of company bearers is regarded as a punishment because it is additional duty." Furthermore, Hoff doubted that the Army contained 800 men physically and mentally capable of handling Hospital Corps responsibilities. Another assistant surgeon remarked that the bearer drill was "as a source of amusement to the rest of the com-

mand, . . . a great success—but in all other respects, . . . a great failure and productive of no good." The pay was initially certainly not tempting—only in July 1892 was the hospital corpsman given the supplementary pay that had previously rewarded such "often exceedingly trying and very dangerous" work, a sum that might tempt him to brave drill, disease, and ridicule.[41]

As Hoff had predicted, the Medical Department experienced difficulty both in filling openings in the Hospital Corps and in keeping them filled. By mid-1888, 135 of the corps' 739 positions remained vacant. Some who had been hospital stewards before 1887 had not been able to pass the examinations for steward in the Hospital Corps, although considerable leeway was given to candidates who might reasonably be expected to remedy their deficiencies by further study. Great difficulty was also experienced in finding qualified men to serve as cooks. The ten openings for enlistees from civilian life were restricted to graduates of schools of pharmacy and veterans who had done Hospital Corps–type work while in the Army. Although the corps' desertion rate of 2 percent in 1889 contrasted favorably with the Army's average of 10.3 percent, low reenlistment rates made it difficult to keep a trained staff. Thus, while the creation of the Hospital Corps made systematic training possible, many problems concerning the Medical Department's enlisted personnel remained to be solved.[42]

Problems of Victims of War

New responsibilities resulting from the need to assist the victims of the Civil War—among them refugees, newly freed slaves, and veterans—increased the expenses of the Medical Department in the aftermath of that conflict and for a time threatened to ensnare it in an unending tangle of administrative complexities. The requirement to provide the medical care that the Bureau of Refugees, Freedmen, and Abandoned Lands offered those it assisted was short-lived. Established within the War Department in March 1865, the bureau operated forty-six hospitals by the fall. When Congress appropriated no funds for the bureau's medical division for fiscal year 1866, apparently as the result of oversight, the secretary of war ordered the Medical Department to fill the gap. That year alone, this assistance cost $267,391.92, a sum that paid for medical supplies and, seemingly, the cost of contracts for civilian surgeons. The department also provided the services of medical officers, eighteen of whom were detailed to the bureau for the period 1 June through October 1865; one of them, initially a volunteer, headed the bureau's medical division from the time of its creation until its dissolution in 1872. The number of those in need decreased. Medical Department assistance rapidly dwindled, and the bureau began to hire its own contract physicians. By 1 September 1866 it needed the services of only nine medical officers. A year later they, too, had been reassigned, and by the spring of 1869 all bureau hospitals but the one in the District of Columbia had been closed. When the bureau's operations ended and the District of Columbia became responsible for the expenses of the Freedmen's hospital there, a medical officer was assigned to handle that institution's finances.[43]

The responsibilities the Medical Department assumed for the veterans of the Civil War, on the other hand, brought it an enormous, persistently complex, long-lasting, and totally unfamiliar administra-

tive burden. In 1862, when Congress first required the Army to provide prostheses to veterans who had held the rank of captain or below, the department assumed the responsibility for testing, supplying, and overseeing the quality of these items. For decades after the war ended, it continued to pay for prostheses and for associated travel expenses. Surgeon General Barnes duly recorded that by the end of fiscal year 1866 the department had supplied almost 4,000 legs, more than 2,000 arms, 9 feet, 55 hands, and 125 other devices.[44]

Barnes' suggestion that provision be made to pay a monetary equivalent or commutation payment to those who qualified for an artificial limb but did not choose to order one was adopted by Congress in 1870, making it possible to compensate those unfortunates whose unhealed, inflamed, or abbreviated stumps could not accommodate a prosthesis. The legislature also permitted the Medical Department to replace prostheses or to make renewed commutation payments at five-year intervals. The money quickly became more popular than the prostheses it replaced. In 1872 the department was also required to provide either commutation payments or prostheses for Civil War veterans whose loss of the use of a limb had resulted from paralysis, as well as trusses for soldiers who suffered hernias while on active duty in the Civil War. Four years later it had to furnish prostheses, but not trusses, to all veterans in need of such aid, whether their service had been in the Army or in another branch of the military service.[45]

Although amputees died at a faster rate than their able-bodied comrades, the demands for prostheses did not materially diminish. Surgeon General Murray believed that much of the failure of requests for artificial limbs or their monetary equivalent to decrease in number should be blamed on the deterioration in wounded limbs that made prostheses necessary where they had not been before. Believing that a good artificial limb, if properly cared for, could last ten years, Murray protested a congressional move to reduce the replacement period from five to three years. He noted that since only a small number of crippled veterans requested limbs rather than commutation payments, "legislation . . . to secure more frequent payments seems to be, in my opinion, of doubtful utility or propriety." Nevertheless, in March 1891 Congress enacted the measure to which Murray had objected and added injury to insult by failing to grant the Medical Department more money to meet the increased expenses. The tendency to choose the payment over the limb continued. The artificial arm was generally regarded as useless, and 98.6 percent of those entitled to receive it chose the monetary equivalent; 78.1 percent of those entitled to the artificial leg also preferred the money, even though the prosthesis in this instance was helpful.[46]

Another reason for the failure of the demand to fall may have been private agents who worked to stir up business among the disabled so that they could claim 10 percent of the value of the commutation payment. These men concealed from the veteran the fact that he could easily deal directly with the Surgeon General's Office himself. Surgeon General Moore was able to note in 1892 that by 1889 the campaign to eliminate the use of intermediaries between his office and the disabled had been successful.[47]

The medical care of veterans living in the Soldiers' Home in Washington, D.C., was another Medical Department responsibility. The new hospital at the Home was named after Barnes and designed by Capt. John Shaw Billings, a man of many and varied tal-

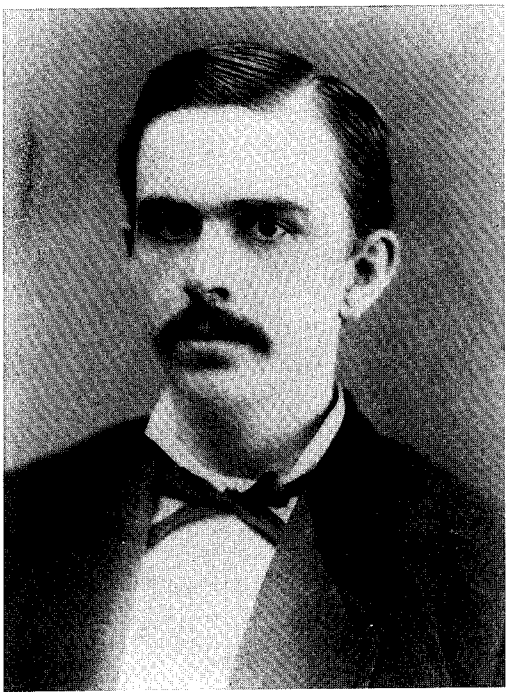
ents and much determination.[48] Only a portion of the Home's funds came directly from the government; but, as surgeon general, Barnes was a prominent member of the board. An Army medical officer, assisted by an Army steward, cared for the Home's sick. This institution was but one among several, including the Columbia Hospital for Women and Lying in Asylum and the Providence Hospital, for which the Medical Department managed federal funds voted to support indigents, regardless of their status as veterans or non-veterans.[49]

The greatest of the Medical Department's administrative burdens in the decades immediately following the end of the Civil War involved paperwork, especially the paperwork concerning the sick and injured that was required to enable the government to make decisions about pensions for Civil War veterans. The number of requests for the information necessary to prove eligibility for this form of aid grew in proportion to Congress' liberalization of laws regarding it, even as the documents to be searched deteriorated both from age and use.[50]

The Record and Pension Division of the Surgeon General's Office, where hospital and burial records and monthly sick and wounded reports were sent and their data transcribed into permanent registers, was almost independent, from the outset seemingly as much a part of the Pension Bureau as of the Medical Department. Both the surgeon general and the secretary of war watched the division's work closely. The staff of clerks was large, the number reaching 290 in 1883, and the sheer volume of work was impressive. In the year from July 1865 through June 1866 the department provided information in 26,589 cases to the Pension Bureau, 8,000 to the paymaster general, 10,623 to the adjutant general, and 4,000 to agents acting for various veterans. In that same period it also "examined and classified" 210,027 disability discharges.[51]

This information was contained in 4,000 registers. Their often faded or illegibly written entries, taken from the reports of medical officers serving in hospitals and in the field, were arranged in the worst possible way for the purpose of verification, by date of admission rather than alphabetically. The number of clerks and hospital stewards conducting these searches remained inadequate, and their enthusiasm for their work was scarcely overwhelming. As a result, a backlog of requests soon developed. At the end of fiscal year 1870 more than 3,000 requests remained unanswered, and by the end of the next fiscal year that figure had surpassed 9,000.[52]

The story of the next sixteen years was one of constant struggle. Employees were undisciplined, records deteriorating, and the memories of veterans concerning the details of their service fading, thus complicating searches. Even though Civil War records continued to be added to the Medical Department's collection for many years, some clerks were still assigned to collecting and recording meteorological reports from various post surgeons, a responsibility that was not turned over to the Signal Corps until 1874. Congress and the secretary of war added and withdrew personnel as the backlog waxed and waned, motivated alternately by pressure from veterans groups and by a desire to reduce expenses. At times enlisted men had to be designated hospital stewards and detailed in that capacity to help in the work when funds to hire clerks were inadequate. Despite occasional direct intervention by the secretary of war himself, Surgeon General Murray's instigation of an efficiency rating system for the department's clerks, and, finally, pressure from the adjutant general,



FRED C. AINSWORTH

the situation failed to improve. The head of the Record and Pension Division, Maj. Benjamin F. Pope, appeared to be totally overwhelmed by the administration of his organization. In 1886, after consultation with both Acting Surgeon General Baxter and the adjutant general, the secretary of war finally decided to replace Pope with Capt. Fred C. Ainsworth.[53]

Ainsworth, a remarkable and ambitious man whose talent for administration was unadorned by diplomacy, proved to be the solution to much of the confusion and inefficiency that had been plaguing the Medical Department in its attempts to deal with veterans and their records. He came to office in December 1886. Moore had been surgeon general a month and, in the course of pushing vigorously for increased discipline and order in the department's management, was already setting up guidelines that would smooth Ainsworth's path. Armed with new regulations calling for semiannual efficiency ratings and severe restrictions on leave, Ainsworth fired the lazy and incompetent and instituted improved procedures. Instead of dealing with the backlog by hiring new clerks for whom new work would have to be found if they were not to be left idle when it had been reduced, he required those already hired to work overtime to clear it up. Not content with increased productivity and the resultant marked reduction in the number of unanswered requests, he began supplementing records with information he obtained from private hospitals that had sheltered sick and wounded Union soldiers. He also took up the matter of the deteriorating records and decided upon a card catalog as the answer to the problem. When his work was complete, all the cards on each individual soldier were filed together and grouped by regiment. Ainsworth's approach worked so well that the secretary of war ordered the consolidation of his organization with the various offices of the adjutant general that had been doing similar work and placed Ainsworth in charge of the new and independent Record and Pension Division that resulted.[54]

Left behind when the new division took over the Civil War personnel records were cards holding detailed descriptions of men who had taken the physical examination for entrance into the Army. This collection was valuable in identifying deserters. When post commanders reported desertions to post surgeons, their medical officers turned the information in to the surgeon general. Should a deserter or an undesirable then try to reenlist under another name, the Medical Department could usually identify him by means of the description on his card.[55]

Because the growing accumulation of records from the Civil War years was of

great value, its location was of considerable importance. In December 1866 the Medical Department found space in the former Ford's Theater, where the medical records shared the second floor with the library, whose direction Surgeon General Barnes had placed in Billings' capable hands in 1865. This building was to a limited degree fireproof, but the roof was flammable and the walls were structurally weak. By the time of Barnes' retirement, Ford's Theater was also badly overcrowded, and a movement was under way to find still larger and safer accommodations.[56]

Nevertheless, only in the spring of 1885, after much campaigning by both Surgeon General Murray and Billings, now a major, who became head of the Library and Museum Division when it was created in 1883,[57] did Congress authorize the construction of a new fireproof building. It was to be smaller than the Medical Department wanted and "very plain and simple." Even before the move into the new structure on what is now Independence Avenue had been completed in early 1888, the facility was too small for the purpose for which it had been built, and some records had to be housed elsewhere. It was, however, definitely a safer haven than Ford's Theater, where during renovation in 1893 the floors collapsed, killing twenty-two people and injuring three times that number.[58]

State of the Art

Even before the Civil War had ended, the era of modern medicine was already dawning across the Atlantic, and by 1893 rapid progress was being made in the struggle against disease and infection. The age when miasmas were regarded as the cause of most sickness was rapidly coming to an end. In France Louis Pasteur was studying the role played by microscopic bits of living matter in the diseases of plants and animals, and in 1885 he introduced the first successful rabies vaccine. In Germany physician Robert Koch was developing an approach to obtaining pure bacterial cultures and refining the procedure by means of which these cultures could be used to establish the identity of a specific organism and the fact that it caused a specific disease. Although he was not the first to identify *Vibrio cholerae*, his work with cholera was responsible in large measure for the widespread acceptance of a small living organism as the cause of the much-dreaded Asiatic cholera and of its transmission through contaminated water. In England in 1867 surgeon Joseph Lister published *On the Antiseptic Principle in the Practice of Surgery*, detailing his successes in preventing the infection of surgical wounds. His approach proved unnecessarily complex and was not quickly accepted outside Europe; minimizing the exposure of wounds to germs by sterilizing surgical instruments and dressings soon proved more effective than spraying the operating room with disinfectants. Nevertheless, because of his work as well as that of those who followed him, surgeons would be able to undertake operations of a kind that would earlier have almost inevitably been followed by fatal infection.[59]

The significance of the medical revolution that was taking place in Europe was not initially appreciated by American physicians. More concerned with the immediate and the practical than their European counterparts, they were skeptical about the new scientific medicine and the germ theory. Moreover, medical education in the United States was traditionally not the kind that would stimulate an interest

in the scientific aspects of medicine. By the time Surgeon General Sutherland retired from the Medical Department in May 1893, however, the number of medical scientists following in the footsteps of the pioneers was rapidly growing.[60]

Despite their initial lack of enthusiasm about developments in Europe, the leaders of the Army Medical Department were eager to use the experiences of the Civil War to advance the science of medicine. During the conflict Barnes' predecessor, Surgeon General William A. Hammond, had encouraged the creation of what became the Army Medical Museum to house the legacy of the Civil War in the form of a collection of anatomical specimens obtained from the victims of that conflict. He had also supported the library, which became known as the Surgeon General's Library, that had been started on a modest scale by the first surgeon general, Joseph Lovell.[61] Hammond's successors attempted not only to build upon their heritage by assigning some of their most respected medical officers to work with the specimens and reports collected during the war but also to make the library into a world-respected institution. Both the library and the museum would continue to grow and to contribute to the progress of medical science. But, as the scientific work being undertaken in Europe would demonstrate, the attempt to uncover the mysteries of disease merely by amassing statistics and anecdotal accounts could not succeed.[62]

The Surgeon General's Library, the collection that would in 1956 become the National Library of Medicine, was arguably the Medical Department's most valuable and lasting contribution to medical science developed in the decades immediately following the Civil War. As new developments in the world of medical science began to grow in number with great rapidity, the nation's best-educated physicians came increasingly to rely on medical libraries, particularly the Surgeon General's Library, for the information that kept them abreast of the work of their colleagues around the world. Much of the library's growth in size and fame resulted from the work of Billings. Working aggressively and imaginatively to increase the library's holdings, he made the most of the meager funds allotted that institution by astute buying and by trading copies of the department's various publications for the books, journals, reports, manuscripts, letters, pamphlets, and portraits he believed it should have. By 1875 the library had copies of about 75 percent of the available periodical literature and the largest collection of pamphlets in the country. To classify the collection, after some experimentation, Billings adopted a revised version of the system used by the Royal College of Physicians in London, employing a series of 5″ by 7″ cards to keep track of the library's holdings.[63]

Because the library's funds seemed to be in almost constant jeopardy, Barnes and Billings had to move shrewdly to further its interests. They arranged to have it regarded as "the medical section of the Congressional Library" and thus as especially deserving of congressional favor. Billings actively publicized the facility, and the number of those relying upon its service grew rapidly, particularly among civilians. He urged physicians to pressure Congress any time it seemed likely that it might cut the library's funds, and he gave freely of the fruits of his own experience to advise those managing similar institutions. A vital part of his effort involved issuing catalogs that would inform the interested public, both in the United States and in Europe, of the library's holdings. After Billings published

a sample catalog in 1876 and brought to bear whatever political influence he could garner, Congress, its enthusiasm dampened by the expense involved, voted a modest sum in February 1879 to print the first two volumes of the *Index Catalogue*, a volume of which appeared each year thereafter. Despite congressional misgivings, the publication was an instant success with the physicians it was intended to serve. One physician called it "a monument of useful labor, a time saving directory to medical literature, a delight and a blessing to the medical scholar," adding, "May the Lord save Dr. Billings to finish it." [64]

To compensate for the inability of the *Index Catalogue* to keep up with current literature, the surgeon general gave his permission in 1879 for Billings and an associate to list the most recently published medical literature throughout the world in a privately financed journal, the *Index Medicus: A Monthly Classified Record of the Current Medical Literature of the World.* Billings requested authors and publishers to send him their publications for listing in the *Index Medicus*, forwarding what he received to the library after they had been indexed.[65]

The library held copies of many books by Medical Department authors, among them two painstakingly detailed volumes by Billings—*A Report on Barracks and Hospitals, With Descriptions of Military Posts* (Circular No. 4), published in 1870; and *A Report of the Hygiene of the United States Army, With Descriptions of Military Posts* (Circular No. 8), published in 1875. In response to epidemics of two long-dreaded diseases, cholera and yellow fever, from 1864 through 1867 Billings, with the need for public support of the library obviously in mind, also prepared in pamphlet form bibliographies of the library's works on those diseases. Surgeon General Barnes, meanwhile, assigned assistant surgeon Capt. Ely McClellan to conduct a study of cholera as ordered by Congress. The resultant report joined "A History of the Travels of Asiatic Cholera" by McClellan and a civilian physician, a report by Supervising Surgeon General of the Marine Hospital Service John M. Woodworth, and Billings' full-scale bibliography of works on cholera to become *The Cholera Epidemic of 1873 in the United States*, which the Surgeon General's Office published in 1875.[66]

When Billings retired from the Army in 1895, the library contained more medical publications than the two next largest medical libraries in the United States combined. It may have already become the largest such facility in the world. Thousands of physicians benefited from its riches. The money that Billings obtained from Congress for the library also made it the wealthiest medical library in the world. Moreover, he established a pattern of donations to the Surgeon General's Library, which permitted him to add significantly to the collection and thus to increase its value to the medical profession.

The museum displays were another legacy from the past, one that eventually, like the library, came under Billings' guiding hand. Even before the end of the Civil War, the museum laboratory had seen Lt. Joseph J. Woodward's first pioneering experiments with microscopic photography. In the years after the war, Army scientists continued to prepare, examine, and photograph specimens of pathological anatomy and slides contributed by both civilian scientists and medical officers. As the museum grew, it played an increasingly important role in advancing the science of pathology. Skeletons, weapons, and other objects from Indian tribes, as well as spec-

imens from the animal world, also poured into the museum. The surgeon general noted in 1891 that among these oddities was a newly acquired section of femur fractured by a shot at Chancellorsville in 1863; in the twenty-eight years since the injury, the bone had healed, but a chronic infection remained to cause the long-suffering veteran's death "from absorption of pus from wound." [67]

Work done in the museum laboratory was almost entirely limited to photomicrography and testing medical supplies. As late as 1879 Woodward clearly thought that the theory that germs caused disease was outmoded. In spite of the fact that three of the Medical Department's most outstanding medical officers, Woodward, Billings, and Maj. George A. Otis, were at one time or another assigned to the laboratory, "almost none" of the department's work, as medical historian Percy M. Ashburn has pointed out, "bore directly on the prevention of disease or the improvement of health." Ashburn also noted that "practically none of it was being done outside the office of the Surgeon General." [68]

In 1869, having failed in the attempts he and another medical officer made to discover whether a minute fungi could cause disease, Billings expressed disillusionment with the potential of the microscope and the development of cultures of bacteria for throwing light on the cause of disease. His interest in his microscope began to wane just when bacteriologists in Europe were beginning to discover the organisms causing such diseases as amebic dysentery, typhoid fever, malaria, leprosy, tuberculosis, cholera, diphtheria, tetanus, and one type of pneumonia. Although he made many significant contributions to the field of public health thereafter, Billings remained, as Fielding H. Garrison has put it, a member of "the older or philosophical school of hygienists" and "in no sense of the term a bacteriologist." [69]

As the years passed, the museum received from civilians an increasing number of specimens illustrating non-war injuries and diseases. This situation met with Billings' approval, since he saw the museum as performing a service for all doctors and believed that it should contain items of general medical interest. To add to the collection, superfluous items were exchanged with other museums, which were kept informed of the Medical Department's holdings by means of catalogs and checklists. In less than fifteen months after the medical museum opened in Ford's Theater, its exhibits drew more than 1,400 visitors, both American and foreign, and by 1870 European authors were illustrating their books with woodcuts made from museum photographs. The museum's growing reputation led to its use by various organizations for their gatherings. Exhibits sent abroad showed foreign scientists how the United States Army handled hospitalization, evacuation, and patient care. Despite the international reputation of the museum, congressional support was not generous and came only in response to pleas from the surgeon general. Yet from the museum and the activities centered there would come the American Registries of Pathology, where thousands of cases of diseases were recorded for study, and, after World War II, the Armed Forces Institute of Pathology.[70]

The principal concern of museum personnel for many years after the end of the Civil War was transforming the mass of surgeon's reports into the Medical Department's major publication, the *Medical and Surgical History of the War of the Rebellion*, which made heavy use of museum specimens for its illustrations. The history, conceived by Surgeon General Hammond in

1862 "to advance the science which we all have so much at heart, and to establish landmarks which will serve to guide us in future," consisted of two volumes, one on medicine and the other on surgery, each of which was divided into three parts of 700 or more pages. A 350-page appendix containing reports of engagements, usually submitted by the medical directors involved, was added to the medical volume. The author-editors of the volumes were all medical officers. Woodward, an experienced pathologist, was responsible for the first two parts of the medical volume, published in 1870 and 1879, with the third published in 1888. The first two parts of the surgical volume were published in 1870 and 1876, the third in 1883. The entire history was finally completed after delays stemming both from Woodward's prolonged illness and death and from the "pressure of current work at the Government Printing Office." [71]

The authors of these volumes detailed the medical and administrative problems faced by the Medical Department during the Civil War and the efforts made to resolve them. The illustrations, both photographs and drawings, were of exceptionally fine quality, and the case histories are even today a gold mine for anyone interested in learning how the arts of medicine and surgery were practiced during the Civil War. The discussions often contained histories of how the problems in question had been handled for centuries, but the masses of statistics were essentially only listings, with little analysis. The multitudinous tables merely grouped diseases by geographic area and race. The categories into which the various ailments were divided in the statistical tables showed that the authors still regarded vapors and fumes from decaying matter as the most likely causes for the spread of the diseases that traditionally posed the greatest threat to armies, among them malaria, typhoid, typhus, dysentery, diarrhea, and even measles.

Woodward's lengthy effort to pin down the cause of the dysentery that had devastated the Union Army was not a scientific study in the manner of Pasteur and Koch but a history of attempts to solve the puzzle dating from the days of the Greeks. He even attacked those who suggested that "bacteria are in some way disease-producers" and who thus "permitted the survival in certain quarters, of the doctrine that dysentery is thus caused." Maj. Charles Smart, the author of the final medical volume, was more ready than Woodward to admit the possibility that something he sometimes called a germ (a term he used alternately with poison) might be the cause of typhoid fever, but he obviously did not think it likely. The instruments and the techniques that might have indisputably proven that bacteria caused the diseases and infections of the Civil War had not been developed when Woodward and Smart made their observations. The information their work might otherwise have revealed was unavailable even after more sophisticated microscopes and staining techniques had been devised. The pioneering work with wound antiseptics conducted during the Civil War and recorded in the *Medical and Surgical History* had no apparent impact on the work of Lister, which was under way before the publication of the first volume.[72]

When the *Medical and Surgical History* first appeared, it was greeted with enthusiasm throughout the Western World. In praising the publications of Army medical officers in 1874, Virchow undoubtedly had it principally in mind when he spoke of "the most extreme exactitude of detail, a

statistic careful even as to the smallest matters . . . here united in order to collect and transmit to contemporaries and to posterity with the utmost completeness, the knowledge purchased at so dear a price." Hammond's hopes for the history were to a large degree frustrated, however. In the wake of the Civil War, as James H. Cassedy noted in *American Medicine and Statistical Thinking, 1800–1860*, "the laboratory effectively dominated medical research. Statistical analysis receded, temporarily but decidedly, into the background," to reappear only in the twentieth century, when "investigators [had gained] the competence in higher mathematics that was needed for statistics once again to play a major role in clinical and scientific studies." Thus, with the passage of time the *Medical and Surgical History of the War of the Rebellion* became recognized as "the world's outstanding compilation on military medicine." Much of its value today lies in its detailed descriptions and illustrations of the plans used for Civil War general hospitals and ambulances, the discussions of the reasoning that led to the development of the various designs, and the reports of various medical directors concerning some of the major battles. The very inability of the medical officers responsible for these volumes to add significantly to the progress of medical science is revealing of an era that was coming to a close even as they wrote.[73]

The Medical Department's major official contributions to medical science in the period 1865–1893 fell in the realm of preserving the past for the benefit of the present and the future. The work done in the museum and library in the 1860s and 1870s was, according to Billings in 1903, "in part merely incidental to the preparation of [the] medical and surgical story of the war, in part for the advancement of medicine, and in part for the pleasure of the young men engaged in it." The passage of time would reveal that its "direct results on the science and art of medicine were not great," even though "its indirect results have been . . . important."[74]

Few U.S. Army medical officers, whether they worked in the museum or in the field, appear to have been seriously interested in the new techniques Koch had developed. One exception was Maj. George M. Sternberg who, impressed by Koch's work, visited the laboratory of the German physician and briefly worked with him in 1886, when the Medical Department sent him to Europe as the U.S. representative to the International Sanitary Conference in Rome. Although an article written in 1883 promoting an Army career for young physicians maintained that Army posts provided good microscopes, some senior Army physicians still disapproved of work with this instrument; in 1890 a medical officer working in the Surgeon General's Office described Sternberg's work with it as of no "earthly bit of good" to the department. Mindful of the problems that this attitude caused him, Sternberg noted with some bitterness that he had had to pay personally for the expensive equipment he needed to set up his own laboratory, even though "apparatus of the same kind, purchased with government money, [had] been for two years lying idle at the Army Medical Museum." Nevertheless, Sternberg continued his research, in 1892 giving a paper on practical accomplishments in the field of bacteriology and his own work in the field that produced favorable comment from the highly respected pathologist William H. Welch at Johns Hopkins.[75]

Although Lister's work met with much skepticism for many years, the practical

value of what he was doing was more easily grasped than that of researchers with microscopes. Convinced after a visit to England in 1877 that Lister's work had great merit, another young medical officer, Capt. Alfred C. Girard, informed Surgeon General Barnes: "Be the 'germ theory' true, or partly true, or an absolute mistake, practically it matters not; for the present it is the best explanation we have for a most successful method and the best guide in its use." Barnes was sufficiently impressed by Girard's report to have it sent out to all medical officers as a circular, but without any specific endorsement. Surgeon General Murray, in spite of his reputedly conservative temperament, openly accepted the notion of bacteria as a cause of infection and predicted a time when, because of Lister's research, the world of surgery would be transformed by antisepsis. Murray's annual report of 1884, issued when Lister's work was still not fully appreciated in England, was the first such document to mention the use of antiseptics by Army surgeons during or following surgery.[76]

By 1893 the first traces of the changes that would profoundly affect the Medical Department in the years to come were already evident. The formation of the Hospital Corps would make training enlisted personnel for modern warfare easier, and post surgeons were less isolated than they had been in 1865. But most medical officers were still attached to small units that were scattered about the country, and the drive to prepare the Army for modern warfare was yet in its infancy. The *Medical and Surgical History of the War of the Rebellion* stood as an eloquent symbol of the dedication and the frustrations of the medical officers who could not yet accept germs as a cause of disease. Steeped in the older traditions and almost overwhelmed by administrative burdens, the surgeon generals of the period 1865–1893 left the challenge of leading the department boldly toward the new era of medical science to their successors while Army surgeons in the field continued to practice medicine as had their predecessors for generations. Change would come, but it would come only gradually.

NOTES

1. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1866, pp. 2–3 (hereafter cited as WD, *ARofSG*, date). The fiscal year ran from July through June.

2. James M. Phalen, *Chiefs of the Medical Department, United States Army, 1775–1940*, pp. 47–69.

3. Barnes became surgeon general as the result of the court-martial conviction of his predecessor, the brilliant but tactless and occasionally arrogant Brig. Gen. William A. Hammond. Although the rank assigned to the position of surgeon general was brigadier general, on 13 March 1865 Barnes was brevetted major general because of his services in the Civil War. See ibid., pp. 48–49.

4. Ibid., pp. 48–50; Ltr, SG to Levi Maish, 3 Jan 1878, Entry 2, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; L. D. Ingersoll, *A History of the War Department of the United States . . .*, pp. 233, 247 (hereafter cited as *History of WD*); William Q. Maxwell, *Lincoln's Fifth Wheel*, p. 318; George M. Kober, *Reminiscences of George Martin Kober, M.D., LL.D.*, p. 197.

5. James E. Pilcher, *The Surgeon Generals of the Army of the United States of America*, pp. 65–66; Phalen, *Chiefs*, p. 52.

6. Phalen, *Chiefs*, pp. 62–64; Pilcher, *Surgeon Generals*, pp. 64, 74–76.

7. First quotation from Ltr, J. S. Billings to Ezra M. Hunt, 13 Oct 1883, cited in Wyndham D. Miles, *A History of the National Library of Medicine*, p. 161 (hereafter cited as *History of NLM*); second quotation from Pilcher, *Surgeon Generals*, p. 68; ibid., pp. 67, 69; Phalen, *Chiefs*, pp. 55–57; in RG 112, NARA: Ltr, Ch Med Purveyor to SG, 3 Nov 1873, vol. 17, Entry 10, and Surgeon General's Office (SGO) Cir 3, 21 Apr 1885, vol. 7, Entry 63.

8. Quotation from Pilcher, *Surgeon Generals*, p. 70; Phalen, *Chiefs*, pp. 60, 63. Not long before his death at the age of 90, Brig. Gen. Jefferson R. Kean, who joined the Medical Department in 1884, recalled hearing that President Grover Cleveland had selected Moore by running down the names of medical officers in the *Army Register* and appointing the first one he reached for whom he had no letters of recommendation. See Kean Interv, p. 14, in folder Interview (1950), Ms C14, Jefferson R. Kean Papers, National Library of Medicine (NLM), Bethesda, Md.

9. Pilcher, *Surgeon Generals*, pp. 74–76; Ltr, SG to F. M. Cockrell, 23 Feb 1884, Entry 2, RG 112, NARA; [Jedediah H. Baxter], *The Medical Part of the Final Report Made to the Secretary of War by the Provost Marshal General*; Samuel C. Busey, *Personal Reminiscences and Recollections . . .*, pp. 303, 306–07, 308.

10. Pilcher, *Surgeon Generals*, pp. 75–78; Phalen, *Chiefs*, pp. 63–64; William B. Bean, *Walter Reed*, p. 45; Edward M. Coffman, *The Old Army*, p. 384.

11. First and second quotations from Pilcher, *Surgeon Generals*, p. 82 (see also p. 79); third quotation from Ltr, Jos. C. Bailey to SG, 31 May 1893, in Ms C100, George Miller Sternberg Papers, NLM; Phalen, *Chiefs*, pp. 66–69; "The New Surgeon General," p. 51.

12. Coffman, *Old Army*, p. 218.

13. WD, *ARofSG*, 1865, p. 4, and 1866, pp. 7–8; in RG 112, NARA: Ltr, Charles H. Crane to C. McCormick, 18 Jul 1865, Entry 7, and Ltrs, Crane to J. W. Morrison, 3 Aug 1865, to Dorothea Dix, 11 Sep 1865, and to Henry A. Armstrong, 10 Oct 1865, and SG to Henry Watson, 17 Mar 1870, and J. S. Billings to Samuel A. Wood, 24 Sep 1874, Entry 2. In his capacity as assistant surgeon general, Crane relieved Barnes of much of the routine administration of the office.

14. Quotation from WD, *ARofSG*, 1866, p. 1; ibid., pp. 2, 5; in RG 112, NARA: Ltr, Crane to McCormick, 18 Jul 1865, Entry 7, and Ltrs, W. C. Spencer to O. P. Morton, 16 Nov 1865, Crane to Conrad Baker, 25 Nov 1865, Spencer to J. M. Richard, 25 Oct 1866, SG to W. W. Corcoran, 9 Nov 1866, Entry 2, and Telg, SG to C. Baker, 17 Jan 1866, Entry 2.

15. WD, *ARofSG*, 1866, p. 5; War Department, Surgeon General's Office, *Medical and Surgical History of the War of the Rebellion*, 2–3:901; Ltrs, Crane to D. C. Pearson, 21 Apr 1868, to S. J. P. Miller, 16 Jul 1874, and to Thomas G. Maghee, 10 Sep 1874, and SG to J. M. Marvin, Entry 2, RG 112, NARA.

16. George M. Kober's quoted comments, cited in Percy M. Ashburn, *A History of the Medical Department of the United States Army*, p. 109 (hereafter cited as *History of MD*); Preliminary Inventory of RG 112, pp. 28–29, NARA, which states that the Fi-

nance Division was in operation "from the time of the Civil War" (p. 28).

17. Quotations from Otto L. Nelson, Jr., *National Security and the General Staff*, p. 12; ibid., p. 13; Memo, J. M. Schofield to SG, 5 Oct 1892, John McA. Schofield Papers, Manuscript Division, Library of Congress, Washington, D.C.; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 224 (hereafter cited as WD, SGO, *SGO*); WD, *ARofSG*, 1874, p. 20n. For the responsibilities of medical directors, see, for example, in Entry 63: Instrs for Med Dirs, 14 Sep 1874, vol. 5, and Ltrs, Crane to "Sir" [All Med Dirs], 1 Aug 1876, vol. 5, and to Med Dirs, 3 Aug 1876, vol. 5, and 6 Jan 1877, vol. 6; in Entry 2: MD Form, 1868 (e.g., 17 Aug), and Ltrs, SG to E. L. Baker, 22 May 1877, to Med Dir, Div of Atlantic, 6 Sep 1877, to Med Dir, Dept of Arizona, 11 Nov 1878, among many others, and to G. W. Scofield, 6 Feb 1873, and also Crane to Med Dir, Dept of Gulf, 18 Apr and 10 Jun 1873, to Med Dir, Div of Atlantic, 24 Oct 1874, to Med Dir, Dept of Gulf, 6 Feb 1877, and to Med Dirs, Depts of South, Gulf, Dakota, Platte, Missouri, Texas, California, Columbia, 20 Feb 1877; and in Entry 12: Ltr, F. Branch to SG, 9 Feb 1868. All in RG 112, NARA.

18. Ltrs, John J. Milhau to SG, 18 Mar and 7 Oct 1868 and 25 Feb 1869, Thomas A. McParlin to SG, 5 May 1868, Ebenezer Swift to SG, 13 Jun 1868 and 19 Mar 1870, James Simons to SG, 30 Aug 1868 and 24 Feb and 19 Mar 1869, Andrew K. Smith to SG, 28 Oct 1868, William J. Sloan to SG, 11 Jun 1869, John Moore to SG, 9 Jul 1869, and to Capt L. V. Eziane [sp ?], 20 Sep 1869, and Charles Page to SG, 25 Jul 1869. All in Entry 12, RG 112, NARA.

19. WD, *ARofSG*, 1868, p. 6; in RG 112, NARA: Ltrs, SG to J. D. Cameron, 16 Oct 1876, and to Levi Maish, 3 Jan 1878, Entry 2, and Ltrs, J. J. Milhau to SG, 18 Mar and 7 Oct 1868, Entry 12.

20. Quotation from "The Army Medical Staff Bill," p. 150; Samuel L. Baker, "Physician Licensure Laws in the United States, 1865–1915," pp. 173–74.

21. Edgar Erskine Hume, "Admission to the Medical Department of the Army Half a Century Ago," p. 199; Ltr, Crane to Joseph B. Brown, 30 Aug 1875, Entry 2, RG 112, NARA. Arthur was promoted to brigadier general in the National Army on 5 August 1917.

22. Ltrs, Crane to Med Dir, Div of Atlantic, to Med Dir, Dept of Dakota, to C. B. Byrne, all 31 Jul 1875, to J. B. Brown, 30 Aug 1875, to E. E. Barnum, 23 Apr 1880, and to Med Dir, Dept of Arizona, 1 Sep 1883, D. L. Huntington to Charles M. Gandy, 22 May 1883, and SG to J. D. Cameron, 16 Oct 1876, and to A. E. Burnside, 26 Jul 1878, all Entry 2, and SGO Cir Info, 29 Jun 1897, Entry 66. All in RG 112, NARA.

23. John Shaw Billings, *A Report on the Hygiene of the United States Army . . .*, p. 106; Paul Starr, *The Social Transformation of American Medicine*, pp. 84–85; in RG 112, NARA: Ltrs, SG to G. W. Scofield, 6 Feb 1873, and Crane to H. S. Smith, 13 Jan 1876, and to Med Dirs, 4 Aug 1880, Entry 2, and Ltrs, A. K. Smith to SG, 28 Oct 1868, J. J. Milhau to SG, 25 Feb 1869, J. Simons to SG, 19 Mar 1869, Josiah Simpson to SG, 24 Jun 1869, and J. Moore to SG, 9 Jul 1869, Entry 12.

24. Also affected by the restriction were the Inspector General's, Quartermaster's, Adjutant General's, Engineer, Commissary, Pay, and Ordnance Departments. See AGO GO 15, 11 Mar 1869. See also WD, *ARofSG*, 1868, p. 7, 1869, p. 10, and 1871, pp. 6–7; "Army Medical Staff Bill," p. 150.

25. James A. Tobey, *The Medical Department of the Army*, p. 23; Erna Risch, *Quartermaster Support of the Army*, p. 511; Robert M. Utley, *Frontier Regulars*, p. 15; WD, *ARofSG*, 1874, pp. 20–21; Billings, *Report on Hygiene*, p. 106; Ingersoll, *History of WD*, pp. 209, 286–87; in RG 112, NARA: Ltrs, Crane to Sutherland, 1 Oct 1873, and SG to William Windom, 1 Jun 1878, to H. Clymer, 5 Apr 1880, and to Joseph E. Johnston, 5 Apr 1880, Entry 2, and Instrs for Med Dirs, 14 Sep 1874, vol. 5, Entry 63.

26. First quotation from "Army Staff Rank," p. 373 (see also pp. 13–14, 136, 374); second quotation from American Medical Association (AMA), *Petition of the American Medical Association to the Senate and House of Representatives in Behalf of the Medical Corps of the Army . . .*, App., p. 19 (see also pp. 3–4, 11); "Army Medical Staff Rank," p. 311; Harvey E. Brown, *The Medical Department of the United States Army From 1775 to 1873*, p. 203; "Memorial of the American Medical Association," p. 72.

27. Quotation from Ltr, Crane to Med Dir, Dept of Texas, 8 Feb 1877, Entry 2, RG 112, NARA. In loc. cit., see his similar letters to Med Dirs, Depts of Platte, Missouri, Dakota, 8 Feb 1877, as well as those to Med Dirs, Depts of South, Gulf, Dakota, Platte, Missouri, Texas, California, Columbia, 20 Feb 1877, to J. D. Baynes, 5 Jun 1877, and to J. B. Downey, 7 Jul 1877; in Entry 63, see those to "Sir," 1 Aug 1876, vol. 5, to Med Dirs, 3 Aug 1876, vol. 5, to Med Dir, 6 Jan and 25 May 1877, vol. 6, and to Med Offs, 20 Feb 1877, vol. 6, plus SG to A. E. Burnside, 13 Jul 1878, vol. 7. See also James E. Sefton, *The United States Army and Reconstruction, 1865–1877*, pp. 250–51.

28. WD, *ARofSG*, 1882, p. 19; Jerry M. Cooper, *The Army and Civil Disorder*, p. 27; in RG 112, NARA: see, for example, Ltr, SG to A. E. Burnside,

13 Jul 1878, vol. 7, Entry 63, and Ltrs, SG to James A. Garfield, 2 Jul 1868, to W. Windom, 1 Jun 1878, to Burnside, 16 and 26 Jul 1878, to J. E. Johnston, 5 Apr 1880, and to H. Clymer, 5 Apr 1880, Entry 2.

29. Although in 1890 the legislature required promotion examinations for all Army officers below the rank of brigadier general, the regulation was apparently not applied to the Medical Department. Quotation from Pilcher, *Surgeon Generals*, p. 69; John van R. Hoff, "Outlines of the Sanitary Organization of Some of the Great Armies of the World," p. 513; SGO Cir Info, 29 Jun 1897, Entry 66, RG 112, NARA. On the question of rank versus title for medical officers, the reader will note that while Army surgeons are generally referred to as surgeon or assistant surgeon in the 1888 and 1889 annual reports, they are consistently given their ranks in the 1890 and subsequent reports.

30. Edward M. Coffman, "The Long Shadow of the Soldier and the State," p. 80; Utley, *Frontier Regulars*, p. 47; Martha L. Sternberg, *George Miller Sternberg*, p. 91; WD, *ARofSG*, 1889, pp. 14–15, and 1890, p. 12; *A Military History of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1881–1963*, pp. 5–7; Timothy K. Nenninger, *The Leavenworth Service Schools and the Old Army*, pp. 6–7; in RG 112, NARA: Telgs, Girard to SG, 24 Jun 1892, and C. H. Alden to Med Dir, Dept of Dakota, 26 Jun 1892, box 13, Entry 17, and Ltr, SG to James Laird, 20 Jul 1888, Entry 2, and Ltr, SG to SW, 15 Feb 1890, Entry 22.

31. WD, *ARofSG*, 1891, pp. 13–14; AGO GO 19, 26 Feb 1891, and GO 86, 26 Oct 1891 (pp. 41–43, 46–49); Coffman, *Old Army*, p. 232.

32. Quotation from Ltr, SG to Charles H. Alden, 27 Apr 1889, Entry 2, RG 112, NARA; in loc. cit., see Ltr, D. L. Huntington to C. M. Gandy, 22 May 1883. See also Raphael P. Thian, comp., *Legislative History of the General Staff of the Army of the United States . . . From 1775 to 1901*, p. 38; Morris J. Asch, "Army Medical Service," pp. 203–04; and the surgeon general's annual reports for numbers of applicants to department.

33. AGO GO 55, 27 Jul 1883; Ltrs, Crane to William B. Allison, 16 Jan 1883, and D. L. Huntington to C. H. Miller, 16 Jun 1883, to Charles A. Sumner, 5 Jun 1884, to John Raymond, 8 Oct 1884, to W. E. Fisher, 22 Nov 1884, and to A. C. Mooreland, 28 Jun 1886, and SG to F. M. Cockrell, 26 Apr 1884, to C. H. Penrose, 11 Dec 1886, to Med Dir, Dept of Columbia, 2 Feb 1887, and to Joseph R. Smith, 17 Feb 1887, Entry 2, RG 112, NARA; Robert S. Henry, *The Armed Forces Institute of Pathology*, p. 154 (hereafter cited *AFIP*).

34. Erwin H. Ackerknecht, *A Short History of Medicine*, p. 194; AGO Cir 9, 6 Aug 1892; AGO GO 76, 16 Dec 1887; in RG 112, NARA: Ltrs, Charles R. Greenleaf to Fred C. Ainsworth, 24 Dec 1887, and to Post Surg, Davids' Island, 26 Mar 1888, Entry 2, and Ltr, Greenleaf to Stephania Mikulewicz, 14 Mar 1890, Entry 22.

35. "The Rank and Pay of the Hospital Stewards of the Army," pp. 670–71; Ltrs, Crane to Joseph Anderson, 21 Jun 1871, and to Med Dir, Dept of Gulf, 10 Jun 1873, Entry 2, RG 112, NARA; Paul R. Cutright and Michael J. Brodhead, *Elliott Coues*, p. 107; John M. Hyson, "William Saunders," p. 436.

36. John Shaw Billings, "Notes on Military Medicine in Europe," pp. 236–37; AGO GO 78, 6 Jul 1874, GO 30, 9 May 1877, and GO 47, 15 Mar 1881; in RG 112, NARA: Ltr, AG to SG, 19 Sep 1872, vol. 16, Entry 10, and Ltr, SGO to R. Murray, 20 Feb 1880, vol. 1, Entry 16, and Ltr, SG to J. D. C. Atkins, 5 Feb 1877, Entry 2.

37. Quotation from WD, *ARofSG*, 1886, p. 35; ibid., 1885, p. 39; John van R. Hoff, "What is a Hospital Corps?," pp. 315–16; Junius L. Powell, "Some Observations on the Organization and Efficiency of the Hospital Corps . . . ," pp. 330–31; Coffman, *Old Army*, p. 381; AGO GO 62, 4 Jun 1885; in Entry 2, RG 112, NARA: Ltrs, D. L. Huntington to Bernard Persh, 13 Sep 1884, to Med Dir, Div of Atlantic, 24 Sep 1884, to H. C. Gesserer, 18 Jul 1885, to B. B. Gell, 7 Apr 1886, and to Andrew F. Peters, 22 Jun 1886, and SG to Med Dir, Dept of Arizona, et al., 21 Jun 1886, and SGO to E. L. Bragg, 15 Jan 1887, and C. R. Greenleaf to 2d Compt, Treas Dept, 13 Jul 1889.

38. First quotation from Russell F. Weigley, *History of the United States Army*, p. 290; second quotation from WD, *ARofSG*, 1885, p. 39; ibid., 1886, p. 35; Graham A. Cosmas, *An Army for Empire*, pp. 17–18; James L. Abrahamson, *America Arms for a New Century*, p. 61; Coffman, *Old Army*, p. 396. The motivation for the establishment of the Hospital Corps was not entirely identical with that for the service corps sought by other departments (see Risch, *Quartermaster Support*, pp. 561–62, 565) since the Medical Department had broken free before the Civil War of many of the problems caused by temporary detailing of civilians and enlisted men to serve as stewards (see Mary C. Gillett, *The Army Medical Department, 1818–1865*, pp. 129–30).

39. Ltrs, D. L. Huntington to Post Surg, Watervliet Arsenal, 5 Nov 1885, and C. R. Greenleaf to F. C. Ainsworth, 29 Apr 1887, to Med Dirs, 7 Jan 1889,

and to 2d Compt, Treas Dept, 13 Jul 1889, and SGO Cir 1, 26 Apr 1889, Entry 2, RG 112, NARA; WD, SGO, *SGO*, p. 45. Unless otherwise indicated, all material on the Hospital Corps is based on AGO GO 56, 11 Aug 1887, from which the quotation is taken.

40. Ltrs, Charles Smart to G. W. Miller, 8 Jun 1888, and C. R. Greenleaf to Smart, 1 Oct 1888, Entry 2; Note [initialed CRG], 22 May 1890, Entry 22. All in RG 112, NARA.

41. First and second quotations from Ltr, John van R. Hoff to SG, 13 Oct 1888, Entry 17; third quotation from L. W. Crampton to Med Dir, Dept of Platte, 26 Sep 1888, Entry 17; and fourth quotation from Ltr, SG to C. E. Hooker, 21 Jan 1889, Entry 2. All in RG 112, NARA. In loc. cit., see Ltrs, Joseph K. Corson to Med Dir, Dept of Columbia, 8 Jul 1888, and C. Page to SG, 19 Nov 1889, Entry 17, and SG to Chair, MilAffs Cmte, HofReps, 24 Mar 1888, Entry 2. See also Charles Sutherland, "Organization of Hospital Corps," in *Pan-American Medical Congress Transactions*, 1:688; Jack D. Foner, *The United States Soldier Between Two Wars*, pp. 84–92.

42. WD, *ARofSG*, 1888, pp. 141–42, 1889, p. 9, and 1891, pp. 10–13; Ltrs, C. R. Greenleaf to George Dieffenbach, 1 Dec 1887, to E. P. Harrison, 6 Mar 1888, to Post Surgs, 7 Aug 1888, to William Everts, 27 Aug 1888, and to Harry J. Ramsey, 9 Sep 1889, and C. Smart to Charles H. Swan, 27 Mar 1888, Entry 2, RG 112, NARA.

43. WD, *ARofSG*, 1866, pp. 2–3; Paul S. Peirce, *The Freedmen's Bureau*, pp. 44, 48–49, 87–89, 91–92; *Message From the President to the Two Houses of Congress at the Commencement of the Second Session of the Fortieth Congress . . .*, ed. Ben. Perley Poore (Washington, D.C.: Government Printing Office, 1867), pp. 472, 478, 480–82, 494; *Message From the President of the United States to the Two Houses of Congress at the Commencement of the Third Session of the Fortieth Congress*, ed. Ben. Perley Poore (Washington, D.C.: Government Printing Office, 1869), pp. 491, 499; George R. Bentley, *A History of the Freedmen's Bureau*, pp. 76, 209; in RG 112, NARA: Ltr, SG to Freedmen's Hospital, Wash., D.C., 19 Jul 1872, Entry 2, and Rpt, Samuel Jessop, 15 Jan 1869, Entry 51, Charleston, and AGO SO 435, 31 Aug 1866, and SO 266, 10 Jun 1867, Entry 57.

44. WD, *ARofSG*, 1866, pp. 3–4; Ltrs, Crane to J. D. W. Grady, 1 Aug 1865, and J. S. Billings to Monroe & Gardiner, 10 May 1867, Entry 2, RG 112, NARA.

45. WD, *ARofSG*, 1876, pp. 4–5, 1877, p. 4, 1881, pp. 4–5, and 1892, p. 7; Ltrs, Crane to Hugo Wangelin, 3 Aug 1879, and to Jay Gould, 6 Jan 1871, and SG to Com of Pensions, 15 Jun 1872, Entry 2, RG 112, NARA.

46. Quotation from Ltr, SG to John Findlay, 22 Jan 1886, Entry 2, RG 112, NARA; WD, *ARofSG*, 1891, p. 6, and 1892, p. 11.

47. WD, *ARofSG*, 1892, pp. 7–8, 10.

48. Among Billings' later designs was the Johns Hopkins Hospital.

49. Fielding H. Garrison, *John Shaw Billings*, pp. 278–335; Miles, *History of NLM*, p. 106; Paul R. Goode, *The United States Soldier's Home*, pp. 28, 51, 91, 93–94, 97, 102; Constance McL. Green, *Washington*, p. 310; Billings, *Report on Hygiene*, pp. lv–lvi; in Entry 2, RG 112, NARA: Agreement, SG and Sister Loretta O'Reilly, 3 Dec 1868, and Ltrs, SG to Moses Kelly, 8 Aug 1868, to U.S. Sen and HofReps, 6 Dec 1869, to Pres of Sen and Speaker of H, 10 Dec 1870, to U.S. Sen and HofReps, 13 Dec 1872, and to Aprops Cmte, 5 Dec 1874, and Crane to Eds, *Am Encyclopedia*, 10 Mar 1876.

50. WD, *ARofSG*, 1883, p. 15, and 1884, p. 19; Mabel E. Deutrich, *Struggle for Supremacy*, pp. 22, 27, 32.

51. WD, *ARofSG*, 1866, p. 6; ibid., 1883, p. 15, 1886, p. 5, 1887, pp. 4–5, and 1888, p. 5; Deutrich, *Struggle*, p. 22; in RG 112, NARA: Orders, SW to SG, 21 Jun 1873, vol. 17, Entry 10, and Ltr, J. S. Billings to N. Van Clernam, 26 Jul 1879, Entry 2.

52. WD, *ARofSG*, 1870, p. 5; Deutrich, *Struggle*, pp. 27–28; in RG 112, NARA: Ltrs, SG to J. A. Garfield, 2 Jul 1868 and 23 Feb 1869, and to W. Windom, 10 Feb 1877, and Ltr, Crane to J. J. Woodward and to George A. Otis, 22 Aug 1870, Entry 8.

53. Deutrich, *Struggle*, pp. 21, 26–30; in RG 112, NARA: Orders, SW to SG, 21 Jun 1873, vol. 17, Entry 10, and Ltrs, SG to J. A. Garfield, 2 Jul 1868, to H. Williams, 11 Mar 1874, to Sol M. Merrill, 2 May 1874, to Com, IndAffs, 14 Jan 1876, to W. Windom, 10 Feb 1877, and to Div Heads (various), 9 Jun 1885, and Crane to Campbell Williams, 3 Jun 1877, to Post Surgs, 20 Jul 1881, and to Page, 25 Jul 1881, all Entry 2, plus SGO Cir, 27 Jul 1883, and Orders, SG, 3 Aug 1883, vol. 7, Entry 63. For more detail on this problem, see the surgeon general's annual reports for the period.

54. WD, *ARofSG*, 1888, pp. 137–38, and 1889, p. 13; Deutrich, *Struggle*, pp. 30–34, 36–43; Ltrs, D. L. Huntington to T. T. Carson, 29 Jun 1887, and to Robert B. Vance, 2 Feb 1887, and Orders, SG, 25 Jun and 14 Jul 1887, Entry 2, RG 112, NARA.

55. WD, *ARofSG*, 1891, p. 15, and 1892, pp. 17–18; AGO Cir 6, 3 Jul 1891; SGO Cir, 9 Jul 1890, Entry 22, RG 112, NARA.

56. WD, *ARofSG*, 1867, p. 4, 1880, pp. 17–18, and 1881, pp. 16–17; Miles, *History of NLM*, p. 28; Henry, *AFIP*, pp. 54, 73–75.

57. The Library and Museum Division was part of the Surgeon General's Office.

58. The library and museum had initially been separate organizations. Quotation from WD, *ARofSG*, 1885, p. 36; ibid., p. 35, and 1888, p. 140; AGO GO 31, 19 Mar 1885; Miles, *History of NLM*, pp. 163–64, 168; Henry, *AFIP*, pp. 79–80; in RG 112, NARA: Orders, SG, 28 Dec 1883, and Ltrs, D. L. Huntington to Edgar A. Means, 24 Jan 1884, and SG to William Mahone, 14 Dec 1883, to HofReps Mbrs, Conf Cmte, 12 Feb 1885, and to Chair, Sen Aprops Cmte, 1 Mar 1887, all Entry 2, plus Pamphlet, 1883, vol. 7, Entry 63.

59. John S. Chambers, *The Conquest of Cholera*, pp. 335, 344, 348; Peter Baldry, *The Battle Against Bacteria*, pp. 30–31, 37; Wesley W. Spink, *Infectious Diseases*, pp. 7–8, 162, 165, 363, 428–29; Fielding H. Garrison, *An Introduction to the History of Medicine*, 3d rev. ed. and enl., pp. 620–21, 623–24, 633–35.

60. Garrison, *History of Medicine*, pp. 578–79; Richard H. Shryock, *Medicine in America*, pp. 29–31, 71; Ackerknecht, *Short History*, pp. 209–11; Kenneth M. Ludmerer, *Learning To Heal*, pp. 4, 18, 23–26, 83–84, 119, 178, 235, 245; William G. Rothstein, *American Physicians in the Nineteenth Century*, pp. 265–66, 285–94.

61. Before Joseph Lovell was appointed surgeon general in 1818, the Army had no permanent medical service, and although the title of surgeon general was sometimes used, it was not given to the head of any of the temporary medical services created to meet wartime needs. During the War of 1812 James Tilton was given the title of physician and surgeon general.

62. James H. Cassedy, "Numbering the North's Medical Events," pp. 232–33.

63. Dorothy M. Schullian and Frank B. Rogers, "The National Library of Medicine," p. 11; WD, *ARofSG*, 1872, p. 10; Ltr, Billings to William Wesley, 27 Jul 1867, Entry 2, RG 112, NARA; John Shaw Billings, "Who Founded the National Medical Library?," p. 299; idem, *Selected Papers*, pp. 4, 81; James H. Cassedy, *Medicine in America*, pp. 77, 85. For a detailed discussion of post–Civil War history of the Surgeon General's Library, see Miles, *History of NLM*, on which, unless otherwise indicated, much of the material in this chapter concerning the library is based.

64. Publication of the *Index Catalogue* ceased in 1961. First quotation from Ltr, SG to Thomas Settle, 20 Aug 1872, Entry 2, RG 112, NARA; second and third quotations cited in Miles, *History of NLM*, p. 129. In Entry 2 above, see Ltrs, Billings to H. R. Spoffard, 12 Feb 1872, and SG to L. M. Morrill, 9 Feb 1872, to M. Wurtz, 22 May 1872, and to John Eaton, 25 Nov 1872. See also WD, *ARofSG*, 1874, p. 19, 1878, pp. 17–18, 1879, p. 17, 1881, p. 16, and 1882, pp. 16–17; Billings, *Papers*, p. 229.

65. Billings, *Papers*, pp. 229–30.

66. WD, *ARofSG*, 1875, pp. 15–16; War Department, Surgeon General's Office, *The Cholera Epidemic of 1873 in the United States*; Orders and Ltr, SG to Ely McClellan, 7 May and 24 Dec 1874, Entry 2, RG 112, NARA.

67. Quotation from WD, *ARofSG*, 1891, p. 7; Henry, *AFIP*, pp. 36, 51–66; Ltr, D. L. Huntington to E. A. Means, 24 Jan 1884, Entry 2, RG 112, NARA; Esmond R. Long, *A History of American Pathology*, p. 167.

68. Quotations from Ashburn, *History of MD*, p. 134; WD, SGO, *Medical and Surgical History*, 1–2:374.

69. Quotations from Garrison, *Billings*, p. 342; ibid., pp. 152, 411; John Z. Bowers and Elizabeth P. Purcell, eds., *Advances in American Medicine*, 1:347; William D. Foster, *A History of Medical Bacteriology and Immunology*, p. 65.

70. The story of the museum and its transformation into the Armed Forces Institute of Pathology is told in detail in Henry, *AFIP*. See also Ltrs, SG to C. Cole, 15 May 1872, and D. L. Huntington to L. C. Pitcher, 4 Mar 1886, Entry 2, RG 112, NARA; SGO Cir 2, 4 Apr 1867; WD, *ARofSG*, 1866, p. 8, 1868, p. 6, 1870, pp. 9–10, 1873, pp. 8–9, 1874, pp. 15n–16n, 1876, pp. 17–18, and 1877, pp. 12–13; George A. Otis, "Notes on the Contributions to the Army Medical Museum by Civil Practitioners," p. 164; John E. Erichsen, "Impressions of American Surgery," p. 720; "Science Schools and Museums in America," p. 290; John Shaw Billings, "On Medical Museums," pp. 309, 311; M. C. Leikind, "Army Medical Museum and Armed Forces Institution of Pathology in Historical Perspective," p. 75; Long, *American Pathology*, p. 128.

71. First quotation from Henry, *AFIP*, p. 14; second quotation from WD, *ARofSG*, 1886, p. 33. See also ibid., 1888, p. 141.

72. Quotation from WD, SGO, *Medical and Surgical History*, 1–2:374; ibid., 336–47, 367, 651, 653, and 1–3:500–508; George H. Daniels, ed., *Nineteenth-Century American Science*, p. 177; Henry, *AFIP*, pp. 89–90; Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery From Empiric*

Craft to Scientific Discipline, p. 507; Cassedy, "Numbering Medical Events," pp. 232–33.

73. First quotation from address given by Virchow on 2 August 1874, cited in AMA, *Petition*, p. 19. (This quotation from Virchow is a popular one, although rarely reproduced at length. William G. Morgan's assumption that Virchow was specifically referring to the *Medical And Surgical History* is apparently a common one. But in the address as published in "Summary," pp. 299–300, as well as in Kober, *Reminiscences*, p. 224, in the AMA, *Petition*, p. 19, and very briefly in William G. Morgan, "Contributions of the Medical Department of the United States Army to the Advancement of Knowledge," p. 781, Virchow refers only to Medical Department publications in general. Thus, since only one part of each volume of the *Medical and Surgical History* had appeared by 1874 and since medical officers were responsible for many other publications in the period 1865–1874, it seems likely that Virchow had more than the *Medical and Surgical History* in mind when he spoke.) Second and third quotations from James H. Cassedy, *American Medicine and Statistical Thinking, 1800–1860*, p. 238. Fourth quotation from Esmond R. Long, "The Army Medical Museum," p. 370. See also idem, *American Pathology*, p. 129; Cassedy, *Medicine in America*, p. 66; AMA, *Petition*, p. 20.

74. Billings, *Papers*, p. 264.

75. Sternberg became surgeon general in 1893. First quotation from Ashburn, *History of MD*, p. 148; second quotation from Sternberg, *Sternberg*, p. 88. See also ibid., pp. 67, 70–87, 91–92; John Mendinghall Gibson, *Soldier in White*, pp. 136–37; Asch, "Army Medical Service," pp. 203–04; Ltr, Sternberg to SG, 27 Nov 1883, Ms C100, NLM. In 1892 Sternberg provided a group of scientists with the details of his work producing immunity to smallpox in calves, to include data on an experiment that demonstrated the in vitro effects of immune serum on the vaccine virus. See George M. Sternberg, "Practical Results of Bacteriological Researches," pp. 68–86.

76. Quotation from SGO Cir Order 3, 20 Aug 1877, vol. 6, Entry 63, RG 112, NARA; Garrison, *History of Medicine*, pp. 588–91; Phalen, *Chiefs*, p. 56; WD, *ARofSG*, 1884, p. 32, and 1885, p. 27; Gert H. Brieger, "The Development of Surgery," in *Davis-Christopher Textbook of Surgery*, pp. 9–10.

Chapter 2

SUPPORTING THE ARMY



The administrative difficulties encountered in the Surgeon General's Office in the first decades after the end of the Civil War did not significantly affect the work of military physicians serving posts scattered about the United States. Neither Reconstruction in the South, where "federal military activity... was negligible," according to historian John Hope Franklin, nor labor unrest in the more northern states in 1877 brought major new challenges. Wherever they were, Army surgeons continued to care for soldiers who had to endure long hours of physical labor under miserable conditions and disability from the ravages of disease. Because of corruption and wrangling between government and private contractors, the prompt and reliable delivery of the items of diet needed to preserve health still could not be guaranteed, even after the nation's railroad network had spread far through the West and refrigerated cars had joined the other cars that ran the rails. Finally, until the germ theory was widely accepted, Army physicians had no reason to change the way in which they attempted to maintain the health of the garrisons they served.[1]

Preventive Medicine

In the United States in the decades immediately following the end of the Civil War, preventive medicine remained the only effective weapon against disease. The public health movement was just beginning to gain real momentum. Although military physicians did not understand the relationship between poor sanitation and disease, they traditionally recognized the importance of preventive medicine. The surgeon general emphasized his belief in the vital role played by sanitation in maintaining the health of the Army by requiring surgeons to report regularly to him about the condition of their posts. Line officers were not motivated to take the recommendations of post surgeons seriously until 1874, when the Army required the latter to submit official reports on post sanitation to the commanding officer, who in turn had to record any objections and then forward the reports to the commander of the territorial command.[2]

Immunization against smallpox was, like sanitation, a weapon in the fight against disease that was employed by the Army far more than it was by the civilian population. An antivaccination movement that discouraged immunization contributed to a rising incidence of smallpox in the communities near military posts and increased the exposure of soldiers to the disease. Although vaccination was mandatory in the Army, those who had not been immunized for several years or who had

been vaccinated with questionable material might be susceptible to this highly contagious and dreaded disease. Authorities blamed a postwar letdown in precautions for an epidemic among black soldiers that resulted in more than 800 deaths in the year ending 30 June 1866.[3]

In spite of the Medical Department's efforts to prevent illness, Army physicians still encountered a high rate of both disease and discharge for chronic disease and disability, and even occasional terrifying epidemics. Many more soldiers were discharged because of the effects of rheumatism, venereal disease, heart disease, alcoholism, hernia, epilepsy, dysentery, and chronic respiratory disease than because of crippling wounds. From 1 July 1868 through 30 June 1873 the rate of discharge for blacks and whites combined averaged 32 per 1,000 men, a figure that Surgeon General Barnes attempted to put into perspective for the secretary of war by pointing out that during the period 1861–1870 the annual discharge rate for British troops stationed in the United Kingdom was 33.76 per 1,000.[4]

Major fluctuations in the overall disease rate in the Army from year to year resulted chiefly from epidemics of cholera and yellow fever. Because both illnesses were associated with "dirt and unclean habits" (wrongly in the case of yellow fever, which is transmitted only by several species of the *Aedes* mosquito, most often *Aedes aegypti*), they were grouped with those that medical scientists classify as "filth diseases," spread through the feces and urine of their victims. U.S. soldiers were vulnerable to both cholera and yellow fever. Any immunity acquired from cholera is short-lived, and although one attack of yellow fever confers permanent immunity, winter temperatures in the United States were too cold for the *Aedes aegypti* to survive. Epidemics of yellow fever occurred only when ships from Caribbean ports where the disease was endemic brought these insects with them to the United States. A large majority of soldiers came from northern cities; because of the vulnerability of *Aedes aegypti* to low temperatures and the duration of the voyage from the Caribbean, the likelihood of their gaining immunity to yellow fever was small. Together the two diseases were responsible for almost half the total numbers of Army deaths from all causes. Only 9.7 percent of the fatalities among the blacks and 13 percent among the whites resulted from wounds or injuries in 1867. With blacks now serving in the Army, medical officers studying possible racial differences in disease susceptibility noted that while 10.7 percent of total deaths among blacks resulted from yellow fever, the comparable rate among whites was 31.6 percent. The number of cholera fatalities steadily declined after 1867, whereas in 1868 yellow fever deaths were high. Beginning in 1869, disease rates from all causes fell, largely because of an overall decrease in yellow fever and cholera cases.[5]

Yellow fever struck units in Florida with particular severity in the decade after the end of the Civil War. In 1867 it killed one soldier at Key West and twenty-seven more at Fort Jefferson. The surgeon general asked the Army surgeons involved to send him any information they had on how the epidemic might have started, and by 1868 Billings was actively attempting to add more books on yellow fever to the Surgeon General's Library. In 1869 yellow fever hit Pensacola. Despite efforts to isolate the garrison from the civilian population, among whom the disease first appeared, twelve soldiers at Fort Barrancas fell ill and died. While assigned to the post, Assistant Surgeon Sternberg, then

a captain, contracted yellow fever, acquiring both a lifelong immunity and a lifelong interest in the disease.[6]

Yellow fever reappeared at Fort Jefferson in 1873. The attempt to spare the garrison by moving some men to Loggerhead Key was only partially successful; a few cases occurred within five days of arrival at the new site. Almost all those who remained at the fort fell ill, and thirteen of the twenty-five who contracted the disease died. Moving the garrison stationed in the Mobile, Alabama, area proved more successful; although many civilians in Mobile died, soldiers were spared. The disease continued to follow essentially the same pattern in subsequent years, threatening posts from Charleston to New Orleans. The Army continued to respond in the same way, moving as many men as possible away from stricken areas until the epidemic had run its course, an approach that was generally effective. Among those who contracted the disease, mortality remained high, with a third or more dying.[7]

In 1879 Sternberg was detailed to join the civilians on the newly created Havana Yellow Fever Commission of the National Board of Health,[8] which had been formed following a deadly yellow fever epidemic the preceding year. With three other members, Sternberg traveled to Cuba to study the disease. Two of the men with whom Sternberg worked, commission member Juan Guiteras and Carlos Finlay, an adviser to the commission in Cuba, would later play significant roles in the Army's struggle against yellow fever, but at this time a year's study led only to the conclusion that the science of bacteriology had not yet progressed to the point where the secrets of this deadly disease could be revealed. Despite strong efforts, the Medical Department lacked an effective weapon against yellow fever except flight. Without an understanding of how it was spread, doctors could not otherwise prevent it, and the purges and emetics still used to treat almost all diseases were of no avail as a cure.[9]



GEORGE M. STERNBERG

Although yellow fever was widely feared, cholera could be more dangerous, especially in epidemic years. Because cholera was spread mainly through water contaminated with the cholera vibrio, it was not confined to the South. At the time, the understanding of how this disease was spread was limited. Although an English physician, John Snow, had proved in the 1850s that water contaminated with the feces of cholera victims transmitted cholera, medical historian Wesley W. Spink maintains in his *Infectious Diseases: Prevention and Treatment in the Nineteenth and Twentieth Centuries* that "it was not until 1892 that the etiology and mode of transmission of cholera was recognized." Many

in the United States who accepted the idea that cholera was "portable" continued to believe that something in the atmosphere was also involved or that "predisposing causes" were necessary for its spread. The number of titles that Billings listed in his 1875 bibliography on cholera illustrate the widespread concern caused by this disease, which could survive in almost any climate and kill in a matter of hours. In 1864 another worldwide pandemic struck the United States, causing 278 fatalities along the coast of North Carolina, and by 1866 the disease was spreading to the West at a rapid rate, helped in part by the failure of the Army to realize that those without symptoms could be carrying the disease. Some mild cases of cholera might have been diagnosed as simple diarrhea, which also afflicted the Army at this time.[10]

From collecting points on Governor's Island in New York harbor, where "carcasses, offal, and floating debris of every description" covered the beaches, soldiers and the cholera vibrio boarded trains and boats together to journey to Fort Monroe, Virginia; to forts on the Mississippi River; and to posts in Missouri, Arkansas, and Texas. From July through December 1866, 192.6 of every 1,000 white soldiers and 258.4 of every 1,000 black soldiers contracted Asiatic cholera. More than 40 percent of white cases were fatal; almost half the total of 1,527 white soldiers dead from disease in 1866 and 1867 fell victim to cholera, while wounds or other injuries killed only 155. The Medical Department, its interest in the question of the extent to which health varied according to race unabated since the Civil War, noted that blacks, too, suffered severely from cholera, more than half the black victims dying. Their mortality rate from all causes was 12 percent, three times that of whites, and cholera caused two-thirds of the total of 536 black fatalities. Cholera also killed several medical officers and contract surgeons, including one who had left his sickbed to care for his patients. Among the civilians succumbing to cholera at Fort Harker, Kansas, in the summer of 1867 was Sternberg's first wife, and for some time after this tragedy he "was unfitted [*sic*] for duty from physical and mental prostration."[11]

Because of repeated epidemics since the first in 1832, Asiatic cholera was more familiar by the late 1860s, but Army surgeons treating patients stricken with the disease were still unable to mitigate its terrifying symptoms. Despite their efforts, the cholera victim suffered from

> diarrhoea, vomiting and purging of rice water, cramps, collapse, cold surface, cold extremities, cold tongue, cold breath, . . . leaden hue . . . , shrunken features, anxious expression, sunken eyes . . . , incessant thirst, . . . entire suppression of urine, jactitation [tossing back and forth], nervous agitation, sometimes slight delirium, [and] finally coma from uraemia, loss of pulse, and death.

The mere sight of such a victim was horrible even after his death because of the corpse's "very striking . . . muscular movements."[12]

With Army physicians unable to prevent deaths from cholera, the Medical Department redoubled its efforts to avert epidemics. Especially after 1868, the most favored approach involved quarantine; men were moved neither into nor out of infected areas. Often when the need for such an approach became obvious, troops had already spread the disease far and wide. Efforts to prevent local contagion among the soldiers at each individual post sometimes required "extraordinary precautions." A guard might be stationed over

the latrines to require any man who had "two actions of his bowels within twenty-four hours" to use an "earth closed commode" the next time so "that its character might be inspected." Considerable attention was focused on the quality of the drinking water and upon improved sanitation. Water might be sent to the department in Washington for testing, but this step was taken in the belief that any "organic matter" in it was harmful to the patient who was already suffering from cholera. Potassium permanganate was used to purify water found to contain such "organic impurity." [13]

Army surgeons also implicated crowding, bad ventilation, "crowd poisoning," and human waste as factors contributing to cholera outbreaks. They intensified efforts aimed at keeping quarters "scrupulously clean" and latrines disinfected in times of epidemic; interest in disinfectants and methods of disinfecting was considerable, even before the role of germs was generally recognized. The presence of vermin and swarms of flies was noted at one New York port where cholera had taken a high toll, but apparently no one suggested that these creatures were more than a mere reflection of poor sanitation. Those responsible for the care of cholera patients might require that their soiled bedding be burned and their unsoiled bed linen disinfected and boiled before laundering.[14]

The efforts of 1866–1867 produced little in the way of concrete and demonstrable results, despite at least one attempt to study the blood and urine of victims and the appointment of a board to study sanitation and ways to prevent the spread of cholera on Governor's Island. A circular issued in June 1868 required Army surgeons to use special forms to record the details of cases of epidemic disease, especially yellow fever and cholera. With the coming of the public health movement and the use of the laboratory to make prompt diagnosis of the first cases possible, cholera ceased to be a major threat in the United States after its final appearance as a significant problem in 1873. Only after this epidemic did Congress order the Medical Department to conduct the investigation of the disease, which was carried out by Assistant Surgeon McClellan.[15]

In spite of epidemics, the Medical Department's advice was not necessarily followed, and the conditions under which the average enlisted man lived remained primitive. Housing was put up casually and became increasingly defective with the passage of time. Latrines were poorly located and maintained. Beds were crowded and vermin-infested. Although weekly baths were required, adequate facilities were often lacking, especially at smaller and older barracks and in the years immediately following 1865.[16]

Although the water supply at most forts was apparently satisfactory, it was recognized as a possible source of disease. Surgeons could send samples to the Army Medical Museum laboratory for "biological examination" and "chemical analysis," but the analysis resulted in a report that detailed only the presence and amount of chlorine, nitrites, nitrates, free ammonia, albuminoid ammonia, and total solids in the water, not the presence of bacteria. Although by 1890 many posts were tapping into municipal water supplies, this move guaranteed neither quantity nor quality. Experiments with effective means of producing safe city water were under way in the late 1880s and 1890s, but as late as 1911 only 20 percent of city populations drank filtered water. Cisterns used to collect rain water could also accumulate for-



POST HOSPITAL AT JEFFERSON BARRACKS, MISSOURI

eign matter if not carefully maintained, springs and wells might be contaminated by runoff, and summer droughts could concentrate pollutants to the danger point.[17]

In working up criteria for improved sanitation, the Medical Department was particularly concerned with ventilating barracks and particularly with venting sewer gases, commonly believed to be capable of spreading typhoid and other diseases. With the passage of time, therefore, medical officers were increasingly involved in designing and installing effective sewage systems. Post surgeons became very knowledgeable on the subject of the design of sewers, flush toilets, and vent stacks, and devoted much time and energy to the improvement of post sanitation. They rarely seemed concerned, however, that even the most effective system discharged raw sewage into the nearest river, from which the water supply of the post or of some other community might be drawn. As garrisons grew in size, the question of sanitation became more acute, yet the expense involved in installing new systems was discouraging. As a result, some surgeons continued to struggle to improve sanitation at bases where years of accumulated human wastes oozed to the surface with every rainstorm and the urine-saturated wood of ancient outhouses reeked in the sun. Others wrestled with problems originating in sewers that, while possibly of recent origin, were poorly designed, constructed, and maintained. The services of an experienced and careful plumber were necessary to ensure the proper installation of new sewer systems. The proper pipe, the caulking of the joints, the venting of the traps, and the ventilation by soil stacks were all important, but qualified plumbers were hard to find.[18]

Between the inept installation of new facilities and the poor design and condition of older structures, unusual problems could arise. At Jefferson Barracks, Missouri, the cold air shaft of the furnace in the hospital basement ran within a yard of an open sewer vent. Because the wood of the shaft had rotted and was full of holes, sewer fumes were drawn into the furnace, heated, and sent throughout the building. Furthermore, since none of the soil pipes rose above the roofline, few fumes ever left the building. When attempts to improve the plumbing were undertaken in the 1880s, the post surgeon faced multiple problems. He insisted that he "had closely watched the work as it was being done, but under [his] very eyes the soldier plumber had his own way." The miscreant connected the water closets in the new hospital annex not to the new pipe that ran to the river but to the old one, which led to an abandoned sinkhole. He also set ventilation pipes for the water closets so low that when a toilet was flushed, the water flowed into the ventilation pipe. Rather than resetting the pipes after this disaster, he filled them "so completely with putty that neither air nor water could escape." The surgeon reported that "this evil was corrected," but the "discovery and removing [of] defective plumbing" continued. The decision to take water from the St. Louis mains, following on the heels of the installation of the new plumbing system, was regarded as "a great sanitary improvement." [19]

Another post with a high disease rate was Fort Douglas, Utah Territory, where the enlisted men did not have the benefit of a sewer and had to use earth closets (latrines in which excreta were covered with earth) that were "unsuitable, offensive to both sight and smell, dangerous to health, as well as indelicate from the mode of operating them." For a while the sewer serving officers was not flushed frequently enough, and the odors that resulted mingled with those from the earth closets and from the "faecal matter" spilled onto the ground when the closets were emptied. "The stench from this cause and from the buildings themselves is very great," the surgeon noted. He had also to contend with "waste pipes of the bath-room and kitchens of two barracks" that emptied onto the ground so that in winter, with the ground frozen, their effluent flowed "under the barracks, saturating the ground with filth." The ground was "strewn with filth dripped from the boxes when emptied, filling the air with foul odors," and effluent from the post polluted the river from which water was drawn.[20]

Old forts in the East experienced similar problems with sanitation. At Fort Hamilton, New York, where as late as 1890 most of the garrison was still lodged in damp, leaky, badly ventilated casemates that provided "just the kind of quarters in which rheumatism, pulmonary trouble, and low fevers are developed," the enlisted men's toilet facilities consisted "of an immense trough with a beam . . . laid along the front edge on which a man must sit. Everything behind is open. . . . The disgusting sights and odors and the lack of privacy condemn the plan utterly."[21]

Recruiters traditionally counted on the large northern and midwestern cities to provide a major proportion of new soldiers, but a common assumption was that rural areas provided the best soldiers. Crowded quarters and poor sanitation were undoubtedly especially hard on the morale of

> a young raw recruit, pure as the air upon his native hills, and as verdant as the grass and leaves of his rural home, fresh from clean feather-beds, butter, eggs and pumpkin pies, when . . . he is

ordered to report to the Sergeant . . . , and is assigned to little else than standing room in a dormitory and a place in line to wait his turn for a seat in the mess-room, to a pine-table, tin-cups, and everlastingly boiled meat.[22]

Convinced by his experience and research that "nothing certainly is more productive of contentment than a generous and varied diet," Billings examined the Army ration. Far from butter, eggs, and pumpkin pies, it was conducive not only of poor morale but of disease as well; the field ration consisted principally of greasy salt meat, dry bread, and thoroughly sweetened coffee, occasionally supplemented with beans. The Army officially insisted that it was more than adequate. Billings, however, maintained that "nothing can be more certain . . . than that the ration *per se*, that is, without addition by exchanges and purchases, is insufficient." Until the late 1880s the formal ration did not contain "any vegetable element," and without it, Billings pointed out, the men would "soon be affected with the scurvy." This deficiency emanated, apparently, from a widespread failure to understand the importance of vegetables in the diet. Tomatoes were better for preventing scurvy than the traditional potato and could be easily provided in cans, yet ignorance about their importance sometimes led to a refusal to issue them on the grounds that they could be used only to replace an item in the regular ration. As a result, although at least one surgeon regarded even a single case of scurvy as disgraceful, in the years 1865 through 1874 few forts west of the Mississippi escaped without at least one or two cases. A post's record for a single year sometimes showed more than a dozen victims, but only once did a severe problem run unchecked into a second year.[23]

Despite the growth of the nation's network of railroads, the increasing availability of canned goods, and the advent of ice machines and refrigerator cars to preserve fresh foods, the Army ration remained grossly deficient for many years. The Medical Department encouraged soldiers to hunt and garden to supplement their diets and also suggested that a portion of the allotment of such items as bacon, sugar, coffee, soap, and vinegar be sold and that the money received in return be used to buy more valuable items of diet. To raise their own antiscorbutics, however, soldiers had to pay for the seeds from their own pockets, and to save items from the ration in order to sell them or trade them to make up for deficiencies, they had to deprive themselves. Some contributed their own money toward the purchase of vegetables and fruits. Even these options, however, were unavailable to members of the exploratory team that Lt. Adolphus W. Greely led into the Arctic in 1884. The largest number of Army deaths related to diet in this period resulted from the failure of a relief ship to arrive before Greely's food reserves gave out. With the expedition's contract surgeon among the dead, the medical details of the disaster will never be known, but the deaths of twelve of Greely's men were attributed to starvation and one to scurvy. Even after 1890, when vegetables became a required part of the official ration, occasional cases of scurvy still appeared.[24]

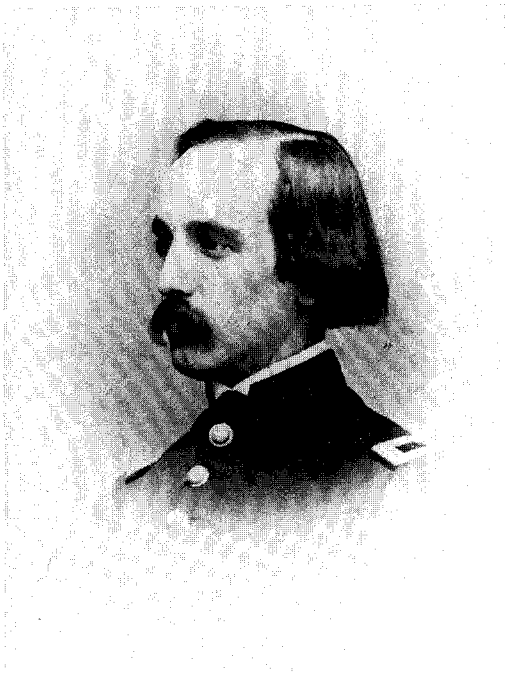
Other facets of the Army's ration also came under fire. In the course of his examination of Army posts in 1875, Billings concluded that it lacked not only vegetables but "albuminates" (or proteins). An experiment in preserving beef by freezing all the meat for the season in ice and snow in early winter was conducted at Fort Bu-

ford in the Dakota Territory. The savings in forage that resulted from not having to feed the cattle during the winter months was counterbalanced by the poor quality of the meat so preserved. Billings also questioned the soldier's allotment of bread. In his opinion, 18 ounces a day was inadequate unless "supplemented by a good supply of the starchy vegetables." [25]

In the final analysis, cooks could spoil not only the appeal to the palate but the healthfulness of any food, and some items were beyond redemption. Billings quoted a Civil War authority as saying that "beans, badly boiled, kill more than bullets" and particularly deplored the custom of detailing unqualified enlisted men to cook for hospitalized patients. He noted that the Army surgeon who was required to inspect the post's food once a week was also required to inspect the way the ration was prepared whenever he suspected that a food-related disease might be afflicting the garrison. Neither cooking nor refrigeration could make salt pork palatable in hotter climates. Even in the late 1880s it was "condemned as repugnant to the taste and sight" in Texas, but the commissary general of subsistence insisted that it was "one of the most important and valuable components of the ration." [26]

Post surgeons were also concerned with personal hygiene. Billings believed that "next to fresh air and proper food, personal cleanliness is the most important agent in preserving the mind and body in proper working order. . . . A dirty man will, in most cases, be a discontented, disagreeable, and dissolute man; for the condition of his skin has more to do with a man's morale than is generally supposed." His studies of Army posts in 1870 and 1875 revealed his awareness of the difficulties involved in providing bathing facilities. Both officers and men seemed to understand the importance of personal cleanliness, but a poor water supply and a lack of adequate heat all too often discouraged attempts to bathe. Available facilities were sometimes antiquated, especially in the South. At Fort Monroe, where saltwater baths were possible in warm weather, "the greater part of the command do not wash their whole persons from November till June." Billings recommended the use of showers rather than tubs and urged that warm water be made available. "It is," he noted, "economy and good policy to make the facilities for this purpose such that men shall consider their bath a pleasure and a necessity." Commanding officers generally cooperated with efforts to encourage cleanliness, but the secretary of war apparently wanted garrisons to set up their own bathhouses without charging the government for the expense.[27]

The Medical Department was also concerned about the clothing soldiers wore. In the summer of 1867 medical directors in the various parts of the country were polled for their opinions on the "hygienic fitness (for the localities where they are now on duty)" of the uniform. One such report, printed by the Surgeon General's Office in the spring of 1868, was the work of Capt. Alfred Alexander Woodhull. Woodhull emphasized the importance of different designs and weights of uniform for different seasons and climates. He believed that a lighter and better ventilated hat was needed for warm weather, and a different, more protective version for cold weather. The undershirt, its thickness varying with the seasons, should reach "the middle third of the thigh," thus guaranteeing adequate protection for "the organs most sensitive to changes of temperature." Woodhull suggested that this



ALFRED ALEXANDER WOODHULL

garment would be easier to wash if a fabric containing 35-percent cotton were substituted for all wool. Beyond this, "company officers should be held responsible that their men always wear drawers," both for comfort and health, and, in addition, "large and warm leggings" for those at "exposed, north-western posts." [28]

Woodhull was particularly critical of the design of the Army uniform. It was "tight-fitting, wadded," restricting breathing and preventing the evaporation of perspiration. In the South it was "insufferable in the warmer months." The soldier's "martial bearing," Woodhull believed, should result from his training, not from clothing so thick and so tight as to "hold the soldier in position." In 1878 commanding officers in the Deep South were permitted to use lighter-weight clothing, some of which had to be purchased out of the individual soldier's salary.[29]

The combination of complaints from the South about clothing that was too warm with complaints from the North about the inadequacies of cotton underclothing during harsh winters only served to emphasize the need for a new approach to the design and fabric of uniforms. In 1893 a medical officer maintained that recent changes in clothing had only made matters worse.

> It seems essential to tie the soldier down with straps and strings and then load him up like a freight car. He is half-choked with high-standing collars; he has straps ingeniously arranged across his chest so that he cannot breathe by his chest muscles; he has belts and clothing so tightly bound around his waist that he can not breathe by his abdominal muscles, and on his head is placed a contrivance that is protection neither to eyes nor head.[30]

The design of the uniform of the cadets at West Point was no better. The clothing in question was so tight that it interfered "materially with the natural development of the muscular, circulatory, and respiratory systems." It caused nausea, headaches, and faintness, but the cadets liked the appearance of close-fitting uniforms so much that they had their tailors alter them to be tighter still. The only way to eliminate the problem, therefore, was to completely restyle the uniform. An investigating committee agreed and recommended that trousers be designed to be looser at the waist than the ones in use.[31]

In the decades after the Civil War a broader and more positive approach to the Army's health was also evident. The Army began promoting health of mind and body rather than merely preventing disease. Much effort was devoted to reducing problems caused directly and indirectly by alcoholism and to advocating athletic

training and specific programs of recreation. Echoing the philosophy then being espoused by such civilian authors as William James, Surgeon General Sutherland believed that "the athlete cares more for his training than for vicious indulgence" and that the encouragement of athletics could be expected to "reduce the prevalence of drunkenness to a minimum." This approach may have been in part responsible for the decrease in overall venereal disease and alcoholism rates after 1879. By 1889 most Army surgeons rated "the personal habits, cleanliness, etc., of the men as excellent," but the number of alcohol-related admissions, more than 40 per 1,000 mean strength in the 1880s, continued to arouse concern. Prohibition of alcohol on base resulted only in the growth of "dens of dissipation and disease just beyond the jurisdiction of the commanding officer," and with venereal diseases an important cause of ineffectiveness, doctors began to favor establishing post canteens serving beer.[32]

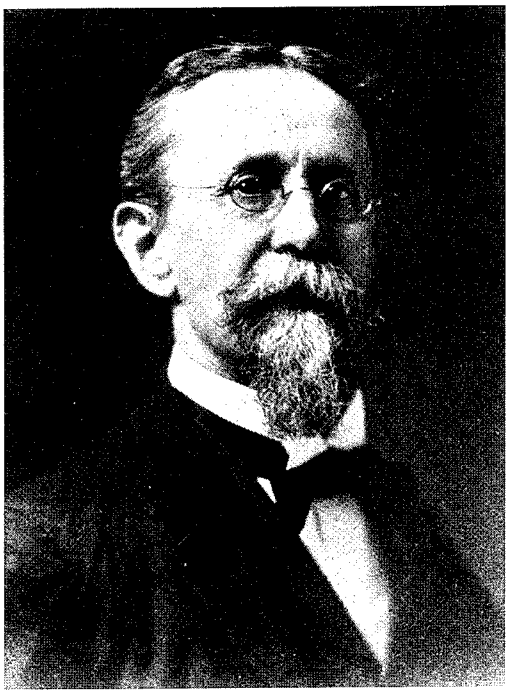
Although respiratory diseases traditionally took a considerable toll among the nation's soldiers, they were taken for granted, perhaps because they did not have the chronic character of such problems as alcoholism and venereal disease. The common cold affected many. In fiscal year 1887, 80.9 men out of every 1,000 were admitted to sick report because of "catarrhs and common colds" and another 62.24 per 1,000 because of more serious problems, primarily bronchitis, pneumonia, pulmonary tuberculosis, and pleurisy. In 1890, however, a major influenza epidemic caused the Medical Department some concern, and it was followed in 1891 and 1892 by occasional serious but localized influenza outbreaks.[33]

Surgery

Although disease remained a significant cause of ineffectiveness despite determined efforts of medical officers to prevent its spread with improved sanitation, deaths from wounds increased as campaigns against the Indians became more intense and inspired greater interest in target practice. In fiscal year 1870 wounds killed half as many as disease among whites and more than a quarter as many among blacks. Thus the work of the surgeon who repaired the damage resulting from Indian attacks and mishaps with weapons continued to be vital to maintaining the Army's effectiveness.[34]

The use of anesthesia no longer caused dissension within the medical profession. Since the days of the Mexican War in the late 1840s, with rare exceptions, surgeons had not had to deal with struggling and terrified patients. By late 1883 both Army surgeons and civilian practitioners were using cocaine and its derivatives as local painkillers. Chloroform was falling deeper into disfavor because of its effects upon the heart. Medical Department physicians preferred ether, which in fiscal year 1886 they used almost twenty-four times as often as a combination of ether with chloroform. No anesthesia deaths were reported that year, although surgeons noted problems related to the use of anesthesia in three cases receiving ether, one receiving chloroform, and one a mixture of the two.[35]

In surgery as in preventive medicine the period 1865–1893 was one of transition. For many years after the Civil War, physicians who did not appreciate the implications of the germ theory hesitated to perform complex operations for fear of infection. When an assassin's bullet cut President Garfield down in July 1881, doc-



DANIEL SMITH LAMB



JOSEPH J. WOODWARD

tors did not undertake exploratory surgery to determine the extent of his injuries. Instead, they repeatedly poked and probed the wound with unsterilized instruments and unscrubbed hands. Even the use of a primitive metal detector, devised by Alexander Graham Bell, failed to locate the bullet. In the postmortem examination performed following Garfield's death two months later, Army Museum pathologist and contract surgeon Daniel Smith Lamb traced the bullet's ten-inch course through the body to its final lodging near his pancreas. Lamb blamed the death on secondary hemorrhage, but modern scientists familiar with the records of Garfield's care have concluded that the cause of the fatal bleeding was infection.[36]

For those fated to attend a dying president at a turning point in the history of medicine, the strain of the unusual responsibility they bore was almost unbearable, especially when coupled with the flood of criticism that appeared in both professional and more popular publications from those who would second-guess their approach to the president's care. Garfield's physicians, among them Maj. Joseph J. Woodward, considered by those who knew him to be "highly strung," were emotionally drained. In July 1882, a year after the president's death, Woodward was still so overwrought that he was unable to attend the autopsy of Garfield's executed killer, Charles J. Guiteau.[37]

An increased appreciation of the benefits of antisepsis would eventually produce a major change in the approach of medical officers to surgery. Initially, they remained very cautious about undertaking abdominal surgery. A psychological barrier still lay between the surgeon, military or civilian, and his undertaking a type of operation previously associated

only with the direst of consequences. He first had to be sure in his own mind that removing an infected appendix, for example, would save a life that would otherwise probably be lost, and thus he would perform an appendectomy only when the patient was so close to death that nothing was likely to save him. Nevertheless, as early as 1885, an optimistic Surgeon General Murray foresaw a day when that barrier would fall, when

> the hope of modern abdominal surgery will . . . be realized, by the application, at the hands of military surgeons, of abdominal section [surgery involving an incision into the abdominal cavity], under antiseptic precautions, to gunshot wounds of the abdominal viscera, with ligature of all bleeding vessels, and the closure by suture of all intestinal wounds.[38]

Elaborate routines before beginning to operate became increasingly common as physicians began to realize that more than mere cleanliness was necessary to prevent the development and spread of infection during operations. Representative of this approach was the procedure recommended in 1892 to surgeons of the National Guard. They were to scrub their hands with a sterilized brush in hot water for several minutes before operating, then immerse them for three minutes in a hot saturated solution of potassium permanganate. A three-minute soak in a hot solution of oxalic acid followed, with three minutes in a hot solution of bichloride of mercury completing the routine. Understandably, the adoption of rubber gloves in 1889 was dictated by concern for the hands rather than by any belief that germs on them might survive to infect the victim.[39]

Hospitals

When so many units were isolated and disease rates were high, even the smallest Army post had to have a building where the sick could be sequestered for care. The temporary field hospitals and dressing stations that served troops in the field were in use too short a time to become contaminated with disease, but Medical Department experts believed that permanent hospitals were inevitably reservoirs of disease after ten years of use. Anticipating a regular need for new construction, they developed standardized designs for 12-, 24-, and 48-bed facilities. They recognized that while few posts were large enough to justify building the largest size, the 12-bed design that met most requirements was inefficient because the space necessary for office and storage was almost as great as that taken up by its single ward. The money necessary to build and maintain these facilities was initially part of the Army's annual budget for construction, but after 1874 it was voted as specific sums appropriated for hospital construction and maintenance. Although willing to fund a joint Army-Navy general facility, Congress gave the department less than half that required to give each Army post a hospital, to keep it in good repair, and to replace it every ten years. Medical officers were all too frequently forced to watch their facilities deteriorate, powerless to remedy the situation.[40]

In actual practice, many post hospitals occupied makeshift quarters, poorly constructed and of inappropriate design, where ventilation and heating systems worked at cross-purposes. An 1875 inspection revealed that the facility at Fort Hamilton, New York, was a "temporary hospital" in which "the original materials and workmanship were so inferior that a

constantly increasing expenditure was necessary to keep the buildings in repair." At Fort Wood in New York Harbor, the hospital's drinking water supply was compromised by the location of the cistern in which it was collected less than three yards from another that received the discharge from the water closets. Furthermore, many of the numerous posts hastily established in the Reconstruction South had to adopt whatever shelter was available until suitable buildings could be built. In 1877, with Reconstruction at an end, the secretary of war ordered that no building be either constructed or occupied as a hospital without first obtaining the written opinion of the medical officer concerned.[41]

The surgeon general never stopped urging that medical officers be directly involved in the design of hospitals and the improvements made in them. Surgeon General Sutherland expressed himself as particularly pleased with the plans that had been used to build hospitals in 1887 and 1889. These facilities were heated "by steam" and ventilated "by aspiration," their walls were covered with an "asbestos finish," and the woodwork was unpainted. Sutherland termed the design "a complete aseptic building." By 1892 he was able to report that there were few complaints about hospital accommodations. A sign of the changing times was the debate that arose in the late 1880s about whether construction funds should be used to cover the cost of installing telephones.[42]

Although the Army no longer had any use for the huge general hospital that served the men of many regiments during the Civil War, the Army-Navy Hospital at Hot Springs, Arkansas, was a new type of general hospital, staffed by both Army and Navy medical officers. Opened in January 1887 to supplement the care offered by the network of post hospitals, it took in patients from all military services, both those on active duty and retirees, officers and enlisted, from all parts of the country. Among the maximum of eighteen officers and sixty-four enlisted men treated there at any one time were patients suffering from diseases that were expected to respond to hot mineral waters, including rheumatism, gout, and neuralgia, as well as chronic diarrhea, skin diseases, alcoholism, and other chronic conditions resulting from malaria or syphilis. Surgeon General Moore hoped that the hospital would significantly reduce the number of disability discharges. After four years, Surgeon General Sutherland was pleased with what the new hospital's hot mineral waters could do for its patients, especially for sufferers from rheumatism. Half of those sent to this facility because of "diseases of the nervous system" and "nervous depression, brought on by the great strain of our modern life with its increased mental activities," were also returned to duty. Among the total number restored to duty, however, "necessarily, in a certain proportion, there is a return of the disease."[43]

Above and Beyond Health Care

In the course of guarding the Army's health during the years following the end of the Civil War, medical officers were swept up by forces well beyond the field of medicine that were shaping the nation's history and the Army's role in it. As Weigley wrote in his history of the U.S. Army, "These were the Army's last years as the constabulary for pacifying Indians. . . . A restlessness of coming change was already present." Almost imperceptibly at first, the foundations were being laid for a new

Army, one in which the medical officer would be increasingly required to develop administrative skills.[44] The nation itself was becoming more industrialized, and the labor upheavals that accompanied this change at times reached such a pitch that military intervention was needed, and physicians had to accompany Army units sent to the sites of violence or anticipated violence.

Neither disease nor injuries ever seriously threatened the troops called out to maintain the peace in the summer of 1877, when waves of labor disorder hit the East and Midwest. Nevertheless, surgeons from far distant posts had to be called in to support soldiers who, with little if any planning, were moved in small units from one place to another in response to violence and reports of violence. Although this type of threat was not limited to the East, eventually most of the soldiers in the Division of the Atlantic became involved in preserving order.[45]

For the Medical Department, this situation again exacerbated the shortage of surgeons. Any time a small garrison remained at a post when most of the men were sent to the areas of greatest unrest, two physicians instead of one were needed, one for the post and one for the men in the field. The surgeon general ordered that civilian doctors be hired to care for the men of posts whose surgeons were on detached duty, but only on a by-the-visit basis. Additional difficulties arose when, because of the rapidity and the lack of preparation that characterized these troop movements, surgeons found themselves short of supplies. One serving in West Virginia was forced to plead vigorously by telegraph for replacements for medicines and instruments that were apparently lost in transit, either from his post or from the New York supply depot. Fortunately, the acute stage of the situation lasted only a few weeks, and troops were soon on their way back to their regular posts.[46]

With labor violence contained and with the dwindling of the Indian threat,[47] time was available to consider and prepare for the role the Army would play in the future should the United States become involved in a major war. The increasingly intricate administrative duties that would be assumed by medical officers trying to meet the needs of an army functioning in ever larger units dictated a greater emphasis on education and training at all levels. The involvement of medical officers in this effort was initially somewhat sporadic, but it grew in magnitude and scope as both medicine and the organization of the Medical Department became more complex.

One early teaching responsibility lasted only three years. In 1886 surgeons at posts whose garrisons demonstrated an interest in first aid were ordered to conduct informal classes for officers and enlisted men. They were to lecture on "practical treatment of the unhidden diseases, early aid to the injured, the most expeditious and proper manner of treating temporarily gunshot wounds, poisoned wounds, frostbite, bruises, dislocations, hemorrhage, and fractures of bones; applications of the tourniquet, the most approved method for resuscitation from drowning and other kindred subjects."[48]

Although this order setting up these classes was rescinded in June 1889, the involvement of post surgeons in training continued. Many found themselves responsible for training unenthusiastic litter-bearers and, after 1887, Hospital Corps members in first aid as well as in the other aspects of their duties; they were particularly encouraged to use marches to famil-

iarize hospital corpsmen with their responsibilities. Field operations were established at camps of instruction to train large numbers of men, which was not possible at individual posts, and details from the Medical Department joined them. The trainees learned how to set up dressing stations and field hospitals,[49] as well as how to move "dummy wounded" back through the chain of evacuation much as had been done during the days of Jonathan Letterman and his ambulance corps in the Civil War. Emphasizing the experimental nature of these training operations to its surgeons, the department urged participants to make suggestions for improvement.[50]

Experience brought several weaknesses to light. Ambulances proved to be fragile and their equipment inadequate. Additional problems resulted from the fact that, as in the past, commanding officers did not assign their ablest men to help the wounded. Moreover, those detailed as litter-bearers often ignored the required training drills. One surgeon reported that "the personnel is not select, the service is unattractive, and the training inadequate." The work of the hospital corpsmen, on the other hand, proved more encouraging. "All duties were performed by the Hospital Corps cheerfully and in a satisfactory manner," reported an assistant surgeon with troops from Fort Niobrara, Nebraska. Because these camps were often unable to provide the hospital corpsmen with the horses they needed for maximum mobility, the "opportunity for instruction and practice" was limited, but it was nevertheless of "benefit to the service." [51]

Training varied from group to group under this system, and little uniformity was achieved. To help standardize procedures, Surgeon General Moore encouraged his officers to work on training manuals. In time several of good quality were developed. For example, with the aid of a board of medical officers and the advice of other experienced Army physicians, a provisional manual for training hospital corpsmen was revised and published in 1891 as the *Drill Manual for the Hospital Corps*. Also, the volume *Notes on Military Hygiene,* based on lectures that Woodhull, by then a major, gave to line officers studying at Fort Leavenworth beginning in 1886, was recommended for use in new courses being taught line officers at Fort Leavenworth, West Point, and Fort Monroe. Surgeon General Sutherland urged that companies of instruction be created for hospital corpsmen at a few posts so that medical officers could train large numbers together. This approach, he believed, would also simplify the problem of enlisting civilians directly into the Hospital Corps who might already have received education as druggists or cooks but who still needed military training.[52]

In 1891, to try out his idea, Sutherland began organizing three companies of instruction. He had those training west of the Mississippi spend six months at either Fort Riley in Kansas, Fort D. A. Russell in Wyoming, or Fort Keogh in Montana. Three or more medical officers, three hospital stewards, four acting hospital stewards, a bugler, an artificer, a tailor, and forty or more privates were to form each company. At the time of the surgeon general's retirement in May 1893 these schools were still being run on an experimental basis, but the general testimony was to the superiority "of the schools-instructed men . . . , and no one who has seen the work of the companies as units can question the certain superiority of bodies of men so trained over any organization locally gathered and individually instructed." [53]

Medical Department officers were also requested to help in training the physicians serving with the National Guard, whose supporters were growing because of the labor unrest of 1877. The relationship of the state-controlled Guard to the Regular Army was characterized by misgivings on both sides, but because Guard units would have to work closely with regulars in the event of war, wisdom dictated that the Guard's "organization and methods [be] based upon or assimilated with those of the regular troops." During their tenure as surgeon general, both Moore and Sutherland expressed significant reservations about the custom of having National Guard surgeons appointed by their colonels without the benefit of an examination for professional competence. Yet when the surgeon general of the Michigan National Guard urged the creation of a state examining board, Sutherland refused to allow Regular Army surgeons to serve on it, lest they be drawn into acrimonious disputes.[54]

Nevertheless, the Medical Department did, upon request, detail medical officers for duty at National Guard encampments to advise Guard doctors how best to maintain the health of their troops, to handle their administrative responsibilities, and to assist in training nonprofessional medical personnel. One Regular Army physician, not particularly impressed by what he saw, noted that the National Guard surgeons seemed to regard "the annual encampment in the light of a picnic, an 'outing,' which offers them relaxation from work, and which should be spent in frolic and festivity." Some camps were almost luxurious, equipped with electricity and city water and supplied with fresh fish and fresh vegetables and fruits, as well as eggs, butter, and milk, even though their latrines might be "neglected and offensive." Familiar with neither the importance of discipline and sanitation nor the everyday routines of the Medical Department, the average National Guard physician was unable to advise his commanding officer on sanitary matters, to train stretcher-bearers and attendants, or to deal with reports, supplies, and other administrative requirements. Thus Surgeon General Sutherland welcomed enthusiastically the formation of the Association of Military Surgeons of the National Guard of the United States.[55] From the outset it was an important vehicle for the education of the National Guard's medical staff, and, through its journal, for the education of all military surgeons. The surgeon general assigned some of his most experienced medical officers to attend the association's meetings.[56]

Sutherland also criticized Guard units because of their lack of a permanently organized hospital corps to evacuate and care for the sick and wounded. Even though National Guard corpsmen were merely detailed to their duties from the line, some took to their responsibilities with enthusiasm. In 1889 Regular Army Capt. Louis Brechemin complimented Illinois Guard corpsmen upon their unfailing "zeal and intelligence in learning the drill" and the "promptness and faithfulness" with which they "attended to their other duties," praise that another medical officer echoed in 1892 in describing the men of Michigan units. Despite earnest efforts, Medical Department officers were only beginning to impress both medical and line officers in the National Guard with the necessity for close attention to sanitation and hygiene and to familiarize them with the routines of the Regular Army.[57]

Off-duty Pursuits

Since military posts were usually small, the surgeon was responsible for the care of



ELLIOTT COUES

only a few men, and the necessity for examining occasional local pension applicants added little to the demands made upon him. What he did in his off-duty hours was largely his personal choice. He might turn to private practice, to the study of the fauna and the flora of the area around his post, or to other scientific pursuits.

Surgeon General Barnes believed that caring for local citizens enabled his medical officers to provide better care to their soldier patients, "by reason of the experience gained by becoming familiar with the diseases prevalent in the locality." The tradition of private practice was thus encouraged for many years, as long as care of private patients did not cause the medical officer to neglect his Army duties. The War Department, too, apparently supported this approach, but civilian physicians, resenting competition from military physicians, occasionally protested that Army medical officers often treated even well-to-do patients without charge and sometimes supplied them with the Army's medicines. In 1877 members of the Medical Association of the District of Columbia complained about Colonel Baxter, then serving in Washington as chief medical purveyor. They alleged that he deliberately, and with some success, tried to lure female patients away from the city's physicians and that he used the opportunity to care for prominent politicians as a means of furthering his own career. They charged that President Grant had benefited both from the free services of medical officers and from medicine provided by the Army. The extent to which the medical officer in the field was obliged to care for the civilians at his post, most often quartermaster employees and officers' families and servants, had never been entirely clear, but in 1884 the Army stated specifically that both regular and contract surgeons must care for the families of officers and enlisted men without pay as part of their normal duties whenever "practicable." This move deprived medical officers of a previously available source of added income, but since they had traditionally cared for families as part of their private practices, it could not have added to the demands made upon their time. As Army posts diminished in number and grew in size, significant amounts of spare time were not as easily found, and in 1892 Surgeon General Sutherland concluded that a private practice interfered "materially with the performance of public duties" and ordered the time-honored custom abandoned.[58]

Having devoted his off-duty hours as a young medical officer to research, Billings was convinced that a post surgeon should always have some type of research project available to work on as time permitted, "for

his own mental health and pleasure." Army surgeons continued to use their spare time to increase their knowledge of natural history, just as they had before the Civil War. The surgeon general officially ordered Capt. Elliott Coues, who would become a widely respected naturalist, to work at the Smithsonian Institution classifying specimens he had collected while serving beyond the Mississippi. In 1881, concluding that he could not serve in the Medical Department and devote the time he wished to his work as a naturalist, Coues left the Army. Medical officers unwilling to give up their careers might be forced to sacrifice their work in natural science. Although the official responsibilities of the medical officer became increasingly demanding and complex and his time for other pursuits was diminishing, within the limitations that their careers in the Army permitted, a few always found time to pursue their interests in sciences other than medicine.[59]

The decades between the end of the Civil War and 1893 were, because of the impending revolution in medicine, the last in which the Medical Department officer would be forced to wage war against disease with few weapons other than smallpox vaccine, the traditional devotion to cleanliness, and common sense. They were the last when he would be routinely required to work in relative isolation, unable to obtain the prompt advice of his peers whenever he needed it and to obtain supplies rapidly whenever he needed them. They were also the last when the Army would have to fight the Indian.[60]

NOTES

1. Quotation from John H. Franklin, *Reconstruction*, p. 120; War Department, Surgeon General's Office, *Manual for the Medical Department, 1906*, pp. 209–12; Jack D. Foner, *The United States Soldier Between Two Wars*, p. 15; John Shaw Billings, "Progress of Medicine in the Nineteenth Century," in *Smithsonian Institution Report for 1900*, p. 637; Edward M. Coffman, *The Old Army*, pp. 246, 251–52; War Department, *[Annual] Report of the Secretary of War*, 1878, 1:102; James A. Huston, *The Sinews of War*, p. 256.

2. The number, boundaries, and names of the geographic, or territorial, divisions and the departments and districts into which they were divided and subdivided changed from time to time. See AGO GO 125, 17 Nov 1874. In Chapter 9 of his volume *The Sanitarians*, John Duffy provides a detailed discussion of changes in public health in the United States after the Civil War.

3. Austin Flint, *Clinical Medicine*, p. 751; Martin Kaufman, "The American Anti-vaccinationists and Their Arguments," pp. 464, 467–68; War Department, Surgeon General's Office, *Medical and Surgical History of the War of the Rebellion*, 1–3:624, 627; War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1886, p. 9 (hereafter cited as WD, *ARofSG*, date); John McL. Keating, *A History of Yellow Fever*, pp. 103–04; Wilson G. Smillie, *Preventive Medicine and Public Health*, p. 8; Ltr, Crane to Post Surg, Fort Craig, N.Mex., 9 Feb 1869, Entry 2, and Rpt, Samuel Jessop, 15 Jan 1869, Entry 51, Charleston, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.

4. WD, *ARofSG*, 1874, pp. 5–7.

5. Quotation from *Dorland's Illustrated Medical Dictionary*, 24th ed., s.v., "disease, filth d."; WD, *ARofSG*, 1868, pp. 3–4, 1869, pp. 6–7, and 1870, pp. 4–5; Coffman, *Old Army*, p. 328.

6. WD, *ARofSG*, 1869, p. 4, and 1874, p. 12; Ltrs, Crane to E. Thomas, and to W. F. Cornick, both 14 Nov 1867, and J. S. Billings to S. W. Butler, 14 Jan 1868, Entry 2, RG 112, NARA; George M. Sternberg, "An Inquiry Into the Modus Operandi of the Yellow Fever Poison," pp. 22–23; idem, "A Study of the Natural History of Yellow Fever and Some Remarks Upon the Treatment . . . ," p. 639; Keating, *Yellow Fever*, pp. 15, 17.

7. WD, *ARofSG*, 1874, pp. 10–12, 1875, pp. 6–7, 1876, pp. 7–9, and 1878, pp. 6–7.

8. The founders of the National Board of Health were, for the most part, those who had created the American Public Health Association seven years earlier. The board lasted only three years, being "doomed to failure almost from the start," according to one medical historian, in part because "the country as a whole was not yet ready for a nationwide health promotion service." Quotation from Smillie, *Public Health*, p. 18.

9. Ibid., pp. 18, 21, 576; Ralph C. Williams, *The United States Public Health Service, 1798–1950*, pp. 76–79, 165; Martha L. Sternberg, *George Miller Sternberg*, p. 274; James M. Phalen, *Chiefs of the Medical Department, United States Army, 1775–1940*, pp. 71–72; William B. Bean, *Walter Reed*, p. 73.

10. First quotation from Wesley W. Spink, *Infectious Diseases*, p. 165; remaining quotations from Charles E. Rosenberg, *The Cholera Years* (1987), pp. 196–97; Lloyd G. Stevenson, "Science Down the Drain," p. 10; Wyndham D. Miles, *A History of the National Library of Medicine*, p. 33; War Department, Surgeon General's Office, *Report on Epidemic Cholera in the Army of the United States During the Year 1866*, p. 22 (hereafter cited as WD, SGO, *Epidemic Cholera, 1866*). The first epidemic, in 1832, precipitated more terror in the United States than subsequent pandemics, presumably because cholera had never been encountered before in this country. See Mary C. Gillett, *The Army Medical Department, 1818–1865*, pp. 11–13.

11. First quotation from John Shaw Billings, *A Report on the Hygiene of the United States Army . . .*, p. 18; second quotation from WD, SGO, *Epidemic Cholera, 1866*, p. 35; ibid., pp. vi, xiv–xv, xviii; WD, *ARofSG*, 1866, p. 5, and 1867, pp. 3–4.

12. WD, SGO, *Epidemic Cholera, 1866*, p. 26.

13. First four quotations from War Department, Surgeon General's Office, *The Cholera Epidemic of 1873 in the United States*, p. 492 (see also pp. 471–72); remaining quotations from idem, *Epidemic Cholera, 1866*, pp. xvii and 61 (see also pp. xiv–xvi); idem, *Report on Epidemic Cholera and Yellow Fever*

in the Army of the United States, p. 35; WD, *ARofSG*, 1866, p. 4.

14. Quotations from WD, SGO, *Epidemic Cholera, 1866*, pp. 25, 27 (see also pp. 23, 29, 37, 64); idem, *Cholera Epidemic of 1873*, p. 479; SGO Cir 5, 20 Apr 1867.

15. John S. Chambers, *The Conquest of Cholera*, pp. 335–36, 351; WD, SGO, *Cholera Epidemic of 1873*, p. 476; idem, *Epidemic Cholera, 1866*, pp. 26, 62–63; WD, *ARofSG*, 1874, p. 19; William G. Rothstein, *American Physicians in the Nineteenth Century*, pp. 265–66; Duffy, *Sanitarians*, pp. 193–94.

16. Foner, *United States Soldier*, pp. 8–9, 17–19; Edward J. Forster, *A Manual for Medical Officers of the Militia of the United States*, pp. 12, 68; Coffman, *Old Army*, pp. 385–86; WD, *ARofSG*, 1887, pp. 73–74, 83, 1890, p. 77, and 1892, pp. 87–88.

17. WD, *ARofSG*, 1885, pp. 37–38, 1888, pp. 120–26, 1889, pp. 81–82, 1890, pp. 81–86, 1891, pp. 61–63, and 1892, pp. 70–84; Duffy, *Sanitarians*, pp. 201–02; in RG 112, NARA: Ltrs, SGO to Charles E. Goddard, 23 May 1884, D. L. Huntington to Goddard, 9 Oct 1884, and to Ely McClellan, 22 Dec 1884 (quotations), and Charles R. Greenleaf to George E. Pond, 8 Feb 1888, and to John van R. Hoff, 19 Mar 1888, all Entry 2, and Ltrs, Greenleaf to W. M. Mew, 24 Jan 1890, and to SG, 17 Feb 1890, and [Mew?] to SG, 1 Apr 1891, plus Memo, SG, 3 Jul 1890, all Entry 22.

18. WD, *ARofSG*, 1886, p. 78, 1889, pp. 55–57, 59, 87, and 1890, pp. 57–69.

19. Ibid., 1889, pp. 56, 59; quotations from pp. 61–62, except last, from p. 82.

20. Ibid., 1886, p. 80; quotations from pp. 77, 81, 82–83.

21. Ibid., 1889, p. 55 (first quotation), 57–58, 1890, p. 58, and 1891, p. 56 (second quotation).

22. Quotation from Billings, *Report on Hygiene*, p. xvii; Coffman, *Old Army*, pp. 329–31.

23. Quotations from Billings, *Report on Hygiene*, pp. xxxii, xxvii, xxx; ibid., pp. xxxviii–xxxix; Ltr, E. P. Morang to SG, 5 Sep 1865, vol. 10, Entry 10, RG 112, NARA; Don Rickey, Jr., *Forty Miles a Day on Beans and Hay*; Darlis A. Miller, *Soldiers and Settlers*, pp. 42–44.

24. Billings, *Report on Hygiene*, p. xxx; WD, *ARofSG*, 1885, p. 52, 1889, pp. 71, 74, 1891, p. 4, and 1892, p. 84; Ltrs, D. L. Huntington to Zilla M. Pavy, 7 Dec 1885, and J. H. Baxter to R. H. Firth, 24 Sep 1886, Entry 2, RG 112, NARA; Erna Risch, *Quartermaster Support of the Army*, p. 507; Huston, *Sinews*, p. 268.

25. Billings, *Report on Hygiene*, pp. xxix (first quotation), xxx, xxxiii (second quotation), xxxiv–xxxvi.

26. First quotation from ibid., p. xl; remaining quotations from WD, *ARofSG*, 1889, p. 79 (see also pp. 76–77, 81, 81n3).

27. First and second quotations from Billings, *Report on Hygiene*, pp. x, 52 (see also p. 107); third quotation from idem, *A Report on Barracks and Hospitals . . .*, p. xvii; Risch, *Quartermaster Support*, pp. 488–89.

28. Quotations from Alfred Alexander Woodhull, *A Medical Report Upon the Uniform and Clothing of the Soldiers of the U.S. Army*, pp. 1, 16, 19, 18 (see also pp. 5–9, 24–25); Foner, *United States Soldier*, p. 86.

29. Quotations from Woodhull, *Medical Report*, pp. 10, 11; WD, *ARofSG*, 1889, p. 68n.

30. Quotation from Charles E. Woodruff, "Military Medical Problems," p. 235; ibid., p. 236; WD, *ARofSG*, 1887, pp. 74, 78–80, 1888, p. 102, 1889, p. 68, 1890, p. 76, and 1891, pp. 68–69; AGO GO 80, 17 Oct 1888; Alfred Alexander Woodhull, *Notes on Military Hygiene for Officers of the Line*, 1899, p. 24; in RG 112, NARA: Ltr, C. R. Greenleaf to Post Surg, Fort Huachuca, Ariz., 22 Jun 1888, Entry 2, and Ltr W. C. Gorgas to Post Adj, 31 Mar 1889, Entry 22.

31. WD, *ARofSG*, 1889, pp. 63 (quotation), 67–68.

32. Ibid., 1887, pp. 64–65, 1889, p. 90 (third quotation), 1890, pp. 78 (fourth quotation), 79; 1891, pp. 69–70; 1892, p. 91 (first two quotations); Rickey, *Beans and Hay*, p. 159.

33. Chambers, *Cholera*, pp. 351–52; WD, *ARofSG*, 1866, p. 5, 1867, pp. 3–4, 1868, pp. 3–4, 1869, pp. 6–7, 1870, pp. 4–5, 1885, p. 7, 1886, pp. 8–9, 1887, p. 104 (quotation), and 1891, p. 17; Ltrs, Joseph C. Brown to Med Dir, Dept of Texas, 20 Feb 1890 (and those for March–May on influenza), Moore to E. Leyden, 17 Jun 1890, J. O. Kennedy to "Our Dear Protector," 16 Mar 1891, and Arnold to Asst AG, 25 Jan 1892, Entry 22, RG 112, NARA; Coffman, *Old Army*, p. 390; Billings, *Report on Hygiene*, pp. vii–viii; Edgar Erskine Hume, *Victories of Army Medicine*, p. 187.

34. WD, *ARofSG*, 1870, pp. 4–5, 1876, pp. 6–7, 1884, pp. 20–21, 1885, pp. 47–48, 58–59, 1886, p 26, and 1887, p. 65.

35. Erwin H. Ackerknecht, *A Short History of Medicine*, p. 177; Rothstein, *American Physicians*, p. 193; WD, *ARofSG*, 1886, p. 28; "Miscellany—The Danger of Chloroform and the Safety of Ether as an Anaesthetic," p. 223.

36. Robert S. Henry, *The Armed Forces Institute of Pathology*, pp. 68–69 (hereafter cited as *AFIP*); Charles G. Heyd, "The Evolution of Modern Surgery," p. 63; Daniel S. Lamb, "Record of the Post-mortem Examination of the Body of President J. A. Garfield . . . ," p. 585; Ms C66, Official Medical Bulletins Relating to the Health of the President, National Library of Medicine.

37. Quotation from R. Murray, "Necrology, Joseph Janvier Woodward," p. 280; Henry, *AFIP*, p. 81; "Obituary," p. 250; Charles E. Rosenberg, *Trial of the Assassin Guiteau*, pp. 239–40; Daniel S. Lamb, "Report of the Post-mortem Examination of the Body of Charles J. Guiteau," p. 43.

38. WD, *ARofSG*, 1884, p. 23, 1885, pp. 26 and 27–28 (quotation), and 1886, pp. 96–97; Ackerknecht, *Short History*, pp. 177–78; Rothstein, *American Physicians*, p. 258.

39. The Goodyear Rubber Company made the first pair of rubber gloves to be used in surgery on the order of Johns Hopkins surgeon William S. Halsted, who wished to protect the hands of the operating room scrub nurse who would soon become his wife. See Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery From Empiric Craft to Scientific Discipline*, p. 476; idem, "Lister, His Books and Evolvement of His Antiseptic Wound Practices," p. 124; SGO Cir, 1 May 1888, Entry 2, RG 112, NARA; Charles B. Ewing, "The Treatment of Wounds From the Aspect of Germ Infection," pp. 147–49; Rudolph Matas, "Surgical Operations Fifty Years Ago," pp. 52–53.

40. Billings, *Report on Hygiene*, p. 2; Ltr, SG to P. H. Sheridan, 31 Oct 1872, and Announcement, Charles H. Crane, 20 Mar 1876, Entry 2, RG 112, NARA; Foner, *United States Soldier*, p. 23; Fielding H. Garrison, *John Shaw Billings*, pp. 156–57; Risch, *Quartermaster Support*, p. 486.

41. Billings, *Report on Hygiene*, pp. lvii, 32 (quotations), 101; Rpt, S. Jessop, 15 Jan 1869, Entry 51, Charleston, RG 112, NARA; AGO GO 98, 20 Oct 1877.

42. WD, *ARofSG*, 1889, pp. 56–57, 1890, p. 12 (quotations), and 1892, p. 59; Ltrs, SG to William B. Allison, 18 Jun 1884, and C. R. Greenleaf to Post Surg, Willett's Point, NY Harbor, 16 Aug 1887, to SG, 20 Sep 1887, and to C & P Tel Co., 1 Oct 1887, Entry 2, RG 112, NARA.

43. WD, *ARofSG*, 1887, p. 92, and 1891, p. 9 (quotations); AGO Cir, 20 Dec 1886; in RG 112, NARA: Ltrs, SG to A. A. Sulcer, 4 Sep 1883, and to Med Dirs, 3 Oct 1888, and C. R. Greenleaf to Charles Lilime, 26 Apr 1889, Entry 2, and Ltr, SG to AG, 5 Mar 1894, Entry 22.

44. Russell F. Weigley, *History of the United States Army*, pp. 265 (quotation), 292.

45. Telg, SG to J. M. Dickinson, 11 Aug 1877, Entry 34, RG 112, NARA. Unless otherwise indicated, material on the 1877 strikes is based on Jerry M. Cooper, *The Army and Civil Disorder*, pp. 43–66.

46. Ltrs, L. D. Maurice to SG, 23 Jul 1877, WD to Crane, 23 Jul 1877, and C. G. Sawatte [?] to SG, 3 Aug 1877, Entry 12; Ltr, SGO to Med Dir, Div of Atlantic, 7 Aug 1877, Entry 2; Telgs, SG to John M. Cuyler, 21 Jul 1877, and to S. M. Horton, 23 Jul 1877, J. H. Baxter to C. Sutherland, 23 Jul 1877, Cuyler to SG, 23 Jul 1877, E. McClellan to SG, 24 Jul 1877, and C. S. DeGraw to SG, 7 and 31 Aug 1877, Entry 34. All in RG 112, NARA.

47. See Chapter 4 for a discussion of the Medical Department's role when the Army again became involved in social unrest in the 1890s.

48. AGO GO 86, 20 Nov 1886.

49. A general hospital was a facility that served more than one regiment, a field hospital a facility of whatever size set up in the field. The dressing station was the ambulance station or the clearing station.

50. WD, *ARofSG*, 1890, p. 44 (quotation), 1891, p. 40, and 1892, p. 17; AGO GO 56, 24 Jun 1889, and GO 3, 13 Jan 1891; in RG 112, NARA: Ltrs, D. L. Huntington to M. W. Wood, 3 Jul 1886, C. R. Greenleaf to J. E. Pilcher, 15 Mar 1887, and to Charles Page, 20 Mar 1888, and J. H. Baxter to Med Dirs, 23 Apr 1888, Entry 2, and Cir Ltr, Charles Page, 28 Aug 1888, and Ltr, Louis Brechemin to Med Dir, Dept of Platte, 15 Oct 1888, Entry 17.

51. First quotation from WD, *ARofSG*, 1890, p. 49 (see also pp. 50–55, and 1891, pp. 40–41); second quotation from Ltr, Timothy E. Willing [?] to Med Dir, Dept of Platte, 2 Dec 1888, and remaining quotations from Ltr, C. H. Alden to SG, 14 Aug 1889, both in Entry 17, RG 112, NARA. In loc. cit., see Ltrs, J. Meacham to Med Dir, Dept of Platte, 22 Sep 1888, and L. Brechemin to Med Dir, Dept of Platte, 15 Oct 1888; Rpt, William D. Dietz, 9 Oct 1889; and Note, [signature ?], 1889.

52. WD, *ARofSG*, 1891, p. 37; Alfred Alexander Woodhull, *Notes on Military Hygiene for Officers of the Line*, 1909, Note to 4th Edition; ibid., 1890; in RG 112, NARA: Ltrs, C. R. Greenleaf to Lewis Balch, 21 Jul 1888, and to C. S. Weizmann, 10 Jun 1887, Entry 2, and Ltr, Greenleaf to J. S. Billings, 12 Mar 1890, and 2d End, CRG, 6 Aug 1898, Entry 22, and Ltr, L. Brechemin to Med Dir, Dept of Platte, 15 Oct 1888, Entry 17.

53. Ltr, J. M. Schofield to SW, 31 Dec 1892, John McA. Schofield Papers, Manuscript Division, Library of Congress, Washington, D.C.; WD, *ARofSG*, 1891, p. 12, 1892, pp. 15–17, and 1893, p. 16 (quotation); John van R. Hoff, "Some Notes on Military Sanitary Organization," p. 79; Charles H. Alden, "Instruction of the Hospital or Ambulance Corps in the United States," p. 450.

54. Ltrs, C. M. Woodward to SG, 10 Nov 1891, and SG to AG, 8 Mar 1889 (quotation), and to Woodward, 14 Nov 1891, and Rpt, Louis Brechemin, 2 Dec 1889, Entry 17, RG 112, NARA; WD, *ARofSG*, 1890, p. 56, and 1892, p. 19; Charles R. Greenleaf, "The Necessity of a Properly Organized Hospital Corps in the National Guard," p. 496; Peter Karsten, "Armed Progressives," in *The Military in America From the Colonial Era to the Present*, pp. 252–53.

55. Although the membership was initially limited to National Guard physicians, it was soon opened to medical officers from all the military services.

56. WD, *ARofSG*, 1890, p. 55, 1891, p. 35 (quotations on pp. 34, 36), and 1892, pp. 19–22; Greenleaf, "Necessity," p. 493; idem, "The Medical Officer of the Summer Encampment," pp. 145–46; Alfred C. Girard, "The Sanitary Duties and Rights of Medical Officers as Affecting Their Relations With the Commanders of the Line," pp. 68–69; Hoff, "Some Notes," p. 79; Ltr, AGO to SG, 21 Mar 1889, and Rpts, Louis Brechemin, 2 Dec 1889, and William Owen, 18 Aug 1891, Entry 17, RG 112, NARA; Edgar Erskine Hume, *The Golden Jubilee of the Association of Military Surgeons of the United States*, p. 7.

57. Rpt, Louis Brechemin, 2 Dec 1889 (quotations), and Ltr, William Corbusier to SG, 21 Aug 1892, Entry 17, RG 112, NARA; WD, *ARofSG*, 1892, p. 19.

58. First quotation from Ltr, SG to W. J. Purnam, 5 May 1874, Entry 2, RG 112, NARA. In loc. cit., see also SG to H. J. McGaffigan, 8 Feb 1872, and to James B. Belford, 9 May 1884, and Crane to Med Dir, Dept of California, 28 Apr 1873, and to Med Dirs, 22 Oct 1879. Second quotation from Raphael P. Thian, *Legislative History of the General Staff of the Army of the United States . . .*, p. 433. Third quotation from SGO Cir, 11 May 1892, Entry 66, RG 112. See also WD, *ARofSG*, 1886, p. 7, and 1890, p. 57; AGO GO 55, 27 Jul 1883, GO 75, 23 Oct 1883, and GO 65, 9 Jul 1884 (p. 8); Samuel C. Busey, *Personal Reminiscences and Recollections*, pp. 303–09; Phalen, *Chiefs*, p. 63; Sylvia D. Hoffert, "Childbearing on the Trans-Mississippi Frontier, 1830–1900," p. 279.

59. Quotation from John Shaw Billings, *Selected Papers*, p. 266; Paul R. Cutright and Michael J. Brodhead, *Elliott Coues*, pp. 91, 123, 139–40, 150, 200–201; Edgar Erskine Hume, *Ornithologists of the United States Army Medical Corps*, pp. xxiv–xxv, 1–6, 77, 546–47.

60. Miller, *Soldiers and Settlers*, p. 330.

Chapter 3

THE INDIAN WARS



From 1865 until the Battle of Wounded Knee in 1890 the Army's primary responsibility was, as it had been before the Civil War, subduing the Indians who threatened white settlers and white ambitions. Most garrisons at the small and isolated forts of the West were involved only in minor guerrilla engagements that placed a premium on mobility and resulted in few casualties, and thus their post surgeons were principally occupied caring for the sick. For the physicians accompanying the few major expeditions organized to fight the Indians, caring for the troops in wild and unsettled country constituted a considerable challenge, their best efforts handicapped by the lack of a nearby hospital, by terrain that often prevented the use of wheeled vehicles for evacuation, and by acute supply problems. Supplies for men who were to be away from their base for months had to be kept to a minimum in the interests of mobility. At the same time, commanding officers had no alternative but to sacrifice mobility for days or weeks to move the sick and wounded with the expedition, since assigning a detachment to escort them back to the nearest post hospital weakened the entire force. As one officer pointed out, "In savage warfare, to leave one's wounded behind is out of the question." [1]

Fighting an Unorthodox Enemy

Many factors affected the way in which the Indian wars were fought, but none was as fundamental as the uncertain nature of communications. Since the headquarters of the geographical divisions and departments of the West were able to exercise only a minimum of control over their subordinate commands, the success of both soldiers and surgeons depended not only on their ability to function independently and resourcefully but also on their willingness to take great risks and endure prolonged hardships. For all of them, much of the Civil War experience proved to be irrelevant; some of it was a definite handicap. As suggested by one military historian, "The Civil War had . . . accustomed leaders and soldiers to conventional war fought according to white men's rules, and readjustment to guerrilla-style war was not easy." [2]

Because of the poor state of communications, neither the commanding officers of the Divisions of the Missouri and of the Pacific nor those of the subordinate departments were much involved in the decisions that governed day-to-day operations against the Indians. The commanding generals of the departments gave Army surgeons their assignments, and the departmental medical directors exercised super-

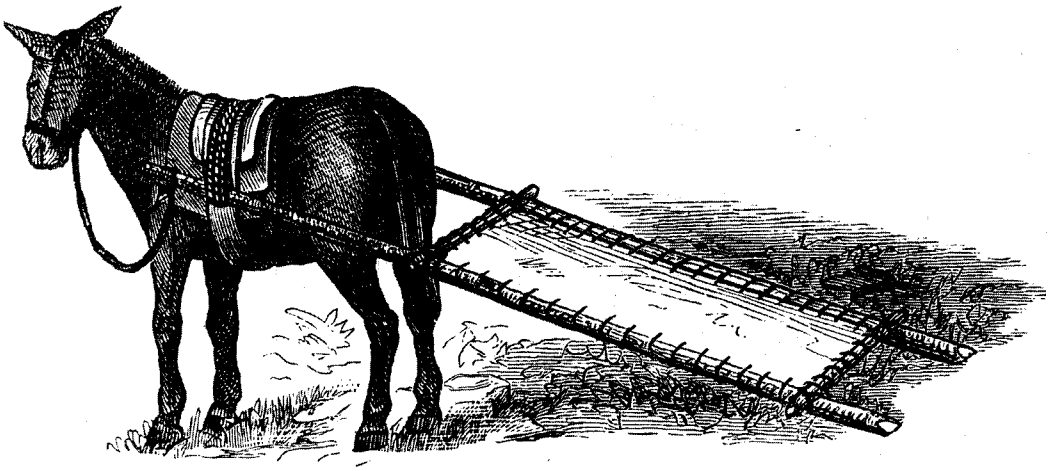
vision over the professional work of their subordinates, reporting monthly to the surgeon general about their performance. During the height of the Indian wars, because of the shortage of medical officers, these subordinates included contract physicians, who often had to accompany expeditions as well as to staff Western posts. Fortunately, the skills of many contract surgeons were comparable to those of career medical officers. Many had served as physicians in one capacity or another during the Civil War, while the youngest were frequently prospective medical officers, whose lack of experience was counterbalanced by their high caliber.[3]

Difficulties with supply, evacuation, and hospitalization, all related to poor transportation, handicapped surgeons attempting to care for the sick and wounded of units fighting Indians. Those trying to move supplies and those trying to move patients faced similar handicaps, many dictated by the nature of the warfare, communications, and the terrain. A shortage of wagons at crucial times increased the problems experienced in keeping an expedition supplied, whether with food, medicines, shelter, or litters for the sick and wounded.[4]

To supply posts and expeditions in areas still seriously threatened by the Indian presence, items were usually moved by water or rail as far as possible and then unloaded for transport by wagon, often under heavy guard, to those forts that were otherwise inaccessible. Expeditions picked up what they needed from the posts where they originated and, when possible, from posts along the way. Supplies were occasionally moved forward beyond the farthest posts for storage at an advance base. When troops were following a river, a steamer sometimes served as a moving depot, from which a train of pack mules could be periodically replenished. Logistics became even more complicated during the winter because of the condition of roads and trails.[5]

The successful pursuit of a highly mobile enemy over trails impassable to wagons required that only an absolute minimum of supplies be taken with an expedition. In addition, when troops were deep in Indian country and contact with the enemy was momentarily anticipated or when the trail was particularly rough or steep, wagons might be abandoned and everything carried on the backs of mules. The expedition's surgeons would then have to carry all their needs on their own horses or, at the most, to rely on one or two pack animals. Fortunately, in the era before antiseptic surgery, elaborate equipment was not necessary. When unexpected events brought the men to the point of starvation, the surgeons involved had to exercise more than the usual ingenuity, even though the number of wounded was usually very small.[6]

The Medical Department had developed no evacuation doctrine describing how the wounded should be moved in areas where trails were narrow, rough, intersected by streams and gullies, and thus impossible for wheeled vehicles to negotiate. Neither the department nor the Army provided litters with which to carry the wounded. The need for mobility often forced surgeons accompanying expeditions to abandon all but the most essential of their equipment, and as far as evacuation was concerned, they often in a very real sense lived off the land. Litters and similar devices, even if available, would not be taken with them because reasonable substitutes could be found along the way. Service in the field against the Indians convinced Assistant Surgeon General



MULE PULLING A TRAVOIS

Crane that somewhere in each command involved in Indian warfare were men sufficiently ingenious to meet whatever challenge they might encounter in moving the wounded. Believing that an overall policy should be developed concerning the means of evacuation to be employed when wagons could not be used, Surgeon General Barnes instructed Assistant Surgeon Otis, then a captain, to report to him how evacuation in this type of situation had been handled in the past. After examining a variety of approaches, Otis could offer nothing more specific in the way of a solution than his conviction that "uniformity in equipment" was of great importance.[7]

Thus left to their own devices as far as evacuation was concerned, Army surgeons relied heavily on the horse or mule litter. Each litter required the services of two animals and four soldiers, one man to lead each beast and two more to walk beside the litter to keep it from swaying, a precaution that was necessary because when the animals walked in step, the litter took up a rocking motion. The opportunity to train animals to carry litters (mules, which took smaller steps, were preferred to horses) was rare, but untrained beasts were likely to panic because of their unaccustomed burden. Each pair also needed to be matched carefully as to pace, since a faster animal in front might pull free of the harness, while a faster one in the rear would push the litter forward upon the leader. The length of poles used to construct the litter was also critical, as the animal in the rear had to be able to see the ground in front of his feet.[8]

A convenient alternative to the litter was, as contract surgeon Valentine T. McGillycuddy put it, the "travor, travois, traveau, travoise, or travail." While one end of this litter-like device was fastened to a horse or mule, the other dragged upon the ground. The travois had distinct advantages. It could be made from materials near at hand, such as branches, small trees, or the poles from captured Indian tepees (since there was no animal at the rear, the length of the poles was not critical); any pack animal (pack animals were usually mules) could be used because

no special training was needed; and only one beast was sufficient to move the travois and only two men to guide it, one to lead and a second to steady the patient and carry the free end over streams or rough spots. As an expedition progressed and the number of disabled increased, the pack animals seldom became available to the Army surgeons for evacuation purposes. Even though the total weight of the supplies that the mules carried was less and less over time as food was consumed by the men, they themselves were in a weakened state because of having to live on short rations, and redistributing loads to free them for use with litters was impossible because they could no long carry their usual heavy loads. While some surgeons preferred to use the litter over uneven ground, those favoring the travois pronounced it to be "well adapted for transporting the wounded over a rough country." Both litter and travois challenged physicians to experiment with improved designs that might minimize their drawbacks.[9]

When a hasty retreat allowed no time to construct litters or travois, surgeons were forced to improvise, placing a wounded soldier astride a horse or mule, regardless of his condition, the resultant pain, or the threat of hemorrhage. As a last resort, a patient was moved short distances seated upon the clasped arms and hands of other soldiers or carried in a blanket, with each corner held by one of his comrades. The medical director of units in the Pacific Northwest that were involved in the Modoc War, which took place in terrain where lava beds intimidated even unburdened horses, devised a litter that was borne on the back of a single mule, "something like a reclining chair," and had a carpenter make up several for his use.[10]

The wounded of the Indian wars could usually be taken directly to a post hospital, but occasionally facilities had to be established in the field. Tents were generally used for this purpose, although any available shelter might be pressed into use. During the Modoc War a "general field hospital" was established in the late spring and early summer of 1873 to replace a temporary facility; in this instance, structures made of "framing timber" covered with "paulins" supplemented the tents. Under most circumstances the number of sick and wounded who could not be sent back to a post hospital was very small, and what was called a field hospital was most likely a ten-bed facility at best.[11]

Performing surgery under such primitive conditions probably caused little difficulty for surgeons who, as Civil War veterans, were more familiar with surgery and its problems than most civilian physicians. Arrow wounds were not often encountered, however, even in the Indian wars, and thus few physicians became skilled in dealing with them. Removing an arrow from a wound without leaving its head behind required particular skill. Body fluids tended to soften the animal tendons that the Indians used to fasten the arrowhead on the shaft so that the surgeon might leave the head imbedded in the wound. Medical officer Lt. Joseph H. Bill had familiarized himself with the designs used by many different tribes and developed a technique for removing the arrow shaft and head at one time. In an article published in 1862, he pointed out that since Indians invariably placed the head either parallel to the slit in the shaft that accommodated the bow string or at right angles to it, it was easy to ascertain how the head lay without making a wide incision. One method that Bill described involved a looped wire inserted along the shaft to snare the head, making it possible to pull out both parts of the

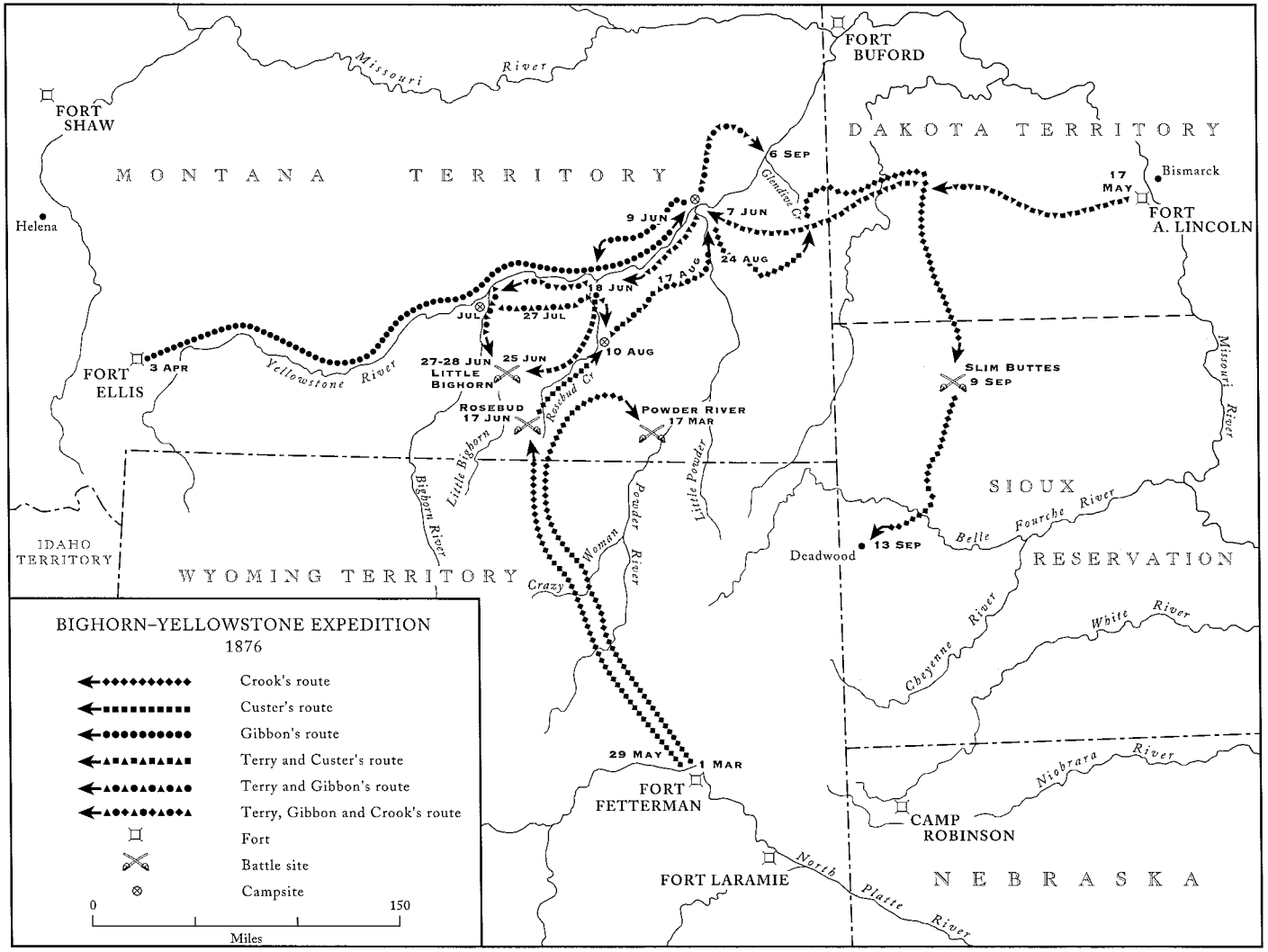
arrow at once. He also pointed out that when an arrowhead had embedded itself in the skull, it could be used to raise any piece of bone that it had depressed in the process, possibly eliminating the need for the surgeon to take further steps to alleviate pressure upon the brain. Indians often aimed for the navel, a broader target and one without bones to shield vital organs, but Civil War veterans knew that surgeons could do little to save men with penetrating abdominal wounds. Unless the victim were very lucky, if hemorrhage did not kill him, infection would.[12]

Wounds were not a major threat to soldiers serving in the West, but long grueling marches in extreme temperatures as well as severe food and water shortages could have devastating effects on their health. Disease, especially typhoid, malaria, and scurvy, was a great and often victorious enemy. Operations against the Indians in cold weather when snow covered the ground were too successful to be abandoned, but Army surgeons never found an effective treatment for the frostbite or freezing that was the possible price paid for continuing the effort. Deep gangrene and infection often resulted from cold injuries, and death was the frequent outcome. The amputation of toes or feet was common in these cases, but nonsurgical approaches were sometimes tried. On one occasion, at least, surgeons wrapped the patient's frozen feet in "cloths wet with whiskey." They dosed him internally with quinine mixed with a tincture of chloride and iron, administered three times a day, and with morphine for his pain. Two days later, when the skin began to slough from the sufferer's feet, his doctor removed the whiskey-impregnated fabric and substituted cloths soaked in lime water and olive oil, but the patient's legs continued to swell for two more days until death ended his agony.[13]

Supporting a Major Expedition

Army surgeons serving with the troops in the West saw action against many tribes and over a vast area, from the Southwest with its Apaches and Utes to the Northwest with its Modocs and Nez Perces. Yet no Indians put up fiercer resistance to the encroachment of the white man than those of the Northern and Southern Plains. Perhaps the most prolonged ordeal was that endured by the Army surgeons of the Bighorn-Yellowstone Expedition in 1876 on the Northern Plains. This complex campaign, part of a decade-long and increasingly intense effort to force the Sioux and the allied Cheyennes onto a reservation, involved three separate commands, all from the Division of the Missouri, that attempted to converge on the Sioux in an area roughly defined by the Yellowstone, Bighorn, and Little Bighorn Rivers and Rosebud Creek (*see Map 1*). Plans for this operation called for the commander of the Department of Dakota, Brig. Gen. Alfred H. Terry, who also commanded the entire expedition, to lead troops, among them Lt. Col. George A. Custer's 7th Cavalry, east from Fort Abraham Lincoln, near Bismarck, Dakota Territory. Col. John Gibbon from the Department of Dakota led a second force east following the Yellowstone River from Fort Ellis, Montana Territory. The commander of the Department of the Platte, Brig. Gen. George Crook, led a third column from Fort Fetterman, Wyoming Territory, north along the old Bozeman Trail.

The area that was the expedition's destination was exceedingly difficult to supply. Much would have to come in through Fort Buford, Dakota Territory, on the Missouri River near its confluence with the Yellowstone River, more than 1,000 miles from the nearest rail line. From Fort Buford the


FORT BUFORD
Missouri River
FORT SHAW
DAKOTA TERRITORY
MONTANA TERRITORY
6 SEP
Glendive Cr
17 MAY
Bismarck
FORT A. LINCOLN
Helena
9 JUN
7 JUN
24 AUG
17 AUG
18 JUN
JUL
27 JUL
10 AUG
3 APR
FORT ELLIS
Yellowstone River
27-28 JUN LITTLE BIGHORN
25 JUN
ROSEBUD 17 JUN
Rosebud Cr
POWDER RIVER 17 MAR
SLIM BUTTES 9 SEP
Missouri River
Bighorn River
Little Bighorn
Powder River
Little Powder
SIOUX
Belle Fourche River
RESERVATION
IDAHO TERRITORY
WYOMING TERRITORY
Deadwood
13 SEP
Crazy Woman
Cheyenne River
White River
29 MAY
1 MAR
FORT FETTERMAN
Niobrara River
CAMP ROBINSON
FORT LARAMIE
North Platte River
NEBRASKA
BIGHORN–YELLOWSTONE EXPEDITION
1876
Crook's route
Custer's route
Gibbon's route
Terry and Custer's route
Terry and Gibbon's route
Terry, Gibbon and Crook's route
Fort
Battle site
Campsite
0
150
Miles

MAP 1

mouth of the Powder River was 235 miles and that of the Bighorn 399 miles. The other rivers of the area could not be relied upon for the movement of supplies because they were both "shallow and uncertain." [14]

Evidence that Maj. William J. Sloan, medical director of the Department of Dakota, was planning for the medical aspects of the expedition is scanty. During the winter of 1876 he was incurring added expenses for medical officers, hospital stewards, and other personnel, and also for medical supplies for new posts and for field service; but whether any of these expenditures represented planning specifically for the Bighorn-Yellowstone Expedition is hard to determine. The number and quality of the surgeons seemed to concern Sloan, as well as Maj. John E. Summers, medical director of the Department of the Platte, more than supply. Sloan, who supervised the work of a dozen regular medical officers and almost twice that many contract surgeons serving more than twenty posts, urgently telegraphed the surgeon general in late April that "if Assistant Surgeon Williams could be sent back without delay, it would relieve me of much embarrassment." [15]

Sloan's concern was justified, for when Gibbon and 450 men left Fort Ellis on 3 April to struggle eastward through often deep snow, his entire medical staff consisted of a single physician on his first assignment as a member of the Medical Department. Although Gibbon could have signed on contract surgeons, for unspecified reasons he chose not to do so. His sole medical officer was Lt. Holmes O. Paulding, a 24-year-old physician who was apparently already showing the first signs of the heart disease that would kill him in 1883. Paulding had been the post surgeon at Fort Ellis, where the cavalry battalion for Gibbon's force had been stationed.[16]



HOLMES O. PAULDING

From the outset Paulding encountered two of the difficulties that could confront expeditions like the one to which he had been assigned. To the threat posed by the Indians were added supply shortages and treacherous weather. Paulding could not bring with him as much of the supplies that he had collected at Fort Ellis as he wished, "not having room for any more." Infantry units joining the expedition from Fort Shaw, Montana Territory, brought him some of what he needed. Although the snow melted quickly when the sun shone, the weather was capricious. As late as June, warm sunshine alternated with heavy snow and high winds, and nights could be bitterly cold. The Indians managed to make their presence known, although at first they did not attack. Thus, until the end of May, Paulding's patients, except for a man with a broken leg, were sick rather than injured. The ambulance wagons that



JAMES P. KIMBALL

were carrying those too ill to march moved slowly because of the soft wet ground, and, in recalling his situation a few weeks later, Gibbon concluded that he had been "entirely devoid of any proper means for the transportation of sick or wounded." He added that his supplies should have been carried by a "well-organized pack train." [17]

On 23 May the Indians struck for the first time, ambushing and killing three men who had left the camp to hunt. Paulding's duties on this occasion were limited to examining mutilated bodies. Only one soldier had been scalped, but knives and gun butts had wrought havoc. Some injuries had been inflicted while the men were still alive. This horror caused the officers of Gibbon's command to reassess their vulnerability. Paulding was ordered to be prepared to douse all lights in the hospital tent in the event of a night attack unless a life depended on immediate surgery.

As the column continued forward, more minor accidents and ailments required Paulding's attention, and he was himself briefly sick. One patient, a scout who had broken his collarbone, had to be retrieved six miles from camp; the doctor noted that in this case he "expended a lot of brandy" as well as ten grains of quinine. Another patient was suffering from acute rheumatism and a third from a severe sore throat.[18]

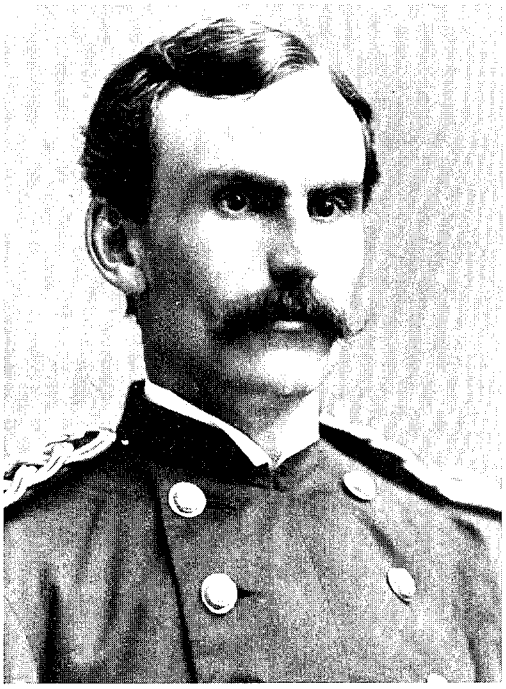
On 9 June Gibbon's command met Terry's column, which had also been plagued by the weather. Even as Terry's forces gathered at Fort Lincoln, a large number was suffering from frostbite, and the deep snow delayed the arrival of many more men. Capt. James P. Kimball, who had been detached from his new assignment at Fort Brady, Michigan, to join Terry as Custer's senior medical officer, was himself delayed by a blizzard, which he later credited for saving his life by preventing him from joining Custer.[19]

When Terry finally started out in May, the medical director for his command was the same Capt. John W. Williams whose presence had been so urgently sought by Sloan. Williams supervised the work of five medical officers and bore the ultimate responsibility for the health of a total of 925 officers and men, 700 of them from Custer's 7th Cavalry. His supplies moved by both steamer and wagon up the Missouri and Yellowstone Rivers to a depot at the mouth of Glendive Creek, which ran into the Yellowstone River south of Fort Buford. On 1–2 June a heavy snowstorm slowed the command's progress, and thus it did not reach the Powder River until the seventh. Here a small hospital was set up to care for four men who became ill or were injured during the march.[20]

Upon their meeting, Terry ordered Gibbon to start up the Yellowstone River to-

ward the mouth of the Bighorn. On 18 June, after an arduous march, Gibbon again met with Terry, who had come upriver on his supply steamer, the *Far West*. Gibbon joined him on that vessel several days later, remaining there ostensibly "for the purpose of conferring," but Paulding insisted that Gibbon stayed because he had colic. By the twenty-fifth, and after a day of ridge-walking far from the nearest source of water, Paulding informed Terry that the men with him could go no farther without a rest. Terry apparently took his advice, but by the time the men could continue, a drenching rain was falling. Cavalry units preceded the infantry, and when the foot soldiers finally arrived at the camp, the troopers were preparing to set out again—heavy smoke had been spotted rising in the air "some miles up on the Little Horn."[21]

Paulding shared the general excitement that resulted from the reports that began to come in. On 26 June he joined a company sent out to scout along the bluffs. He later recorded in his diary that he had already concluded that Custer had been defeated but that his opinion was not widely held. In fact, Custer had divided his command, and all those he kept with him had been killed, among them the highly regarded Lt. George E. Lord, post surgeon at Fort Buford, who, like Paulding, had only recently been appointed to the Medical Department. Lord's body, initially unrecognized, was positively identified only after Williams noticed that one body was wearing a pair of unbleached socks, bought when he and Lord were together. Maj. Marcus H. Reno and the remainder of the 7th Cavalry were at that point sorely beset on the bluff. One of the physicians with Reno's command, contract surgeon James M. DeWolf, was also among the dead, shot once in the abdomen and six times in the head and face.



GEORGE E. LORD

A second contract surgeon with Reno, Henry R. Porter, set up a field hospital where, using a tent as both ground cover and operating table, he amputated a private's leg. He was caring for more than fifty wounded when the Indians finally abandoned their attack with the approach of the Terry-Gibbon commands.[22]

Once the newly arrived force had determined that none of the men with Custer had survived, the challenge of evacuating Reno's wounded was met under Williams' watchful eye. Hand litters, mule litters, and travois were constructed to move the wounded, but even when carried by eight men, the hand litters proved slow and tedious. The litter-bearing mules were so fractious carrying their unaccustomed burdens that the wounded were terrified. Accounts of this phase of the evacuation of wounded vary, but according to Williams, whose narrative is the most detailed, the



BENNETT A. CLEMENTS

travois proved entirely satisfactory. On 28 June mules were chosen from Custer's pack train in the belief that their exhaustion would render them tractable. Since the command had few mule litters and travois, and evacuating the wounded even just a few miles further by hand litters slowed progress, on the twenty-ninth Gibbon ordered that more mule litters and travois be made. Tepee poles, rawhide, and canvas were used to produce nineteen mule litters and ten travois, the latter adapted from an Indian design with a basket of rawhide straps suspended from the two poles. With the less seriously injured men on horseback and the remainder on travois and litters, the move to the *Far West* went surprisingly well. All were loaded on board and ready for their voyage back to Fort Lincoln before dawn on the morning of the thirtieth in spite of bad weather, six crossings of the Little Bighorn River, and a recalcitrant mule that knelt and dumped the amputee in his litter upon the ground.[23]

In the wake of the disaster both Sloan, just recently promoted to lieutenant colonel, and the surgeon general showed considerable anxiety about the future. In a telegram to Barnes, Sloan reported the catastrophe and the loss of two medical officers; asked for the immediate dispatch of a contract surgeon; and, "in view of recent events," requested the cancellation of the leave of one of his medical officers. A few days later Barnes telegraphed both Sloan and Summers to suggest that they assign both Terry and Crook a full surgeon. Summers replied that he had already ordered Maj. Bennett A. Clements, post surgeon at the St. Louis Barracks in Missouri, to join units coming to reinforce Crook. Sloan stated that although he had been waiting for the surgeon whose leave had been canceled to arrive in his department, he would send another to comply with the surgeon general's recommendation. Sloan also asked for and received permission to requisition a three-month supply of medicines for 300 men to be sent to Fort Lincoln. Determined that Summers be promptly resupplied, Barnes telegraphed the medical storekeeper responsible for filling Summers' requisition that he was not to take leave until the supplies were on their way.[24]

For a month Gibbon and Terry remained in the area of the mouth of the Bighorn, awaiting the arrival of Crook's command. According to Paulding, a "general Hospital [was] established by Field Orders" on 4 July. Although he gave no detail about its size or construction, this facility was described as "general" because it served men from more than one regiment. Two weeks later one of Paulding's officer patients committed suicide, shooting himself when he could no longer endure his "neuralgia and

nervous prostration." The weather was very hot, and both typhoid and scurvy were beginning to appear among the men. Paulding was caring for an average of thirty-five to forty cases at a time. Antiscorbutics were promised but took weeks to be delivered. He could care for so many patients satisfactorily only because of the assistance of his hospital steward, who was "acting as a medical officer." [25]

After moving three miles on 24 July, the Terry-Gibbon force awaited the return of Williams and the steamer from Fort Lincoln before starting out on the twenty-seventh toward the mouth of Rosebud Creek. The sick, accompanied by Williams and Porter, went by steamer. On 2 August Indians attacked men from the steamer who were attempting to retrieve forage stored at the mouth of the Powder River. Artillery fire turned back the attackers, but a scout was wounded. Although "the gallant Dr. Porter" risked his own life to care for the scout where he fell, the wounded man soon died. That same day the last of twelve companies arrived to reinforce Terry, and twenty patients were transferred to a second steamer for the journey back to Fort Lincoln.[26]

As long as the command remained camped along a navigable part of one of the tributaries of the Yellowstone, neither supply nor the evacuation of seriously or chronically ill patients was a major problem. On 8 August the Terry-Gibbon force left the mouth of the Rosebud, and on the tenth it finally met Crook's command. United at last, the entire Yellowstone Expedition on the eleventh "cut loose from [the] train & [went] across country," still, however, following the Yellowstone River eastward. On the seventeenth it reached the mouth of the Powder River, where thirty-four more patients boarded the steamer that had been following the march. Crook left Terry on the twenty-fourth, and on 6 September, when Terry and Gibbon reached Glendive Creek, Paulding concluded that "the expedition against hostile Sioux" had "died a natural death." [27]



CURTIS E. MUNN

Crook's men were also preparing for the expedition against the Sioux in the early months of 1876. Since Summers, like Sloan, did not accompany the expedition, Capt. Curtis E. Munn, newly arrived on detached service from Camp Robinson, Nebraska, was Crook's senior surgeon and medical director. Under Munn served two contract surgeons, John Ridgely and Charles R. Stephens (three physicians to care for a force twice the size of Gibbon's command, which was accompanied only by Paulding). Munn was allowed the use of four ambulance wagons and a supply wagon. The weather in early March again proved a tough adversary when Crook's men finally started north from Fort Fetterman. On one occasion the

warmth of the sun was "in a few moments" succeeded by "snow . . . coming in from all quarters, accompanied with severe gusts of wind." The mercury in the thermometer dropped rapidly and eventually solidified, Crook recalled, "until we were having a regular blizzard." A day and a night were spent waiting out the storm before the command could continue.[28]

Munn had a patient in one of his ambulances almost from the outset—for four days and 84 miles, a herder wounded by the Indians journeyed with the command. The wagon train, including the ambulances, was left behind on 7 March at Crazy Woman's Fork with orders to head for the site of old Fort Reno, abandoned in August 1866. Ridgely accompanied the wounded herder and the sick to set up a field hospital there for them and for any evacuees sent back in the future. Munn continued on with his supplies, among them instruments, dressings, medicines, twenty-four blankets, a rubber bed cover, and bottles of brandy, all carried on the backs of two mules. With the ambulance wagons no longer available, he had to resort to a travois for a rider who was pinned when his horse fell on the icy path. On 16 March the command was divided once again. Now the pack train was also left behind, Stephens remaining with it and the two battalions assigned to guard it, while Munn went on with the three battalions making a night march to follow a fresh Indian trail.[29]

In the encounter that followed, six soldiers were wounded and four killed. Only fifteen minutes were required to construct travois out of tent poles obtained at the village from which they had driven the Indians. These devices were very effective on this occasion; Munn reported that a private with a penetrating abdominal wound was evacuated over 100 miles of rough terrain back to old Fort Reno without harm. Two more of the men who were moved on travois were suffering from severe attacks of rheumatism—whether the "rheumatism" that so often plagued members of the expedition was caused by rheumatoid arthritis or some related condition or by hemorrhaging into joints and muscles resulting from scurvy is not known. Unfortunately, all that awaited the sufferers when they reached old Fort Reno was a single tent that was wet on the inside. As the outraged Munn reported, Ridgely, an elderly physician who had served as a contract surgeon in the War with Mexico thirty years before, had spent all his time either in sleep or in "querulous controversies." Within two hours Munn had made his patients comfortable; however, since all the men had been suffering intensely from the cold and many more cases of rheumatism were developing, Crook decided not to remain at old Fort Reno but to return to Fort Fetterman to await the arrival of better weather before proceeding with his mission.[30]

At Fort Fetterman, Munn discovered that several cases of erysipelas had recently occupied beds in the post hospital and that the wounded there had not done well. As a Civil War veteran he knew that erysipelas, later recognized as a streptococcal infection, was highly contagious. Despite his great respect for the post surgeon he decided, therefore, to send his patients, except the herder, with Stephens, who was returning to Fort D. A. Russell, Wyoming Territory. On his way back to Camp Robinson on 30 March, Munn stopped at Fort Laramie "much exhausted." He developed "pulmonary congestion, and remained several days a patient and guest of Asst. Surgeon Hartsuff, U.S.A., the post surgeon of the Station." Although Munn finally



JULIUS H. PATZKI



JUNIUS L. POWELL

reached Camp Robinson on 7 April, it was several more days before he was well enough to resume his duties there.[31]

Crook set out once again from Fort Fetterman at the end of May. His force now numbered about 1,000 soldiers, slightly more than in March, and the medical staff had been entirely replaced. His new medical director was the Fort Laramie post surgeon, Capt. Albert Hartsuff, who had been on leave when Crook's command first left Fort Fetterman. Hartsuff was assisted by Capt. Julius H. Patzki, a Regular Army surgeon and the post surgeon at Fort Fred Steele in the Wyoming Territory; by a contract surgeon, Junius L. Powell; and possibly by a third doctor, identified in only one account as Richard H. Stevens, about whom little else is known. Accompanying this force were 1,000 pack mules. On 8 June Crook again set up a supply base, this time at Goose Creek, 300 miles from the rail depot handling supplies for his expedition. Here 260 Indian scouts joined him. At Goose Creek he left his wagons and, apparently, Powell with some sick and injured. On the seventeenth, 40 miles north of Goose Creek, Crook's command encountered as many as 1,500 Indians. During the engagement that followed, the surgeons had to move the wounded often to keep them from the enemy. Dressings had to be hastily applied, and since Rosebud Creek, which Hartsuff viewed as "a miserable little stream," was 2 miles away, no water was available. The Indians killed nine soldiers and wounded eighteen before they were driven off, and another soldier accidentally shot himself with his pistol. No injuries were caused by arrows.[32]

No serious attempt to pursue the enemy was possible because the wounded could neither be abandoned nor dragged along at top speed. Their suffering from the pain of

their injuries and their loss of blood was magnified by the extreme heat and the shortage of water. Soldiers built "a rough shelter of boughs and branches" to serve as a hospital, and Hartsuff, Patzki, and Stevens, assisted by a line officer who had once attended a course of medical lectures, worked all night to ready the wounded, both soldiers and Sioux, for the return to Goose Creek. The next day, 18 June, travois and a litter were made from cottonwood and willow branches, and with thirteen of the wounded riding their own horses, the command turned south. Carried on the litter (Hartsuff maintained it was a litter, but Crook recalled that it was a travois) was Capt. Guy V. Henry, an officer who had been shot through the eye. A hardy soul, he reassured his anxious comrades that he was "bully" even after one of the mules carrying the litter shied and threw him twenty feet down a rocky incline. "Countless ravines and gullies" had to be traversed to avoid crossing deep water with the travois, but finally Crook and his men arrived back at Goose Creek. On the twenty-first, after having wagons spread with fresh grass for the wounded, a third of whom were in serious condition, Crook ordered them returned to Fort Fetterman, where they had to be sheltered in a barrack because the hospital was being renovated.[33]

Crook and the rest of his command remained in the Goose Creek area until Lt. Col. Wesley Merritt and ten companies of cavalry arrived on 3 August to reinforce them. Merritt's medical director, Surgeon Clements, had under him at least two contract surgeons, Robert B. Grimes, whose services Summers had specifically requested, and Edward LeCompte. Acting Assistant Surgeon McGillycuddy had apparently already joined Crook sometime in July, coming in with a supply train. Because of his seniority, Clements took over as the medical director of Crook's entire force. Two days after Merritt's arrival, Crook was again on the move, leaving his sick and wounded with a physician at Goose Creek and taking with him the remaining surgeons, seven in number if Stevens was still with Crook, and the more than 2,000 men that now formed his command. Keeping supplies to a minimum, he carried as much as he deemed absolutely necessary on 240 pack mules, two of which bore medical supplies. A few days later he joined Terry's force.[34]

On 23 August Crook put twenty-five of his sick on the *Far West* and then separated from Terry. The next day, after leaving behind his wagon train and the remainder of those too ill to march, who were watched over by hospital attendants and a guard, he started east and turned south in his search for the Sioux. Crook was confident that he was adequately prepared to bring with him any in his command who became disabled along the way. The material that would be needed to make travois was loaded with other supplies on the backs of his ever-faithful mules. Since they were trained to follow in a column behind an animal equipped with a bell and since they kept up with the march whether they dragged travois or carried packs, the sick and wounded were in no danger of being left behind to the savage mercies of the Indians.[35]

Despite the sacrifices Crook had made to enable his command to move rapidly in pursuit of the Sioux, heavy rains slowed progress. Thus his wet and shivering men began to pay the price for his gamble in leaving so much of his supplies behind—a shortage of food. Crook telegraphed the commanding general of the Division of the Missouri, Lt. Gen. Philip H. Sheridan, to request that supplies of grain and vegetables be readied to meet them at Dead-

wood in the Black Hills of the Dakota Territory. By 7 September no pork, bread, or coffee remained. Soldiers had to kill and eat some of their horses and mules. Depression was widespread. Men and beasts alike were in poor condition, and symptoms of scurvy were appearing. Those whose horses could no longer bear them staggered forward, their feet bleeding and their legs swollen. A member of Crook's force wrote less than two months later that he had seen "men so exhausted that they were actually insane. . . ." [36]

By 8 September the command's situation was desperate, and life was "almost unendurable." Crook detached 150 men and sent them out on his strongest horses to find and bring back food to the others. In their search they encountered an enemy village near Slim Buttes. At the end of the ensuing two-day struggle, which eventually involved another 250 of Crook's men, the Indians abandoned the village, leaving behind their supplies of dried meat and fruits. Surgeons cared for fifteen wounded soldiers, one of whom later died, and for Indian casualties as well. Several lodges became temporary hospitals, where surgeons amputated the leg of a seriously wounded officer. An Indian chief with a fatal abdominal wound underwent surgery without chloroform, silently, but with "the sweat of agony . . . upon his forehead." The command then resumed its trek south over ground that was wet from almost constant rain. McGillycuddy, who apparently shared the responsibility for transportation with Hartsuff, reported that nine travois and three litters were used to move the casualties from Slim Buttes south toward Deadwood, where wagons met them.[37]

Because captured Indian supplies, which were devoted to the sick and wounded, did not eliminate the need for food, Indian ponies became a part of the menu. Crook's men found no wood to use for fuel along the way. By 12 September some were so debilitated that they lay down upon the wet ground without shelter. When rain again began to fall, they were drenched. Mules were exhausted by their struggle to keep going in the mud, and some fell while crossing streams. Frequent soakings led to "rheumatism and kindred ills," especially among older men. Only by eating wild plums, cherries, and buffalo berries did his soldiers limit the inroads of scurvy. Crook reported with some satisfaction that by the time his men reached the Belle Fourche River, near the end of their journey, only 2.1 percent were disabled, a figure that included wounded as well as sick. Clements later reported to Summers that his supply of medicine up to that point had been "sufficient but not ample" and that he had lost no men to disease.[38]

An advance party had already reached Deadwood City, and on 13 September, while "breakfasting on pony steak," Crook's starving men beheld a wondrous sight: Coming toward them was a herd of cattle, followed by wagons full of flour and vegetables, and all accompanied by citizens of the various towns of the area, hurrying to welcome them. That night "everyone ate as though he never expected to see another meal, . . . and the camp for the first time in many days rang with laughter and merriment." [39]

Even so, the situation for Clements' patients remained difficult. Few men continued to fall ill. Their symptoms, however, had "a typhoid character." The wagons had brought only food; tents were still needed to shelter the sick and wounded, and the clothing of all the men was in poor condition. With cold and wet weather apparently on its way, Clements feared for the future

well-being of the men, but a supply train from Fort Fetterman arrived on 14 September, bringing medicines, blankets, and hospital tents. Crook urged that the campaign be continued, but Sheridan decided to terminate the ill-fated expedition.[40]

Although Clements never commented about personal hardship in his reports, he did complain bitterly to Summers in early October that line officers failed to keep medical officers informed about what they intended to do. He emphasized that he found it very difficult to plan for the care of his patients when he had no idea what the command would be doing. He clearly blamed the lack of shelter for them upon his ignorance of what might be ahead.[41]

Except for the 255 killed and 46 wounded in Custer's disaster at the Little Bighorn, the casualties of the Bighorn-Yellowstone Expedition had been, like those of most efforts against the Indians, quite low, 19 killed in action and 42 wounded. When Crook's command finally headed back to Fort Fetterman, it left 39 sick and wounded with Curtis Munn at Camp Robinson. "Many of them were ill," Clements noted, but within "two hours, after their arrival all were washed, cleanly clad and in bed, and had beef tea given them." The Surgeon General's Office concluded that "every medical officer" involved in this campaign had performed well "under most trying and difficult circumstances and surroundings." The effects of the ordeals, especially those of the final starvation march, would long remain with its participants. In 1886, when Clements died after a lengthy illness, his physician noted that his patient had "shared . . . hardships equally with the others, living for days on unsuitable food, from which he contracted a dyspepsia that never deserted him and to which he attributed his symptoms."[42]

Surgeons and Their Work

Because of its size and complexity and the time it consumed, the Bighorn-Yellowstone Expedition differed markedly from the most common operations against the Indians, and because of the disaster that befell Custer, it has gained a prominent place in history's spotlight. The physicians who endured the ordeals of that expedition were by no means the only Army surgeons to see action during the Indian wars, however. At least one saw his service less as hardship to be endured than as exhilaration to be enjoyed. Such a man was the remarkable physician who served with Capt. Henry W. Lawton and his cavalry troop in 1886, when they were chasing the enemy through the rough and blazing country along both sides of the Mexican border. Assigned to the territory of Arizona, Lawton and his men covered 2,000 miles in the summer of 1886 under conditions so arduous and at times in areas so steep that horses broke down, and the pursuit eventually had to be conducted on foot. For all those participating in this campaign, unusual strength of will, zest for adventure, and physical stamina were required, yet no Army surgeon ever enjoyed the challenge of Indian warfare more than contract surgeon Leonard Wood.[43]

A recent Harvard medical school graduate, Wood was among those who had been given a contract while awaiting an appointment as assistant surgeon. He had passed the Medical Department's entrance exam in spite of the board's misgivings about his "acquirements in Physics and Chemistry," but he did not thrive under the ordinary day-to-day routine and discipline of an Army post. When his command began the active pursuit of Geronimo and his Apaches, however, Wood came into his own. He eagerly vol-



LEONARD WOOD

unteered for field duty, and the missions he undertook were so dangerous that they earned him a Medal of Honor (and with it the resentment of many line officers) twelve years later, by which point he had acquired many influential friends.[44]

Neither the 120-degree heat that alternated with violent storms nor the rocky terrain fazed Wood as he rode with Lawton in pursuit of the desperate Apaches. He took every opportunity to demonstrate and test the fabric of which he was made, remaining in the saddle for incredible lengths of time and retaining his vigor and his enthusiasm while lesser men fell by the wayside. In addition to the men of his command, he cared for Mexican civilians who rarely received the attentions of a physician. In one instance, he operated on a child in an attempt to cure her cross-eyes when he was not experienced in this type of surgery and could neither provide postoperative care nor learn whether his efforts had been successful. His willingness to operate suggests more rash enthusiasm than mature judgment. Nevertheless, Wood's commanding officer was in despair over the possibility of losing his services when he became the victim of a tarantula bite that temporarily laid him low with pain, fever, and delirium in July 1886.[45]

Wood's prowess soon attracted the attention of Brig. Gen. Nelson A. Miles, newly appointed to command the Department of Arizona. Miles shared Wood's New England background and was impressed by his physical condition. He assigned Wood, in addition to his regular duties, the responsibility of determining whether the best white athletes could equal the endurance of Apache warriors. Wood's experience seemed the best answer to the question, since only he and the officer with whom he worked most closely lasted out



BERNARD SEMIG

the entire campaign. By the late summer, when Geronimo finally surrendered, Wood was functioning more as a line officer than as a surgeon, having been placed in command of a detachment that was ordered to seek out escapees from Geronimo's band, a mission that failed despite Wood's best efforts.[46]

Few surgeons are likely to have equaled Wood's stamina, vigor, and zest, although others faced and would continue to face with similar courage challenges like those in which Wood delighted. He obviously found the life of the line officer more intriguing than that of the Army surgeon. His initial assignment, completed while he was still a contract surgeon awaiting a vacancy in the Medical Department, started him out on an unusual path, one that he was to follow during the rest of his distinguished career in the Army: Wood the physician would continue to play second fiddle to Wood the military officer. In this he differed from most of the surgeons involved in the Indian wars, who were apparently content to limit their services to those normally expected of medical officers.

Although they may not all have been as enthusiastic about the challenges they faced as Wood, Army surgeons exposed to danger in the West usually learned to live with it. Some became casual in the face of enemy fire, and the records of the period contain many stories of their heroism and level-headedness in action. In the Pacific Northwest contract surgeon Bernard Semig was severely wounded in 1873 while assigned to troops attempting to force the Modocs back onto their reservation in southern Oregon. Although hit in the shoulder, he refused to leave his patient. After he was hit again, he fell unconscious. The loss of a foot because of the second wound apparently did not keep Semig from continuing to work under contract for the Army until he was finally appointed assistant surgeon in 1874. During an 1877 campaign against the Nez Perces, who were resisting attempts to remove them from their homelands in the Wallowa Valley of Oregon, Surgeon Sternberg was forced to interrupt his caring for a patient at night; the enemy fired so constantly at his candle that he finally had to extinguish it. On the Southern Plains yet another contract surgeon, Thomas McGee, showed uncommon coolness under fire when he was applying dressings to a wound during a raid on an Arapaho village in July 1874. Spotting a warrior about to shoot a nearby soldier, McGee grabbed his patient's gun, shot the Indian, and calmly returned to his bandages.[47]

Modern historians have questioned the competence of these surgeons of the Indian wars, assuming that no competent physician would willingly undertake to live in

such isolation and to function under such primitive conditions. In *Frontier Regulars: The United States Army and the Indian, 1866–1891*, Robert M. Utley, believing that primitive living conditions and low pay discouraged "able doctors," concluded that most Army physicians, "whether regular or contract, . . . lacked the competence of their brethren in civil life." In 1883, however, Morris J. Asch pointed out in the *New York Medical Journal* that although the medical officer's pay did not compare favorably with that earned by doctors practicing in large cities, it was generous when contrasted to that available to newly fledged physicians in civilian life. Medical officers also had the benefit of a steady income, even when sick, and could count on a pension of 75 percent of their salaries when they retired. Furthermore, in Asch's opinion, Regular Army surgeons on the whole were as capable as physicians anywhere in the world.[48]

Care of Reservation Indians

The long-term care of Indians who had given up the struggle against the white man was rarely among the Army physician's responsibilities. The reservations on which they were gathered were under the Bureau of Indian Affairs, which had agreed that the Army would play no role in their management unless the bureau requested aid. At least one medical officer, who apparently did not have the Army's approval for his care of reservation Indians, found his Army pay docked by the amount the bureau had paid him for dealing with its charges. The few Army surgeons who were assigned to care for reservation Indians did not seem to resent the responsibility and, on some occasions, seized the opportunity to study the language of their patients. But for those caring for the Indians the Army retained as prisoners, the challenge was great and the satisfaction small.[49]

Unlike most Indians defeated by the Army, Geronimo and those who had fought with him against Captain Lawton's force were not immediately confined to a reservation. As prisoners, they remained the responsibility of the Army rather than the Bureau of Indian Affairs. A group of about 500 Chiricahua Apaches, including women and children, were sent from the Arizona Territory, where authorities believed they would continue to foment trouble, east to Florida, where the captives had been promised a new home on a reservation. There their health remained the responsibility of Army surgeons.[50]

The health of Geronimo's Apaches, like that of so many Indians, whether they were the responsibility of the Army or of the Bureau of Indian Affairs, remained poor, plagued by high rates of both disease and death. Most of the Apaches defeated in 1886 were shipped to Fort Marion, at St. Augustine, although in spite of promises that they would all be kept together, a few of the men were sent to Fort Pickens, Pensacola. Forced to live crowded together under conditions characterized by poor sanitation and given an inadequate diet, those at Fort Marion began to die at a rapid rate; 22, 15 of them children, died within the first six months. By 1888 all the Florida exiles had been moved to the Mount Vernon Barracks in Alabama, where initially they had no shelter but crude huts in a low area inhabited by malaria-bearing mosquitoes. By 1890 the death rate was above 100 per 1,000. In four years 120 of these unfortunates had died. This figure included 30 of the 112 children who, despite their parents' despair, had been sent to the



PETER J. A. CLEARY

Indian School at Carlisle, Pennsylvania, an institution that was, like other Indian schools, severely overcrowded. More than half the 79 adult males still alive were in poor health, often because of malaria.[51]

The Army surgeons responsible at various times for the health of the Apaches at Mount Vernon Barracks were a diverse group. The assignment was obviously not considered a desirable one for regular medical officers—two who served there were heavy drinkers, if not actual alcoholics, and another was mentally ill. Although the regulars were eager to be elsewhere, not all contract surgeons shared their opinion; one acting assistant surgeon who had served there was annoyed at having his contract canceled as not needed. All physicians assigned to care for the Apaches were to some degree frustrated by the poor health of the Indians, but not all felt compassion for their condition.[52]

Assistant surgeon Walter Reed, who was assigned to Mount Vernon Barracks from the summer of 1887 to 1890, was dismayed at the rapid inroads that tuberculosis, not generally recognized as a contagious disease until the end of the century, was making among the captives, its progress aided in part, he believed, by their low morale. In January 1891 his successor as post surgeon, the hard-drinking Maj. Peter J. A. Cleary, blamed the mortality on the climate, callously assuring the surgeon general that "when they are thoroughly acclimated, those left of them will be healthy." But as the months went by, the deaths continued. Cleary reported children dying from chronic dysentery, bronchopneumonia, and tuberculosis, with the latter responsible for adult deaths as well. He blamed the death of a deformed baby on deliberate poisoning, a conclusion he reached because of the tribe's reputation for destroying children with congenital deformities.[53]

The susceptibility of the Apaches to disease presumably resulted in part from the stress under which they lived in an area of the country that was so far from home and so strange to them and in part from a lack of previous exposure to the ailments characteristic of Florida and Alabama. Thus, in a sense, Cleary was correct—those who survived (became "thoroughly acclimated") would undoubtedly as a result thereafter have greater resistance to some of the diseases that had killed so many of their fellow tribesmen. While confirming that venereal disease was not a significant problem, a study of the health of all Indians initiated in 1903 demonstrated that tuberculosis was a particular danger to them, both on reservations and in schools off the reservations. The investigation blamed both the unhygienic surroundings in which they had to live and their poor diet.[54]

In frustration at their inability to materially reduce the high death rate, physicians took to blaming the Indians themselves for it. In May 1891 Dillon J. Spotswood, a contract surgeon working under Cleary, attributed one death to "Indian medicine" and maintained that another resulted from the patient's being "tampered with by the squaws" after successful treatment for an "enormous abscess." He noted in June, however, that the death rate was dropping, a fact he attributed to the establishment of a bakery. Although the Apaches no longer had to eat the "wretched bread which [they] baked for themselves," upon which he blamed most of the cases of dysentery, deaths and disease, particularly among children, continued. Of 5 fatalities in July, Spotswood blamed 3 on "Indian poisons given as medicines" and another on "syphilitic rheumatism." Cleary, too, was now convinced that the foods the Apaches ate and the medicines with which they dosed themselves were responsible for many fatalities. Ignoring the apparent lack of milk to feed the infants, he insisted that the principal cause of infant deaths was the half-cooked meat their mothers fed them, since "the little wretches eat it with the avidity of carnivorous animals." He ordered Spotswood, as the physician directly responsible for their care, to make a regular habit of visiting their homes and trying to educate the mothers.[55]

Despite the efforts of both Cleary and Spotswood, in fiscal year 1891 the death rate had reached more than 142 per 1,000. When Lt. William W. Wotherspoon, the officer placed in charge of the prisoners in 1891, first visited these Apaches, he reported that they were "in filthy nakedness, clothed only in rags, with hair infected with vermin, their skin caked with accumulated filth, their houses filled with dirt and offal, sleeping on the ground in the most abominable rags, cooking and eating on the ground, treating and killing their own sick." By the spring of 1892 strict controls over hygiene and sanitation were in force. All children except the very youngest had "to be paraded once each week" so that the state of their health could be checked. All sick had to report at once to the surgeons, and the clothes of anyone who died had to be burned. A hospital was built, and the diet improved.[56]

Obviously proud of what he had accomplished as far as sanitation was concerned, Wotherspoon was distressed that in the summer of 1892 Spotswood's replacement, Capt. William C. Borden, considered his new charges to be filthy. The lieutenant admitted, however, that the improvement over what he had himself found a year earlier might make him see the 1892 picture as rosier than it was; the death rate had fallen to less than 110 per 1,000. Borden apparently proposed such radical improvements in sanitation that even his superior, Cleary's replacement, Maj. Curtis E. Munn, grown frail and bibulous since his days with the Bighorn-Yellowstone Expedition, questioned their practicality. Munn emphasized, for example, that it was unrealistic to expect the Indians to use earth closets even if they were provided. He noted that there was a real need for fresh milk for the two-year-olds, who were too young to be adequately fed on regular rations alone.[57]

Despite Munn's lack of support, Borden remained much interested in the health of the Apaches. He blamed the high death rate of their children upon inadequate clothing in cold months and, above all, on an unsuitable diet after weaning. He noted that the Apaches, accustomed to the dry weather of the Southwest, preserved meat by hanging it in the sun to dry and that

they continued to follow the same procedure in the humid climate of Alabama, where the meat rotted. Then, badly cooked by Borden's standards, it was fed both to adults and to children, whose digestive systems could not handle it in its decomposed state. He also blamed the tuberculosis rate largely on the fact that the prisoners were, contrary to their custom, living in permanent housing and that the buildings initially provided for them were poorly ventilated and constructed. Accustomed to leaving behind any filth that might have accumulated in the short period they were in one place and to burning the housing and clothing of anyone who died, Apaches allowed garbage and trash to collect in the dark dampness of their new quarters.[58]

By 1893 many Apache men had enlisted in the Army and, with the benefit of military inspections and discipline, were living under conditions similar to those of white soldiers. Borden noted that the village itself was now "on the crest of a hill," with "plenty of sunlight and free circulation of air. The houses are of fairly good construction, are well lighted by good-sized windows, . . . and are easily kept clean." Despite the attention and care devoted to sanitation, hygiene, and diet, diarrhea was still causing a high death rate among the Apache children in 1893, and tuberculosis continued to kill many adults. Borden, for whom tuberculosis was apparently the first concern, explained that the rate was constantly high because the disease had become well entrenched in the tribe.[59]

In 1894 the attempt to retain the Apaches in the East was finally abandoned, and the survivors were sent to Fort Sill, Oklahoma Territory. Here the tuberculosis contracted in Alabama was blamed for a death rate that remained high, 83 per 1,000 in 1894–1895, but in an environment more like that of their homeland, new cases of that disease were less common.[60]

The Last Battle

As the 1880s wore on, major expeditions and significant battles became fewer. Railroads were proliferating and telegraph lines connected Army posts, easing the Army's logistical problems and encouraging further settlement in the West. Finally, in December 1890 the white man and the Indian fought their last major engagement at Wounded Knee in South Dakota. No longer guerrilla warfare, the fight was waged on the white man's terms; the Medical Department could function much as it had in the Civil War, now with the help of the disciplined members of the new Hospital Corps drilled in the management of evacuation.[61] The Army was able to move the required men and supplies by train, and troops no longer had to march endless miles, in constant danger of ambush, along trails often impassable to wheeled vehicles. The Indian this final time was surrounded, outnumbered, and totally vulnerable.[62]

Unrest among the Sioux at two reservations in South Dakota brought reinforcing Army units to the area in November 1890 under Miles, now a major general and the commanding officer of the Division of the Missouri. The tension was particularly great at the Pine Ridge Reservation, where by the end of the month more than 1,300 men were stationed. With the nature of any possible action relatively predictable, the medical director of the Department of the Platte, Lt. Col. Dallas Bache, could plan and organize the Medical Department's response. He sent in the tentage and equip-

ment needed for a 25-bed hospital, a facility that was soon expanded to 60 beds to serve all the units involved in what became an effort to crush the Sioux. Surgeon Hartsuff, now a major and once again involved in a struggle against the Sioux, took charge of the field hospital, aided by an assistant surgeon, two Hospital Corps noncommissioned officers, and ten Hospital Corps privates. The two battalions that formed the 7th Cavalry brought with them two medical officers, a hospital steward, four Hospital Corps privates, and two ambulance wagons. A battalion of the 9th Cavalry arrived with a medical officer, an acting hospital steward, five Hospital Corps privates, and an ambulance wagon. Although physicians at Pine Ridge concluded that a larger contingent from the Hospital Corps would have been desirable, they also believed that the field hospital, which had been set up on the Pine Ridge Reservation, could handle about 3 percent of the command.[63]

The discharge of an Indian's rifle on 29 December during the Army's attempts to disarm the Sioux at their camp along Wounded Knee Creek led to violence. The Indians suffered high casualties. Their situation hopeless, the survivors were soon fleeing the melee, but the artillery stationed on high ground above the camp took a heavy toll as they fled. The Army had not expected hostilities, but the soldiers were prepared for the possibility. In their final battle, the Indians had never had a chance.

During the conflict, the value of training men for such duties as evacuating the wounded and the need to train more of them became evident. Because of the shortage of hospital corpsmen, civilians had been hired to drive the ambulance wagons. When hostilities broke out, several of these untrained men were so terrified that they fled the scene. Captain Hoff took over one of the abandoned ambulances himself, and when he encountered the men who had deserted their vehicles, "he drove them to their duty." The contrast between the conduct of these men and that of the hospital corpsmen and the company bearers proved that the Army's training was well worth the effort and expense devoted to it. One hospital steward was killed in action. Two corpsmen rescued a wounded officer during renewed action on 30 December by taking an ambulance wagon beyond the line of skirmish to retrieve him. After surgeons examined all the wounded, placing a tag with each describing his injuries, the corpsmen handled the initial dressings accordingly. They then evacuated "not only our own wounded men but wounded Indians [who] were, with great promptness and dispatch, removed and cared for in the field hospitals which were extemporized for their benefit." [64]

The discipline and training that the Hospital Corps provided its corpsmen stood them and the Army in good stead, but their experiences during the Battle of Wounded Knee convinced Medical Department authorities that the services they could render should be taken more seriously. Medical officers had long realized that these valuable assistants should not be forced to face the enemy unarmed, and this engagement demonstrated that regardless of the circumstances, horses should be available for corpsmen just as they were for the cavalry.[65]

Not all surgeons were as disciplined as the hospital corpsmen. Standing on a hill, watching the battle unfold, was Capt. Charles B. Ewing, who, according to Colonel Bache, was present "not on duty but as a spectator." When a cavalry troop galloped by, Ewing grabbed a riderless horse and sped off with the others, forgetting in

his enthusiasm to bring his dressings with him. After fifteen minutes and three miles, he realized his mistake and turned back. By the time the day was over, Ewing had been on the field more than seven hours. Excluding his brief escapade, he spent half his time at a dressing station and the rest helping in the evacuation of the wounded and the removal of most of the dead.[66]

Shortly after the battle Colonel Bache told another medical officer that 29 soldiers, as well as an Indian scout, had been killed and another 30 wounded. He also estimated that as many as 115 Indians had been killed and knew that Army surgeons were caring for 8 Indian wounded in addition to 25 wounded women and children. "The slaughter of the Indians must have been sickening," Bache wrote on 1 January 1891. "It is sickening now to step through the lines of broken women and children that we have as prisoners." [67]

Most of the duties performed by surgeons during the battle were mundane, such as setting fractures and stopping bleeding, and required medical skill rather than military discipline. Ewing's greatest challenge involved the reattachment of the fleshy part of a nose. When he first saw this patient, an interpreter who accompanied the command's Indian scouts, the entire nose forward of the bone was "hanging by a mere shred and bleeding profusely." Several days later when Ewing removed the stitches, the damaged appendage was firmly in place. Among the patients encountered by other surgeons was an officer whose pocket watch had been fragmented and driven into his abdomen by a bullet; the pieces were removed by Surgeon Reed, now a major assigned to Fort Keogh, Montana.[68]

In the days that followed the battle, surgeons performed more major surgery, although Indian patients refused to submit to operations even when death was the only alternative. After waiting thirty-six hours, Ewing decided that he must amputate a shattered leg because the breaking of both tibia and fibula had damaged major blood vessels and destroyed much soft tissue below the knee. He believed that the need for surgery was so urgent that he had to proceed even when attempts to lay the dust of the dirt floor in the Sibley tent used as an operating room were only partially successful. Despite "persistent antiseptic irrigation of the stump" and free drainage from the wound, the patient died as a "result of pyemia involving staphylococcus pyogenes." [69]

Anticipating prolonged and fierce hostilities, medical officers had set aside a considerable amount of space in buildings in the area. Several large dormitories at the Oglalla School on the Pine Ridge Reservation were supplied with 150 beds and bedding; the executive board of the new Soldiers' Home at South Dakota's Hot Springs allotted two-thirds of the home's capacity, or 200 beds, for battle casualties; and another 40 beds awaited the sick and wounded at Forts Robinson and Niobrara in Nebraska. Army casualties received their initial care in the field hospital at Pine Ridge. Enemy wounded were also taken to the reservation, where they were sheltered in tents and a small church made available to the Indians by a group of missionaries. Once emergency care had been given, Army casualties in need of further treatment were sent back to their post hospitals as soon as they could be moved. Only two went to Fort Robinson and none to the other beds set up for the use of battle casualties. Many were carried twenty-six miles by ambulance directly from the field hospital to Rushville, where Colonel Bache had arranged to have a sleeping car with

its beds made up waiting, and thence by train, six of them to Fort Omaha, Nebraska, and twenty-one to Fort Riley, Kansas. Of the forty-six patients in the field hospital on 4 January 1891, only eighteen remained on the fifth. These were the last wounded from Indian warfare for whom Army surgeons would ever care.[70]

Until the Battle of Wounded Knee, the surgeons who accompanied the Indian-fighting troops after the Civil War usually worked with small and isolated units, without the aid of a disciplined, well-trained Hospital Corps and without the benefit of the understanding of disease and infection that would come with the era of modern medicine. Just as the experiences of the Civil War were irrelevant to those of the Indian wars, so, too, were the challenges of the Indian wars irrelevant to the demands of modern large-scale warfare. Although the Medical Department had had its first significant lesson in improving the health of primitive peoples when it tried to reduce the disease and death rates among the Apaches in Alabama, the experiences of the Indian wars before 1890 prepared neither the Army nor the department for the next military struggle the nation was to face. Wounded Knee was a turning point. It was the first battle in which the Medical Department's Hospital Corps took part and the last battle of the Indian wars. It was also the last battle whose wounded did not have the care of physicians thoroughly conscious of the danger germs posed to their patients. For the Medical Department, Wounded Knee was more the last engagement of an age that had almost passed than it was the first of a new era.

NOTES

1. Quotation from War Department, *[Annual] Report of the Secretary of War*, 1876, 1:476 (hereafter cited as WD, *ARofSW*, date); Don Rickey, Jr., *Forty Miles a Day on Beans and Hay*, p. 272; James A. Huston, *The Sinews of War*, pp. 256–59; Robert M. Utley, *Frontier Regulars*, p. 48; Philip H. Sheridan, *Record of Engagements With Hostile Indians* . . . . Unless otherwise indicated, background material for this chapter is based on Russell F. Weigley, *The American Way of War*; idem, *History of the United States Army*; and Utley, *Frontier Regulars*.

2. Quotation from Weigley, *History*, p. 268; Francis P. Prucha, *The Great Father*, 1:544–45, 548–49; Otto L. Nelson, Jr., *National Security and the General Staff*, pp. 12–13; Paul A. Hutton, *Phil Sheridan and His Army*, p. 301.

3. AGO GO 101, 21 Aug 1882, and GO 121, 1 Jul 1865; Ltr, D. L. Magruder to SG, 4 Apr 1866, Entry 12, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C. After 1882, commanding officers were urged to send only Regular Army surgeons with expeditions.

4. Huston, *Sinews*, p. 256; Darlis A. Miller, *Soldiers and Settlers*, pp. 287–88.

5. Prucha, *Great Father*, 1:548–49; Miller, *Soldiers and Settlers*, p. 300.

6. George A. Otis, *A Report to the Surgeon General on the Transport of the Sick and Wounded by Pack Animals*, pp. 1–3, 19–20, 23n.

7. Ibid., p. 3. See also pp. 1–2, 24, 26–28, and passim.

8. Ibid., pp. 13–15, 24–28; War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1875, p. 10, 1877, pp. 11–12, 1880, pp. 10–11, 1881, p. 11, 1882, p. 10, and 1883, pp. 19–20 (hereafter cited as WD, *ARofSG*, date); Rickey, *Beans and Hay*, pp. 243–44.

9. Quotations from Otis, *Report on Transport*, pp. 25, 22. See also pp. 17–19, 22n, 24, 26, 26n.

10. Quotation from Ltr, Henry McElderry to John Green, 30 Jun 1873, file F, Entry 624, RG 94, NARA; Ltr, Crane to McElderry, 22 Aug 1873, Entry 2, RG 112, NARA; Rickey, *Beans and Hay*, pp. 326–27.

11. Quotations from Ltr, H. McElderry to J. Green, 30 Jun 1873, in file F, Entry 624, RG 94, NARA; WD, *ARofSG*, 1892, p. 5; Otis, *Report on Transport*, p. 19. See Chapter 2 for a discussion of post hospitals.

12. Rickey, *Beans and Hay*, pp. 130, 254, 269, 272; Martha L. Sternberg, *George Miller Sternberg*, p. 13; Joseph H. Bill, "Notes on Arrow Wounds," pp. 367, 369–71, 374–77, 381–83, 385, 387; Frank H. Hamilton, *A Treatise on Military Surgery and Hygiene*, p. 526; George A. Otis, *A Report of Surgical Cases Treated in the Army of the United States From 1865 to 1871*, pp. 144–63; Peter D. Olch, "Medicine in the Indian Fighting Army, 1866–1890," pp. 32–41.

13. Otis, *Report of Surgical Cases*, p. 167.

14. WD, *ARofSW*, 1876, 1:309.

15. Quotation from Telg, William J. Sloan to SG, 22 Apr 1876, Entry 34, RG 112, NARA. In loc. cit., see Telgs, John E. Summers to SG, 6 and 26 Jun 1876, and, in Entry 57, AGO SO 73, 23 Apr 1875. See also Holmes O. Paulding, *Surgeon's Diary With the Custer Relief Column*, pp. i, 2–4, 33; John M. Carroll, ed., *General Custer and the Battle of the Little Big Horn*, p. 176. Except when otherwise indicated, all material on the medical care of Gibbon's column is based on Paulding, *Diary*.

16. Ltr, SG to Holmes O. Paulding, 10 Apr 1876, Entry 2; Ltr, Surgeon General's Office (SGO) to L. C. Gordon, 17 Apr 1876, Entry 12; and AGO SO 260, 30 Nov 1874, Entry 57. All in RG 112, NARA.

17. First quotation from Paulding, *Diary*, p. 3; remaining quotations from WD, *ARofSW*, 1876, 1:476; ibid., 1:460, 471–72.

18. Paulding, *Diary*, p. 17.

19. Edward S. Luce, ed., "The Diary and Letters of Dr. James M. DeWolf," p. 76; Maria B. Kimball, *A Soldier Doctor of Our Army*, pp. 82–84; Ltr, William J. Sloan to SG, 18 Nov 1876, H. R. Porter Papers, Entry 561, RG 94, NARA; Mil Svc Card, James P. Kimball, Entry 89, and Ltr, SG to Kimball, 27 Jan 1877, Entry 2, RG 112, NARA.

20. WD, *ARofSW*, 1876, 1:460–61; John S. Gray, *Centennial Campaign*, pp. 271–74.

21. First quotation from WD, *ARofSW*, 1876, 1:473; second quotation from Paulding, *Diary*, p. 20.

22. WD, *ARofSG*, 1876, p. 7; idem, *ARofSW*, 1876, 1:477; Augustus L. DeVoto, "A Trooper With Custer," pp. 68–71; Edward S. Petersen, "Surgeons of the Little Big Horn," pp. 41–43; Douglas D. Scott,

Richard A. Fox, Jr., Melissa A. Connor, and Dick Harmon, *Archaeological Perspectives on the Battle of the Little Bighorn*, pp. 97, 99, 132–33; in Entry 561, RG 94, NARA: Ltrs, George E. Lord to SW, 8 Jul 1875, J. F. Head to J. B. Brown, n.d., and G. E. Michaelis to L. W. Lord, 29 Sep 1876, George E. Lord Papers, and also Mil Hist, James M. DeWolf, idem Papers; in RG 112, NARA: Ltr, SG to Lord, 5 Jun 1876, Entry 2, and Ltr, Geo. D. Ruggles to CO, Fort Buford, Dak.T., 21 Apr 1876, Entry 12; Gray, *Centennial Campaign*, pp. 274, 279.

23. Otis, *Report on Transport*, pp. 21, 23n2; WD, *ARofSG*, 1876, p. 13; idem, *ARofSW*, 1:474–75; Sheridan, *Record of Engagements*, p. 58; Carroll, *Little Big Horn*, p. 103.

24. Quotation from Telg, William J. Sloan to SG, 8 Jul 1876, Entry 34, RG 112, NARA. In loc. cit., see also ibid., J. E. Summers to SG, and SG to Sloan and Summers, all 17 Jul 1876; J. S. Billings to Sloan, 11 Jul 1876; and SG to Geo. T. Beall, 1 Aug 1876.

25. Quotations from Paulding, *Diary*, pp. 27–28; S. L. A. Marshall, *Crimsoned Prairie*, pp. 170–71.

26. Quotation from Rpt, Orlando H. Moore, 4 Aug 1876, in WD, *ARofSW*, 1876, 1:481; ibid., 1:465; Sheridan, *Record of Engagements*, p. 60.

27. Quotations from Paulding, *Diary*, p. 29; Otis, *Report on Transport*, p. 23n; WD, *ARofSW*, 1876, 1:466–67.

28. Quotation from George Crook, *General George Crook*, p. 191; ibid., p. 190; Herbert M. Hart, *Old Forts of the Northwest*, p. 146; Otis, *Report on Transport*, p. 19; in RG 94, NARA: Ltr, Curtis E. Munn to John E. Summers, 12 Apr 1876, file F, Entry 624, and Statement, [?] to M. Heitman, 13 Jan 1903, Reel 409, Mf1064; in RG 112, NARA: Ltr, SGO to Abram French & Co., 18 Jul 1876, Entry 12.

29. Otis, *Report on Transport*, pp. 18–19; Rpt Extract, Charles E. Munn, 12 April 1876, John Ridgely Papers, Entry 561, RG 94, NARA; Hart, *Old Forts*, p. 42.

30. Quotation from Rpt Extract, C. E. Munn, Ridgely Papers, Entry 561, RG 94, NARA; Otis, *Report on Transport*, p. 19; Marshall, *Crimsoned Prairie*, p. 126; WD, *ARofSW*, 1876, 1:441; idem, *ARofSG*, 1876, p. 12.

31. Quotations from Ltr, C. E. Munn to J. E. Summers, 12 Apr 1876, file F, Entry 624, RG 94, NARA; in loc. cit., see also Note, Munn, n.d.

32. Sources do not agree on the number of casualties, which have been reported to be as high as twenty-eight killed and fifty-six wounded. Powell would become an assistant surgeon in 1878. Quotation from Otis, *Report on Transport*, p. 20; Crook, *Crook*, pp. 194–95; Bourke, *Crook*, pp. 289–90, 318–19; John F. Finerty, *War-path and Bivouac*, p. 85; WD, *ARofSW*, pp. 1:308–09; in RG 94, NARA: AGO SO 17, 11 Feb 1876, and Mil Hist, Curtis E. Munn, 1876, Reels 267 and 409, Mf1064, plus Hartsuff's narrative, 1876 [?], report, 17 Jun 1876, and letter to Med Dir, Dept of Platte, 20 Jun 1876, all file F, Entry 624; in RG 112, NARA: Ltr, SG to Julius H. Patzki, 7 Dec 1876, Entry 2, and Ltr, Patzki to SG, 29 Feb 1876, Entry 12, and Mil Svc Card, Patzki, Entry 89.

33. First and third quotations from Bourke, *Crook*, pp. 316–17 (see also p. 319); second quotation from Crook, *Crook*, p. 197; Ltr, J. R. Gibson to J. E. Summers, 28 Jun 1876, Entry 12, RG 112, NARA; Otis, *Report on Transport*, p. 20; Marshall, *Crimsoned Prairie*, p. 131; Finerty, *War-path*, p. 85.

34. Crook, *Crook*, pp. 197, 200–201; Bourke, *Crook*, p. 345; Otis, *Report on Transport*, p. 23n; in Entry 561, RG 94, NARA: Ltr, Edward LeCompte to Med Dir, Dept of Platte, 30 Jul 1876, Edward LeCompte Papers, and Ltr, Robert B. Grimes to SG, Jul 1876, Robert B. Grimes Papers, and Rpt, Valentine T. McGillycuddy, 31 Jul 1876, and Ltr, idem to SG, 18 Feb 1878, Valentine T. McGillycuddy Papers; in RG 112, NARA: Ltrs, SG to Bennett A. Clements, 14 and 26 Jun 1876, Entry 2, and Telgs, J. E. Summers to SG, 6 Jun 1876, and SG to Clements, 26 Jun 1876, and to Med Dir, Dept of Platte, 27 Jun 1876, Entry 34.

35. Rpt (copy), Bennett A. Clements, 25 Sep 1876, file F, Entry 624, RG 94, NARA; WD, *ARofSW*, 1876, 1:467, 507–08; Ltr, Clements to J. E. Summers, 25 Sep 1876, Entry 12, RG 112, NARA.

36. Quote from Ltr, Walker S. Schuyler to his father, 1 Nov 1876, in Crook, *Crook*, p. 206; Rickey, *Beans and Hay*, pp. 262–63; Bourke, *Crook*, p. 366; WD, *ARofSW*, 1876, 1:506; Finerty, *War-path*, pp. 254–56, 261.

37. First quotation from Finerty, *War-path*, p. 278 (see also p. 300); second quotation from Charles King, *Campaigning With Crook and Stories of Army Life*, p. 131; Crook, *Crook*, pp. 206–07, 207n; WD, *ARofSW*, 1876, 1:506; Otis, *Report on Transport*, pp. 23n, 25–26; in RG 94, NARA: McGillycuddy Rpt, 30 Sep 1876, McGillycuddy Papers, Entry 561, and Clements Rpt, 25 Sep 1876, file F, Entry 624; in RG 112, NARA: Ltr, Clements to Summers, 25 Sep 1876, Entry 12.

38. First quotation from Ltr, Schuyler to his father, 1 Nov 1876, in Crook, *Crook*, p. 211; second quotation from Ltr, Clements to Summers, 25 Sep 1876, Entry 12, RG 112, NARA; WD, *ARofSW*, 1876, 1:507–09; Finerty, *War-path*, p. 301.

39. First quotation from Finerty, *War-path*, p. 306; second quotation from Ltr, Schuyler to his father, 1 Nov 1876, in Crook, *Crook*, p. 209.

40. Ltrs, B. A. Clements to J. E. Summers, 7 (quotation) and 8 Oct 1876, Entry 12, RG 112, NARA.

41. Ibid., 7 Oct 1876.

42. Crook, *Crook*, p. 212; War Department, Adjutant General's Office, *Chronological List of Actions . . . With Indians From January 1, 1866, to January, 1891* (N.p., n.d.), pp. 39–40; in RG 112, NARA: Ltrs, Charles H. Crane [?] to Curtis E. Munn, 8 Jan 1877 (first and second quotations), and to B. A. Clements, 16 Jun 1877 (third and fourth quotations), Entry 2, and Ltr, Clements to Summers, 8 Oct 1867, Entry 12; in RG 94, NARA: Ltr, Charles Page to SG, 11 Nov 1886 (fifth quotation), Bennett A. Clements Papers, Entry 561, and Mil Hist, Bennett A. Clements, Reel 409, Mf1064.

43. Hermann Hagedorn, *Leonard Wood*, 1:68–69, 71.

44. Quotation from Ltr, D. L. Huntington to L. Wood, 5 May 1865, Entry 2, RG 112, NARA; John M. Carroll, ed., *The Medal of Honor*, p. 98; Jack C. Lane, *Armed Progressive*, pp. 2–4.

45. Hagedorn, *Wood*, 1:68–69, 71–72, 76–77; Jack C. Lane, ed., *Chasing Geronimo*, pp. 16, 65, 69, 132–33; idem, *Armed Progressive*, pp. 8–11, 13–15.

46. Hagedorn, *Wood*, 1:108–09, 111; Lane, *Armed Progressive*, pp. 12–13, 17; Nelson A. Miles, *Serving the Republic*, p. 224.

47. Lane, *Armed Progressive*, p. 8; Sternberg, *Sternberg*, pp. 60–61; WD, *ARofSG*, 1875, p. 9, and 1883, pp. 35–36; Frank U. Robinson, "The Battle of Snake Mountain," pp. 96–98; Bourke, *Crook*, p. 76; Ltr, H. McElderry to J. Green, 30 Jun 1873, in file F, Entry 624, RG 94, NARA; George M. Kober, *Reminiscences of George Martin Kober, M.D., LL.D.*, pp. 311–12; Ltr, Charles B. Ewing to SG, 30 May 1893, Ms C100, George Miller Sternberg Papers, National Library of Medicine (NLM), Bethesda, Md.

48. Quotation from Utley, *Frontier Regulars*, p. 87; Morris J. Asch, "Army Medical Service," pp. 203–04.

49. Ray H. Mattison, ed., "The Diary of Surgeon Washington Matthews, Fort Rice, D.T.," pp. 5–6; William Corbusier, *Verde to San Carlos*, pp. 249–50; Ltrs, Thomas F. Azpell, Entry 227, RG 112, NARA.

50. Angie Debo, *Geronimo*, pp. 294–95.

51. Ibid., pp. 292, 316–20; Crook, *Crook*, pp. 289–91; Telgs, P. H. Sheridan to G. Crook, 3 and 5 April 1886, in George Crook, *Crook's Resume of Operations Against Apache Indians, 1882 to 1886*, pp. 19, 21; Herbert Welsh, *The Apache Prisoners at Fort Marion, St. Augustine, Florida*, pp. 3–4, 6; Frank C. Lockwood, *The Apache Indians*, pp. 320–21; William C. Borden, "The Vital Statistics of an Apache Indian Community," p. 7; Prucha, *Great Father*, 2:842–44; William G. Pollard, "Structure and Stress," M.A. thesis, pp. 128, 133–34.

52. In RG 94, NARA, see documents in papers of William C. Borden and Dillon J. Spotswood, Entry 561, and in those of Peter J. A. Cleary and Curtis E. Munn, Reels 325 and 409, Mf1064.

53. Quotation from WD, *ARofSG*, 1892, p. 51; ibid., p. 52; Debo, *Geronimo*, pp. 337, 339, 342–44; William B. Bean, *Walter Reed*, pp. 42–45; Ltr, SG to Peter J. A. Cleary, 25 May 1890, Reel 325, Mf1064, RG 94, NARA; John Duffy, *The Sanitarians*, pp. 196–97; Wesley W. Spink, *Infectious Diseases*, p. 221.

54. Prucha, *Great Father*, 2:846.

55. WD, *ARofSG*, 1892, p. 52 (quotations), 53.

56. Quotations from ibid., pp. 54, 53; ibid., 1896, p. 92; Debo, *Geronimo*, p. 348; Borden, "Vital Statistics," p. 7.

57. WD, *ARofSG*, 1892, pp. 53–54; in RG 112, NARA: Rpt, Jos. D. Smith, 27 Jun 1892, sub: Inspection of the Medical Department, Entry 38, Mount Vernon Barracks; in RG 94, NARA: Ltr, D. J. Spotswood to SG, 12 Mar 1892, Spotswood Papers, Entry 561, and Efficiency Rpt, Curtis E. Munn, 13 Feb 1892, Munn Papers, Reel 409, Mf1064.

58. Borden, "Vital Statistics," pp. 6, 8–9.

59. Ibid., pp. 6 (quotations), 10.

60. WD, *ARofSG*, 1893, p. 69, and 1896, p. 92; Lockwood, *Apache Indians*, p. 322.

61. See Chapter 1 on the formation of the Hospital Corps and Chapter 2 on the training of its members.

62. Prucha, *Great Father*, pp. 560–61.

63. WD, *ARofSG*, 1891, pp. 37–38, 41.

64. First quotation from Ltr, James W. Forsyth to AG, 1 May 1898, Entry 561, RG 94, NARA; second quotation from WD, *ARofSG*, 1891, p. 12; ibid., pp. 39–41, and 1892, p. 22.

65. WD, *ARofSG*, 1891, pp. 40–41; in RG 112, NARA: Ltr, John van R. Hoff to SG, 13 Oct 1888, Entry 17, and SGO Cir 14, 30 Apr 1891, Entry 66.

66. Quotation from Ltr, Dallas Bache to Charles R. Greenleaf, 18 Apr 1891, Ms C91, Charles R. Greenleaf Papers, NLM. See also Charles B. Ewing, "The Wounded of the Wounded Knee Battle Field . . . ," p. 40.

67. Quotations from Ltr, Bache to Greenleaf, 31 Dec 1890, cont on 1 Jan 1891, Ms C91, NLM. See also WD, *ARofSG*, 1891, pp. 38, 40. The statistics on the number of wounded in Bache's letter differ from those given in the annual report, which itself contains conflicting information. According to the an-

nual report, the Army had 31 wounded in the main battle and 8 in a later skirmish. Yet, also citing statistics from Colonel Bache's official report, the Army had 36 casualties and 30 severely injured Indians, most of them women and children. The annual report further notes that 28 Indians were taken to the hospital facilities on the Pine Ridge Reservation.

68. Ewing, "Wounded Knee," pp. 39–43 (quotation); Bean, *Reed*, pp. 49–50. Reed was promoted to major on 4 December 1893.

69. Ewing, "Wounded Knee," pp. 48–49 (quotations); WD, *ARofSG*, 1891, pp. 38–39.

70. Ewing, "Wounded Knee," p. 42; Ltr, Bache to Greenleaf, 5 Jan 1891, Ms C91, NLM.

Chapter 4

A NEW DIRECTION



In 1893 the United States was entering a period of great change. The Indian wars were over. The nation's productivity, like its population, was increasing rapidly. The expansion of foreign trade focused attention on trade routes and international competition. President Grover Cleveland had scarcely been inaugurated, however, before a growing number of bank closings and business failures brought the nation to the brink of economic chaos. By the summer of 1894 four million unemployed were seeking work. Among those still employed, wage reductions triggered strikes and related violence greater than those of 1877. By 1895 the threat to the economy was waning, and the nation was ready to channel its energies in new directions. Enthusiasm for the destiny of the United States as a world power was burgeoning, and the outbreak of revolution in Cuba appeared as a promising opportunity to demonstrate U.S. strength and righteousness.[1]

The world of medicine was also rapidly changing. In Europe in the two decades immediately following the end of the Civil War, the pace of the medical revolution was accelerating, and American physicians who had studied in Europe were leaders in an increasingly successful effort to bring European standards in medical education to the United States. European scientists discovered the causative agents of an impressive list of diseases, among them amebic dysentery, gonorrhea, typhoid fever, malaria, tuberculosis, erysipelas, cholera, diphtheria, and tetanus, all threats to an army's effectiveness. Each discovery produced a host of new challenges for those who sought to prevent or cure disease. The isolation of the diphtheria bacillus was followed by the finding that it produced a deadly toxin. The subsequent development of an antitoxin that was clearly lifesaving convinced many doubters that the new scientific medicine was not mere "bacteriomania" and encouraged scientists to seek out other diseases whose ravages could be defeated in the same way. The discovery that serum from a patient who had recovered from typhoid, when mixed with the typhoid bacillus, would clump, or agglutinate, made possible the Widal test for diagnosing typhoid in 1896. A similar principle would eventually be used to develop the valuable Wassermann test for syphilis.[2]

The proof that the so-called filth diseases—principally typhoid fever, cholera, and the various forms of dysentery—were spread by infected excreta and by anything that came in contact with them enabled doctors to develop more effective and efficient approaches to sanitation. The public health laboratories that began to appear in major U.S. cities in response to developments in Europe tested water supplies and assisted



SURGEON GENERAL STERNBERG

in the diagnosis of communicable diseases. Towns and cities set up water and sewage systems, and more local governments accepted garbage collection as one of their responsibilities. In the United States, public health was beginning to become "both institutionalized and professionalized."[3]

In providing "definite proof of the value of the laboratory approach," according to noted medical historian Erwin H. Ackerknecht, these and similar developments encouraged the entry of the Army Medical Department into what would be a new and glorious era, one in which the new science of bacteriology would make the laboratory an indispensable institution. The surgeon general who would now triumphantly take the department to the forefront of the medical revolution was the 55-year-old Brig. Gen. George M. Sternberg. Restive under the regimes of his predecessors, Sternberg was apparently eager to create for his subordinates the climate he had long sought for himself.[4]

During the last decades of the nineteenth century, however, Congress made it impossible either for the Medical Department to take full advantage of the medical revolution in Europe or for the Army to prepare for the possibility of a foreign war. Sternberg himself believed that "the principal reason for supporting an army in time of peace" was the maintenance of "an efficient organization . . . which will be ready for service in any emergency and serve as a nucleus for the larger army which will be required in case of war." Because the legislature failed to vote an increase in the size of the nation's armed forces, preparations to meet future challenges had to be based on quality rather than quantity. Even this approach proved difficult to follow, for the nature of war was becoming ever more complex, and as Civil War veterans aged, fewer trained men were available for call-up. The need for planned, systematic training of the men, both officers and enlisted, who would be asked to meet the challenge of large-scale modern warfare became increasingly obvious.[5]

The New Surgeon General

After years of bitter political infighting, during which he had learned how to manipulate legislators and politicians to his own advantage, Sternberg succeeded Sutherland upon his retirement as surgeon general in May 1893. Sternberg was not the most senior member of the Medical Department. He had ranked at the very bottom of the list of those who passed the department's entrance examination when he took it during the Civil War. He could not claim to have had the administrative experience of his predecessors or of some of the other candidates

for the position, nor had he spent any appreciable length of time in Washington, where he might have become familiar with the work of the Surgeon General's Office. Nevertheless, at a critical time in both the nation's history and the history of medicine, Sternberg was the man for whom the moment called. Unlike his predecessors and his rivals, he was a scientist in the modern sense of the word. Years of determined, painstaking research, conducted under often difficult circumstances, had made him a widely respected bacteriologist, one of the few Americans whose accomplishments rivaled those of the Europeans.[6]

Sternberg developed his skills in the use of both camera and microscope while still a post surgeon and also familiarized himself with the latest laboratory techniques while working with Koch in 1886. His discoveries paralleled some of those of his famous contemporaries. Although the European bacteriologist Elie Metchnikoff received credit for having discovered the phagocytic action of white blood cells in 1892, Sternberg had independently theorized about the scavenging activities of these corpuscles in the early 1880s. Almost simultaneously with the French scientist Louis Pasteur he discovered the organism later identified as the principal cause of lobar pneumonia. He conducted experiments with disinfectants and established the fallacy of several highly regarded theories concerning the causes of yellow fever and malaria, publishing many articles and books based on his research.[7]

When Baxter died in 1890, physicians and military officers—among them Maj. Gen. John McA. Schofield, the Army's commanding general; United States senators; and such eminent citizens as Andrew Carnegie and Enoch Pratt—had joined an effort to have Sternberg appointed to the vacancy. But the importance of bacteriology and the significance of Sternberg's achievements were not as widely appreciated as they would become by 1893, by which time the picture had changed. On learning that medical officers junior to him were applying to succeed Sutherland, Sternberg decided to present his own name formally to the president as a candidate. This time his candidacy, again supported both by men of influence and by an outstanding record as a scientist, was successful.[8]

After his selection as surgeon general, Sternberg continued to publish and to assume positions of leadership in various civilian associations, clubs, and other organizations. These included Washington's Cosmos Club, the District of Columbia Subcommittee on Permanent Relief and Sanitary Dwellings for the Poor, the Sanitary League of Washington, D.C., the American Medical Association, of which he was president in 1897, and various scientific bodies. He also became a frequent visitor to the White House, as physician and then as friend, under both Cleveland and McKinley.[9]

The Medical Department had been moving forward into the new world of science before Sternberg's appointment, and the use of antiseptics was by this time taken for granted. The new surgeon general stood as a symbol both of what the department had been and of what it should be in the years to come. While others in the department would have undoubtedly made better administrators, Sternberg, with a record both of physical courage in war and of scientific accomplishment in peace, was essentially the man of the hour. Captain Reed greeted Sternberg's appointment to head the department in May 1893 with the comment, "The fossil age has passed."[10]

But Sternberg had a darker side. The driving ambition that had enabled him to con-

tinue his research even during assignments to isolated posts was not an unalloyed blessing. Perhaps because he was frustrated that much of his work consisted of disproving the purported discoveries of others and that his positive achievements so often seemed to be anticipated by others, his continual need for recognition eventually became strong enough to cause resentment. While many physicians who joined the Medical Department during Sternberg's tenure became leaders in a golden age of military medicine, some became wary of their chief's private ambitions. Initially enthusiastic about Sternberg, even Reed was eventually convinced that the surgeon general would try to claim credit for his accomplishments.[11]

Personnel and Training

Although the number of posts and post surgeons had diminished since the late 1860s, the responsibilities of the individual medical officer, for the most part, had grown. The garrison he served was larger, he was usually required to care for military families, and he was involved in training litter-bearers and hospital corpsmen. The management of post hospitals grew in complexity with the recognition of the importance of antiseptic surroundings and the accompanying increase in the number of operations. An understanding of exactly how filth was related to disease gave rise to an appreciation of the need to advise post commanders on the upgrading of sanitation and to remain abreast of the latest changes in the state of the art. Sternberg believed, moreover, that the medical officer had a responsibility to the public as well as to the Army and should therefore be willing to discuss hygiene and sanitation with all who were interested. Thus he raised no objection when medical officers taught in civilian medical schools.[12]

A small staff of six medical officers worked in the Surgeon General's Office to coordinate the efforts of Army surgeons in the field. The way in which the various administrative functions were organized varied with the passage of time. During most of the period of Sternberg's service as surgeon general, the office consisted of four divisions: the Library and Museum Division; the Hospital Corps and Supply Division, which bought and distributed medical and hospital supplies to the National Guard as well as to the Regular Army; the Record, Correspondence and Examining Division, whose functions included managing the department's accounts; and the Sanitary and Disbursing Division, which handled the prostheses issued to veterans, the personal identity section, and similar matters. A medical officer stationed in Washington was also responsible for health at the Soldiers' Home, although he was apparently not regarded as part of the administrative staff of the Surgeon General's Office.[13]

Unappreciative of the increased responsibilities of Army surgeons and not content with having entirely eliminated funds for contract surgeons from the Medical Department budget, Congress proposed in 1893 reducing the number of assistant surgeons from 125 to 95. The legislators reasoned that if the department could handle 210 posts in 1869 with only 193 medical officers, the loss of 30 assistant surgeons would not cause a problem when only 120 posts remained in existence. In 1869, however, the department had been able to hire 184 contract surgeons. Repeated reductions in the number of contract surgeons over the years and the elimination of this position had already resulted in leave being

a rare privilege for the department's regular surgeons, as Sternberg emphasized in his annual reports. Congress finally agreed to a reduction to 110 assistant surgeons, this figure to be attained by attrition.[14]

The decreasing number of surgeons in the Medical Department and the growing range of the duties that rested upon their shoulders made it more desirable than ever that Army doctors be completely prepared from the outset to meet the challenges that would face them. But even the best of neophyte medical officers was inadequately trained to deal with several aspects of his new responsibilities. Civilian medical schools devoted scant time to the preventive medicine that was so vital to maintaining the health of any Army unit. Since only in the last quarter of the nineteenth century did American schools begin to offer courses in bacteriology, U.S. physicians had to go abroad to study in this field. Moreover, the administrative aspects of military medicine were expanding and becoming more complex, but civilian medical schools did not familiarize young physicians with either the intricacies of the resultant paperwork or such matters as the design of hospitals and ventilating, heating, and sewer systems. Had study in an Army medical school been available earlier, a Civil War veteran pointed out, the new medical officer would have been "spared some of those hard lessons of laborious and dearly bought experience" and enabled "to adjust [his] previously acquired information to the exigencies and changing phases of military life." Although several European countries had established military medical schools and former Surgeon General William Hammond had tried to start one during the Civil War, in 1893 the United States Army still had no such institution.[15]

Since by this time advanced schools were being established for different branches of the Army, Sternberg easily persuaded Secretary of War Daniel S. Lamont, a personal friend, to order that a graduate school be established for the Medical Department. Perhaps as persuasive an argument as any in favor of the new institution at this point was that of Sternberg, who spoke in terms of "improvising a school" that would add "nothing to the expenses of the Army Medical Department" while offering "all the advantages that could be derived from one costing heavily for its establishment and maintenance." It would use facilities, equipment, and materials, including biological specimens, that were already in the department's possession. Its regular staff would be composed of men working in Washington, although some lectures were to be given by experts who were not in the Medical Department—whether they contributed their services without charge is not stated in Sternberg's annual reports. Since Sternberg believed that the principal "duty of an Army Medical officer is to preserve the efficiency of his command by guarding it against unsanitary influence and preventing disability from diseases that are known to be preventable," the new school became the first institution in the country to specialize in public health and disease prevention. It also familiarized the neophyte medical officer with military regulations and provided him with the understanding of military discipline, authority, and training that would enable him to command respect as a military officer.[16]

The Army Medical School's first session, held in the Army Medical Museum, ran from November 1893 to March 1894 and was attended by five newly commissioned medical officers and four experienced assistant surgeons. The regular staff was composed of Col. Charles H. Alden, who as-



ARMY MEDICAL MUSEUM CLASSROOM



JOHN SHAW BILLINGS

sisted Sternberg in his office and served as president of the faculty; Lt. Col. William H. Forwood, attending surgeon at the Soldiers' Home; and Majors Billings and Reed. An understanding of bacteriology was required, and the first graduates had to pass examinations in duties of medical officers, military surgery, military medicine, military hygiene, chemistry, pathology, and Hospital Corps drill. They were also given instruction in riding and "auxiliary courses," among them military law.[17]

Reed, who was the Army Medical Museum curator and director of the museum's pathology laboratory, taught clinical and sanitary microscopy, subjects whose importance grew with every passing year. The number of "pathogenic organisms" that his class studied was considerable. They included both staphylococci and the bacilli responsible for such diseases as anthrax, typhoid, tuberculosis, and diphtheria. Apparently not all of his students were impressed by the American Medical Association's stand that "the investigation of . . . microscopic organisms and their effects lies at the very foundation of modern medicine and surgery"; a few showed little sign of effort beyond the absolute minimum necessary to pass.[18]

Another important subject in the new school's curriculum was surgery, a rapidly expanding specialty. By 1897 young Army physicians were being trained in the new field of abdominal surgery, learning how to manage intestinal anastomosis (the surgical joining of two separate sections of intestine to restore their continuity) and the removal of the gallbladder or kidney. William W. Keen, a Civil War surgeon so highly regarded that he had been asked to help care for the ailing President Cleveland in 1893, lectured on surgery of the head. In spite of the breadth of the curriculum,

"field service," or the management of the wounded and their evacuation away from the front, was not, as a medical historian of World War I commented, "dignified by a special course of lectures. . . ." [19]

The 1894 decision to reduce the size of the Medical Department by attrition forced the cancellation of the session scheduled for the winter of 1894–1895 because of the lack of students, although the laboratories continued to be used as classrooms for several medical officers requesting instruction. When the school was reopened in November 1895, the number of students was again small, but the classes were considered so valuable that on 6 July 1897 the school's session was lengthened to five months, beginning the following November.[20]

Part of the value of the Army Medical School was the opportunity to study specimens on display in the Medical Museum, among them some that had been involved in a series of experiments conducted by Capt. Louis A. LaGarde in cooperation with the Ordnance Department. Using an experimental .30-caliber Springfield rifle and the standard .45-caliber Springfield, LaGarde sought to determine the effects on both men and armies of newly developed small-caliber rifles and the steel-jacketed bullets they fired, a topic of concern to all military surgeons. The tests used a variety of subjects, including rabbits, horses, powder cans filled with wet sawdust, and, apparently, human corpses. Of particular interest in this connection was LaGarde's report that the bullet fired by the .30-caliber weapon had greater penetration than the .45 and caused less shock. He also determined that the heat generated by the firing was never high enough either to cause damage to the flesh about the wound or to kill germs.[21]

The collections managed by the Library and Museum Division of the Surgeon General's Office under Billings' direct supervision continued to increase in value. Both military and civilian scientists used them to further their own professional growth. Many sources, including both dentists and physicians, contributed items for the museum, some of which were used to educate the public as part of the Medical Department's exhibits at such widely publicized events as the World's Columbian Exposition in Chicago in 1893. This fair also featured a regulation post hospital "and a field hospital under canvas, adjoining." [22]

Many studies were conducted at the Army Medical Museum, including those Reed designed to improve methods of handling and preserving specimens. Among the most interesting were those involving the newly discovered "weird and wonderful" X-ray, first publicly demonstrated in Germany in December 1895. Reed's initial request for permission to buy X-ray equipment was rejected, but by 10 June 1896 he had an X-ray machine with which he located a bullet in the thigh of a patient in a local hospital. Sternberg soon thereafter obtained machines for several post hospitals. Much was yet to be learned about the use of this revolutionary device, particularly the unpleasant nature of the burns that resulted from the long exposures then required. A medical officer reported that one of his patients with a gunshot wound had been irradiated in a civilian hospital for twelve hours to make eight pictures. The bullet sought in this instance was never located, but the patient suffered an 8- by 15-inch burn that was still not entirely healed six months later. The "most distressing feature of the case," the surgeon noted, was "the intense pain, which nothing but morphine will control." [23]

Wishing to offer medical officers opportunities to improve their skills beyond

those available in Washington, Sternberg assigned promising young officers to posts near civilian medical schools to encourage them to undertake further study and research, an approach used by Baxter when he was surgeon general. Following Sternberg's lead, the medical directors of some military departments also attempted to increase the professional expertise of their subordinates, presenting them with hypothetical practical problems to which they were expected to devise solutions. The goal of this type of exercise was not so much testing the medical officers' knowledge as stimulating their minds. They were encouraged to include line officers in discussions of assigned problems so that their active cooperation in preventing disease might be more easily obtained.[24]

The training of the recently formed Hospital Corps also concerned Sternberg, who sought to perfect its organization and utilization. He decided that because many of its members would be serving in the East, a school of instruction should be established at Washington Barracks (now Fort McNair), a site ideally located for units along the Atlantic Coast. Hospital Corps training could be run in conjunction with the medical school, providing inexperienced surgeons an opportunity to observe and participate. The program at Fort D. A. Russell in Wyoming was cut back and eventually eliminated in favor of that in Washington, where a new hospital was built in connection with the Barracks.[25]

Before hospital corpsmen could be adequately trained, decisions had to be made about the role they would play in the future. Medical officers studied the way in which other armies handled the challenge of managing casualties on the battlefield and discussed the location and manning of field hospitals, dressing stations, ambulance and medical supply depots, and the desirable amount and type of equipment. Since specific doctrine to guide the use of medical personnel in the field had yet to be determined, developing guidelines for training corpsmen to meet wartime responsibilities was difficult. At least one surgeon believed that the availability of medical officers at the front would make the utility of first aid training for corpsmen questionable. The likelihood that the longer range of newly developed weapons would require the dressing station as well as the field hospital to be located farther from the front made it difficult to predict whether medical officers or hospital corpsmen would in the future be responsible for the initial care of the wounded.[26]

The training offered hospital corpsmen, however, was still principally designed to prepare them to meet the demands of a peacetime Army whose greatest challenge might continue to be Indian warfare. As a result, the course in the East differed slightly from that in the West, because the hospital corpsmen in the West were more likely to have to bear arms to defend their patients. The school in Washington did not require drill with firearms, although all schools of instruction gave classes in cooking, riding, the care of horses, first aid, anatomy, physiology, nursing, and pharmacy. Doubts about the worth of ambulance and litter drills remained.[27]

In 1896 the Medical Department found it necessary to change its approach to the training of hospital corpsmen. From 1891 to 1896 schools of instruction had trained more than 400, but attrition was so great that only a minority of those serving in 1896 had been through the formal program. The department thus decided that schools in the West should return to the concept of training in small groups. The surgeon general

had the training company at Fort Riley, Kansas, broken up and the men distributed among other posts. The benefit anticipated from this approach was apparently entirely financial—once trained, these men would not have to be sent as far to reach their new assignments. Sternberg did not, however, break up the company of instruction that had been organized for corpsmen in Washington; it served as a pool from which men could be drawn to assist in emergencies wherever they occurred.[28]

Although much of the Medical Department's effort concerned corpsmen working in the field, further changes involved those serving in hospitals. Experience showed that it was both impractical and unsanitary for such corpsmen to wear their regular uniforms while on duty. Sternberg suggested that they be given white linen or duck uniforms to be worn over the regular clothing in cold weather and as a substitute for it in hot. These fabrics would not absorb infectious material as easily as the customary uniform, and the conspicuousness of stains would make it easier to spot areas that should be soaked in disinfectant before washing. Despite the logic of the suggestion, several years passed before the white uniform was adopted.[29]

The increased salary available to corpsmen after July 1892 resulted in an improvement in the quality of men submitting applications to take the Hospital Corps entrance examination. Nevertheless, complaints arose concerning their performance, since successful candidates were often the most intelligent rather than those best suited physically and morally for the work. They also proved less able to direct the efforts of others than those who had functioned as attendants in previous years. Sternberg pointed out to those who complained that if the officers making the recommendations had exercised better judgment in their choice of candidates, the problem would never have arisen.[30]

As forts were abandoned and Congress continued its drive to reduce expenses, the number of hospital corpsmen and stewards, like the number of assistant surgeons, began to drop. Of the 589 privates in the Hospital Corps on 30 June 1893 (positions for 598 were authorized), only 530 remained in 1895. In the same year 6 of 122 hospital stewards left the service, and in March 1896 Congress reduced that figure to 100. Most medical officers publishing articles on the Hospital Corps seemed to agree that the ratio of Hospital Corps privates to the total strength of a command should approximate 2 percent, with 1 hospital steward and 3 acting hospital stewards assigned for every 30 privates.[31]

The notion that every company had four good men who were willing to add the work of the litter-bearer to their other duties proved unrealistic, as had been predicted when the concept was originally proposed not long after the creation of the Hospital Corps. In March 1896, therefore, the War Department issued a general order requiring all enlisted men to be taught how to carry litters and to administer first aid. Surgeons were to familiarize company officers with the litter drill and with emergency care of the wounded so that these officers could then train their men. In October 1897 a second general order required that enlisted men practice these skills at least four hours every month and that each post surgeon train his hospital corpsmen in first aid and litter-bearing for at least eight hours in that period.[32]

The expertise of Regular Army hospital corpsmen was of little help to their National Guard counterparts. Guard components met rarely and briefly, and if, as was

often the case, a National Guard unit was not in the same brigade with a regular regiment, then regular corpsmen were not available to familiarize their counterparts with their work. Training standards and equipment differed from unit to unit. The relationship of Regular Army and National Guard medical officers continued, however, to be generally pleasant. Guard physicians often displayed an active interest in the Medical Department's most recently acquired equipment and requested copies of the new supply table, which listed the furniture, appliances, and drugs used by the department, including "appliances for operating in accordance with the requirements of aseptic surgery." The two groups exchanged information through the Association of Military Surgeons, which in the summer of 1893 opened its membership to Regular Army medical officers. A few Guard doctors even attended some Army Medical School classes.[33]

Preventive Medicine

In an era when disease was not often treated successfully, prevention was critically important. After a year as surgeon general, Sternberg presumably believed that his medical officers were handling their responsibilities in this area satisfactorily, despite the obstacles they encountered in their work, since he maintained that the health of the Army was generally good. The great majority of the enlisted men continued to come from cities where, through exposure since childhood to a host of diseases, they had acquired a certain resistance to many of the most common ailments. The health of black troops had improved markedly, and only Indian scouts suffered to any great extent from sickness. The accommodations given to Indian soldiers were inferior, often old, dilapidated, badly ventilated, and dirty. Crowding aggravated what was regarded as an inborn tendency to tuberculosis, while a high rate of alcoholism only exacerbated all other problems. Black soldiers, on the other hand, were sick even less than white; their rate for 1895 was 811.6 per 1,000 versus 1,116.44 for whites. High rates of sickness at a few posts served as reminders of the need for careful and constant attention to sanitation and hygiene.[34]

In his attempts to maintain the Army's health, Sternberg found himself fighting many of the problems that had challenged his predecessors. Casemates used as sleeping quarters, defective ventilation, vermin, dilapidation, overcrowding, and poor sanitation were still common wherever troops were stationed, although by 1896 he could report that "facilities for personal cleanliness have been greatly improved at our military posts." Determined to be fully and accurately informed about living conditions wherever Army units were stationed, he emphasized to his medical directors that he expected them to conduct personal inspections of all posts within their territories, avoiding reliance on the opinions of nonmedical officers about sanitation and the work of surgeons.[35]

Water supplies remained a major concern—soldiers used many sources, including rivers, cisterns, wells, artesian wells, streams, and ponds—but two new approaches to the problem of obtaining a safe supply gained strength in the mid-1890s. One involved drinking only the water obtained from ice machine condensers. This move was so successful at Fort Ringgold in Texas, where it was inexplicably followed by a drop in malaria as well as typhoid rates, that a larger condenser was installed to

produce 2,000 gallons a day. More popular were filters, often employed in conjunction with boiling. Such a system had apparently been in use for some time at Jefferson Barracks, where water was obtained from the St. Louis mains.[36]

For a period in 1895 while its settling basin was being cleaned, the local company that supplied water to Fort Leavenworth pumped directly from the Missouri River. Since the water came from a point less than a mile below the spot where the post sewage spewed into the river and less than two miles below the outlet of a sewer system serving a village of more than 1,500 people, it was not surprising that those who drank it found it was "not only very muddy, but positively foul." Typhoid appeared at the fort, and efforts to have the drinking water boiled were only partially successful. By 1896 some families who relied upon river water for drinking were using filters.[37]

Properly used, some models of filters could remove an average of 98.54 percent of the bacteria in the water, but they required frequent cleaning and were very fragile. In 1897 the Medical Department began urging the use of portable filters in the field, where troops often drank from streams despite surgeons' efforts to discourage the practice. Although effective portable filters proved expensive, the cost seemed justified because of the long-range savings that would result from improved health.[38]

In an era when enthusiasm for physical education and the vigorous life was growing, the discipline gained through athletics was increasingly valued as a means both of preventing disease and of creating a state of glowing health. Believing that "the true athlete is he who has taught his muscular system absolute, unquestioning obedience, and such a one is most amenable to control," the Medical Department continued its efforts to encourage athletics and physical fitness. Capt. James E. Pilcher pointed out that "preparatory training, by which deficiencies are corrected and a proper equilibrium of the system secured," required medical supervision. But the money for building the necessary gymnasiums was not always forthcoming, even when without them the men might head for the "evil resorts" of a nearby city. Recreation and stimulation for the mind were also desirable as a means of filling the soldiers' spare time and lessening the temptation to indulge in the excessive use of alcohol.[39]

Several other approaches to the problem of alcohol abuse were tried during this period. The canteen system was not universally favored. Some believed that selling beer on base encouraged young men to start drinking. Once they started, they might be more easily tempted to seek hard liquor off post. In any event, a reduction in the number of inebriates might come at the cost of increasing the total number of men who drank. The fact that the revenue of the canteen accrued to the fund used for the food that was bought to supplement the regular ration only tended to make a disinterested judgment more difficult.[40]

Few Army doctors attempted to cure alcoholics. The Medical Department recommended that they be dismissed from the Army or, at the very least, be refused reenlistment. Captain Arthur devised a method of treating drunken episodes that was designed to restrain the alcoholic from further pursuing his inebriated ways. Arthur believed that it was important not to excuse the drunk from his duties any longer than absolutely necessary because this only encouraged his overindulgence. To speed the miscreant's return to sobriety, his stomach should be pumped, with the aid of a



CHARLES SMART

hospital corpsman and a wooden gag if he protested the procedure too vigorously. "Hot beef extract, with cayenne pepper," should then be administered and after an hour, the soldier should be returned to duty. Only if the drunkard fell into a coma or showed signs of delirium tremens would Arthur hospitalize him. In attempts to retain the services of an otherwise worthwhile alcoholic sergeant, Lt. Edward L. Munson devised a slightly different approach. His cure used "suggestion and . . . the association of ideas, combined with the effect of whatever tonic and anti-alcoholic properties that was possessed by strychnine." The sergeant was given a hypodermic of sulphate of strychnine, atropine, and morphine each day and allowed to drink all he wanted. After he had consumed alcohol, he was given a hypodermic of apomorphine, which worked as an emetic. The resultant "intensifying nausea," together with assurances that the intolerance for alcohol caused by these drugs would be long-lasting, made the very thought of alcohol sickening. Both the Arthur and Munson approaches apparently won adherents among post surgeons.[41]

In its drive to prevent disease, the Medical Department also took part in efforts to design an adequate emergency ration, one that would be light in weight and high in calories. Studies of various concentrated forms of food began in 1895, and when a decision was reached a year later, forty-five officers, nine of them medical officers, had participated. In the summer and fall of 1895 units in the field tested some of the proposed items. On one occasion soldiers were supplied with a coffee tablet, a bean soup tablet, crackers, and bacon. Each man then prepared his own lunch. By 1400 hours some participants were feeling nauseated, and others were actively vomiting. Diarrhea added further to the misery of many. Within two more hours the landscape was littered with wretched and retching bodies, although all soon recovered. Interviews and further personal testing of the individual components of the ration by the intrepid surgeon involved in this test suggested that both the bean soup and the crackers were in some way to blame for the fiasco. During another test, the men of the 1st Cavalry subsisted on a different ration without apparent harm for five days of a ten-day march.[42]

In December 1896 a 4,110-calorie emergency ration was adopted, following its recommendation by a four-man board headed by Major Smart. It called for sixteen ounces of hard white bread of the kind normally provided to the Army, since it kept well and was familiar to the men; roast ground coffee beans or tea, to be sweetened with saccharin rather than sugar to

keep the weight of the ration down and to lessen "the prevalence of diarrhea due to intestinal fermentations"; and ten ounces of bacon, also of a type with which the men were familiar. The board believed that the high proportion of fat was necessary to add calories to a ration that had to be compact and light in weight. A soup tablet was on the list, but the board could not find a manufacturer who would guarantee the use of the desired formula. This ration was not to be used for more than ten days at a time.[43]

The drive to prevent disease, coupled with the realization that insects might in some manner spread "the germs of cholera and other diseases," led to suggestions that window screens were more than a mere luxury. Army surgeons were aware of the malaria parasite and searched for it in the blood of their fever patients. Some believed that these organisms were transmitted directly through drinking water, but Sternberg was skeptical of this theory. Although the role played by the mosquito in malaria was not yet firmly established, the connection of malaria with the sort of wetlands that breed mosquitoes had long been noticed. Having observed that at Fort Myer, Virginia, where the malaria rate was high, the number of patients with this disease went up rather than down after the drinking water was filtered, Surgeon Reed theorized that "emanations from the Potomac Flats" might have something to do with the malaria rate.[44]

In diphtheria and, subsequently, tetanus, prevention was made easier by the availability of both positive diagnosis and treatment. Since supplies of the diphtheria antitoxin were inadequate, the Army established its own "diphtheria antitoxin 'plant' " at Jefferson Barracks. Here horses were injected with the toxin in gradually increasing doses until a high level of antitoxin had been produced in their blood. Some patients in whom the antitoxin from horses was used experienced typical immune reactions in the form of rashes, joint pains, and, in one instance, a fatal paralysis, all of which were blamed on the antitoxin. Nevertheless, reports on its use as both a cure and as a preventive for this terrifying disease were generally favorable.[45]

Despite the precautions taken to purify drinking water, typhoid and fevers with typhoid-like symptoms continued to plague the Army. The new Widal test would in time prove especially valuable, but its true value would not be appreciated until physicians learned how to administer it and until they realized that different fevers were spread in different ways and that, therefore, prevention depended on distinguishing between them.[46]

Treatment of typhoid, like that of other fevers, had changed to some degree through the years. Patients were no longer bled, and although the noted physician Sir William Osler maintained that purging had also been abandoned, Army surgeons were still dosing typhoid patients with calomel (mercurous chloride), followed by castor oil. Antipyretics, among them quinine and phenacetin, were frequently used, and other preparations, such as chloral or mixtures containing a narcotic, were employed to induce sleep.[47]

Efforts both to prevent and to treat disease still often followed lines developed decades, even centuries, earlier. But new discoveries were beginning to provide explanations about why improved sanitation and hygiene resulted in lowered disease rates and to suggest different approaches to both diagnosis and treatment. In his "Valedictory Address to the Graduating Class of the Army Medical School, Washington, D.C.," in 1896, Civil

War surgeon John H. Brinton rejoiced that "the bright days of advancement illuminate the whole horizon." In 1897 a physician wrote in the *Boston Medical and Surgical Journal* that it was "but yesterday that medicine [became] a hand-maiden of science and . . . escaped from the domain of inexact empiric art." [48]

Surgery

Progress in surgery was more dramatic than that in the prevention and treatment of disease. Encouraged by the optimistic reports of colleagues who traveled abroad to observe the best surgeons of Europe, Medical Department officers were undertaking a wider range of operations than ever before. They not only performed abdominal surgery, but they performed it earlier in the course of the patient's disease, before a fatal outcome became inevitable. The resultant improvement in the survival rate led to further and still earlier attempts. One civilian physician used an article in the *Journal of the American Medical Association* to urge in the strongest terms that surgeons operate "in every case of appendicitis, promising or unpromising, at the earliest possible moment." Nevertheless, the belief that the patient might recover from appendicitis without an operation and thus that surgery might subject him to unnecessary risk still caused many doctors to hesitate.[49]

Surgery to repair hernias had not been common before the era of antiseptic surgery. Even when it was performed, it was done only in desperate attempts to relieve strangulation. Fewer attempts to force the protruding intestine back into place without an incision were made as surgeons experienced increasing success with what was then called the "radical cure," or surgical repair involving an incision. Sternberg made herniotomy part of a campaign to keep good men with curable disabilities in the Army—one estimate suggested that twenty to thirty men received discharges each year because of hernias. He hoped thereby also to limit the number of disability pensions the government had to pay. In 1895 the Army gave the soldier with an operable hernia the option of having this problem repaired by an Army surgeon chosen by the surgeon general, thus avoiding a disability discharge. Sternberg noted that even when surgery did not enable the hernia victim to remain in the military, it at least made earning a living as a civilian easier. Medical officers performing herniotomies appear to have been successful; in sixty-seven cases dating from 14 August 1895, there were only three relapses and no deaths.[50]

Success in simpler forms of surgery encouraged attempts to conduct more demanding operations. In addition to herniotomies and appendectomies, Army surgeons were by 1898 undertaking hysterectomies and other forms of gynecological surgery, nephrectomies (removal of the kidney), and surgical repair of abdominal wounds. They removed gallstones and attempted the surgical relief of peritonitis, peritoneal abscesses, and intestinal perforations. Their few failures no longer discouraged them, and the number of patients undergoing abdominal surgery grew. Of eighty-one patients upon whom such operations were performed in fiscal year 1898, seventy-seven survived.[51]

Caution also marked postoperative care. Medical officers waited several days before allowing their patients to take nourishment by mouth. Lieutenant Munson permitted nothing by mouth for two days after surgery, while Maj. George W. Adair

recorded nourishing one of his patients by enema exclusively for five days postoperatively. The postoperative recovery period for herniotomy patients in the mid-1890s was also prolonged. Deputy Surgeon General Forwood kept his hernia patients in bed for thirty days after surgery and insisted that they refrain from "violent exertion" for at least three months thereafter. Other Army surgeons kept their patients in bed as long as six weeks.[52]

The frequency of abdominal surgery led Sternberg to order post surgeons not only to set aside a room to be used exclusively for surgery but also to develop routines designed to reduce the chance of infection and enhance the likelihood of an uneventful recovery. After administering thirty cc. of sherry as preoperative medication (whiskey was also used for this purpose), one Army surgeon had a large area around the operative site shaved and scrubbed with soap, water, and a solution of bichloride of mercury. The patient's stomach was washed out by means of a lavage tube "as a special precaution against vomiting" before the ether was administered. Immediately before the operation began, all gauze, absorbent cotton, and other materials that would be needed were routinely sterilized. Once a patient entered the operating room, the area around the operative site was covered with "hot, sterilized towels." Kangaroo tendon was recommended for deeper sutures, although catgut was used for more superficial stitching. At least one surgeon preferred "silkworm gut" for stitches taken in the skin; since they were non-absorbable, they were removed a week after the operation. To avoid infection and the failure of hernia repair because of sloughing of internal stitches, the kangaroo tendons were sometimes soaked for forty-eight hours in ether and for another twenty-four hours in bichloride of mercury in ether, then stored in a solution of carbolic acid and alcohol. Surgeons and attendants in the Army's operating rooms were beginning to wear "linen suits, linen operating aprons, and canvas shoes, the arms being bare to the elbow." Hands and forearms were always subjected to the usual scrubbings and soakings to render them as germ free as possible.[53]

The progress that had been made in the field of surgery since the death of President Garfield in 1881 was most eloquently demonstrated when, a few weeks before Sternberg's appointment as surgeon general, President Cleveland first noticed a growth in the roof of his mouth. Maj. Robert M. O'Reilly, one of his personal physicians, was asked to examine the growth when he arrived at the White House to pay a social call. Alarmed by what he saw, he returned the next day to remove a bit of the abnormal tissue. This he sent, without identifying his patient, to the Army Medical Museum's laboratory for examination. Having established the malignant nature of the tumor, O'Reilly called in Cleveland's civilian physician, Joseph Decatur Bryant of New York, who had the grim diagnosis confirmed by Dr. Welch at Johns Hopkins. From this point onward O'Reilly helped Bryant coordinate the president's care, but played only a minor role in it himself.[54]

Much involved in the nation's problems, Cleveland postponed the necessary surgery until July. His physicians then faced a double challenge—to do whatever could be done to preserve the president's life and ability to function effectively at the head of a troubled nation, and to keep word of the seriousness of his condition from reaching a public already on the verge of panic because of the depressed state of the economy. When rumors about Cleveland's health began to

circulate, his doctors informed the press that he was suffering only from rheumatism and dental problems. Even the families of the surgeons involved were kept in the dark about the identity of the patient.[55]

Although Cleveland was only 56 years old in 1893, he was close to exhaustion because of his efforts to guide the nation through a critical period. He also had a history of kidney problems and was "very corpulent, with a short, thick neck, just the build and age for a possible apoplexy." Nevertheless, Cleveland's physicians moved with a confidence that contrasted sharply with the uncertainty that afflicted Garfield's medical attendants. Particularly concerned about the anesthesia to be used, they decided that as much of the surgery as possible would be done under nitrous oxide and arranged to have it administered by a dentist known for his skill and experience with its use. On 1 July, after two teeth had been removed and the initial incisions made in Cleveland's upper jaw, O'Reilly took over from the dentist and administered ether for thirty-one minutes while two civilian surgeons removed all the upper jaw on the affected side except "the floor of the orbit and the intermaxillary portion." A second operation, much smaller in scope, was performed on the seventeenth to remove remaining traces of the cancer. The prosthesis that replaced the missing bone enabled Cleveland to speak normally almost from the outset so that neither the press nor the public appreciated the extensive nature of the surgery he had undergone. Unlike his unfortunate predecessor, Cleveland did not have to contend with infection. He recovered with impressive rapidity from his ordeal, and Bryant was soon able to return to his practice, leaving Sternberg to watch over his patient's recovery until 1 September, when Cleveland was found to be "all healed."[56]

Ever since the operation, much controversy has centered about the question of the true nature of Cleveland's tumor. In 1975 the late Gonzalo E. Aponte, former chairman of pathology at the Jefferson Medical School in Philadelphia, initiated a thorough study of the tissue removed from Cleveland's mouth and held since 1917 by the Mutter Museum in Philadelphia. After both considering the historical background of the controversy and examining the tissue itself, the scientists conducting the study concluded that the tumor was "verrucous carcinoma, a low-grade malignant tumor known to behave more mildly than the ordinary oral cancer."[57]

The growing complexity of surgery and the frequency with which it was now undertaken, the emphasis on antisepsis, and the greater reliance on diagnostic tests, antitoxins, and immunization in the battle against disease, all had increasingly widespread effects on hospital design. The old style of post hospital was not large enough to shelter both a room reserved exclusively for surgery and the laboratory without which the physician could not offer his patients the benefit of modern medicine. In addition, proper accommodations were also needed for various types of equipment, including that for applying plaster casts, whose use eliminated the long confinement to bed that was otherwise necessary.

Congress voted money for hospital construction on a year-by-year basis, and special bills were required for expenditures that went beyond the yearly sum. But Sternberg was able to obtain money both for new post hospitals and for the modification of existing facilities. The plans for the new hospitals called for hot water heat, concrete basements, and pressed steel ceilings for the ground floor. Additions to existing facilities at some posts included op-

erating rooms and laboratories. At other posts, operating rooms were enlarged or new ones installed in existing rooms. More space for beds also occasionally proved necessary. The joint Army and Navy general hospital in Arkansas was not being fully utilized, however, and an appeal went out to the medical directors of the various military departments to refer more patients. In 1897 eligibility was extended to include, whenever there were vacancies, honorably discharged soldiers and sailors, both regulars and volunteers.[58]

Domestic Conflict

With the period of major Indian depredations in the past, few of the Medical Department's patients were the victims of intentionally inflicted wounds. The only action Army units saw from 1893 to the spring of 1898 involved social unrest. Labor violence was not a new problem to the post–Civil War government, but Army units were used more intensively than ever before to deal with strikes, riots, and threats of riot that occurred during Cleveland's second administration. In the West the unemployed stole trains or forced their way upon them in attempts to make their way East. Workers in mines and factories protested reduced wages. Strikers at the Chicago Pullman plant were supported by mobs who harassed railroads west of the Mississippi and interfered with their operations. Although governors mobilized the National Guard in their states to help restore order, appeals to Washington for assistance were numerous. Regular Army units were ordered to guard bridges and tunnels, reclaim stolen trains, and restore and maintain order from Chicago to Sacramento. An estimated two-thirds of the Army was eventually involved in dealing with labor violence spawned by the railroad strikes alone. Injuries to Army regulars were few and usually minor, but since disease spread easily in areas where many men were camped together in temporary accommodations, surgeons were needed to advise on sanitation and to care for the sick.[59]

In July 1894, in response to one of the most threatening episodes of labor violence of his administration, President Cleveland sent approximately 2,000 men, most of them from Fort Sheridan, near Chicago, and Fort Leavenworth, to Chicago to guard government property and restore the mail service during a strike by Pullman workers. The soldiers were stationed at various sites about the city, but the largest number camped in Lake Front Park. Because of the lack of trees there, the sun blazed directly upon the men, an "impalpable black dust, which was exceedingly unpleasant" covered everything, and the ground "emitted a disagreeable odor, when disturbed by digging or sprinkling with the hose."[60]

Unsure both about the possible inroads of disease and about the number of casualties for which they might be responsible, the Medical Department contingent at Chicago was ready for all eventualities. Since some units arrived unaccompanied by doctors, Maj. Alfred C. Girard, the post surgeon at Fort Sheridan who served briefly as the chief medical officer, was required to assign Army physicians recalled from leave in such a way as to have at least one at each major camp. To ensure adequate coverage, a minimum of two civilian physicians also had to be brought in for the emergency. With the arrival of Maj. Daniel G. Caldwell with troops from his post at Madison Barracks, New York, and with his assumption of responsibilities as



DANIEL G. CALDWELL

chief medical officer, the medical staff at Chicago was almost complete. The greatest number of Regular Army surgeons serving at any one time in the Chicago area during the strike was ten, six of whom were sent to the Lake Front camp. Four hospital stewards, four acting hospital stewards, and twenty-five Hospital Corps privates assisted them.

Girard set up a field hospital in tents erected at the Lake Front site, ordering the equipment he needed from Fort Leavenworth by telegraph. Supplementary equipment and supplies were contributed by the medical officers of the various units sent to the area. Only a few days after the first troops arrived, a thirty-bed facility awaited the sick and injured. Each bed had mosquito netting because of the many flies that inhabited the Lake Front Park. The hospital remained open until 18 July, when the camp was broken up and patients sent to the hospital at Fort Sheridan.

Each day a surgeon and a hospital steward, equipped with a medicine chest, made the rounds in a light wagon from the Lake Front headquarters to each of the small units that were scattered about the area. The medical officer held sick call and had the Lake Front camp send an ambulance to pick up anyone in need of hospitalization. Caldwell stated that this approach to the problem of providing care to the men of small units proved to be a "very satisfactory plan." [61]

Most patients seen by medical officers suffered from acute diarrhea, blamed by Caldwell upon the heat and the fact that soldiers often drank water from fire hydrants. Girard, on the other hand, maintained that the cause was "prolonged use of the canned meat of the travel ration," which caused "intense thirst. . . ." He noted that the meat was of such quality that a man had to be very hungry indeed to eat it more than once. The injured who needed the help of Army doctors were few. A caisson explosion on 16 July killed three and wounded ten, but Army surgeons arrived too late to help. The physicians of the nearby Illinois Militia cared for the victims and sent them on to civilian hospitals in Chicago. When the explosion victims were in a condition to be moved further, they were taken to the Fort Sheridan hospital.[62]

The troops sent to maintain order when the railroad strike spread to the Sacramento area, early in July, included approximately eight Army companies and three from the Marine Corps. These men originally bivouacked in the railroad station, sleeping upon the hard surface "in the midst of the heat and roar and glare." After seventeen days they were permitted to pitch tents in the shop yards, where they

could construct floors and paths of wood in the shade of eucalyptus trees and piles of lumber. Only the cavalry troops lacked tents, and some of them were able to seek shelter in railroad cars. The men's food consisted of the field ration supplemented "with a fair proportion of fresh vegetables," but the water taken from city mains contained "considerable river mud." Those who regularly drank this "beverage" pronounced it safe, despite the misgivings of medical officers.[63]

The Medical Department contingent at Sacramento grew gradually. The initial two doctors, acting hospital steward, and two Hospital Corps privates were reinforced by four more privates on 13 July and the next day by a hospital steward, an ambulance, four mules, and the private who was detailed to drive them. Because of the presence of Marines, a Navy medical officer, a Navy apothecary, and two male Navy nurses were also available to care for the sick and injured, although the senior medical officer at Sacramento was Major Pope, post surgeon at the Army's Angel Island in San Francisco Bay. A civilian physician normally employed by the railroad also offered his services. As units were sent from Sacramento to guard the rail line at other points, medical personnel were detached to go with them, an Army assistant surgeon and two Hospital Corps privates to Truckee, California, on the thirteenth and Navy medical personnel to Rocklin, California, on the fourteenth.

Pope selected the railroad depot dining room at Sacramento as the site of the field hospital, since it was large, well lighted, and well ventilated. Inside, shutters blocked the heat and glare, and a Pullman car standing in the depot supplied bedding. Under orders from the city's mayor, the restaurant provided special diets. The Navy surgeon contributed a filter for the water so that patients did not have to imbibe mud. To remove the casualties of labor violence and to guard them from the mob, the hospital sent out four armed litter-bearers with an ambulance accompanied by a deputy U.S. marshal to guide the medical unit through the local streets.

Like their colleagues in Chicago, medical officers in Sacramento encountered few injured men in need of treatment. On 11 July, however, strikers derailed a train carrying U.S. mail when it was three miles from the station, killing four men and injuring six, one fatally. The train sent to assist the victims carried armed guards, an Army assistant surgeon, a Navy assistant surgeon, and two Hospital Corps privates. Except for a man whose hideous injuries proved fatal while he was still in the operating room, the casualties quickly recovered. Two days later Pope and four members of the Hospital Corps were again called to the scene of violence, but the only casualty was a striker shot in the abdomen. Pope cared for him until a patrol wagon arrived to take him to a civilian hospital, where he later died.

The health of the men at Sacramento was initially regarded as excellent, since an average of only 1 percent needed treatment. The diarrhea that afflicted the few who were ill was blamed on the heat and the drinking of too much ice water. Doctors had those suffering from heat prostration sponged with cool water and dosed with "a little digitalis or Aromatic Spirits of Ammonia." They treated diarrhea with a saline laxative, followed by "diarrhea tablets" containing calomel (still in use despite its removal from the supply table by Surgeon General Hammond during the Civil War), morphine sulphate, capsicum, ipecac, and camphor.[64]

Although marshes bordered the camp at the railroad station on two sides, malaria did not appear until 2 August. The fact that so many developed the disease apparently took medical officers by surprise, for they had noted that civilians working in the area had not been severely afflicted in years past. By the time the troops left Sacramento on 3 September, doctors were treating forty-three cases, many suffering from gastric pain as well as fever. Pope used atropine and morphine in combination to treat these sufferers until their stomachs would tolerate quinine. Even after the men had left Sacramento, cases of malaria continued to develop among them—more than eighty were treated for the disease at the Presidio in San Francisco. Thus, despite the occasional violence that marked the disorders, disease proved to be the greatest enemy faced by the units called upon to restore order in the Sacramento area during the strikes of 1894.[65]

In spite of labor problems, the period from 1893 to the outbreak of the Spanish-American War in 1898 was quiet for the Army. For the Medical Department, however, it was a period of great change. During these five years under Sternberg's leadership, the department entered the era of modern medicine. An increasing number of Army hospitals became small medical centers in the modern sense, complete with laboratories and well-equipped operating rooms. With Sternberg's encouragement, surgeons successfully performed operations that they would not have dared to attempt ten years earlier. At his insistence, young physicians began to receive formal training in military medicine, instead of being sent out to sink or swim on their own or being thrown upon the mercies of a senior surgeon for indoctrination. Medical officers also continued to educate National Guard officers about the basic requirements of Army medicine and the absolute necessity for strict attention to sanitation. Despite the advances made under Sternberg, supplies on hand were of the type needed by post surgeons—not by physicians caring for the wounded of a modern fighting force—and the department itself remained small. As a result, the number of medical officers who benefited from Sternberg's efforts was also small, too small to overcome the ignorance of military medicine of the hordes of civilian physicians who would swell the department's ranks in 1898.[66]

The effects of these deficiencies were multiplied by the fact that Medical Department leaders were not preparing plans for meeting the demands of a major war that would result in large numbers of sick and wounded. The Franco-Prussian War of 1870–1871 had had much to teach about the organization and operation of the medical service of troops in such a conflict, but no one in the United States studied its lessons in any depth until after the Spanish-American War. Successive manuals designed to guide members of the department continued to concentrate almost entirely on the management of medical care at the various posts, and the need for field service regulations for the Army had not become apparent. Furthermore, the demands of the new military medicine were greater by far than those of the old, and the department had not yet had sufficient time to create all the laboratories, to acquire all the equipment, and to train all the men needed to meet the new expectations. These deficiencies would prove devastating as an abruptly swollen Army gathered to launch the invasion of Cuba and the Philippines.[67]

NOTES

1. Allan Nevins, *Grover Cleveland*, pp. 523–24, 528; Edward M. Coffman, *The Old Army*, p. 246.

2. Quotation from D. W. Cathell and William T. Cathell, *Book on the Physician Himself*, 11th ed. (Philadelphia: Davis, 1902), p. 109, as cited in William G. Rothstein, *American Physicians in the Nineteenth Century*, p. 266; James H. Cassedy, *Medicine in America*, p. 89; Harry F. Dowling, *Fighting Infection*, pp. 14, 29–30, 99–100. Forms of dysentery other than the amebic include shigellosis, or bacillary dysentery, and giardiasis. A recently discovered cause of dysentery is *Campylobacter*. The Widal agglutination test was developed by French physician Fernand Widal. The Wassermann test was developed by August von Wassermann, a German bacteriologist.

3. John Duffy, *The Sanitarians*, pp. 126–56, 175–97, 254 (quotation); Cassedy, *Medicine in America*, pp. 108–09.

4. Erwin H. Ackerknecht, *A Short History of Medicine*, p. 161. See also pp. 167–70, 199.

5. Quotations from War Department, Surgeon General's Office, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1894, p. 16 (hereafter cited as WD, SGO, *ARofSG*, date); James L. Abrahamson, *America Arms for a New Century*, pp. xiv, 14, 34–35, 37–38; Peter Karsten, "Armed Progressives," in *The Military in America From the Colonial Era to the Present*, p. 247; Graham A. Cosmas, "From Order to Chaos," pp. 105–06.

6. Ltrs, Sternberg to John M. Schofield, and Schofield to Sternberg, both 10 Apr 1893, John McA. Schofield Papers, Manuscript Division, Library of Congress, Washington, D.C.; Rpt, 1 May 1861, p. 6, Entry 77, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; Fielding H. Garrison, *An Introduction to the History of Medicine*, p. 718; Ltrs, R. C. Davis to Sternberg, 7 Mar 1887, Jos. C. Bailey to SG, and J. C. Breckinridge to SG, both 31 May 1893, J. P. Wright to SG, 8 Jun 1893, and other correspondence in Ms C100, George Miller Sternberg Papers, National Library of Medicine, Bethesda, Md.

7. Esmond Long, *A History of American Pathology*, pp. 206–07; in Entry 63, RG 112, NARA: Instrs for Med Offs to Whom a Microscope Is Furnished, 1 Jul 1868, vol. 3, SGO Cir 1, 1 Jul 1871, vol. 4, and Supply Tables, 1883, vol. 7; Mary C. Gillett, "A Tale of Two Surgeons," pp. 406–07, 411–13; Frederic P. Gorham, "The History of Bacteriology and Its Contribution to Public Health Work," in *A Half Century of Public Health*, p. 73; William Bulloch, *The History of Bacteriology*, pp. 182–85, 187, 214. See also articles by and about Sternberg in the Bibliography.

8. John M. Schofield, *Forty-six Years in the Army*, p. 183; John M. Gibson, *Soldier in White*, pp. 159–60, 166–67; Martha L. Sternberg, *George Miller Sternberg*, p. 130.

9. Sternberg, *Sternberg*, pp. 139–40, 148–49; "Public Health," p. 98; George M. Sternberg, "The Address of the President," p. 1373; Gibson, *Soldier in White*, pp. 178–79, 243.

10. Cited in William B. Bean, *Walter Reed*, p. 55.

11. Ltr, G. M. Sternberg to SG, 10 May 1869, vol. 12, Entry 10, RG 112, NARA; Bean, *Reed*, p. 153 (quotation from Reed to Mrs. Reed, 9 Dec 1900). Among the medical officers who joined the department in the late 1890s whose names would be well known by the time of World War I were Bailey K. Ashford, Frederick F. Russell, and the Philippine Tropical Disease Board members (*see Table, Chapter 11*).

12. According to Edward M. Coffman, in 1890–1891 alone, the Army abandoned roughly a fourth of its posts (see "The Long Shadow of the Soldier and the State," p. 80). See also "Examination of Army Medical Officers for Promotion," p. 694; Sternberg, "Address," p. 1374; Alfred Alexander Woodhull, "The Better Type of Medical Officer," pp. 341, 345; Bean, *Reed*, p. 64; WD, *ARofSG*, 1895, p. 50.

13. For a time before June 1894 supply and the Hospital Corps were managed in two separate divisions. See WD, *ARofSG*, 1898, pp. 100, 138, and 1899, p. 22; Preliminary Inventory of RG 112, pp. 28–32, NARA; Ltr, Charles Smart to SG, 30 Jun 1894, Entry 245, RG 112, NARA.

14. "The Fifty-third Congress, the Army and Navy Medical Services and the Marine-Hospital Service," p. 413; AGO GO 43, 6 Sep 1894; WD, *ARofSG*, 1893, pp. 13–14, and 1894, pp. 14–15, 17.

15. Quotations from John H. Brinton, "Valedictory Address to the Graduating Class of the Army Medical School, Washington, D.C.," p. 604; "Army Medical School," p. 352; Samuel C. Busey, "Address

Delivered at the Closing Exercises of the Army Medical School, March 12, 1897," pp. 671–72; Charles H. Alden, "The Special Training of the Medical Officer . . . ," pp. 676–77; WD, *ARofSG*, 1893, p. 15; George Rosen, *Preventive Medicine in the United States, 1900–1975*, pp. 23–24; John Z. Bowers and Elizabeth P. Purcell, eds., *Advances in American Medicine*, 1:258–59.

16. WD, *ARofSG*, 1893, pp. 14–15, and 1894, pp. 21 (final quotation), 22 (other quotations), 24–25; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, p. 121; "Army Medical School," p. 353; Charles E. Woodruff, "Military Medical Problems," pp. 227, 236–37; Sternberg, *Sternberg*, pp. 132–34; Gibson, *Soldier in White*, p. 175; Graham A. Cosmas, *An Army for Empire*, p. 8; AGO GO 51, 24 Jun 1893.

17. WD, *ARofSG*, 1894, pp. 21–34 (quotation).

18. Ibid., pp. 23, 25, 30 (first quotation), 1896, p. 22, and 1898, p. 23; "Army Medical School," p. 353 (second quotation); Coffman, *Old Army*, p. 384.

19. Quotations from War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 46 (hereafter cited as WD, SGO, *SGO*); Rpt, Louis A. LaGarde, 31 Oct 1893, Entry 53, RG 112, NARA; Robert S. Henry, *The Armed Forces Institute of Pathology*, p. 95 (hereafter cited as *AFIP*); WD, *ARofSG*, 1894, pp. 23, 27, 32, 1896, pp. 118–21, and 1897, pp. 26–27; Nicholas Senn, "Abdominal Surgery on the Battlefield," p. 2.

20. Sternberg, *Sternberg*, p. 132; AGO GO 51, 24 Jun 1893, and GO 43, 6 Jul 1897; "Army Medical School," p. 353; WD, *ARofSG*, 1894, p. 23, and 1895, p. 15.

21. WD, *ARofSG*, 1893, pp. 73–95.

22. Quotation from LaGarde Rpt, 31 Oct 1893, Entry 53, RG 112, NARA; Williams Donnally, "An Opportunity for a Great National Museum," p. 137; WD, *ARofSG*, 1894, p. 28, and 1896, p. 15; Henry, *AFIP*, pp. 93, 101, 103.

23. First quotation from Henry W. Cattell, "Roentgen's Discovery," p. 169; remaining quotations from WD, *ARofSG*, pp. 106–07; ibid., pp. 104, 108; M. Goltman, "The History of X-rays and Their Application in Medicine and Surgery," p. 293; Henry, *AFIP*, p. 100; Gibson, *Soldier in White*, p. 177; Ltr, Henry Lippincott to SG, 10 Jan 1898, Entry 26, RG 112, NARA.

24. Sternberg, *Sternberg*, p. 138; Kimball, *Soldier Doctor*, p. 153; Alfred Alexander Woodhull, "Military Medical Problems," p. 540.

25. H. S. Turrill, "Instruction of the Hospital Corps of the U.S. Army," p. 395; WD, *ARofSG*, 1893, pp. 15–18, 1894, p. 36, and 1895, p. 14.

26. WD, SGO, *SGO*, p. 48; Charles Smart, "Transportation of Wounded in War," pp. 35–36; William C. Borden, "Hospital Corps Instruction at Military Posts," pp. 402–04; Louis A. LaGarde, "The Medical Department in Time of War," p. 585; John van R. Hoff, "Scheme of Military Sanitary Organization," pp. 437–47; idem, "Outlines of the Sanitary Organization of Some of the Great Armies of the World," pp. 426–514. The need to develop specific doctrine for the U.S. Army stimulated increased interest in foreign armies, which in turn inspired many articles on the subject in the *Proceedings of the Association of Military Surgeons of the United States* during this period.

27. AGO Cir 2, 6 Feb 1896; Turrill, "Instruction," p. 400; Charles H. Alden, "Instruction of the Hospital or Ambulance Corps in the United States," pp. 451–52; Borden, "Hospital Corps Instruction," p. 401; Senn, "Abdominal Surgery," pp. 7–8.

28. Alden, "Instruction," p. 99; Turrill, "Instruction," p. 395.

29. WD, *ARofSG*, 1893, p. 19, 1896, p. 15, and 1897, pp. 7–8.

30. Ibid., 1893, pp. 15, 18, and 1895, p. 13.

31. Smart, "Transportation," pp. 35–36; Hoff, "Scheme," pp. 446–47; LaGarde, "Medical Department," p. 585; WD, *ARofSG*, 1894, p. 35, 1895, p. 13, 1896, p. 14, and 1897, p. 6; Coffman, *Old Army*, p. 282.

32. AGO GO 9, 13 Mar 1896, and GO 60, 28 Oct 1897; LaGarde, "Medical Department," pp. 585–86; WD, *ARofSG*, 1896, pp. 14–15.

33. WD, *ARofSG*, 1893, p. 8, 1894, pp. 38–39, 1896, pp. 13 (quotation), 16, 33, and 1897, pp. 40–41; Alden, "Instruction," pp. 94–95; Brinton, "Valedictory Address," p. 599; Edgar Erskine Hume, *The Golden Jubilee of the Association of Military Surgeons of the United States*, pp. 13–14; Karsten, "Armed Progressives," in *Military in America*, p. 249.

34. WD, *ARofSG*, 1893, pp. 22, 63, 102–03, 1894, p. 16, 1895, p. 17, 1897, p. 49, and 1898, p. 28; Coffman, *Old Army*, p. 328.

35. WD, *ARofSG*, 1893, pp. 141–42, 1894, pp. 34, 65–66, and 1896, p. 143 (quotation).

36. Ibid., 1893, pp. 119–20, 125, and 1896, p. 57.

37. Ibid., 1895, p. 26 (quotation), and 1896, pp. 56, 140.

38. Louis C. Parkes, *The Elements of Health*, pp. 29–30; William Osler, "A Study of the Fevers of the

South," p. 1006; WD, *ARofSG*, 1895, pp. 94–95, and 1897, pp. 67–68, 160–61.

39. John S. Kulp, "What To Avoid in Army Athletics," p. 312 (first quotation); James E. Pilcher, "The Place of Physical Training in the Military Service," pp. 170, 173 (second quotation), 178; WD, *ARofSG*, 1893, pp. 138–39, 140–41 (third quotation), 1894, p. 75, and 1895, pp. 98–99; Cassedy, *Medicine in America*, p. 104; Howard E. Ames, "The Hygienic Condition of Enlisted Men as Affected by Moral and Intellectual Influences," pp. 422–24; Coffman, *Old Army*, p. 282.

40. WD, *ARofSG*, 1893, pp. 138–39.

41. Ibid., 1895, p. 43 (first quotation), and 1896, pp. 84–87, 88–89 (remaining quotations).

42. Charles E. Woodruff, "Emergency Rations," pp. 309–44; Louis A. LaGarde, "Notes on an Emergency Ration," pp. 345–51; "The Emergency Ration of the Army," p. 37; "Miscellany—Emergency Rations for the Army," p. 43.

43. Quotation from "Miscellany—Emergency Rations," p. 43; ibid., pp. 42, 44; "Emergency Ration," pp. 37–38.

44. WD, *ARofSG*, 1893, p. 102 (first quotation), 1894, p. 52, 1895, p. 27, 1896, pp. 67, 74 (second quotation), 77, 79, and 1898, p. 39; Bayne-Jones, *Preventive Medicine*, p. 129; Osler, "Fevers of the South," pp. 1002–03; "Are Malarial Diseases Airborne?," p. 943.

45. Quotation from "Public Health—Diphtheria Antitoxin," p. 67; George W. Cox, "Present Status of Serum Therapy," pp. 830–31; H. W. Berg, "The Treatment of Diphtheria, Including Serum Therapy," p. 41; WD, *ARofSG*, 1896, pp. 36–40, and 1897, pp. 58–59; Rothstein, *American Physicians*, p. 278; Hans Zinsser and Stanhope Bayne-Jones, *A Textbook of Bacteriology*, pp. 180–81; William D. Foster, *A History of Medical Bacteriology and Immunology*, p. 102; George M. Sternberg, "Science and Pseudo-science in Medicine," p. 200; idem, *Immunity*, pp. 160, 266–68; Leonard Pearson, "Tetanus," pp. 381, 384.

46. The Widal test took advantage of the fact that the antibodies to typhoid fever found in the blood serum of victims will cause typhoid bacteria to clump. See William H. Welch, "Principles Underlying the Serum Diagnosis of Typhoid Fever and the Methods of Its Application," p. 301; Walter Reed, "Typhoid Fever in the District of Columbia," pp. 145–46; WD, *ARofSG*, 1893, p. 59, 1894, pp. 48–49, 1895, 28–30, and 1898, p. 38.

47. Osler, "Fevers of the South," p. 1001; WD, *ARofSG*, 1895, pp. 27, 31–34, and 1897, pp. 9–12, 79.

48. First quotation from Brinton, "Valedictory Address," p. 604; second quotation from A. T. Cabot, "Science in Medicine," p. 481; Lester S. King, "Germ Theory and Its Influence," p. 797.

49. Quotation from John B. Murphy, "Appendicitis," p. 436; Alfred C. Girard, "Letter From Europe," pp. 319–20, 361–62, 397–98, 435–37, 636–37; WD, *ARofSG*, 1889, p. 44, 1895, pp. 57, 64–65, 1896, pp. 95, 108–16, 1897, pp. 96–97, 109, 114–15, 128–29, and 1898, p. 45; Senn, "Abdominal Surgery," p. 1.

50. Quotation from John M. Banister, "The Radical Cure of Inguinal Hernia From the Standpoint of the Military Surgeon," p. 478; ibid., p. 485; "The Radical Cure of Hernia," p. 506; Sternberg, *Sternberg*, p. 139; Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery From Empiric Craft to Scientific Discipline*, pp. 111–25; Arpad G. Gerster, "How Should the General Practitioner Deal With Strangulated Hernia?," p. 61.

51. WD, *ARofSG*, 1897, pp. 96–97, 99, 109, 128–29, and 1898, p. 45.

52. Ibid., 1895, p. 74, and 1896, pp. 98 (quotation), 102–03.

53. Ibid., 1895, pp. 58, 71 (first two quotations), and 1896, pp. 10, 99 (fourth quotation), 101 (third quotation), 103; SGO Cir 6, 18 May 1895, Entry 66, RG 112, NARA.

54. O'Reilly would become surgeon general in 1902. Welch was not positive that the lesion was malignant, but believed that it probably was. See John J. Brooks, Horatio T. Enterline, and Gonzalo E. Aponte, "The Final Diagnosis of President Cleveland's Lesion," p. 5; Nevins, *Cleveland*, pp. 528–29; Charles L. Morreels, Jr., "New Information on the Cleveland Operations," pp. 542–44; William W. Keen, *The Surgical Operations on President Cleveland in 1893*, p. 30.

55. Keen, *Cleveland*, pp. 1–17, 32.

56. Ibid., pp. 34 (first quotation), 37; Morreels, "Cleveland Operations," p. 547 (second quotation); Nevins, *Cleveland*, pp. 530, 532 (third quotation); Brooks, Enterline, and Aponte, "Final Diagnosis," p. 5; Sternberg, *Sternberg*, p. 136.

57. Brooks, Enterline, and Aponte, "Final Diagnosis," p. 23.

58. WD, *ARofSG*, 1893, p. 13, 1894, p. 13, 1896, pp. 9, 11–12, 1897, pp. 14–16; AGO GO 26, 5 May 1897.

59. Jerry M. Cooper, *The Army and Civil Disorder*, pp. 99, 101–02, 106–08, 115–18, 120. There is also an excellent discussion of the Army's role in civil affairs in Coffman, *Old Army*, pp. 246–54. Un-

less otherwise stated, material on the Chicago aspects of the 1894 strikes is based on Rpts, Daniel G. Caldwell and Alfred C. Girard, and that on the Sacramento aspects on Rpt, Benjamin F. Pope, all in Entry 26, RG 112, NARA.

60. Caldwell Rpt, Entry 26, RG 112, NARA.

61. Ibid.; Telg, S. M. Appel to SG, 5 Jul 1894, Entry 26, RG 112, NARA; Schofield, *Forty-six Years*, p. 495.

62. Girard Rpt, Entry 26, RG 112, NARA.

63. Pope Rpt, Entry 26, RG 112, NARA.

64. Ibid.

65. Cooper, *Civil Disorder*, p. 121.

66. Sternberg, *Sternberg*, p. 158; Mil Svc Card, Benjamin F. Pope, Entry 89, RG 112, NARA.

67. Gibson, *Soldier in White*, pp. 184–85; Sternberg, *Sternberg*, p. 169; WD, *ARofSG*, 1898, p. 103; WD, SGO, *SGO*, pp. 43, 47, 62–63.

Chapter 5

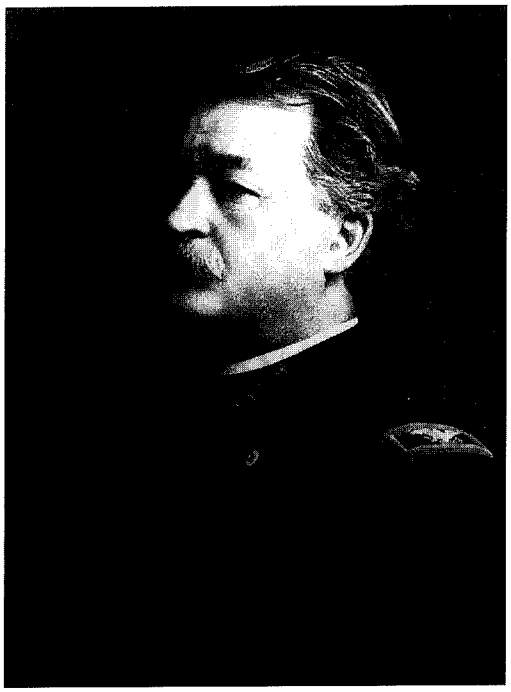
PREPARATIONS FOR CONQUESTS OVERSEAS



"The humane liberty-loving people of the United States have heard the cry of the oppressed starving Cubans for years, and have done all in their power, short of resort to the sword, to relieve their sufferings, but without avail. The ear of the proud, cowardly Spaniard remained deaf to well-meant and most earnest appeals," wrote Col. Nicholas Senn, surgeon general of the Illinois National Guard, not long after war was declared against Spain in April 1898. In his eyes, war, "always a great calamity," became "a weapon in the hand of the Almighty" when waged "for the sake of humanity, for the relief of the oppressed."[1]

The oppressed in Cuba would be the main focus of attention only until 1 May, when an effort to bring pressure on the Spanish in Cuba by threatening their forces in the Philippines resulted in Commodore George Dewey's unexpectedly easy and complete naval victory in Manila Bay. Plans to take over the Spanish empire in the Philippines were then added to those for the conquest of its territories in the Caribbean. The U.S. struggle against the old empire was over almost as soon as it was begun, but the Philippines strongly resisted becoming a part of the new empire. The guerrilla warfare that ensued produced a prolonged challenge both for the Army and for its Medical Department.[2]

When the U.S. battleship *Maine* exploded in Havana harbor on 15 February 1898, the American public blamed Spain and demanded retaliation. Both Congress and President William McKinley were reluctant to take positive steps to prepare for war, however, even under the goading of the abrasive General Miles, now commanding general of the Army. Although the number of medical officers was inadequate for peacetime needs, the possibility of hostilities did not inspire the legislature to vote an increase. The secretary of war specifically prohibited Surgeon General Sternberg from purchasing new supplies until "the question of whether or not there was to be war had been definitely settled." Both Sternberg's directive that supply depots be ready to issue whatever supplies they had and his comment that he had ordered new designs for medical and surgical chests "so as to have them ready for manufacture should the necessity arise" have an almost pathetic ring. Since no decision was made about the size and scope of any campaign until 19 April, when Congress authorized military action against Spain, neither Sternberg nor any of his superiors in the War Department could adequately prepare to meet



NICHOLAS SENN

the requirements of war before the nation was committed to hostilities.[3]

Almost simultaneously with its call for action, Congress authorized both an increase in the regulars from roughly 27,000 officers and men to just under 65,000 and a call for 125,000 volunteers, who were to serve two-year terms. Although the National Guard was not called up as such, National Guard organizations were permitted to volunteer as units, and the nation's young men were not slow to respond. By the end of May the Army numbered more than 160,000, a figure that, after another call for volunteers was issued, reached 275,000 by August. Each of the eight corps that formed this force consisted of three divisions plus independent cavalry and artillery units. A division consisted of three brigades; a brigade, of three 1,200-man regiments. The Medical Department was abruptly required to obtain the supplies and equipment necessary to care for this vast army, to prepare for the evacuation and hospitalization of its sick and wounded, and to instill in the minds of a multitude of neophyte military surgeons an understanding of unfamiliar principles and procedures.

The Medical Buildup

With the declaration of war, Sternberg had to assume administrative duties of great complexity for which nothing in his career had prepared him. As a scientist he had not found it necessary to delegate significant responsibilities to others, and he had continued to follow this general approach in the early years of his tenure as surgeon general. His failure to make major changes in the organization of his office to meet the new challenge suggests that he had difficulty delegating authority, a characteristic of the unskilled administrator. His principal problem, the shortage of trained and experienced doctors, stewards, and hospital attendants, would have been insurmountable in any event.

The chief responsibility for the work of the Medical Department with the forces mobilized for the Spanish-American War, including those sent to the Caribbean, those sent to the Philippines, and those retained in camps in the United States, fell to Col. Charles R. Greenleaf, one of fourteen Civil War veterans still in the department. Greenleaf was designated chief surgeon of the Army in the field and, as such, served on Miles' staff. Greenleaf's duties included determining the organization for medical services in the field, planning for the training of the many neophyte medical officers who joined the effort against Spain, and dealing with any major crisis

concerning the management of supplies and hospitals in the field.[4]

Congress authorized positions for eight corps surgeons and a hundred division- and brigade-level surgeons on 22 April 1898, and on 12 May created spaces for fifteen more regular assistant surgeons. The legislature also allowed for the appointment of as many contract surgeons as were needed, but most of the men called in to serve in either capacity were, like a majority of their volunteer colleagues, strangers to military medicine. Filling these slots was not easy; at the end of May thirteen were still vacant. Since many of the Medical Department's more senior officers were committed to purely administrative duties, even the fall closing of the Army Medical School to free its professors for wartime duties left only a hundred experienced surgeons available for field service and the instruction of new medical officers.[5]

Few of the Medical Department's regular officers had had any experience in preventing disease in large groups of men, and none, not even Sternberg himself, was familiar with the problems of mounting an overseas expedition. Making the best of a bad situation, Sternberg placed those with the most experience in positions where they could guide those with the least. Five Regular Army doctors became chief surgeons of Army corps. Thirty-six served as division or brigade surgeons, leaving only fifty-nine to serve with individual regiments. Three corps and seventy-four division and brigade positions had to be filled by volunteers. They, like all Army surgeons serving in the field, reported to the officers commanding their units, being responsible to Greenleaf only for the professional aspects of their work. Thus the direct authority of the surgeon general was limited to general hospitals, medical supply depots, hospital ships,



CHARLES R. GREENLEAF

and enlisting and assigning hospital corpsmen. To guide the many newcomers upon whom the Army had to depend, Sternberg sent out a revised edition of the *Manual of the Medical Department* that briefly discussed the wartime responsibilities of the Hospital Corps and of medical officers in the field. He also issued a series of circulars outlining the duties of the various positions held by medical officers and detailing appropriate preventive measures, among them sanitary precautions.[6]

The approach to determining the qualifications of the volunteer surgeons for successful duty as military surgeons varied from state to state. State authorities chose the three physicians required by Congress to accompany each regiment, appointing boards to determine their fitness to serve. Few states insisted that candidates undergo physical examinations before joining the Army, and thus some new

medical officers proved unequal to the physical demands of their duties. Although most state boards at least interviewed all physicians seeking to obtain such an appointment, the extent of their inquiry into the candidates' professional skills varied widely from state to state, and some appointments were politically motivated. Homeopaths, who believed that minute doses of medications that produced the symptoms of a disease should be used to treat the disease, appealed successfully to President McKinley for permission to take the examinations and to serve if they passed. Those placed in corps and brigade positions (a few of whom, like Senn, a lieutenant colonel in the U.S. Volunteers,[7] were nationally prominent) were appointed at the national level, thus escaping any requirement for examination to determine either their physical or their professional qualifications.[8]

Service as a member of the National Guard had not fully prepared a physician for service in the wartime Army. The Guard required only that its doctors have medical degrees, this at a time when the nation's medical schools left much to be desired. Thus many physicians with state units were barely competent, if that, in civilian life, although some, like Senn, had received advice and instruction from Regular Army medical officers in the period before 1898. Senn designed thorough physical and professional examinations for those physicians wishing to enter the Illinois Guard, and a few of the National Guard–trained doctors attempted to conduct brief courses for their volunteer colleagues. For the most part, however, regardless of their professional competence, those who had never served in the Regular Army were significantly handicapped when called upon to perform as medical officers. They were totally devoid of any understanding of the administrative work required of them as military surgeons, were unaware of the vital role played by sanitation in maintaining the health of an army, and were unfamiliar with the procedures necessary to acquire and keep adequate stocks of medicines and hospital supplies.[9]

Friction between Regular Army medical officers and those who had only recently left civilian life was inevitable. Many of the latter displayed what a regular medical officer described as the "lack of subordination usual among volunteers." Attempts to give the regimental doctors of volunteer units assignments outside their original units often met with "rebuff or vigorous protest" from regimental commanding officers as well as from the physicians involved. Further exacerbating poor relations was the fact that inexperienced volunteer surgeons were in many instances put in higher positions than regular surgeons, who then found it difficult to guide and indoctrinate their neophyte colleagues, some of whom they regarded as graduates of "one of the inferior medical colleges" and even as "illiterate at the start." Volunteer Senn, on the other hand, looked down upon career Army physicians; he contended that they abandoned efforts to keep up with medical progress after passing the last required promotion exam to earn the rank of major. In some instances, however, the exercise of patience and tact in clearing up misunderstandings led to effective cooperation between regular medical officers serving at the division level and above and the commanding officers of volunteer units.[10]

To fill gaps left vacant by the shortage of military medical officers, the Medical Department signed contracts with civilian doctors. Because of the haste with which

preparations had to be made, the department had to rely on references rather than competency examinations in hiring contract surgeons throughout the Spanish-American War. More than 300 had been hired by the first of August, with the total eventually reaching 650. Some contract physicians were young and inexperienced, and most, like their counterparts in the volunteers, were unfamiliar with the Army's administrative procedures and the specific requirements of military medicine. Their position was characterized by weakness and inconsistencies. Expected to control enlisted corpsmen, they lacked both the military training and the rank that would have enabled them to do so. As "civilians performing the duty of officers," they had "the rights of neither, if it suits the commanding general to deny them." Although they were free of any fear of court-martial because they were subject only to civilian courts, their contracts could be canceled, or, at the very least, not renewed. Many contract surgeons were considered well trained and educated, and one observer noted that they were by and large "temperate in their habits," which Regular Army surgeons, he believed, were not. Even so and despite their achievements during the war, contract surgeons tended to be regarded throughout the Army as "no better than our common packers or civilian teamsters." [11]

The medical officers who participated in the Spanish-American War were initially organized by regiment. Volunteer units were allowed to bring a surgeon, two assistant surgeons, and three hospital stewards with them, while each regular regiment had at least one physician and drew its hospital attendants from the various posts to which its companies had been assigned before the war. The Medical Department's wartime organization in the field was based on that of the Civil War, in which the division hospital became the fundamental unit. A few regimental officers were left with their units to maintain health and determine what soldiers should be sent to the division facility, but most were detailed to serve at the division level. The chief surgeon of each corps was responsible for transforming the organization of the medical staff to meet the new requirements.[12]

Even the physicians directly responsible for care of the Army's patients were required to handle many administrative duties, the performance of which took them away from their patients. Reports had to be filed, requisitions filled out, and records maintained. Regular medical officers sometimes found themselves spending as much as half their time in nonmedical chores, while many of their less experienced colleagues tended to ignore such duties or to make but a half-hearted effort, submitting requisitions in the form of notes on the back of envelopes and omitting other paperwork entirely. Attempts to train volunteer and contract physicians to fill out forms properly and to handle other administrative routines were not always successful. Although Greenleaf apparently set up what he called "schools of instruction" for them, units and their medical officers came and went in some camps with a rapidity that made training impossible. Furthermore, volunteers might have little appetite for learning to do something whose purpose they could not appreciate. The complexity of the Army system greatly discouraged many a former civilian, causing him to abandon the attempt to deal with what he regarded as red tape. A proposal was made, though not acted upon, that a lieutenant of the line be assigned to hospitals to handle administrative details. The

severe shortage of hospital stewards with sufficient experience to assist in the paperwork only made the problem worse.[13]

Providing the wartime Army with an adequate number of either hospital stewards or attendants proved difficult. In increasing the size of the Regular Army in April 1898, Congress neither included a provision for an expanded Hospital Corps nor dealt directly with the question of volunteer hospital corpsmen. The volunteer system, with corpsmen organized by regiment, was not compatible with that of the Regular Army organization, which was formed on an Army-wide basis. Volunteer regiments were allowed three hospital stewards each, but their corpsmen were merely enlisted men detailed to serve as hospital attendants. When a minor change in the law made it possible for a corps commander to transfer from volunteer units to the Hospital Corps twenty-five men for each regiment and fifty more for each division hospital, many regimental commanders once again tended to balk at giving up their men. The adjutant general urged that, following their assimilation into the Hospital Corps, such soldiers be permanently assigned back to their original units. At least one Army corps chief surgeon managed to enlist experienced hospital corpsmen by what was apparently an informal guarantee that they would serve only in that capacity. Erroneously concluding that they would then be committed to three years of service, few of those who had been serving as National Guard corpsmen wished to sign up in the Regular Army. When volunteer units began to disband, authorities decided to let corpsmen who had joined as volunteers go home at the same time as the units with which they had originally served.[14]

The qualifications of the men most often assigned to the Hospital Corps from the line were marginal at best. Many were untrained and inexperienced, although one surgeon found them to be willing workers. Some hospital corpsmen taken from state units were physicians, medical students, or pharmacists in private life, but many were, as so many of their predecessors had been for over a century, "drunkards, epileptics, and other worthless men." Managing such soldiers presented a challenge beyond the talents of the average neophyte medical officer, a problem the chief surgeon of the III Corps met by having a line officer assigned to command his Hospital Corps companies. No time was available to put such a large number of inexperienced troops through the course at the school of instruction at Washington Barracks. This institution, therefore, virtually suspended operations for the duration, except for a few days of orientation, in favor of on-site training at the various general hospitals, and Sternberg had 2,400 copies of a revised *Handbook for the Hospital Corps* issued to assist in Hospital Corps training.[15]

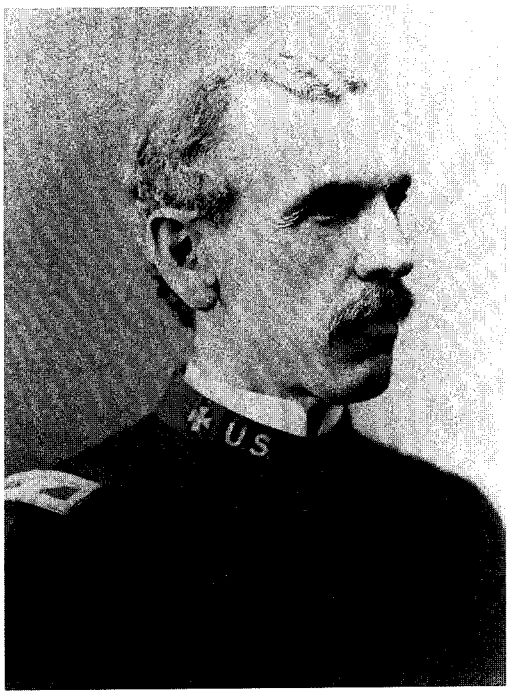
In June 1898 Congress eased restrictions on the number and background of the hospital stewards assigned to the Hospital Corps for the duration of the war, thereby raising the total from 100 to 200. The requirement for a year's service as acting hospital steward before appointment as steward was also eliminated, although the Medical Department considered three months of experience before promotion advisable. Each volunteer battalion was allowed to have an additional hospital steward and each corps an additional 10 beyond that. By the end of June the Hospital Corps consisted of 133 hospital stewards, 172 acting stewards, and 2,940 privates, most of

the latter having transferred from the line. Although 6,000 were serving in the Hospital Corps by November 1898, even this number proved to be inadequate for both an army of occupation in the Caribbean and units that would soon be actively involved in a struggle with the Filipinos.[16]

Initially the Medical Department acted on the assumption that female nurses would be needed only if the conflict proved to be lengthy or severe. Although some historians maintain that Sternberg was reluctant to hire women as nurses, in April 1898 he asked for and received permission from Congress to hire as many female attendants as he might need. In the twenty-five years since the establishment of the first nursing schools in the United States, Sternberg, like many other physicians, had begun to recognize the worth of professionally trained female nurses. Any reluctance on his part to employ them apparently stemmed from his belief that they might be an "encumbrance" should they be sent into the field with an army preparing for action. More than 1,700 contract nurses served at one time or another with the Army during the Spanish-American War; most of them were women, as male nurses were rare.[17]

Obtaining an adequate number of skilled and dedicated nurses remained a problem both throughout the Spanish-American War and, because of epidemics of disease, for months after the fighting stopped. Since no one in the Medical Department had the time to screen applications from women who sought contracts as nurses, the Daughters of the American Revolution offered to assume this responsibility. For a few months Anita Newcomb McGee, a physician and vice-president of the organization, headed a committee that included the wives of both Secretary of War Russell Alger and Surgeon General Sternberg. The members apparently went over the records of all applicants except members of religious nursing orders, who were exempted from the requirement that all nurses be graduates of training schools. They were unable to meet Sternberg's first request, made on 7 May, for four nurses to be sent to the general hospital at Key West, Florida. He wanted women who both met the requirements for training and character and were immune to yellow fever, but only one such nurse could be found. In August, although the active stage of the campaign in the Caribbean was over, "it became necessary to establish an Army Nurse Corps Division of the Surgeon General's Office." McGee became the head of the new organization with the rank of acting assistant surgeon.[18]

Some surgeons were convinced of the inherent worth of female nurses. Senn, for example, noted that "a true nurse is born, not made" and that "few men are born with intrinsic qualities which constitute an efficient, successful nurse." Yet others had serious misgivings, making Sternberg wary of sending nurses to a physician who had not requested them. Army surgeon Col. Dallas Bache believed that men were "more serviceable than women on shipboard, less liable to exhausting sea sickness, requiring fewer facilities and less comfort," and that they were preferable to women on transports and trains as well. Furthermore, "a certain disquiet about morality" inevitably arose when women were present. Small facilities lacked accommodations for them, and their patient loads fluctuated. When the hospital population load fell, nurses had to be able to handle non-nursing duties. As a result, Bache concluded that female nurses should be assigned only to general hospitals. Further complications arose from the fact that the relationship of female nurses to hospital corpsmen was not always good. Nevertheless, at least one department surgeon, future sur-



DALLAS BACHE

geon general Col. William H. Forwood, pronounced "male citizen nurses" to be "worthless." And even Bache eventually praised the accomplishments of female nurses, accepted their help in emergencies, and concluded that the Spanish-American War had established that the Army needed them.[19]

Readying Supply

Because he had ordered before the war began that the supplies the Medical Department had on hand be prepared for distribution, Sternberg was initially somewhat optimistic about the department's ability to furnish all that might be needed; he may have assumed, as so many did, that the campaign would not begin until fall. Although the amount of medicines, stores, and equipment on hand in the spring of 1898 was adequate for the needs of a 27,000-man army in peacetime, Congress' failure to permit peacetime stockpiling for possible wartime needs continually frustrated attempts to provide physicians and hospitals with medicines and equipment once volunteers had been called up.[20]

Thus Sternberg, who was apparently attempting to deal with all supply problems personally, was required to buy enormous quantities at one time and on short notice. He moved quickly to request bids on the most important items, including medical and surgical chests, litters, and field operating cases. He had permission to buy on the open market, but he often could not obtain instruments, medical chests, and the like in this manner. His attempts to speed the process of acquiring the needed items were hindered by what a representative of a relief organization called "the meshes of red tape and requisitionism." Sternberg blamed some of his difficulties on congestion in depots and along a railway network not intended for such burdens. Because the Quartermaster's Department was responsible for most shipping, the Medical Department was powerless to solve the problem. Moreover, forbidden to hire extra personnel and uninformed both about where additional shipments would have to go and about how much would be needed, Sternberg was unable to establish in advance a system for distribution.[21]

Because many volunteer units were not adequately supplied when they arrived in camp, the Medical Department had to draw upon its reserves from the outset. Orders were filled slowly, and regiments that brought medical equipment with them had to rely upon it for some time. The quantities of each item needed were enormous; Sternberg reported in 1898 that he had issued, for example, 272,000 first aid packets, 7,500,000 quinine pills, 18,185 cots



NURSES AT JOSIAH SIMPSON GENERAL HOSPITAL NEAR FORT MONROE, VIRGINIA

and bedsteads with bedding, 23,950 gray blankets, and 2,259 litters. The department was able to provide first aid packets containing antiseptic dressings for each soldier "promptly and liberally." But ambulances, the animals that pulled them, tents, and similar large items were, like railroad transportation, the responsibility of the Quartermaster's Department. Thus the Medical Department had once again to suffer from the failures of another organization, in this instance, one that was also experiencing difficulties related to the general lack of preparedness and a shortage of trained personnel. Ambulances came in slowly, and when they did arrive, they all too often could not meet Sternberg's requirements.[22]

Beyond the problems experienced in obtaining supplies and equipment were those involved in getting them promptly to the medical officers who needed them. On 9 May Sternberg issued a field supply table. When he realized that most of the troops would remain in camps of instruction indefinitely, he also permitted medical officers to order supplies from the regular supply table, which had been drawn up to meet peacetime needs. Inexperienced surgeons underestimated demand, however, ordering inadequate amounts despite Sternberg's warnings on the subject, and because they did not fully appreciate the concept of lead time, they failed to allow for the time that would inevitably elapse between the placing of the order and its arrival. The surgeon general's permission to place emergency orders by telegraph and without his prior approval and to have items shipped by express despite the expense did not solve the problem. Sternberg resorted to telegraphing the nearest depot personally to have the needed items ready



GENERAL HOSPITAL AT FORT MONROE

in the appropriate quantity at the new site whenever he learned that troops were about to be moved or new camps established. Although medical supplies were, on the whole, at least marginally adequate, for a variety of reasons they were not always available. Units on the move often took many of the camp supplies with them, just as they had in the Civil War, forcing the medical officers remaining behind to rely heavily on the aid of charitable organizations. Boxcars laden with supplies were not labeled as to contents, making the job of locating Medical Department property difficult until the bills of lading arrived, possibly days later.[23]

To deal with the supply problem as rapidly as possible, Sternberg ordered the New York and St. Louis depots in early May to prepare at once to meet the needs of 100,000 troops for six months, using the new field supply table as a guide. He also had a subdepot established at Chickamauga, Georgia, to supplement the department's depots in New York, St. Louis, and San Francisco. St. Louis supplied the Chickamauga subdepot and camps in Tennessee, Kentucky, Alabama, and Louisiana and sent the San Francisco depot some items needed for the Philippine expedition. Medical officers with troops involved in the Caribbean effort, as well as those remaining in Florida and in large camps in the East requisitioned supplies from the New York depot.[24]

The pressure on these depots proved to be extreme. Storage facilities in New York City were totally inadequate for wartime. One witness reported that, in spite of the rental of extra space, for more than nine months, half the activity at the depot took place "on the sidewalk, thousands of packages being received, marked, and shipped to their destinations therefrom." In an attempt

to alleviate the burden borne by the New York depot, the Medical Department began to buy directly from dealers in Washington, D.C., Philadelphia, and Baltimore for troops at Camp Alger, Virginia, and for the general hospitals at Forts Myer and Monroe and at Washington Barracks. This move also guaranteed faster delivery on needed items. But the effects of slow transportation were exacerbated by the Quartermaster's Department's custom of mixing medical with nonmedical items in its boxcars.[25]

Organizing a Hospital System

Both the size and the organization of the Army gathering for the war with Spain dictated the development of a new system for providing hospital care in the field. The peacetime system had been based almost entirely on post facilities, which sooner or later received those who were wounded or who fell ill in the field during the Indian wars. The regimental hospital, too large for the peacetime Army and too small for Civil War armies, had been officially abolished in 1862. Surgeon Jonathan Letterman's success in the Civil War suggested that for future conflicts, a systematized approach to medical evacuation and hospitalization should be developed.[26]

The task of designing the Medical Department's approach to the management of evacuation and hospitalization for the Army in the field fell to Greenleaf. He decided to rely on the division facility, proven more effective than the regimental hospital during the Civil War and familiar to Civil War veterans as a field hospital that accompanied the division wherever it went. Each was to hold 200 beds and be manned by 6 officers and 99 enlisted. Three of these facilities, plus a fourth held in reserve, were to be allotted to each Army corps. An ambulance company of 6 officers and 114 men was to be attached to each, ready in time of battle to remove the wounded by litter to dressing stations and thence by ambulance to the hospital. Unfortunately, assuming that the department would draw upon the regimental staff to obtain division hospital personnel, Congress precipitated future controversy by never addressing the problem of staffing the division facility.[27]

The chain of evacuation in this scheme, which was in principle like that developed by Letterman in the Civil War, involved litter-bearers that picked up the wounded on the field and took them to collecting stations, at least one per division, two to three miles back of the front, where they would receive first aid. The casualties would then be loaded on ambulances for a two- to three-mile trip to a field hospital further to the rear. With the battle over, details would search the field and bring any wounded they found back to the collecting stations, where hospital corpsmen would assume responsibility for their care and further transport. This system Greenleaf believed to be much more flexible than the regimental hospital system.[28]

Outside the division hospital staff, a medical officer, a hospital steward, and a Hospital Corps private were to remain with each regiment, caring for soldiers with minor ills in a facility that resembled a dispensary more than a hospital. Each corps had not only a chief surgeon but also a medical inspector, this position being one that was abolished at the end of the Civil War. Each of the three divisions and nine brigades in the corps had a chief surgeon. Together with the forty-eight surgeons assigned to division field hospitals and ambulance companies, this brought the total

number of physicians with a corps that might in theory have as many as 32,000 men to a minimum of eighty-nine. Since volunteer regiments sometimes brought up to three surgeons with them, the corps chief surgeon could hope that he would have additional physicians to cover for those who became ill or were for other reasons unable to serve. This form of organization appeared to offer the most efficient use of both personnel and equipment, although chief surgeons were authorized to deviate from it if necessary.[29]

The old arguments concerning the relative merits of the regimental hospital and a larger facility dated back to the days of the Continental Army. It arose early in the Spanish-American War because each regiment arrived at the huge new camps with at least the rudiments of its own hospital. After the regiments had been organized into brigades and divisions and with disease rates mounting, the Medical Department moved to disestablish the regimental facilities in favor of hospitals at the division level, intending that only patients retained in their quarters be treated at the regimental level and that any personnel, supplies, and equipment in excess of that needed for the dispensary be given to the division hospital.[30]

In spite of the greater efficiency of the larger institution, the decision to abandon the regimental hospital system remained an unpopular one, even at the War Department level. The strength of the opposition, which included volunteer medical and line officers as well as state governors, delayed the formation of division facilities. Regiments often did not have enough medicines and supplies to contribute to a division hospital. Regimental commanders and medical officers resented the threat to their independence, in one instance regarding the establishment of a division hospital as a power play by the corps chief surgeon, a Regular Army medical officer. The sick objected to hospitalization in the division hospital, and regimental surgeons tended to retain them under their own care as long as possible, even resorting to sending patients to boarding houses rather than to division hospitals. Some line officers maintained that the siphoning off of two-thirds of their medical staffs for their division hospitals was to blame for the poor sanitation in their units.[31]

Greenleaf was responsible only for planning the medical care and evacuation for units in the field. General hospitals and hospital trains remained under the direct control of the surgeon general. Sternberg opened general hospitals only as the need for them developed, often by expanding existing facilities. By 30 September he had established ten general hospitals in the United States, one of which was the Josiah Simpson General Hospital, for wounded and sick soldiers returned from Cuba and Puerto Rico. On 30 May he also recommended that arrangements be made for a ten-car hospital train of "tourist sleepers and a dining car." Trains were already removing from Tampa, Florida, men too sick to embark for Cuba when this proposal was approved on 16 June and ten Pullman sleepers, a private car, a "combination car," and a dining car were assigned to the Medical Department. In addition to the surgeon in charge, the train's medical staff consisted of an assistant surgeon, two hospital stewards, twenty Hospital Corps privates, and three civilian employees.[32]

The hospital train's first run began in Washington, D.C., on 17 June and ended in Tampa two days later. From Tampa the train then took patients to Fort McPherson, Georgia, where tourist sleepers, which were

better arranged for the purpose and better ventilated, replaced the Pullmans. Although the slow response of local quartermasters to requests for transportation initially caused irregularities in schedules, on 4 July the appointment of the assistant surgeon accompanying the sick, who was motivated to give high priority to hospital trains, as assistant quartermaster eased the problem. The train continued in service until the spring of 1899, carrying as many as 270 patients on a single run. From time to time it took patients to the general hospitals at Forts Thomas (Kentucky), Monroe, Myer, and McPherson; to that at Washington Barracks; and even to the post hospital at Plattsburg Barracks in New York.[33]

Launching the Cuban Expedition

Although thousands of men assembled at the various camps in the southern United States in anticipation of the invasion of Cuba, only the V Corps,[34] initially stationed in the Tampa area, fought there. As organized in early May, it was to be a 6,000-man force for small-scale raids and incursions that would be used to supplement a naval blockade of the island. Under the command of William R. Shafter, a major general in the volunteers, it grew to include 25,000 men, 17,000 of whom were in Tampa by the twenty-fifth, most of them regulars, accustomed to discipline and familiar with the demands of camp sanitation. Neither Surgeon General Sternberg, an expert on yellow fever, nor General Miles could convince President McKinley to postpone the invasion of Cuba until the fall, when the threat from that disease would be dwindling. In the end, the timing of the invasion and the location of the landing site were based solely on the U.S. Navy's urgent need to capture or destroy the guns guarding the Spanish fleet, bottled up in the harbor of Santiago but still capable of slipping by the U.S. ships guarding the harbor mouth. Shafter was not informed of his specific mission until the end of the month. Indecision at the highest levels resulted in a change of objective from Havana to Santiago at almost the last moment and made a shambles of efforts to plan for the most effective use of Shafter's force.[35]

The V Corps' chief surgeon was Benjamin F. Pope, who now held a volunteer commission of lieutenant colonel. The burden of managing the medical support of such a hastily organized and poorly planned operation must have been particularly heavy after his 1886 failure in managing the Record and Pension Division of the Surgeon General's Office. Under Pope served doctors of varying qualifications, an average of more than 4 for every 1,000 men, among them 36 regimental medical officers, 15 volunteer surgeons, and 20 contract surgeons. In this last group was Acting Assistant Surgeon Guiteras,[36] who had worked with Sternberg on the Havana Yellow Fever Commission in 1879 and was regarded as an authority on yellow fever and other tropical diseases. Guiteras was assigned to work with Pope at V Corps headquarters. Chief surgeons at the division level were Majors Marshall W. Wood of the 1st Division, Henry S. Kilbourne of the 2d, and Valery Havard of the Cavalry Division.[37]

To meet the needs of the V Corps in battle, Pope modified the organization of his hospital corpsmen to achieve greater flexibility, dividing them into three rather than four companies, all to be under his direct control rather than that of the division chief surgeons, with each company commanded by a medical officer of his choice. Only a few men were to be assigned to

work with unit surgeons as orderlies. In the event of battle, each division would have a minimum of one ambulance station two to three miles back of the front and a complete field hospital another two to three miles back of the station.[38]

Although the V Corps ambulance companies were still not completely staffed or equipped when the invading force embarked for Cuba, the division hospital system had now been in place for some time. The hospitals that regiments brought with them to Tampa were gradually absorbed into four division facilities until most of the latter had beds for 150 or more patients. Since most regimental surgeons of the V Corps were regulars, this process aroused little opposition. Orders were issued on 6 June, however, that two tents, an ambulance, and two members of the Hospital Corps be kept at the regimental level. Maj. Louis A. LaGarde and his three assistant surgeons, including future surgeon general Capt. Merritte W. Ireland, set up the reserve division hospital at Port Tampa. As the senior medical officer in Port Tampa, LaGarde was also required to supervise the work of the medical officers with units stationed there. The remaining three division hospitals, each with a fully equipped operating room complete with steam sterilizers and enameled steel folding operating tables, were set up at Tampa under Maj. Wood, who managed his 1st Division's hospital personally, Maj. Aaron H. Appel with the 2d Division, and Maj. George McCreery with the Cavalry Division.[39]

Pope considered the health of the command in Tampa to be good before the invasion, despite a typhoid outbreak and the appearance of both measles and a mild diarrhea that was blamed on the change of climate. Because medical officers traditionally isolated patients with measles as soon as their condition was known, this disease never became epidemic. The form that prevailed in 1898 was mild, causing no real difficulty for medical officers. Typhoid was apparently less widespread than at other camps, probably because the regular troops who formed most of the command were more careful about sanitation than the volunteers who predominated at other large camps in the East. Measles and typhoid patients were kept in Tampa, but the victims of syphilis, a few patients with rheumatism, and some typhoid convalescents were sent north to Fort McPherson.[40]

Concern for the future health of the command when it was serving in the tropics caused guidelines about the prevention of disease to be issued before the invasion. Guiteras, who formulated the advice given out to the troops, was skeptical about the ability of quinine to prevent malaria but recommended it for those occasions "when the individual is subjected to extraordinary depressing influences." He advocated eating many tropical fruits and vegetables; limiting the intake of alcohol, which was "specially deleterious in the tropics"; and boiling all water that was not taken "directly from the springs." Guiteras believed that yellow fever was "not directly transmissible," but that rooms and tents could become infected and that, therefore, hospitals and their populations should be separated strictly from the rest of the force. Additional suggestions offered by Pope included warnings not to "take purgatives when the bowels are regular" and to "peel all fruits before eating." He noted that dry socks were important for healthy feet. The role of mosquitoes in malaria had just been revealed months earlier and their role in yellow fever was still unknown, but Pope also warned that all men should "protect [themselves] from mosquitoes by gloves and nets."[41]

Adequate supplies were necessary to any successful campaign against disease. The need to move medicines, dressings, wagons, ambulances, and animals to and then from Tampa caused significant problems from the outset. Tampa had been chosen as a base when plans called for a small invasion force. As the size of this force grew, so did the congestion and confusion. Two single-track railroads served the base, but only one ran to Port Tampa, where the transports awaited loading. Moreover, the Quartermaster's Department contributed to supply problems through inadequate methods of loading and labeling cargo and a failure to provide more than a few of the wagons needed to move supplies from freight car to ship. The resultant delays in unloading freight and then removing it from the railhead led to a rapid backup of supplies at the Tampa station.[42]

Supply problems grew with the arrival of volunteer regiments without all of the medicines and surgical dressings they needed or the wagons and animals to move them in the field. Because Pope had to provide for these units, he was unable to build up a significant reserve of the required items. In early May he placed a large order and assigned an assistant surgeon to expedite deliveries by serving as acting medical supply officer at Tampa. By late May, however, the supplies Pope had on hand were almost exhausted. His request for permission to buy locally for volunteer units was granted, but by 2 June little was left in the Medical Department depot at Tampa. Three days later, although "freight traffic was almost hopelessly blockaded," part of what Pope had ordered arrived.[43]

One of the most needed items was quinine, which Pope had been ordered to supply to the rebels already fighting the Spanish in Cuba. On 28 May his stocks were further depleted by an order that he supply 300,000 quinine pills to the U.S. Navy and that he rely on local purchases until Sternberg could get another shipment to him. A week later Pope noted that the amount of quinine he had on hand was sufficient "to meet all possible demands."[44]

As the time for embarkation approached, the confusion was great and growing. Uncertainty about the timing of the invasion exacerbated the difficulties involved in preparing for it. With only one pier available for loading, long backups were inevitable. Although on 7 June Shafter was ordered under way as soon as possible, regardless of what might have to be left behind, the expedition's departure was delayed for several days because of false rumors that the Spanish fleet had escaped from Santiago. Unsure about when the ships would leave, Pope became so concerned about his medical supplies that he went to the Tampa warehouse with two hospital corpsmen at midnight of 8–9 June and personally loaded two wagons with supplies, which he then placed on the train for Port Tampa. He ordered his medical supply officer to send a third wagon load to Port Tampa on the ninth. Half the remaining stores formed a reserve to be taken with the expedition, and the other half was left for the use of newly arriving volunteers.[45]

Although Pope had managed, despite the handicaps under which he worked, to have adequate supplies, equipment, and animals on hand at Tampa when embarkation began on 7 June, much of his effort was frustrated, often because the Medical Department had no choice but to rely upon the Quartermaster's Department to deliver the necessary supplies. Medical items were placed in the ships in a random fashion, without regard to when they might be needed, and regimental supplies were not

necessarily loaded in the same vessel as the unit to which they belonged. The quartermaster general's reluctance to obtain transports until he could be sure of how many would be needed added further to the confusion, since he then had to act in haste at the last moment. Because of the inadequate size and number of these vessels, much of what Pope wanted to take, including tents, ambulances, and wagons, was left at Tampa. Time may also have been a factor in leaving ambulances behind, yet Pope and LaGarde both blamed a lack of adequate space, a conclusion in which others concurred. Some of the reserve supply from the warehouse was placed on the headquarters ship and eventually ended up on the *Olivette*, a transport taken over for use as a hospital ship and equipped to handle at least 280 beds. Because most of the Medical Department's supplies in Tampa had already been divided among the medical officers, this reserve was not large.[46]

The vessels upon which the V Corps was embarking had been obtained under the assumption that the landing would be at Mariel, less than two days away, rather than at the southeastern tip of the island, 1,000 miles and almost a week's voyage from Tampa. Matters were further complicated when authorities adopted a British formula for space per man intended for troop transports rather than the converted freighters and passenger vessels available to Shafter's force. As a result, many more soldiers were placed aboard each vessel than it could carry without endangering their health, especially if they were on it for many days. The rough lumber bunks were crowded so close together that, should the hatches ever be closed, "light and air would have been totally excluded and suffocation [would] quickly result."[47]

Heeding warnings from the medical officers responsible for health on board these vessels during embarkation, at the last moment Shafter ordered that 900 men still on the shore not be permitted to board. When the delay in sailing continued, he had a total of 1,000 or more men already on the transports removed. Those who remained on the ships that rode at anchor in the harbor until 13 June suffered because of the heat and poor ventilation, uniforms not designed for extremely hot weather, a monotonous travel ration, and an inadequate water supply. Although Shafter allowed the men off the ships in detachments for exercise, they were not permitted to remain on shore because no satisfactory campsite could be found near the harbor.[48]

Since the refitting of the *Relief*, a vessel belatedly purchased in May for use as a hospital ship, had not been completed when men began to fall ill, the *Olivette*, which had been functioning as the fleet's water-carrier, had to serve in her place. Appel's 2d Division hospital and the medical supplies from the headquarters ship were moved to the *Olivette*, and those who became more than mildly ill were taken to her in small boats, a process Pope described as "often . . . slow and difficult." Once the other ships had set sail for Cuba, the *Olivette* unloaded her measles and fever patients to make room for the wounded that would result from the campaign and headed south.[49]

After days of confusion and with 815 officers, 16,000 men, 1,000 mules, and 1,000 horses on board, thirty-one vessels finally moved out of Tampa Bay onto a sea that was, fortunately, "smooth as glass." Pope was particularly grateful for the fact that the water remained calm while they were under way, since otherwise the "suffering from sea sickness and the foul air of the

unventilated holds would have been intolerable." Even so, when the expedition arrived at its destination on 20 June, 100 patients, most of them suffering from measles or typhoid, had been taken aboard the *Olivette*.[50]

The supply problems with which Pope had been contending cast a long shadow; a matter so badly begun was scarcely likely to end well. Ignoring Guiteras' warning about mosquitoes would also prove to have serious consequences; these precautions apparently seemed to the average man more trouble than they were worth. Clearly, both Pope and Guiteras had done what they could under the circumstances to prepare for the care of the sick and wounded of the V Corps during the campaign in the Caribbean.

Launching the Philippine Expedition

While General Shafter and his V Corps prepared for the invasion of Cuba, the Philippine Expeditionary Force (which by the end of June would become the VIII Corps) was gathering at San Francisco under the command of Maj. Gen. Wesley Merritt, who had also been named commander of the Department of the Pacific,[51] to launch a land attack on Manila to exploit Commodore Dewey's naval victory. Plans for Merritt's command were also changed several times, and its size escalated from 5,000 to 20,000 men. Its first components sailed more than two weeks before the V Corps left Florida, but while Shafter's objective shifted from Havana to Santiago, Merritt knew from the outset that Manila was his goal. Furthermore, San Francisco was already a major supply depot and a sizeable city with a widespread transportation network, and Merritt was a more skilled administrator than Shafter. As a result, the Medical Department was better able to provide care for the sick and wounded of the Philippine expedition than for those who fell ill or were injured in Cuba.[52]

When the force that would undertake the conquest of the Philippines was first ordered to gather at a camp, soon known as Camp Merritt, on high ground on the western side of San Francisco, plans called for it to consist of 5,000 men, most of them volunteers. Even when the entire VIII Corps had been formed, only a quarter of the men were regulars, and sanitation presented problems as it had at every other camp where eager neophyte soldiers and their inexperienced officers gathered. Typhoid as well as the inevitable measles soon appeared. Nevertheless, in July, when a broad-based program of immunization for smallpox was undertaken, disease had not yet become a serious problem, in spite of what Sternberg called the "crowded condition of the camp, the inexperience or carelessness of responsible officers and the unfavorable circumstances of season and location generally." An increase in the number of pneumonia cases, blamed on the cool ocean breezes and chill mists that settled about the site, caused the War Department to order the camp abandoned in favor of the Presidio of San Francisco, "one of the most beautifully situated and one of the most healthful military posts in the world."[53]

The medical personnel assembling in San Francisco were adequate in number to meet the force's needs until it reached the Philippines and faced active combat. Making sure that enough hospital corpsmen accompanied the expedition when it sailed was a problem for the expedition's chief surgeon, Lt. Col. Henry Lippincott. Hospital stewards from several geographic department commands within the United



HENRY LIPPINCOTT

States joined the three who arrived with each volunteer regiment of Merritt's command, but only seventy-five privates had reported for duty before the first men left for the Philippines. After a certain amount of confusion about the status of the attendants in volunteer units, Lippincott, known for his considerable "administrative ability, . . . professional acquirements, [and] capacity for work," finally received authority to have them all transferred to the Hospital Corps. In this way he could obtain enough attendants both for the Camp Merritt division hospital and for those who fell ill on the transports on their way to the Philippines. Despite Lippincott's efforts and the lowering of "the requirements as to intelligence somewhat," the VIII Corps was able to acquire only half the number of authorized hospital corpsmen.[54]

Medical supply also presented difficulties. In planning for embarkation, Lippincott hoped to have each regiment supplied with medical chests by the time it boarded the transports. But when the first units to leave San Francisco sailed on 25 May, the volunteer regiments had "no chests of any description nor any hospital equipments." One of the regular surgeons, unhappy over what he regarded as the inadequacy of his supply of instruments, became embroiled in an argument (which he apparently lost) with Sternberg. When Lippincott arrived in the city, the first units were already embarking. Because of his efforts, combined with those of the San Francisco medical purveyor, the second contingent to leave for the Philippines and all regiments leaving thereafter were supplied with both medical chests and a month's worth of supplies for use on the transports, with another six months' worth in reserve. The ships were carefully loaded, with items most likely to be needed first placed where they could be quickly reached.[55]

Lippincott, like Pope and Guiteras, attempted to educate the troops about disease prevention by issuing a pamphlet about the health problems they might encounter on the transports and at their destination. He emphasized the importance of sanitation, pointing out that "preventable diseases are due to living germs, which flourish in tropical countries like all other plants which require warmth." Cleanliness and keeping dry were especially important. Work during the heat of the day should be avoided when possible. Like Guiteras, he also warned against mosquitoes, which "have been accused of causing malaria"; against flies; and against "a small red insect, or jigger, which burrows in the skin." He added that "the natives are notoriously careless of all sanitary laws, and are infected with numerous diseases. Intercourse with them will be dangerous," especially be-

cause venereal disease was common among the villagers. He issued no warning about yellow fever, since it had never afflicted the population of the Philippines.[56]

The actual journey to reach the Philippines posed a considerable challenge, but the transports that Merritt had obtained to carry the men of the VIII Corps on the month-long voyage to Manila were, fortunately, more suited to the purpose than those available to Shafter's V Corps. The first vessels to set sail carried 2,500 officers and men under the command of Thomas M. Anderson, recently promoted to brigadier general in the volunteers. The vanguard was to be followed by two more contingents a few weeks later; more than 10,000 men had arrived when the Spanish surrendered Manila in August. With the vanguard were a regular medical officer and seven volunteer surgeons, who had "practically no experience in anything pertaining to their duties, except the professional care of the sick and wounded." The shortage of hospital attendants made it impossible to provide as many as Lippincott believed necessary for a voyage that would take longer than a month. Except for the three stewards allowed each of the two volunteer regiments involved, only one steward and five Hospital Corps privates accompanied Anderson's command, all assigned to a regular infantry regiment. Lippincott soon discovered, however, that the situation was not as bad as he had assumed, for in each volunteer unit were twenty-four men who, having been detailed to hospital duty, could serve as corpsmen.[57]

The length of the voyage dictated greater care with sanitation than had been required for ships bound for Cuba. Before each vessel was leased, a medical board inspected it. Before the soldiers boarded her, each ship was thoroughly cleaned and, when deemed advisable, disinfected. Although additional latrines were installed on many ships before the troops came aboard, Lippincott's goal ratio of at least 20 seats for every 1,000 men was not always reached. Since water supplies were limited on some transports and the men preferred showers, which were not available on all ships, personal cleanliness suffered. Dampness, inadequate ventilation, crowded sleeping quarters, and mattresses that teemed with vermin also caused the chief surgeon concern. But drinking water, largely derived from condensers, was good, and food, while not always well cooked, was officially considered of acceptable quality. At least one soldier, however, later recalled that on his transport he was served "rotten prunes and fruit, which, after nearly all the supply was consumed, was found by our surgeon to be full of worms." For those who fell ill on the voyage, hospital facilities varied since not every ship had space that could be set aside to meet Lippincott's standard of 30 hospital beds for every 1,000 men plus two small rooms to accommodate an operating room and dispensary.[58]

Despite the difficulties, Lippincott's efforts to ensure a healthy voyage were rewarded. The annual death rate from disease during the month-long voyage to the Philippines was 1 in 1,000. With every group of transports that sailed for the Philippines, however, some men invariably became too ill en route to continue the voyage. In Hawaii, formally annexed by the United States on 7 July 1898, the American Red Cross attempted to care for these patients with the aid of any Medical Department personnel who could be left behind, but it soon became obvious that continued reliance upon this approach would be unwise. Facilities specifically for the Army's sick were necessary, for the sake both of the ailing soldier and of vulnerable Hawaiians who might be exposed to

diseases to which they had little resistance. In early July, when Lippincott's ship stopped in the islands, he arranged to set up an Army hospital at Honolulu. The initial site proved malarious, however, and since larger accommodations were soon necessary, land was rented and a 100-bed hospital built at a healthier location. As the Army moved increasing numbers of men to Honolulu, more medical officers and more medicines and hospital equipment were also sent to Hawaii, which became an important stopover point for the sick and wounded of the VIII Corps.[59]

The health of the men about to land in the Philippines, like that of those ready to go ashore in Cuba, would depend largely on efforts that had begun only in mid-April, with little chance for planning and even less for stockpiling supplies and equipment. In its attempt to care for thousands of soldiers, most of them enthusiastic amateurs, the Medical Department was handicapped both by its own lack of preparation and by that of the organizations upon which it had to rely. With more time at their disposal, Lippincott and the medical officers of the VIII Corps were able to surmount most of the difficulties that confronted them, but the haste and confusion that marked the planning of the campaign in Cuba would haunt the V Corps from Tampa all the way to Santiago.

NOTES

1. Nicholas Senn, *Medico-surgical Aspects of the Spanish American War*, pp. 9–10.

2. Unless otherwise indicated, all material in this chapter is based on Graham A. Cosmas, *An Army for Empire*.

3. First quotation from United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 1:169 (hereafter cited as *Dodge Commission Report*); second quotation from War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1898, p. 103 (hereafter cited as WD, *ARofSG*, date); Nelson A. Miles, *Serving the Republic*, p. 269; Walter Millis, *The Martial Spirit*, pp. 162–64; James L. Abrahamson, *America Arms for a New Century*, p. 60; James A. Huston, *The Sinews of War*, p. 276; Erna Risch, *Quartermaster Support of the Army*, pp. 519, 523; Report of Commission To Investigate the Conduct of the War, pp. 65–66, 68, Microfilm Reel 6, William R. Shafter Papers, Stanford University, Palo Alto, Calif. (hereafter cited as Com Rpt, Mf Reel no., Shafter Papers, SU).

4. *Register of the Army of the United States for 1898*, pp. 20–29.

5. WD, *ARofSG*, 1898, pp. 100–101, 137–38, and 1899, p. 19; Hermann Hagedorn, *Leonard Wood*, 1:144–45.

6. WD, *ARofSG*, 1898, pp. 100, 105, 138, 140–42; SGO Cir Ltr, 25 Apr 1898, Entry 66, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; *Dodge Commission Report*, 7:3125, 8:38–39.

7. The U.S. Volunteers were drawn from the nation as a whole, rather than from individual states.

8. Martin Kaufman, *Homeopathy in America*, pp. 25–26; "Homeopaths for the Army and Navy of the United States," p. 1430; Nicholas Senn, "Qualifications and Duties of Military Surgeons," p. 505.

9. WD, *ARofSG*, 1898, pp. 139, 159, and 1899, p. 76; Senn, *Aspects*, pp. 20–22, 28–29, 256, 295; *Dodge Commission Report*, 1:169–70, 3:315, 346, and 6:2816; Edward L. Munson, *The Theory and Practice of Military Hygiene*, p. 943; idem, "Contract Surgeons in the United States Army," p. 588; Com Rpt, p. 66, Mf Reel 6, Shafter Papers, SU; "Army Medical Department," p. 206; John K. Mahon, *History of the Militia and the National Guard*, p. 126.

10. WD, *ARofSG*, 1898, pp. 157, 160, 166 (second quotation), and 1899, pp. 52–53 (first quotation); Champe C. McCullough, "The Qualifications, Responsibilities, and Duties of the Regular Army Surgeon," p. 498 (remaining quotations); "Disparagement of the Regular Army Surgeons," p. 378; "Some of the Medical Lessons of the War," p. 485; Rpt, Ch Surg, Second Army Corps, pp. 16–17, Entry 219, RG 395, NARA.

11. WD, *ARofSG*, 1898, pp. 100–101, 157, 160 (first two quotations); Wickes Washburn, "Montauk Point and the Government Hospitals," p. 805 (third quotation); "Army Contract Surgeons," p. 416 (fourth quotation); "Army Medical Department," pp. 201–02; *Dodge Commission Report*, 1:635, 4:1253; Munson, "Contract Surgeons," pp. 588–89; Com Rpt, p. 66, Mf Reel 6, Shafter Papers, SU; Rpt, Ch Surg, Second Army Corps, p. 18, Entry 219, RG 395, NARA.

12. WD, *ARofSG*, 1898, p. 115.

13. *Dodge Commission Report*, 1:609 (quotation), 3:192, 668–69, 4:1146–47, 1337, 1413, and 6:2975, 2982–83, 2987.

14. Dallas Bache, "The Place of the Female Nurse in the Army," pp. 308, 310–11; WD, *ARofSG*, 1898, pp. 101–02, 115, 121, 148–49, 157, 165, and 1899, pp. 51–52; Senn, *Aspects*, pp. 57, 60; *Dodge Commission Report*, 4:1251, 6:2529; Com Rpt, pp. 66–67, Mf Reel 6, Shafter Papers, SU; George E. Bushnell, "The Expansion of the Hospital Corps in War," pp. 145–46. The terms *chief surgeon* and *medical director* were apparently used interchangeably.

15. WD, *ARofSG*, 1898, pp. 101, 158, 167 (quotation), and 1899, p. 21; H. A. Haubold, "The Medical Aspects of Camp Management at Chickamauga," p. 586; Jefferson D. Griffith, "Hospital Experience in the War With Spain," pp. 162–63; Bushnell, "Expansion," pp. 146–47; James B. Agnew, "Carromatos and Quinine," p. 14.

16. WD, *ARofSG*, 1898, p. 148, and 1899, pp. 19–21; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 49 (hereafter cited as WD, SGO, *SGO*).

17. Quotation from George M. Sternberg, "The Medical Department of the Army," p. 213; ibid., p. 214; Susan M. Reverby, *Ordered To Care*, pp. 5, 50; Senn, *Aspects*, pp. 313–15; WD, *ARofSG*, 1898, pp. 102, 121, and 1899, p. 24; idem, *[Annual] Report of the Secretary of War*, 1898, 1(pt.1):179 (hereafter cited as WD, *ARofSW*, date); Bache, "Female Nurse," p. 318; Ltr (copy), Anita Newcomb McGee to SG, [28 Apr 1898], in Anita Newcomb McGee Journal, Entry 229, RG 112, NARA; *Dodge Commission Report*, 1:77, 7:3168; "Trained Female Nurses for the Army," p. 329.

18. WD, *ARofSG*, 1898, p. 102, and 1899, pp. 24–25; Bache, "Female Nurse," p. 316; *Dodge Commission Report*, 7:3168–72; Senn, *Aspects*, p. 320; in RG 112, NARA: McGee Journal, Apr–May 1898, Entry 229, Extract from *American Monthly Magazine*, Entry 229, and Narratives, [Anita Newcomb McGee], pp. 9–12 (quotation), Margaret Dunn, and Margaret Berry, Entry 230.

19. Senn, *Aspects*, pp. 314 (first two quotations), 318–19; Bache, "Female Nurse," pp. 307–09, 316, 319–20 (third quotation), 321–22 (fourth quotation), 323, 325; *Dodge Commission Report*, 2:752 (final quotations); Narrative, Esther V. Hasson, Entry 230, RG 112, NARA; WD, *ARofSG*, 1898, pp. 238, 260, and 1899, pp. 52, 74; Com Rpt, p. 67, Mf Reel 6, Shafter Papers, SU.

20. Martha L. Sternberg, *George Miller Sternberg*, pp. 169–70; "Army Medical Department," pp. 202–03.

21. *Dodge Commission Report*, 1:712, 5:2319, 6:2816, and 7:3117, 3128 (quotation); WD, *ARofSG*, 1898, p. 103; Graham A. Cosmas, "From Order to Chaos," p. 120; Com Rpt, pp. 69–70, Mf Reel 6, Shafter Papers, SU.

22. Sternberg, *Sternberg*, pp. 170–71 (quotation); Risch, *Quartermaster Support*, pp. 538, 556; WD, *ARofSG*, 1898, pp. 103–05, 149; idem, *ARofSW*, 1898, 1(pt.1):179; *Dodge Commission Report*, 1:638, 712–13, and 3:192, 552; Bache, "Female Nurse," pp. 317–18; Com Rpt, p. 68, Mf Reel 6, Shafter Papers, SU. The concept of the first aid packet was not new. Apparently, Roman soldiers used a first aid packet as early as the second century B.C. (see WD, SGO, *SGO*, p. 26).

23. Charles Smart, "Correspondence," pp. 546–47; WD, *ARofSG*, 1898, pp. 103–04, 144; *Dodge Commission Report*, 1:173–74, 7:3117; Com Rpt, pp. 69–70, Mf Reel 6, Shafter Papers, SU; SGO Cir 6, 12 Aug 1898, Entry 66, RG 112, NARA.

24. Sternberg, *Sternberg*, p. 170; WD, *ARofSG*, 1898, pp. 103, 105–06.

25. J. Morris Brown, "Organization and Conduct of a United States Army Medical Supply Depot," pp. 283–84 (quotation); Risch, *Quartermaster Support*, p. 541; WD, *ARofSG*, 1898, p. 104; *Dodge Commission Report*, 1:173–74.

26. *Dodge Commission Report*, 1:571.

27. William H. Devine, "Management of a Field Hospital," p. 97; Charles R. Greenleaf, "The Organization of the Medical Department of the Army in the Field," p. 201; WD, *ARofSG*, 1898, p. 148.

28. WD, *ARofSG*, 1898, p. 208; Greenleaf, "Organization," p. 201.

29. WD, SGO, *SGO*, p. 51; WD, *ARofSG*, 1898, pp. 164–65; *Dodge Commission Report*, 1:571, 3:264, 4:1141, 1313, 1335, and 6:2529. Serving at the corps level were two physicians. Another three served at the division level, nine more as chief surgeons of brigades, twenty-four with field hospitals, twenty-four with ambulance companies, while twenty-seven remained with their regiments.

30. Mary C. Gillett, *The Army Medical Department, 1775–1818*, pp. 26–27; WD, *ARofSG*, 1898, p. 126, and 1899, p. 69.

31. WD, *ARofSG*, 1898, pp. 120–21, 159, 183–87, and 1899, p. 40; *Dodge Commission Report*, 1:643–44, 648, and 3:318.

32. Quotations from WD, *ARofSG*, 1898, p. 106; ibid., pp. 107, 128–29, 151, and 1899, pp. 60–65; Bache, "Female Nurse," pp. 312, 316, 323; *Dodge Commission Report*, 1:657.

33. WD, *ARofSG*, 1898, pp. 128–30; *Dodge Commission Report*, 1:83; Charles Richard, "The Army Hospital Train During the Spanish-American War," p. 201. Richard was in charge of the hospital train.

34. The official designation was V Army Corps. On 7 May 1898, under General Order 36, the War Department officially established seven army corps and on 21 June 1898, under General Order 73, an eighth army corps. Corps identification in this work conforms to modern usage, that is, referring to army corps as corps only.

35. Millis, *Martial Spirit*, pp. 154–59.

36. Although Guiteras is customarily referred to as having been a contract surgeon during the Spanish-American War, he is listed in the *Register of General Officers and Officers of the General Staff, U.S. Volunteers*, March 1, 1899, p. 13, as having been a major and brigade surgeon in the volunteers from 4 June 1898 to 15 July 1898. Pope, in his report in WD, *ARofSG*, 1898, pp. 184–203, refers to him as "Acting Asst. Surg. John Guiteras. Yellow-fever service at Siboney until July 20" in the list of physicians on duty with the V Corps (p. 202) and as an acting as-

sistant surgeon throughout the text. LaGarde, however, refers to Guiteras as a major—specifically, "Maj. John Guiteras, Surgeon, United States Volunteers" (ibid., pp. 213, 216). The body of the surgeon general's annual report refers to him as Dr. Guiteras (see, for example, ibid., 1899, p. 145).

37. WD, *ARofSG*, 1898, pp. 116, 184, 200, 238, and 1899, p. 56; V Army Corps GO 1, 2 May 1898, and SO 4, 5 May 1898, Mf Reel 1, Shafter Papers, SU; *Dodge Commission Report*, 6:3040, 3042–43.

38. V Army Corps GO 7, 8 May 1898, and GO 3, 29 May 1898, Mf Reel 2, Shafter Papers, SU; WD, *ARofSG*, 1898, pp. 187–88, 208; WD, SGO, *SGO*, p. 51.

39. WD, *ARofSG*, 1898, pp. 116, 186, 200–201, and 1899, pp. 39, 57; V Army Corps SO 2, 3 May 1898, SO 6, 31 May 1898, and GO 14, 6 Jun 1898, Mf Reels 1, 2, and 3, Shafter Papers, SU.

40. WD, *ARofSG*, 1898, pp. 188, 199; War Department, *Correspondence Relating to the War With Spain . . .*, 1:36; in Shafter Papers, SU: Ltr, Shafter to SW, 10 May 1898, Mf Reel 2, and V Army Corps SO 13, Mf Reel 3.

41. WD, *ARofSG*, 1898, pp. 203–05. Ronald Ross' first articles on the role of the mosquito in the transmission of malaria appeared in late 1897 and in 1898. The British scientist also sent a letter, dated 24 August 1898, to Surgeon General Sternberg, which contained further evidence that mosquitos could spread malaria. After his arrival in Cuba in December, U.S. Volunteer surgeon Maj. Jefferson R. Kean recommended the use of mosquito nets. This step led to a marked reduction in the number of cases of malaria. For a discussion of public health efforts in Cuba, see Chapter 9. See also R. A. Ward, "The Influence of Ronald Ross Upon the Early Development of Malaria Vector Control Procedures in the United States Army," pp. 207–09.

42. Miles, *Serving*, p. 275; Risch, *Quartermaster Support*, pp. 527, 539, 543; WD, *ARofSG*, 1898, pp. 189–90; George Kennan, *Campaigning in Cuba*, p. 48.

43. Quotation from WD, *ARofSG*, 1898, p. 190; ibid., 1899, p. 56; Kennan, *Campaigning*, p. 5.

44. Quotation from WD, *ARofSG*, 1898, p. 190; idem, *ARofSW*, 1898, 1(pt.1):9; *Dodge Commission Report*, 1:586.

45. Autobiography, William R. Shafter, ch. VII, p. 5, Mf Reel 6, Shafter Papers, SU; WD, *ARofSG*, 1898, p. 190.

46. Ltr, McKay to Shafter, 12 Nov 1898, Mf Reel 6, Shafter Papers, SU; WD, *ARofSG*, 1898, pp. 109, 187, 190–93, 210; *Dodge Commission Report*, 1:129, 142, 188; Risch, *Quartermaster Support*, p. 550.

47. Quotation from WD, *ARofSG*, 1898, p. 190; ibid., pp. 150, 191, 210–11; Risch, *Quartermaster Support*, p. 548.

48. WD, *ARofSG*, 1898, pp. 150, 190–91, 210–11; Risch, *Quartermaster Support*, p. 524; Henry Cabot Lodge, ed., *Selections From the Correspondence of Theodore Roosevelt and Henry Cabot Lodge, 1884–1918*, 1:304–05; in Shafter Papers, SU: Ltrs, Shafter to AG, 9 Jun 1898, Edward J. McClernand to AG, 11 Jun 1898, and Shafter to Taylor, 19 Jun 1898, Mf Reel 3, and Shafter Autobiography, ch. VII, p. 5, Mf Reel 6.

49. Quotation from WD, *ARofSG*, 1898, p. 192; ibid., pp. 107–09, 193, 198, 218; *Dodge Commission Report*, 6:2893.

50. Quotations from WD, *ARofSG*, 1898, p. 192; Shafter Autobiography, ch. VII, p. 5, Mf Reel 6, Shafter Papers, SU; Hagedorn, *Wood*, 1:58; Miles, *Serving*, p. 276; *Dodge Commission Report*, 6:2893; Graham A. Cosmas, "San Juan Hill and El Caney, 1–2 July 1898," in *America's First Battles, 1776–1965*, p. 116.

51. The Department of the Pacific was created 16 May 1898. See WD, *ARofSW*, 1898, 1(pt.2):497, and 1899, 1(pt.2):39.

52. David Trask, *The War With Spain*, p. 386; WD, *ARofSG*, 1899, p. 117.

53. First quotation from WD, *ARofSG*, 1899, p. 121 (see also pp. 98–99, 120); second quotation from W. F. Southard, "Opening of the New Military Hospital at the Presidio, July 9, 1899," p. 454; WD, *Correspondence*, 2:734–35; idem, *ARofSW*, 1898, 1(pt.2):123; N. N. Freeman, *A Soldier in the Philippines*, p. 17; Charles R. Greenleaf, "An Object Lesson in Military Sanitation," p. 485.

54. Ltr, Elwell S. Otis to SW, 17 Mar 1903 (first quotation), Henry Lippincott Papers, Entry 561, RG 94, NARA; WD, *ARofSG*, 1898, p. 263, and 1899, pp. 98, 121–22 (second quotation), 126, 137; *Dodge Commission Report*, 2:1202, 1217.

55. WD, *ARofSG*, 1898, p. 263, and 1899, p. 127 (quotation); WD, *ARofSW*, 1898, 1(pt.2):123; *Dodge Commission Report*, 2:1265; "Medical and Sanitary History of Troops in the Philippines," pp. 826–27.

56. WD, *ARofSG*, 1899, pp. 129, 131; see also pp. 130, 132.

57. Ibid., pp. 117, 122, 137 (quotation); Trask, *War With Spain*, p. 386.

58. Quotation from Freeman, *Soldier in the Philippines*, p. 21; ibid., p. 22; WD, *ARofSG*, 1899, pp. 99, 124–26; WD, *Correspondence*, 2:767; Frederick Funston, *Memories of Two Wars*, p. 171; John

C. Brown, *Diary of a Soldier in the Philippines*, p. 14; Agnew, "Carromatos and Quinine," p. 15; Richard Johnson, "My Life in the U.S. Army, 1899 to 1922," pp. 13–14, Spanish-American War, Philippine Insurrection, and Boxer Rebellion Veterans Research Project, Military History Research Collection, U.S. Army Military History Institute, Carlisle Barracks, Pa.

59. WD, *ARofSG*, 1898, p. 125, and 1899, pp. 11, 138; idem, *ARofSW*, 1898, 1(pt.1):7 and 1(pt.2):123; "Medical and Sanitary History," p. 826; WD, *Correspondence*, 2:756; *Dodge Commission Report*, 2:1287.

Chapter 6

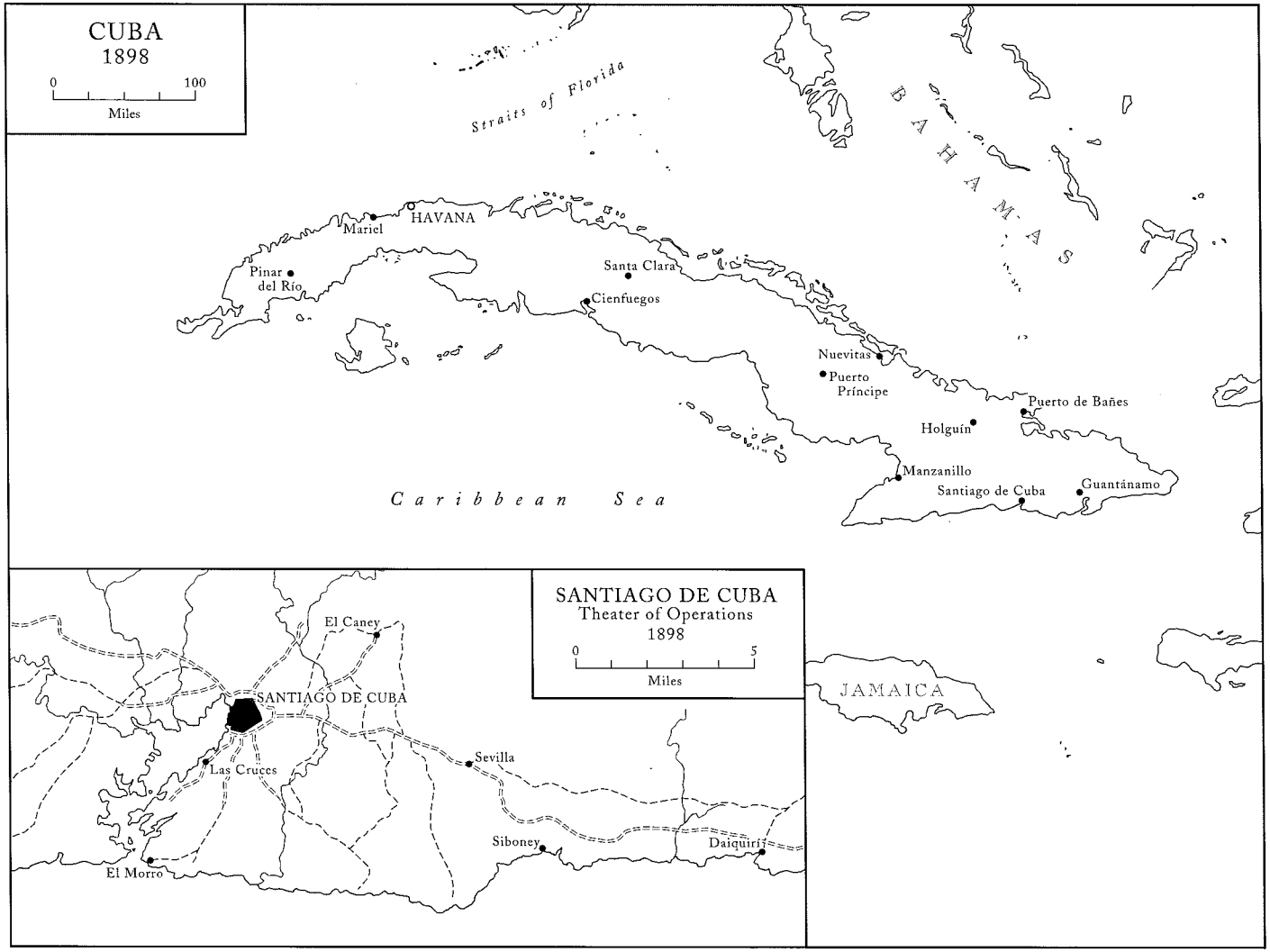
SUPPORTING THE INVASION FORCES

Medical support for the campaign against the Spanish in both the Caribbean and the Pacific in the summer of 1898 was heavily influenced by events that took place while V and VIII Corps troops were still gathering in Florida and California. The haste and confusion of Tampa haunted V Corps medical officers confronting the challenges of operations in Cuba, and those with the units that invaded Puerto Rico after the Spanish surrender in Cuba also experienced frustrations engendered by inadequate planning. In the Philippines, however, VIII Corps medical officers, relatively unburdened by handicaps imposed in the United States, encountered few difficulties caring for the soldiers involved in what proved to be an easy campaign against a thoroughly demoralized foe. An armistice signed on 12 August brought all hostilities between Spain and the United States to a halt the next day, but in both the Caribbean and the Philippines disease proved to be a more persistent and relentless enemy than the Spanish.[1]

In Cuba

The active stage of the Cuban campaign (*see Map 2*) was very brief. General Shafter's V Corps troops landed at Daiquiri on 22 June and took Siboney, a better port eight miles to the west, a few hours later. They then moved inland and to the north to Las Guasimas, where two days later they suffered 52 or more wounded in defeating Spanish troops retreating toward Santiago. Much of the Medical Department's supplies and equipment needed to care for these men was on the transports. A week later, when U.S. troops met the enemy at El Caney and San Juan Hill, medical personnel, working without much of the equipment they needed, had to care for as many as 1,200 wounded, 932 from San Juan Hill. On 3 July the U.S. fleet destroyed the Spanish squadron when it attempted to leave the harbor at Santiago, removing both the need to take Santiago and the need to defend it. Except for exchanges of artillery, machine-gun, and rifle fire between troops entrenched around Santiago on the tenth and eleventh, which produced 2 more wounded for the V Corps, El Caney and San Juan Hill were the last engagements of the war in Cuba. On the fourteenth the Spanish opened discussions that led to the official surrender of Santiago three days later, thus bringing all pretext of Spanish resistance in the island to an end. By this point, the victims of disease rather than the wounded had already become the focus of the department's attention and concern.[2]

The abandonment of initial plans for the invasion of Cuba, which called for a land-


CUBA
1898
0
100
Miles
Straits of Florida
BAHAMAS
HAVANA
Mariel
Pinar del Río
Santa Clara
Cienfuegos
Nuevitas
Puerto Príncipe
Puerto de Bañes
Holguín
Manzanillo
Santiago de Cuba
Guantánamo
Caribbean Sea
JAMAICA
SANTIAGO DE CUBA
Theater of Operations
1898
0
5
Miles
El Caney
SANTIAGO DE CUBA
Las Cruces
Sevilla
Siboney
Daiquirí
El Morro

MAP 2

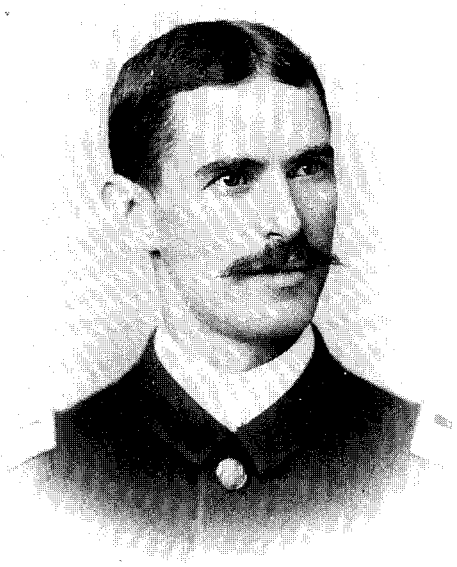
ing near Havana, where flat terrain and good roads would have made moving supplies with the troops a simple matter, led to the landing at Daiquiri, seventeen miles east of Santiago, where steep cliffs lined the beaches and roads were almost nonexistent. Although U.S. soldiers—6,000 on the first day and 11,000 in the following two days—landed unopposed, the surf was so heavy that the V Corps chief surgeon, Colonel Pope, considered it remarkable that only 2 died from drowning. Bringing Medical Department supplies ashore proved almost impossible—not only because the surf was high but also because the need for a multitude of small boats to unload the transports had been overlooked in the haste and confusion that characterized the invasion. Moreover, since the weapons of war had priority over medical supplies, Pope had no claim to the single lighter that was the only transportation consistently available. Unable to move his division hospitals ashore, he pleaded in vain for small boats and crews to move the sick and wounded to the hospital ship *Olivette*, where he had set up the 2d Division hospital.[3]

Although it was of the utmost importance that division hospitals be landed and established ashore as soon as possible, frustration after frustration continued to greet attempts to do so. After the troops had disembarked, the masters of the transports positioned their vessels five to fifteen miles offshore for fear of coming to grief on the rocky coast. The port of Siboney provided a landing beach nearer Santiago. Yet here, as at Daiquiri, small boats were rarely available to unload the transports. In addition, as many as 200 badly needed hospital tents were at the bottom of one ship's hold and inaccessible for many days until the rest of the cargo had been slowly unloaded. Much still remained on board when U.S. troops began their march toward Santiago. Since Medical Department baggage wagons and mules had been left behind in the turmoil at Tampa, medical officers had to improvise shore transportation over a road that was scarcely more than a rocky trail. Some used their own horses as pack animals, but asking hospital corpsmen to carry supplies in litters proved of little use because an average of only two per regiment had been brought ashore. The few surgeons who had taken chests of medical supplies along found them impossible burdens and abandoned them early in the march, to be retrieved later by passing wagons.[4]



BENJAMIN F. POPE

The situation had not significantly improved when U. S. troops encountered the retreating Spanish on 24 June, although Colonel Pope attempted desperately to obtain additional supplies. His request for a



AARON H. APPEL

steam launch to enable one of his officers to pick them up from the various transports produced only a rowboat. Permission to use this craft was soon withdrawn because it was needed elsewhere, and, since the sea was calm only in the mornings, attempts to reach the transports that day soon ended. Pope did manage to board the *Olivette* and order it to Siboney, but wagons to move the more seriously injured casualties the four miles from the battlefield to the beach were difficult to obtain. Until the U.S. Navy could be persuaded to lend craft to move them out to the *Olivette*, they lay without blankets or pillows on the floor of the only available shelter, "a very foul old shed." Some of the wounded were taken on board the hospital ship the evening of the twenty-fourth, and the remainder were removed there before dawn the next day. By 3:00 A.M., after operating at four tables under electric lights, twelve surgeons—including Major Appel of the 2d Division and his three assistants—had completed all surgery. Some of the sick on the *Olivette* had by this time recovered, but with 128 patients on board, among them 40–50 wounded, she was nearing her capacity. As a result, with no tents or supplies on shore, Pope looked anxiously for the appearance of the hospital ship *Relief*, which finally arrived on 8 July.[5]

Fortunately, each soldier at Las Guasimas carried with him a first aid packet containing antiseptic dressings and sterile bandages, which had been distributed among the troops on the transports. Enabling the men to dress wounds even before the arrival of a physician lessened the chance of infection, which, because small-caliber bullets did not produce massive tissue damage, was the principal concern. Although Army surgeons credited these packets, used for the first time on 24 June, with a considerable saving of lives, many soldiers discarded them as they were marching through the tropical jungle after Las Guasimas.[6]

Despite the "fierce, scorching rays of the tropical sun," the health of the men was still good—fewer than 150 were sick. During the lull of several days in the fighting that followed Las Guasimas, Medical Department personnel were free to prepare to care for future patients. The transports were slowly unloaded. The Red Cross, apparently notified the moment the V Corps embarked, sent a steamer ready to help with the wounded. It reached Siboney on 26 June, and on the twenty-seventh a supply of medicines arrived from Tampa and was distributed among regimental medical officers. Major Wood brought the first field hospital, his 1st Division facility, ashore and, after collecting available transportation, including fourteen litters and sur-

geons' horses, moved it to a deserted mansion. Because of the low priority given medical equipment and the poor condition of the roads, his unit briefly functioned without beds or bedding. As Shafter's force advanced toward Santiago, Major Wood moved his facility again, this time to a site where, because no building was available for shelter and tentage was inadequate, his newly obtained bedding became wet.[7]

Removing the wounded from El Caney and San Juan Hill to Major Wood's facility proved exceedingly difficult. The entire line of evacuation was subject to fire, either from the guns on the battlefield or from guerrillas who hid in trees along the route and killed a contract surgeon during the battle of San Juan Hill. The litters needed to remove the wounded from the battlefield often had to be improvised from whatever materials were available, just as they had been during the Indian wars. The ambulance station—also referred to as the aid, dressing, or collecting station—to which the wounded were first taken had to be set up near the line of battle because the further back it was, the more vulnerable it became to spent bullets fired from as much as a mile away. Each regiment usually had its own station, but some units shared facilities. An intermediate station was occasionally established where walking wounded could rest, and, if necessary, be placed in wagons, and where those on litters could stop to have dressings checked or tourniquets loosened.[8]

A shortage of ambulance wagons complicated the rest of the journey back to the field hospital. Exactly how many were on hand by the time of the engagements on 1 July is not clear. Colonel Pope maintained that only three ambulances were ever placed on board the transports and that these were used on 1 July. In his autobiography, however, General Shafter wrote that seventeen were in Cuba by this time, a number that, he believed, would have been adequate had not the total number of wounded been higher than he had anticipated. The drivers of these vehicles and the mules that pulled them soon began to fall ill, often too ill to work, thus further complicating evacuation. Because of the shortage of ambulances, those available to the V Corps were posted near corps headquarters so that Pope, who considered them invaluable, could control their use personally.[9]



MARSHALL W. WOOD

General Shafter differed with Colonel Pope on the value of the ambulance, rationalizing that "on muddy roads [supply] wagons could be made as comfortable as ambulances for the wounded." But a surgeon who saw the wounded and sick from El Caney and San Juan Hill packed into wagons "in an apparently pitiless manner" to avoid the "indefinite waiting by the road-



GEORGE MCCREERY



VALERY HAVARD

side" that would have been necessary to move them by ambulance was not so sanguine. He maintained that between the wagons and the "abominable condition of the roads, the unruly state of drivers and mules, and the great difficulty of obtaining means of preventing jars and jolts, . . . the 4 or 5 miles of wheeled transportation from the battlefields to the field hospital cost the lives of not a few patients." [10]

The only complete field hospital awaiting the wounded from El Caney and San Juan Hill was Major Wood's facility. Although the supply of tents, cots, and bedding was inadequate, the operating room equipment, instruments, and supplies of the three land-based division hospitals were by this point on shore and quickly readied for use. The rest of the division hospital supplies and equipment was reaching shore very slowly, most regimental equipment and medicines were still on board the transports, and much of Major McCreery's Cavalry Division hospital was apparently never unloaded before the ships moved away from the shore. Major Havard, the Cavalry Division chief surgeon, appealed for help to the Red Cross, which responded generously under the direction of its founder, Clara Barton. Surgeon General Sternberg thundered at "the military authority which ordered and superintended the embarkation at Tampa and which directed the forward movement, although the disembarkation of the medical stores and supplies was unaccomplished." [11]

U.S. soldiers were not the only wounded for whom U.S. medical officers cared. From the outset, they had been assisting their Spanish counterparts until the injured prisoners-of-war could be moved to hospitals in Siboney accessible to Red Cross personnel. After the battles on 1 July, Barton, two Red Cross physicians, and

other Red Cross representatives joined U.S. medical officers in caring for 150 wounded enemy soldiers until they could be sent to a large Spanish hospital at El Caney. On the fourth, however, wanting to encourage surrender by disproving rumors among Spanish troops that suggested U.S. savagery toward prisoners, Shafter ostentatiously sent a group of patient-prisoners from El Caney to Santiago by ambulance, making "an excellent impression among the Spaniards." [12]

The ultimate destination of U.S. wounded after the battles at El Caney and San Juan Hill was a base hospital that Major LaGarde had finally been able to set up at Siboney, principally in the tents of his reserve division hospital. He used the furniture and furnishings of nearby buildings to supplement the hospital's supplies and equipment, which had been brought ashore only after Pope had obtained a personal order from Shafter for a steam lighter to unload it. Fortunately, the facility was ready when the vehicles that had carried the medical supplies stored at LaGarde's hospital to the front on 1 July began returning to Siboney laden with wounded. The most severely injured were the first to arrive, 2 among the initial 7 requiring major amputations. Another 1,000 flooded LaGarde's hospital when Major Wood attempted to clear his facility of patients so that he could follow the V Corps forward after the battle. The growing number of casualties at Siboney in the wake of El Caney and San Juan Hill led Pope to begin considering the feasibility of using transports to return some sick and wounded to the United States.[13]

For five days after the engagements at El Caney and San Juan Hill, the staff at the Siboney base hospital worked with little opportunity for rest, although most patients required only the redressing of their wounds. Doctors were prepared to care for a maximum of 200 men, and although 200 wounded apparently remained with the troops in their camp outside the city of Santiago, tents could not be put up fast enough to shelter the 1,142 injured at Siboney, many of whom were "entirely naked." Little in the way of "articles of light diet" was on hand, and the *Olivette* could not offer much help. The supplies brought in by the *Relief* were not enough, and Major LaGarde had to struggle to have even that much unloaded. Once again, the Red Cross came forward with the needed "delicacies," as well as with beds, bedding, and similar items. The Red Cross steamer stood by to provide further aid, and Red Cross nurses assisted in the operating rooms at Siboney, where four U.S. Navy surgeons, a surgeon from the Swedish Navy, and the assistant surgeon general of the Cuban rebel army joined U.S. Army physicians. Surgical teams worked at five to six tables, their members rotating to replace those who became too exhausted to continue.[14]

Hostilities did not officially end for another sixteen days, but when the guns fell silent at El Caney and San Juan Hill, almost 80 percent of the total of less than 1,500 U.S. soldiers wounded in the Spanish-American War in Cuba had already been injured. Some of these casualties required major surgery, which was most often accomplished in field hospital operating rooms; but, according to LaGarde, the damage done by "the portable hand weapons of to-day" was such that for the most part "the subject of military surgery [was reduced] to first-aid work." The Mauser used by the Spanish so impressed one medical officer that he called its ammunition "a humane bullet in every sense of the word." Since most of the wounds

had been inflicted at a sufficient distance to avoid "the explosive effects" that resulted from the use of this type of weapon at close range, wounds healed rapidly and fractures were few. The sterilization of instruments and the washing of surgeons' hands in antiseptics prevented hospital gangrene and many other forms of infection that had haunted the military hospitals of the Civil War. With a conservative approach to surgery now feasible, amputations were rare. Although some patients with abdominal wounds died following laparotomy (surgery that involves opening the abdomen), others whose wounds suggested that their intestines must have been repeatedly pierced nevertheless recovered uneventfully without surgery.[15]

In its annual report for 1898 the War Department proudly noted that of 1,431 regulars and volunteers who were wounded in the Santiago campaign, only 13, less than 1 percent, died of their injuries. The statistics cited, however, are contradictory. The preceding figure is apparently far too low. One of the reports estimated that among approximately 1,000 wounded sheltered in one hospital in Cuba, the mortality was 7 percent, or roughly 70. Elsewhere, the War Department listed for the entire Spanish-American War a total of only 65 men, regulars and volunteers, dying of wounds from 1 May through 30 September 1898. Of these, 8 wound fatalities occurred as a result of action in the Philippines, where approximately 106 regulars and volunteers were injured in combat, a deaths-from-wounds figure of more than 7 percent. Another 40 were wounded, most of them only slightly, in Puerto Rico, and thus, presumably, the number dying from their injuries was low. The surgeon general's totals suggest that for the calendar year 1898, 1,320 regulars were injured by guns in battle, whether in the Caribbean or in the Philippines, and that of 1,457 regulars wounded by gunshot under all circumstances in that period, 88, or 6 percent, later died as a result of injuries received in battle. Given the distribution of the total number of casualties, it is highly likely that most of the 89 regulars who died of wounds during the year died during the Cuban campaign, thus again bringing the figure above 13 even without counting volunteer casualties.[16]

Among the lessons medical officers learned while caring for those injured in June and July was that too early or too frequent changing of dressings could lead to unnecessary infection. Furthermore, as long as the wound could be kept reasonably clean, surgery could wait until the patient had been moved to a permanent hospital. The need for a better method of identifying casualties was also revealed in this conflict, since many of those who died were unidentified, with diagnosis tags either not used or, on the rare occasions when they were used, obliterated partially or entirely by rain. One surgeon suggested that a small metal tag be adopted, to be hung around each soldier's neck. Some medical officers discovered that X-ray pictures eliminated the need for extensive probing to locate bullets that had become lodged in the body and thereby lessened the chances of infection. But X-rays, discovered in 1895 by Wilhelm C. Roentgen, were still so new during the Spanish-American War that many surgeons did not understand their potential, and X-ray equipment was available only on two Army hospital ships and in general hospitals back in the United States.[17]

By the time peace officially arrived in Cuba, the men of the V Corps had already begun to discover that their most danger-

ous enemy was not the Spanish, and medical officers soon realized that their greatest struggle would not be against wounds and infection. Most of the necessary surgery had been performed, and wounds were beginning to heal when Army physicians found themselves struggling against disease that was running out of control, "a thousand times harder to stand up against than the missiles of the enemy," according to Shafter. It spared neither officers nor men, neither civilians nor soldiers. Even the general himself was briefly sick because of what he believed to be sunstroke, causing considerable anxiety for his superiors. His officers were soon falling by the wayside; he later recalled that eventually "all the general officers were ailing, more or less." Civilian employees of the Army also began to fall ill in increasing numbers, and if sick teamsters could not be replaced, the Army was in danger of losing the use of five to ten wagons a day. The sick rate was also high among the enemy—as many as a fourth or more of the Spanish force might be hospitalized at any one time, a figure that reached 2,600 by 2 August. Colonel Senn, of the U.S. Volunteers, now at the Siboney base hospital as chief surgeon of the operating staff, learned from a Spanish surgeon that in his army "many were sick and no one well." [18]

In the V Corps the escalating rate of disease alarmed Lt. Col. Theodore Roosevelt as early as 12 July, a day after the last U.S. soldier fell victim to Spanish guns. He informed Shafter that only 350 of the 600 officers and men among his Rough Riders were fit for duty.[19] Almost half his men who had survived battle had already been laid low by wounds, fever, dysentery, and heat, and their living conditions in Cuba were causing an almost continuous deterioration in their health. The V Corps lacked both adequate shelter and clothing, and rain fell every night and almost every day. Temperatures might fluctuate from 120 degrees in the shade by day to the 60s once the sun had set. While maintaining that he was personally "as strong as a bull moose," Roosevelt noted that his men were suffering from the sun, the rain, the poor drinking water, and the "lack of plain food." Men became so thirsty that even a surgeon confessed that, having consumed all the boiled water in his canteen, he, too, drank from a puddle that he knew might be infected.[20]

The start of negotiations with the Spanish on 13 July brought no respite from the onslaught of disease. By the twenty-second 75 percent of the civilian teamsters and packers working for the Army were ailing—doctors and a hospital were needed for sick civilians, whether Army employees or Cuban victims of the hostilities and the siege, who had no hospital to which they could go. General Shafter stated the following day that 1,500 soldiers were sick with fever, an estimated 10 percent of them with yellow fever. Although deaths were few, by 1 August Shafter was ready to admit that his "command [was] in no condition for active service at present." Four days later, Roosevelt reported that no more than 100 of his men were "fit for any hard work" and that 150 were probably too weak to walk any distance even without their packs. Since they had only one-third of the transportation they should have, they could not move from the site, despite its unhealthiness. Some tents and camp equipment were now coming in, and the delivery of canned tomatoes had reduced the threat of scurvy, but anxiety over the fate of the V Corps should it remain in Cuba continued to grow.[21]

Physicians were falling victim to the diseases they fought, as many as 15 percent being disabled at one time. U.S. Volunteer surgeon Maj. Victor C. Vaughan, who had

already earned an enviable reputation in the field of public health, fell ill with yellow fever on 12 July. Major McCreery died of dysentery on the transport that was taking him home to convalesce from yellow fever, and by the twenty-second Colonel Pope himself was very ill—"I have almost constant vertigo," he wrote, and "am unable to think, to plan, or to recollect." Although he remained with the V Corps until it left Cuba, he was relieved the next day at his own request and replaced by Major Havard. Both Major LaGarde and Maj. William C. Gorgas, who briefly succeeded the popular LaGarde in charge of the base hospital at Siboney, also fell ill. LaGarde, who apparently had malaria, had to return to the United States before the end of August, and Gorgas, a victim of typhoid, followed him in September. Little success met desperate attempts to locate physicians serving in the V Corps in a nonmedical capacity who might be willing to sign on as contract surgeons to fill the vacancies that were occurring. But since the number of physicians in Cuba who were at least temporarily unable to perform their duties grew, the number of patients also rose, and the struggle to provide adequate care for the sick was constant. Although Sternberg sent more physicians to Cuba, keeping an adequate number of doctors on duty remained difficult, and as late as 10 August General Shafter was still requesting that twenty more physicians, preferably medical officers, be sent to Cuba.[22]

The number of men in the hospital at any one time did not accurately reflect the enormity of the problem, for those who were in the camps were generally weak and exhausted. While the number of those with fever who returned to duty often equaled or exceeded the number of those newly afflicted and while the total hospitalized was falling after 2 August, the death rate continued to increase at a frightening pace, from a monthly rate of 0.21 per 1,000 among the regulars in May 1898 to 1.81 per 1,000 in July, peaking at 6.14 per 1,000 in August. The debilitation of the entire V Corps had a disastrous effect upon morale and military effectiveness, which deteriorated still further because of the fear that a devastating yellow fever epidemic might be yet to come.[23]

Several diseases contributed to the enfeeblement of the men of the V Corps at this time, but the most dangerous was malaria, which, because of the habits of the *Anopheles* mosquito, was a particularly great threat to the men camped outside Santiago during and after the siege of that town. To Roosevelt's surprise, malaria affected black units as much as it did white. An estimated 75 percent or more of the soldiers suffered from some form of the disease, but the most common was apparently falciparum. Although the fever usually lasted only four to six days, it left its victims too weak to return to duty. Fortunately, quinine was in sufficient supply by this point, for it was widely used, even for cases of diarrhea, which were often blamed on malaria and were, therefore, often treated with large amounts of quinine, usually administered by rectum. The way in which malaria was communicated from one man to another had just been established, and many Army surgeons still believed that the infection was acquired through water that carried the plasmodium. Thus when the malaria rate continued to rise even after the men were ordered to boil their drinking water, doctors assumed that the order had not been obeyed.[24]

Typhoid, too, was soon exacting a higher death toll in the debilitated V Corps than among the units that remained in the United States, and diarrhea and dysentery

were becoming more common as time passed. Despite all efforts to keep drinking water pure, sources might be polluted by men, by animals, and by laundry washed in streams. Boiling large amounts of water was rendered difficult by the delayed arrival in Cuba of the necessary cauldrons and a shortage of fuel for fires. "Ephemeral fever," which did not respond to quinine and might have been either typhoid or dengue, and other fevers added to the miseries the men were enduring, since they were widespread and debilitating, involving a lengthy convalescence. None of the V Corps' many health problems involved the much publicized so-called embalmed beef. The meat was often unappetizing and sometimes had been so long unrefrigerated as to be inedible, but investigation failed to support charges that any that had been preserved with harmful chemicals had been fed to the troops.[25]



FRANCIS J. IVES

Malaria and typhoid posed the greatest threats to the V Corps, but the most dreaded disease during the Caribbean campaign was yellow fever. Because of the sociable nature of the *Aedes aegypti* mosquito, this disease was more common in towns and cities than in the countryside and therefore a greater threat to an occupying army than to a force encamped outside its walls. The mere thought of yellow fever inspired a growing panic that was fed by uncertainty both about diagnosis and about the means of transmission. Distinguishing between malaria, typhoid, and yellow fever was difficult when neither adequate laboratory equipment nor physicians trained to make the distinction were present in Cuba. The role of the mosquito, only recently recognized as a possible carrier of disease, in spreading yellow fever was unknown. To physicians unaware of the importance of the *Aedes aegypti* mosquito, yellow fever infection seemed to lurk everywhere, in buildings taken from the Cubans and "in the shady nooks about rocky recesses, caves, arbors, etc." The customary approach to preventing disease, keeping camps clean and water sources unpolluted, proved to be as ineffective against yellow fever as that against malaria. Under such circumstances, constant preoccupation with yellow fever and the conviction that an epidemic was inevitable made both misdiagnosis and panic easy.[26]

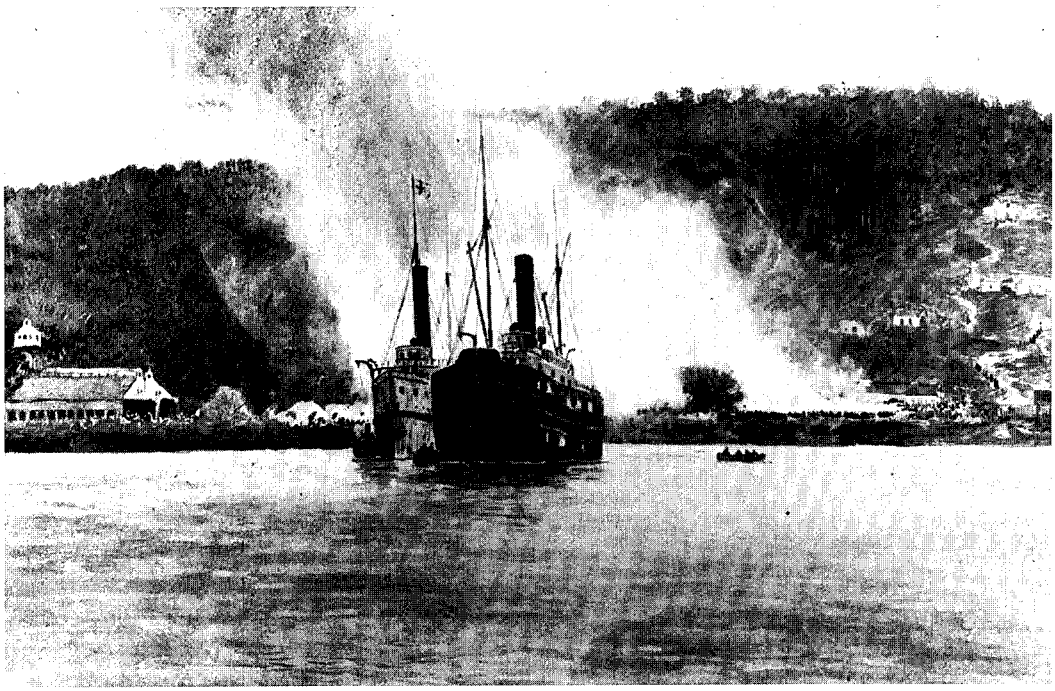
As some suspected at the time, the panic about yellow fever was not justified. Sternberg later concluded that many men supposedly ill with yellow fever were actually suffering from what was then called aestivo-autumnal malaria, the form caused by the falciparum parasite. U.S. Volunteer surgeon Maj. Francis J. Ives, chief surgeon of an independent brigade (also called a provisional division) that had been formed

of two infantry regiments and one unit of cavalry, concluded that the fear of Army surgeons in the field only made matters worse. He believed that they frequently misdiagnosed cases, hospitalizing men who did not have yellow fever with those who did, thereby contributing, as he thought, to spreading the disease. "The majority of these experts were completely stampeded, and were calling everything yellow fever," he reported to Sternberg.[27]

As disease rates mounted and reports of yellow fever cases inspired dread in those who heard them, greater attention was devoted to means by which all disease might be prevented. The long-held belief that yellow fever was somehow related to contamination of the campsite had led to an approach to preventing its spread that was often successful—flight. Some authorities recommended that those diagnosed as having yellow fever be hospitalized and that the rest of their unit advance two miles and reestablish camp. Once Santiago had surrendered, General Shafter held a conference of his general officers and division chief surgeons to discuss an idea favored by Surgeon General Sternberg, that of relocating the entire V Corps from the area where yellow fever was endemic. At a higher altitude, if well cared for, the ailing troops might be restored to health. But in the mountains of Cuba no roads existed over which supplies could be moved, water sources were inadequate, and heavy rains turned mountain plateaus into quagmires where malaria reigned supreme. Shafter decided that "Dr. Sternberg's idea of going 700′–800′ above sea level" was "all fol-der-rol, as you will see if his advice is followed." Changes of camp were difficult for all concerned, including medical officers who had to uproot hospitals and their many patients, and the sick rate apparently rose markedly with each move that was tried. The notion was finally abandoned as not feasible because the stress of repeated moves further lowered the resistance of the men to disease.[28]

By the second week in July the common assumption was that a yellow fever epidemic was taking possession of Siboney, where hundreds of wounded, sick, and healthy nonimmune U.S. soldiers were gathered, a tempting smorgasbord to the city-loving *Aedes aegypti*. The first case was not diagnosed until the sixth, but panic was quick to set in. No more victims of Spanish weapons were being brought in to hospitals, but yellow fever had reportedly struck down 38 men in the town by the twelfth, when the commanding general of the Army and his chief surgeon arrived in Cuba. General Miles estimated at this time that 100 men had been stricken throughout the island. The spread was blamed on troops who, against orders, entered buildings believed to be infected. An attempt was made to keep word of the incipient epidemic secret, but when Colonel Greenleaf, who was responsible for the health of the invasion forces, was informed of the outbreak, he immediately launched an investigation into its origins. He also initiated an aggressive effort to improve sanitation and to exclude all Cuban and Spanish refugees from the city. Even after a Regular Army surgeon was made town administrator, these steps apparently had small effect upon V Corps disease rates at Siboney. In his frustration Colonel Senn, who for a time assisted "in the work of purification," blamed the failure of sanitary improvements to reduce disease levels on a lack of cooperation on Shafter's part.[29]

Drastic steps were clearly called for. At the recommendation of Guiteras, who appears many times playing an advisory role



THE BURNING OF SIBONEY. *In Carlton T. Chapman's drawing, the burning of the fever-infected buildings is depicted from the water, with the hospital ship Relief and a store-ship in the foreground.*

to U.S. troops in the Caribbean, and with the encouragement of Miles, the ultimate solution to the problem became obvious—the town must be burned down. Authorities believed that the source of the infection thus would be destroyed and the ground sterilized. Major LaGarde favored this radical step, even though he considered typhoid a greater danger than yellow fever, which was proving to be generally mild with a short recovery period. Following the prevailing line of reasoning, Siboney was emptied of its inhabitants and, beginning 11 July, each building was burned to the ground when it became vacant.[30]

Attempts at preventing disease, no matter how drastic, proved clearly ineffective. On 21 July General Shafter reported that the number of fever cases in Santiago was increasing rapidly, but he added that observers disagreed about how many were yellow fever. A day later he recorded 214 more cases of various kinds of fever. On the twenty-third he noted a total of about 1,500 victims throughout the V Corps, about 10 percent of whom supposedly had yellow fever. New cases of fever continued to develop as the month wore on. One estimate suggested that as many as 1,300 to 1,400 in the Siboney area alone eventually caught yellow fever in spite of the burning of the city, and that about 15 percent died as a result. A physician commented that the incidence of yellow fever was no higher because it was a disease of the cities and the men were generally stationed about the countryside.[31]

Obviously the escalating disease rates were placing an increasingly heavy burden on V Corps hospitals and their personnel. With ambulances to move the sick back to

the base hospital at Siboney hard to find, regimental surgeons and their facilities were overwhelmed soon after El Caney and San Juan Hill by the ever-growing number of patients, some of whom at one point had to be left on the ground without adequate shelter. Recognizing that he might be inundated with casualties if the V Corps and the reinforcements then arriving from the United States with Miles should conduct a direct assault on Santiago, Major LaGarde cleared his hospital of most of its wounded by 11 July, sending a few back to duty and shipping the remainder north. He then turned an additional twenty-bed facility that he established for the wounded in a small cottage over to the Red Cross. Wishing to isolate those with contagious diseases, he set aside a railroad shed and tents for their exclusive use. He assigned a larger cottage to those with fever (most of whom probably had malaria) and placed Guiteras, who was continuing to serve as the command's expert on tropical diseases, in charge. Still more sick were cared for with the wounded in a hospital that Major Havard had improvised in an old store. The care of these 80 patients and the hospital itself were turned over to LaGarde when Havard and the Cavalry Division moved forward.[32]

For Major LaGarde and the medical team at Siboney, the real trial began on 6 July, when the first case of yellow fever was diagnosed. The entire staff of the Red Cross cottage soon came down with the disease, even though those whom Guiteras questioned on the matter said the building had not been contaminated by yellow fever. It was burned nevertheless, and the ailing staff members joined other yellow fever cases, who were isolated in tents, where by the tenth LaGarde had fourteen patients—nine soldiers, five civilians. The number of yellow fever patients mounted in spite of the destruction of "this dirty little town." He found that having "room to extend our canvas hospital" did not cure the problem of finding enough hospital space, even though in anticipation of the possibility of an all-out assault on Santiago, all tents at Siboney and 200 from Daiquiri had been sent for his use by the thirteenth.[33]

Although most cases of yellow fever proved to be mild, on 19 July, with further confrontation with the Spanish no longer a possibility, Colonel Pope reported to General Shafter that half the V Corps sick lacked shelter and he needed 1,000 more beds. In Siboney Major LaGarde was by this point both discouraged and exhausted. Colonel Greenleaf had put Major Gorgas in charge of the yellow fever hospital that LaGarde had set up, which seemingly freed Guiteras to resume his original role as consultant on tropical diseases, but LaGarde's responsibilities were still growing. His facilities were overflowing, three of his surgeons were ill, and the V Corps had left him no vehicles for transporting supplies. A move to set up a "yellow-fever floating hospital" at Siboney was apparently abandoned. On the twentieth, concluding that everyone had been exposed to yellow fever by that point, LaGarde in desperation threw open the entire tent hospital at Siboney to yellow fever victims, making no attempt to isolate them beyond giving them their own wards.[34]

At some time, presumably shortly after Colonel Greenleaf's arrival in Cuba on 12 July but before the surrender, a detention camp where suspicious cases could be isolated was set up near V Corps headquarters just outside Santiago on the road to Siboney.[35] Soon thereafter a yellow fever hospital was established not far from the detention facility and a contract surgeon

assigned the responsibility for identifying cases to be sent to it. Both the camp and the hospital were placed under Major Ives on 21 July. Between them the two facilities held an average of about 115 patients. Both were "broken up and transferred to Siboney" sometime near the end of July.[36]

Fortunately, on 17 July, the surrender of Santiago made it possible to open hospitals in that city. Regimental tents had at last been unloaded from all the transports, and with shelter available in quantity, accommodations could easily be made for as many patients as needed them. Each regiment was given four tents for patients who were only slightly sick. Each division set up its own hospital for those more seriously ill in the Santiago area. These facilities were soon well equipped with such items as steam sterilizers, water heaters, bath tubs, and steel operating room tables. A 300-bed general field hospital was established on a hill in a central location to house the overflow from division hospitals, and a separate building was set aside for sick officers.[37]

A third yellow fever hospital was established with 150 beds at the beginning of August "across the bay from Santiago" to house all new yellow fever patients throughout the V Corps, making it possible to gradually close the Siboney facility. It was relatively isolated, and by continuing the policy of disinfecting the ambulances and wagons used to transport yellow fever victims, authorities hoped to prevent further spread of the disease. Even though yellow fever had apparently been raging in the city before the surrender, only 61 cases were taken to this facility in July and August. Of the U.S. soldiers stricken in the city before the epidemic ended, 29 died, among them the hospital's pathologist.[38]

On 9 August Secretary of War Alger decided that the immediate establishment of a large general hospital in Santiago was "of the utmost importance" and promised to send as many nurses to staff it as General Shafter considered necessary. Since little lumber and no carpenters were available in Cuba, he had to request that both be sent from the United States to create the facility Alger had in mind. But the corps commander informed the secretary on the tenth that a new plant was not necessary because a large hospital capable of holding 2,000 beds had already been set up in tents and equipped with modern kitchen equipment, a sterilizer, and isolation wards. This facility, presumably an expanded version of the general field hospital, was, Major Wood maintained, "one of the best in the world."[39]

Finding hospital beds at Siboney and Santiago proved in the end to be easier than finding competent personnel. Hospital corpsmen, always inadequate in number, were needed in the field. Volunteers who were left behind to serve as hospital guards attempted to assist in nursing chores, but few had had any training, and because they had other duties, they were not always present when most wanted. The fear of yellow fever exacerbated other difficulties. On at least one occasion at Siboney, where the problem was apparently most acute, the staff assigned to work during the day had to remain on duty around the clock. After his July arrival in Cuba, Colonel Greenleaf pointed out to the V Corps adjutant general that 500 hospital attendants, 100 nurses immune to yellow fever, and a large number of immune doctors were urgently needed. On the fifteenth General Shafter initially refused to grant Greenleaf's pleas for the assignment of more men on a permanent basis to the hospital because he did not want to expose

those at the front to yellow fever and because their services were vital where they were. Greenleaf immediately appealed to General Miles, and that very same day, presumably after Miles required him to do so, Shafter ordered the 24th Infantry, a regiment of black regulars, to help Major LaGarde at Siboney by performing guard duty, police, and nursing chores. Because of "the discipline of these seasoned troops," many of whom volunteered to care for yellow fever patients despite the danger this service appeared to pose to their own health, LaGarde noted that "for the first time in the history of Siboney, order loomed out of chaos." [40]

Obtaining personnel for duties that would involve possible exposure to yellow fever remained difficult throughout the summer. Cuban nurses soon "proved to be worthless" and were discharged. Immune or supposedly immune nurses, many black and female, "a hardy lot of female nurses—I do not mean lady nurses," as Colonel Pope put it, came in from the United States and were considered invaluable. Although none of these nurses contracted yellow fever, 2 of the supposedly immune physicians who came in with them in late July did. The first of about 2,000 men from two immune black regiments, the 2d and 3d Infantry, U.S. Volunteers, ordered to Santiago by Secretary of War Alger in mid-July to care for the sick in that city, arrived in Cuba a month later. Unlike the men of the 24th Infantry, these soldiers, as General Shafter reported after a few weeks, were "undisciplined, insubordinate and vicious. Are not controlled by their officers, terrorize the community by violent acts and cannot be relied upon for any duty." Female nurses proved to be "in every respect superior to males in all division and general hospitals," according to Major Ives, who admitted that he had initially opposed their employment in Cuba.[41]

A continuing shortage of supplies added still further to the difficulties being experienced by medical officers in Cuba. Ives blamed the problem on "vital defects in the supply department of the Army," although he also thought that some reports exaggerated the severity of the problem. Ships were still not carefully loaded; when cargo was removed from two vessels arriving at Puerto Rico in late July, some items destined for Cuba were discovered. Delays in unloading in Cuban harbors also continued to contribute to supply problems. Fortunately, quinine, the most vitally needed medicine, was apparently never in short supply.[42]

With adequate hospital space initially hard to find in Cuba, competent attendants to care for the sick rarely available, and supply problems unrelenting, the difficulties experienced at the V Corps' disease-crowded facilities would have been even greater had it not been for hospital and transport ships. These vessels were credited by Colonel Senn with the saving of "hundreds of lives which, without such means of transport, would have perished in Cuba and Porto Rico." Some of these ships evacuated wounded and convalescents to the United States, while a few others served as floating hospitals offshore and made periodic trips to move their patients back home.[43]

The Army's first such vessel in the Caribbean, the *Olivette*, had started her career without much planning. At the time of the invasion she took on the sick from the transports, who were later transferred to the steamer *Iroquois* to make room for the wounded. The retention of the 2d Division's hospital on board the *Olivette* caused her to assume the character of a permanent hospital ship. She was soon full to capac-

ity, and Shafter requested and received the help of a Navy hospital ship, the *Solace*, while a third ship was apparently later stationed in Santiago Bay to accommodate sick officers and noncommissioned officers. On 9 July, with hospitals in Cuba overflowing with the wounded of El Caney and San Juan Hill and the disease rates climbing, the *Olivette* left Santiago with 279 wounded, arriving in New York City a week later. She returned to Cuba with medical supplies and immune nurses and physicians shortly thereafter.[44]

By this point, the *Relief* had arrived in the Caribbean. Weeks had been consumed in converting her into a hospital ship for the Army, and she was superbly equipped. Her ice-manufacturing plant could produce two tons a day, her distillery 1,500 gallons of water. She carried 360 beds, 750 field cots, 650 extra mattresses, an X-ray machine, medical supplies, and two immune physicians for the Siboney yellow fever hospital. She was ordered to stay close to the scene of military operations and to send the less seriously sick and injured to the *Solace*, whence they would be shipped home if they were not in condition to be quickly restored to duty. After twelve days in port, the *Relief* sailed for New York with 254 wounded. After her return to the Caribbean, she was sent to support the troops who had invaded Puerto Rico, and only transports were left to move the sick and wounded from Cuba to the United States. One more hospital ship, the *Missouri*, put at the disposal of the Army on 1 July, was not ready for service until the end of August.[45]

Because of the shortage of hospital ships, sending sick and wounded patients north was a complex matter involving confusion and ultimately scandal. The use of transports was considered as early as 25 June, after Las Guasimas, and on 4 July, in the wake of El Caney and San Juan Hill, Brig. Gen. Henry C. Corbin, the adjutant general, authorized Shafter to employ for this purpose any ships he found suitable. Shafter had already sent one transport north with 300 wounded on 3 July, and a second set sail with 325 wounded on the fifth. Hospital ships were reserved for the seriously ill and wounded, and transports were neither designed nor staffed to handle patients who came on board in marginal condition or who fell ill on the way. Patients eager to return home sometimes sneaked on board, only to collapse once under way.[46]

Since the importation of yellow fever into the United States was very much feared, a medical board checked over all evacuees to exclude from ships returning to the United States all those even suspected of having yellow fever. Corbin ordered that at Santiago and, if possible, at every other important port, a ship be set aside where those about to return to the United States could be quarantined while they were observed for signs of yellow fever and their possessions disinfected. A doctor from either the Army or the Marine Hospital Service was assigned to certify that all passengers were free of infection; to supervise sanitation, including the quality of drinking water taken on; and to guarantee that no transport crews went on shore, where they might become infected. As early as 22 May 1898 Marine Hospital Service doctors were also authorized to stop and inspect all vessels arriving at U.S. ports, to fumigate them if necessary, and to detain any passengers who might be carrying disease. In addition, Marine Hospital Service physicians sometimes helped with patient care on board the transports, a responsibility usually borne by Army doctors.[47]

Preparing transports to carry convalescents from Cuba presented an even greater



LOUIS A. LAGARDE

challenge than preparing them to carry healthy troops to the island. Despite all precautions, vessels taking men from Cuba often lacked supplies for the sick and carried drinking water that, because of a long period of storage, was repulsive to both smell and taste. As a result of the shortage of medical officers, adequate medical care was hard to obtain. Attempts to modify these vessels by removing partitions to improve ventilation, to set up mess and laundry facilities, and to load needed supplies apparently aroused hostility on the part of captains and crews. Despite the difficulties, sanitation on these transports was regarded by the Medical Department as "fairly good." [48]

No scandals developed concerning conditions on these vessels until mid-July brought what Colonel Pope called "the *Seneca* and *Concho* incidents." Pope, ill because of sunstroke when the *Seneca* left Cuba on the fourteenth, was "therefore unequal to the duties and responsibilities which devolved upon him." Major LaGarde, in his eagerness to have his facility at Siboney ready to take on more wounded should further hostilities place a premium on hospital beds, had loaded eighty-five patients on the *Seneca* three days earlier. On board both the *Seneca* and the *Concho*, the bad water and lack of supplies became a cause celebre. Secretary of War Alger, obviously angry, asked General Shafter why these transports had arrived in the United States "without attendance and medicine." [49]

Excuses and explanations for the situation on the *Seneca* and the *Concho* were many and contradictory. The *Seneca*'s captain later maintained that he had told authorities that his ship was not prepared to carry the sick and that he had been ignored. After a water shortage was also reported on these ships, LaGarde insisted that their captains did not indicate a need for water when picking up patients at Siboney. He further emphasized that in spite of the fact that most of the passengers on these transports were assumed to be either convalescent or healthy, he had placed as much in the way of medical supplies as he could spare on the *Seneca*. He had even assigned the vessel two assistant surgeons, but one of them was later reported to have been sick most of the way. He could not assign a medical officer for the *Concho*, which carried a Red Cross surgeon and four nursing sisters. A nurse later alleged that the *Seneca* carried too many passengers, but the surgeon responsible for determining the load for each vessel denied the charge. Although the Medical Department blamed what was regarded as a high death rate aboard transports upon the "greatly debilitated condition of the men," outraged comments, once started, did not quickly end, and Sternberg's refusal to ac-

cept responsibility for any aspect of the situation only fueled public indignation.[50]

Some confusion obviously also existed about the ports to which these passengers should be taken. Initially, Secretary of War Alger apparently wanted the wounded placed on vessels returning to Florida after unloading troops. By early July transports with convalescents were being required to bring their passengers to Fort Monroe, near Newport News, rather than to Tampa. When the message ordering ships to Virginia was received in Cuba, two more transports had just left, both bound for Florida. One off-loaded 100 of the most seriously wounded at Key West, where a convent had been converted into a joint Army-Navy hospital, before proceeding to Tampa. At Tampa the hospital train met the remainder of her passengers and took them to Fort McPherson in Georgia. Alger was particularly upset, however, that even in early August a transport arrived at Tampa when she was to have gone to New York.[51]

The rest of the V Corps, fleeing disease in a state approaching panic, soon joined the sick and convalescent that these transports were taking from Cuba. No efforts of the Medical Department could prevent the repeated attacks of malaria that were rendering these once-strong men ever more fragile. Typhoid and dysentery continued to undermine morale, and the fear that worse was yet to come grew as the number of diagnosed yellow fever cases mounted. By 8 August three-fourths of the men were, according to General Shafter, "in no condition to withstand an epidemic of yellow fever, which all regard as imminent." [52]

Enthusiasm for the idea of withdrawing the V Corps from Cuba grew rapidly, but the fear that returning soldiers would carry the enemy back with them to the United States had not abated. Mail from Cuba was already being disinfected before entering the United States lest a letter bring in yellow fever, and General Miles had forbidden the circulation of paper money from infected units because it could not be disinfected. The Marine Hospital Service continued to check all vessels coming in from Cuba, whether troop transports or merchant ships. Nevertheless, believing that they had no alternative and convinced that wholesale deaths in their already seriously debilitated commands would follow a yellow fever epidemic, officers began bringing pressure to have their units brought home immediately. General Shafter noted that they agreed with him that "the only salvation for the survivors of the army was to leave Cuba as soon as possible." Roosevelt thundered that the men should be sent north, "not next month or next week, but now, today if possible." [53]

Secretary of War Alger responded immediately and favorably to General Shafter's urgent request that the V Corps be moved back to the United States without delay. The decision made, preparations progressed swiftly, but with so many men sick, the evacuation took more time than the invasion had. Marine Hospital Service doctors in Cuba were ordered to inspect transports and their crews to ensure neither brought yellow fever back to the United States. Adjutant General Corbin cabled Shafter to emphasize his concern that sufficient effort might not be taken to make sure that men with yellow fever were not among those returning home. Those who were too ill to move or who were suspected of having the dread disease, about 1,300 in all, were to be left "in very comfortable condition" to recuperate in Cuba.[54]

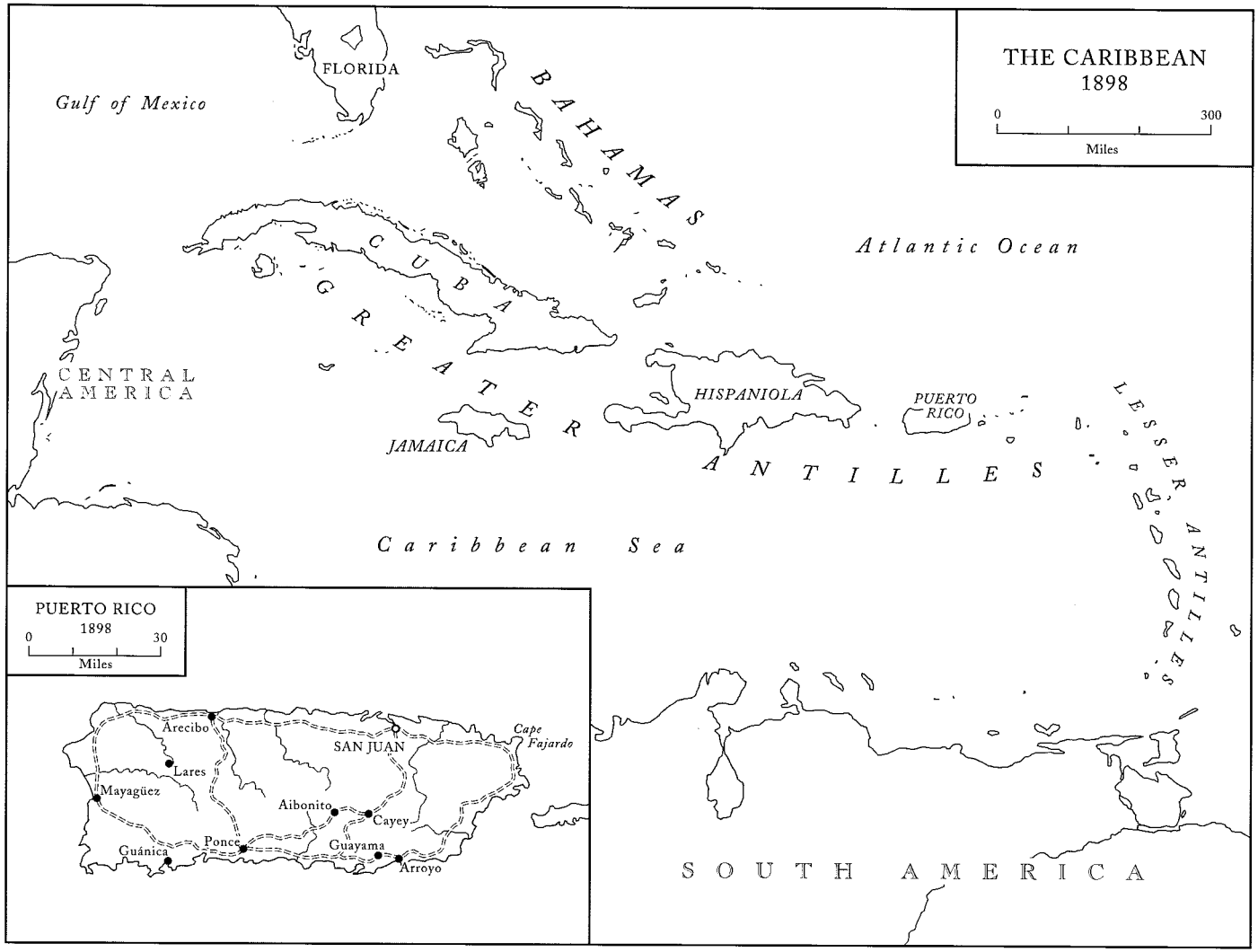
Except for the men who could not be moved, the entire V Corps was to be returned to the United States. In spite of the

probability that some would come down with yellow fever on the transports, General Shafter believed that to keep a sick man in Cuba until his fever had gone would be to inflict a death sentence upon him. Secretary of War Alger, undoubtedly motivated at least to some degree by the furor stirred up when the pleas of V Corps officers reached the press, sent south all the transports he could find. The *Olivette* initially assisted in removing the sick from Cuba; but, after carrying 203 sick to Boston on 15 August and heading south again, she foundered while coaling in heavy seas off Fernandina, Florida, fortunately without loss of life. Although Camp Wikoff on Long Island was not yet ready for them and hurricanes threatened, north they came, the first ship departing Cuba on 7 August, the last eighteen days later. The press attacked conditions on board the transports, and the debilitated condition of the men gave a poor impression, but no epidemics broke out during the voyage home, and the men themselves rarely complained. Major Ives concluded that the evacuation was well and humanely managed, given its hasty nature.[55]

Spanish troops were also returning home—General Shafter's promise that all Spanish prisoners, sick or healthy, would be evacuated from Cuba had been part of the surrender agreement—but the role of the U.S. Army Medical Department in their care ended when they left Cuba. The disease rate among the hungry, demoralized enemy soldiers on the island had also risen with the passage of time, a situation blamed chiefly on poor sanitation in their camps. Since no hospital was available to house the growing number of sick, the Spanish commander, General Jose Toral, had been forced to seek help in establishing a hospital as well as in improving sanitation. The repatriation was to be managed by contract, with the contractor providing medical attendance as necessary on board the transports. Because the ships that were to return former enemy soldiers to Spain were slow to arrive, more than 1,000 Spanish sick were yet to be moved from the island when the last of Shafter's men began leaving Cuba, but almost all had left by mid-September.[56]

In Puerto Rico

The campaign in Puerto Rico (*Map 3*) was even briefer than that in Cuba. The initial landing took place on 25 July, and the armistice brought hostilities to an end on 12 August. For the troops and for their medical officers, the effort in Puerto Rico was less demanding from the outset. The transports that moved the men were far better equipped for the task than those carrying the V Corps. Although what was apparently falciparum malaria afflicted Puerto Rico as it did Cuba, U.S. forces under General Miles, who led this expedition personally, did not encounter the dreaded yellow fever. Because the port of Guanica, near Ponce, taken on the first day, was a good harbor and a highway went through the mountains between Ponce and San Juan, the capital, transportation did not pose the problems that characterized the Cuban campaign. With Miles on 25 July were 3,400 men, originally destined to reinforce General Shafter but who had been held on board their transports at Guantanamo; no troops from yellow fever–infected areas of Cuba were sent to Puerto Rico. Unfortunately, 3,500 reinforcements sent from the United States brought typhoid with them when they joined the troops already there in taking Ponce. Even-


THE CARIBBEAN
1898
0
300
Miles
FLORIDA
Gulf of Mexico
BAHAMAS
Atlantic Ocean
CUBA
GREATER
CENTRAL AMERICA
HISPANIOLA
PUERTO RICO
JAMAICA
ANTILLES
LESSER ANTILLES
Caribbean Sea
PUERTO RICO
1898
0
30
Miles
Arecibo
SAN JUAN
Cape Fajardo
Lares
Mayagüez
Aibonito
Cayey
Ponce
Guayama
Guánica
Arroyo
SOUTH AMERICA

MAP 3

tually 17,000 men from the I, II, and IV Corps were serving on that island under Miles, reinforcements having landed at such varied sites as Guayama, Ponce, and Arroyo. When the fighting ended, only four of Miles' force had been killed and forty wounded, few of them seriously.[57]

Miles consulted often with his chief surgeon, Colonel Greenleaf, who, having arrived in the Caribbean just as disease was beginning to overcome the V Corps, accompanied the commanding general and personally directed the medical support of the effort in Puerto Rico. Nevertheless, some of the difficulties the Medical Department experienced during the invasion of Cuba recurred during the brief Puerto Rican campaign. Among the most persistent problems in this category was the shortage of hospital ships available to serve the troops in Puerto Rico. Last-minute arrangements for a vessel where those who fell ill on transports could be hospitalized became necessary. The Red Cross leased a steamer, the *Lampasas*, and staffed it with Red Cross doctors and nurses who had been prevented from landing at Guantanamo to avoid exposing them to yellow fever. None of the wounded from the first engagement near Ponce required care on the *Lampasas*, but her staff, with the aid of medical supplies from a transport and under the supervision of a contract surgeon appointed by Greenleaf, cared for eighty sick from the invasion force, many of whom were suffering from typhoid. Since no hospital ship accompanied the troops from the United States who landed a few days after the units from Guantanamo, as soon as supplies on the *Lampasas* and another steamer had been offloaded, Greenleaf had the sick from all units on the island, among them many typhoid victims, loaded on the two vessels and sent north to Fort Monroe.[58]

Secretary of War Alger was sufficiently concerned with the care of the wounded that he asked General Miles whether he should not plan to set up a general hospital in Ponce at once and promised to send as many physicians and nurses as might be needed. Although medical personnel presented few problems, for a time nurses were in short supply. Greenleaf asked Surgeon General Sternberg to send male nurses, although he considered females acceptable for service on a hospital ship or in a general hospital. Eventually, however, women were nursing not only in the Ponce general hospital but in smaller facilities, including four post hospitals.[59]

An adequate number of medical officers and hospital corpsmen was present at each of the minor engagements that characterized the campaign. In one instance, however, the grounding of a transport near Ponce hampered the work of the medical staff of I Corps units that landed at Arroyo on 2 August. As a result, neither the many hospital corpsmen nor the animals used to pull Medical Department wagons rejoined the rest of their unit for more than a week, significantly delaying the unloading of the reserve division hospital and its equipment. Some hospital supplies were unloaded by regimental teams that, despite efforts by medical officers, sometimes succeeded in acquiring and retaining division property. Because a certain amount of materiel had already disappeared during the move from U.S. camps to Puerto Rico, the help of the Red Cross and other charitable organizations was again most welcome.[60]

Other supply problems that followed the invasion of Puerto Rico resembled those experienced in Cuba, although they were not as severe. The first thirty-six ships

to arrive in Puerto Rico were not accompanied by invoices, and thus the entire cargo had to be searched to find what each vessel carried. Lighters to unload the transports were numerous, but minor delays resulted from the way in which the transports had been loaded. In one instance hospital tents were at the bottom of the ship's hold and were reached only a week after the landing. As a result, for a few days hospitals were overcrowded because of the lack of shelter. Similar minor delays involved both ambulances, which were, to Greenleaf's annoyance, sometimes used to move supplies, and medicines, causing temporary shortages on shore despite the amplitude of supplies brought with the invading force. Soon, too, "robbery was rife" as each shipment moved forward, but with "more perfect organization and better personnel," the arrival of medical supplies intact became more frequent.[61]

The struggle between those favoring regimental hospitals and those believing that larger institutions were more efficient flared up once again in Puerto Rico, fueled in part by the fact that the invading force was scattered about the island in small units, each requiring medical personnel and supplies. Hospitals were officially organized by brigade, and the need to provide for both individual units and the larger facilities once more produced an apparent manpower shortage, despite the Medical Department's insistence that patients be consolidated in the larger facilities as promptly as possible. Some volunteer units brought no attendants with them other than hospital stewards, exacerbating the difficulty.[62]

When the Army occupied towns in Puerto Rico, medical officers searched for buildings in which to house part or all of their hospitals. As soon as Ponce had been taken, they set up a general hospital there for U.S. patients in a former Spanish military facility, moving out its forty-four Spanish occupants, most of whom were the victims of venereal diseases. The building, according to Colonel Greenleaf, "was in an exceedingly filthy condition, with privies overflowing with liquid excrement and various rooms being indescribably dirty." On 9 August, when General Miles initiated the move on San Juan from Ponce, Secretary of War Alger suggested erecting a new building for the general hospital. Although Miles informed Alger that construction material was abundant, within ten days the surgeon in charge of the cleanup operation had the old structure in completely satisfactory condition, and a new facility never became necessary. The former Spanish hospital could accommodate 200 patients, but since it was initially overcrowded, Greenleaf obtained additional space in a well-run Ponce charity hospital. The Sisters of Charity also allowed him to use a girls' school as a hospital. A minimum number of men were detailed from the various commands to serve as nurses to allow as many corpsmen and medical officers as possible to accompany units into action.[63]

When the troops left Ponce to continue the drive against the Spanish, Colonel Greenleaf was informed that 50 patients would be left in the Ponce hospital. Then "the building was invaded by a promiscuous crowd of stragglers, numbering 150, not over two-thirds of whom required hospital accommodation." Since no security had been set up at the hospital, confusion reigned. Greenleaf quickly set up a convalescent facility that could eventually house 500 in floored and framed huts, to which he sent 125 men. When the hospital ship *Relief* arrived shortly thereafter, some of the

men who were actively ill were placed on board with a few wounded for evacuation to the United States. As the vessel sailed north after leaving Ponce on 15 August, she picked up a few wounded from the brigade hospital at Mayaguez as well. Not long thereafter, however, Surgeon General Sternberg decided that, since the move might jeopardize the health of the increasing number of men actively suffering from typhoid, the Ponce facility should continue in use as a general hospital to shelter all who were still acutely ill with the disease.[64]

Similar facilities were set up in other Puerto Rican communities as they were occupied. Even when of recent origin, the buildings used as hospitals required repair or remodeling of some kind before U.S. medical officers could consider them satisfactory, and Sternberg believed that tents were preferable. Moreover, the laboratory equipment necessary to examine blood samples from soldiers suffering from fevers was never present. Colonel Greenleaf warned against keeping the sick on the island any longer than absolutely necessary, both because of the climate and because of the effect the presence of debilitated soldiers had on morale. Since both he and Surgeon General Sternberg were reluctant, no doubt because of the experiences in Cuba, to use transports to move the sick and wounded, Greenleaf decided to use only hospital ships for this purpose, although he did allow convalescents to be moved by transport. He decided that when the patients in the Ponce hospital had been sent home, ambulance trains would move the sick from camp hospitals to Ponce, whence they, too, could be evacuated to the United States.[65]

Familiar diseases afflicted troops in Puerto Rico as they had in Cuba, but the Army made sure by means of a quarantine that neither yellow fever nor smallpox came in from the outside. Investigation confirmed the fact that typhoid had been imported from the United States, although it was also endemic in Puerto Rico, and the debilitating effect of the island's malaria followed the pattern that had already become familiar in Cuba. Heavy rains increased the incidence of disease. The remedy of moving camp was again discussed, and Greenleaf suggested that the men of one particularly debilitated unit be sent to the mountains to regain their health and strength. At first the disease rate continued to climb—300 remained when the *Lampasas* sailed and new cases were occurring at the rate of ten a day in the Ponce area alone. As the campaign ended, the number of new typhoid cases was at last decreasing, but various digestive problems were increasing, and malaria continued to be a major problem for the army of occupation.[66]

In the Philippines

Unlike the campaigns in the Caribbean, the effort of General Merritt's VIII Corps to take Manila from the Spanish in the Philippines, so well begun in the United States, encountered few difficulties that could be attributed to poor planning. When General Anderson's vanguard of officers and men, the first troops to arrive, landed during the first week of July at Cavite, this peninsula on Manila Bay southwest of the city itself was already under the U.S. Navy's control. The guns of Commodore Dewey's fleet, capable of forcing the surrender of Manila but not of occupying it, and Filipino rebels surrounding the city already had the enemy at bay when U.S. troops began their advance. The Spanish put up little resistance, although for a week they exchanged fire with

the invaders approaching Manila, leaving more than sixty Americans wounded, until Dewey threatened to use his fleet's heavy guns. The outcome of the final battle for the city on 13 August, one day after the armistice had been signed but before the fact was known in the Philippines, was essentially prearranged during secret negotiations earlier in the month. The Spanish commander, who wished to both save face and surrender, agreed to limit his resistance in exchange for an agreement not to shell the city or to involve the Filipino rebel forces that were allied with the Americans. As a result, the final conquest of the city produced less than fifty U.S. wounded.[67]

High seas and rough surf typical of the monsoon season complicated ship-to-shore movement and retarded all unloading at Cavite, but Medical Department personnel were spared the struggle to locate medical and hospital supplies that had hampered the work of their counterparts in Cuba. Thus, Capt. Harlan E. McVay was able to set up a small post hospital promptly. When the sick who were removed from incoming transports began to crowd the first facility, he appropriated a second building nearby so that he had room for 150 beds. Upon the arrival of the corps chief surgeon, Colonel Lippincott, in mid-July, McVay's facility was upgraded and classified as the VIII Corps' reserve hospital. A hospital steward and Hospital Corps privates from volunteer units were assigned to the hospital, and more joined them after the arrival of additional transports flooded it with new patients. When the third group of transports arrived at Cavite at the end of July, old Spanish cots of bamboo were used to accommodate all the sick. Although Colonel Lippincott considered the buildings at Cavite "unsuitable in every way," they continued in use and became the site of surgical operations then considered demanding, including appendectomies. Despite changing designations, the Cavite facility was apparently always regarded as "a kind of post hospital."[68]

In actual fact, Cavite was a poor location for either a camp or a hospital. A stench blamed on rotting bodies trapped in the hulks of Spanish ships sunk in the bay by Dewey in May permeated the peninsula, and the seawall defenses trapped garbage and sewage near the shore. The buildings that sheltered troops were also "reeking with filth." Not even the rudiments of a sewage system could be found; in some barracks and in all private homes "the faeces of generations had been carefully preserved in cemented vaults." In one building where water closets discharging into sealed vaults had been installed, the gas vents had also been sealed, and from time to time "explosions of gas" drove the "trap water out over the room." The water supply was described as "worse than bad," inadequate in quantity, polluted, brackish, and "filled with organic matter." Bathing facilities as such were nonexistent. Lippincott believed that "the general insalubriousness of the locality" together with overwork was responsible for Captain McVay's death from typhoid in January 1899.[69]

On 15 July General Anderson moved some of his men by water from Cavite north to a generally well-drained area only three miles south of Manila. Here, where peanuts had once been grown, Camp Dewey became a landing site for the rest of General Merritt's command. The water, once boiled, proved entirely satisfactory. Brigade surgeon Maj. William D. Crosby of the U.S. Volunteers, who arrived mid-July with the second group of transports, quickly set up "an excellent tent hospital," and Colonel Lippincott sent him fifty tents

and other supplies as they came in. Until the final day of the campaign, all wounded were sent to this facility. Although with the arrival of the expedition's headquarters the men in the Philippines were organized as the 2d Division, the chief surgeon decided, as had Colonel Greenleaf in Puerto Rico, to rely at least initially on a brigade organization rather than one by division.[70] Thus the Camp Dewey facility became the first of two brigade hospitals rather than a new division facility. A hospital would be ready to accompany a brigade on detached duty, and when still more troops reached the islands, each brigade hospital could be expanded, if need be, into a division facility. Shortly after the establishment of the first brigade hospital, Maj. George H. Penrose, a brigade surgeon of the U.S. Volunteers, set up the second. Some of the total of a hundred hospital tents on hand for the use of these two facilities were never needed. The men had been living under arduous conditions, "alternately roasted and basted by the sun and the rain," and, out of desperation in the last stages of the campaign, forced to drink whatever water they could find, but the sick rate was only 4 percent. Of the 124 still hospitalized on 13 August, more than half were wounded.[71]

The arrival of increasing numbers of soldiers dictated a more formal organization of the 2d Division's Hospital Corps personnel. Initially, only 144 Hospital Corps privates and the 48 men chosen from two volunteer units served under Colonel Lippincott. Of this group, 60 served with their regiments, 27 went to each of the brigade hospitals, and 25 were sent to the Cavite hospital. The division chief surgeon, Maj. Herbert W. Cardwell of the U.S. Volunteers, observed that regimental surgeons tended to keep the best of their men for themselves and to send the dregs to serve elsewhere. The first ambulance company, to which 50 privates were assigned, had been formed and its men instructed in their duties even before Lippincott's arrival in the Philippines. The fact that only two ambulances were available caused no great hardship because these vehicles were too heavy to be used over the muddy roads of the area, and the Quartermaster's Department located about forty local vehicles that proved adequate to the need. Since no tents or utensils were available to allow the members of the ambulance company to camp or eat together, they continued to live with their former regiments. Most of the hospital stewards with the volunteers also remained with their units, but a regular steward served in each hospital.[72]

Although the shortage of qualified hospital corpsmen was chronic, the number of medical officers was essentially adequate during the first weeks in the Philippines. Colonel Lippincott found most volunteer physicians happy to be assigned to service in the brigade hospitals and only one colonel particularly reluctant to give up his medical officers. Initially, few regimental surgeons were needed for service outside their regiments, since less than 65 officers and men were wounded before the final day of the campaign. The corps chief surgeon required the services of only one regimental medical officer, an excellent surgeon, capable of performing, among others, "a great many operations for the radical cure of hernia, with wonderful success."[73]

By the time Lippincott was preparing for the final move to Manila, the constant storms that were causing a delay in unloading the transports had rendered supply a major source of frustration. After considerable effort, the chief surgeon obtained a small launch for the exclusive use of the Medical Department so that medical offi-

cers could remove some of their own supplies directly. At Camp Dewey, rain added to the difficulties experienced by medical officers. Although a sufficient number of ponchos had been unloaded to cover the bamboo frames for hospital tents, on 31 July the physicians found themselves caring for patients while standing in water four inches deep. Problems with transportation even led to a shortage of food; for several weeks "but little more than half rations were available." [74]

On 13 August, the final day of Spanish resistance, between 40 and 47 men were wounded. Majors Penrose and Cardwell were at the front all day, supervising care and evacuation. The rocks and holes characteristic of the roads in the area made it likely that litter-bearers would fall, tossing the wounded onto the ground, and thus only a few of the most seriously injured were moved in this way. Since the construction of travois for their patients would have been too time-consuming, surgeons resorted to "native carromatas, two-wheeled carts drawn by diminutive ponies . . . most abominable vehicles," to move the casualties three to five miles to Camp Dewey over "execrable roads" so rough that the jostling tore dressings loose. The natives who drove the "abominable vehicles" worked under guard to prevent desertion. Ambulance stations were set up along the road so that the damage to patients and their dressings could be repaired. Despite the difficulties, by 1900 hours of the day the guns fell silent, all wounded had received medical care and been placed in their beds in one of the hospitals.[75]

The short-lived hostilities of the Spanish-American War taught a hard lesson about the dangers of going to war without adequate preparation. Had the enemy been a more able foe, the result for the Medical Department, as for the Army as a whole, would obviously have been far more tragic. Not surprisingly, therefore, those concerned with the ability of the United States to defend its new role as a world power after 1898 pushed to reorganize both the Army and its Medical Department so that involvement in modern warfare would not spell disaster.

For the Medical Department the greatest tragedy for troops actively involved in hostilities during the Spanish-American War had been produced by disease. The story of the care of wounds in this war was a triumphant one—whether in the Philippines or the Caribbean, the casualties of the Spanish-American War were far more fortunate than those of the Civil War. By 1898 physicians knew how wounds became infected, and the precautions necessary to prevent wound infection were easily taken. The wounded invariably did well in spite of large numbers of inexperienced physicians, difficult terrain, filth, and a shortage of suitable shelter for hospitals. An understanding of how typhoid fever, malaria, and yellow fever were spread was the necessary first step to eliminating the high toll these diseases traditionally took, and the medical profession was only on the brink of that understanding. In the care of wounds the war with Spain represented a new era in medicine, but in the prevention of disease it marked the last gasp of a long dark age.

NOTES

1. Unless otherwise indicated, all material on the Spanish-American War is based on Graham A. Cosmas, *Army for Empire*.

2. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1898, pp. 206, 215 (hereafter cited as WD, *ARofSG*, date). Exact figures on the number of wounded from the Spanish-American War in Cuba vary. See, for example, in the William R. Shafter Papers, Stanford University, Palo Alto, Calif. (hereafter cited as Shafter Papers, SU), the following: Ltr, Joseph Wheeler to AG, 25 Jun 1898, and Rpt, Shafter to AG, 8 Jul 1898, Microfilm (Mf) Reel 3; and V Army Corps GO 36, 19 Jul 1898, Mf Reel 4.

3. WD, *ARofSG*, 1898, pp. 116–17, 195, 206; idem, *[Annual] Report of the Secretary of War*, 1898, 1(pt.1):4 (hereafter cited as WD, *ARofSW*, date); Edward Marshall, *The Story of the Rough Riders*, p. 148; in Shafter Papers, SU: Ltrs, Edward J. McClernand to Ch Surg, 23 Jun 1898, and Benjamin F. Pope to Asst AG, V Army Corps, 23 Jun 1898, Mf Reel 3, and Report of Commission To Investigate the Conduct of the War, p. 71, Mf Reel 6 (hereafter cited as Com Rpt).

4. George Kennan, *Campaigning in Cuba*, p. 87; WD, *ARofSG*, 1898, pp. 116–17, 147, 192, and 1899, pp. 57–58; Erna Risch, *Quartermaster Support of the Army*, pp. 537, 541, 552–53; Ltr, Shafter to AG, 3 Jun 1898, Mf Reel 2, Shafter Papers, SU; United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 1:645 and 8:137, 139 (hereafter cited as *Dodge Commission Report*).

5. WD, *ARofSG*, 1898, pp. 193–94, 198 (quotation), 215, 221–23, 225; Kennan, *Campaigning*, pp. 76, 83; in Shafter Papers, SU: Ltrs, B. Pope to Asst AG, V Army Corps, 23 Jun 1898, and Joseph Wheeler to Shafter, 24 Jun 1898, Mf Reel 3, and Ltr, B. Pope to SG, 25 Jun 1898, in Rpt, Benjamin F. Pope, Mf Reel 6; *Dodge Commission Report*, 6:2894.

6. Nicholas Senn, *Medico-surgical Aspects of the Spanish-American War*, pp. 363–64; WD, *ARofSG*, 1898, pp. 192, 209, 224, 233; Victor C. Vaughan, "The Care of the Wounded at Santiago," p. 32; Robert Reyburn, *Fifty Years in the Practice of Medicine and Surgery, 1856 to 1906*, p. 9; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 52 (hereafter cited as WD, SGO, *SGO*).

7. Kennan, *Campaigning*, pp. 5, 97 (quotation); WD, *ARofSG*, 1898, pp. 117, 194, 218–19.

8. WD, *ARofSG*, 1898, pp. 208–09 (quotation), 219, 224, 227–29, 231; *Dodge Commission Report*, 1:355.

9. Autobiography, William R. Shafter, ch. VII, p. 5, Mf Reel 6, Shafter Papers, SU; WD, *ARofSG*, pp. 116, 187, 195, 198, 206, 227; *Dodge Commission Report*, 1:589; John J. Bigelow, *Reminiscences of the Santiago Campaign*, p. 148; Theodore Roosevelt, "The Rough Riders," p. 678; WD, SGO, *SGO*, p. 52.

10. Shafter Autobiography, ch. VII, p. 4 (first quotation), Mf Reel 6, Shafter Papers, SU; WD, *ARofSG*, 1898, pp. 117, 206 (remaining quotations), 214, 224, 227; *Dodge Commission Report*, 6:2917, 8:527.

11. WD, *ARofSG*, 1898, pp. 117, 194–95, 206, 221–23, and 1899, p. 58 (quotation); Kennan, *Campaigning*, pp. 130–36; Ltrs, Shafter to SW, 27 Jun 1898, and to AG, 8 Jul 1898, and French E. Chadwick to E. McClernand, 27 Jun 1898, Mf Reel 3, Shafter Papers, SU; *Dodge Commission Report*, 6:3031, 8:141; "New York Academy of Medicine," p. 566; WD, SGO, *SGO*, p. 52.

12. John D. Miley, *In Cuba With Shafter*, pp. 137–38 (quotation); WD, *ARofSG*, 1898, p. 198; Ltrs, Shafter to CG, Spanish Forces, Santiago de Cuba, 4 Jul 1898, to Jose Toral, 5 Jul 1898, and to AG, 5 Jul 1898, Mf Reel 3, Shafter Papers, SU; Senn, *Aspects*, p. 322; Kennan, *Campaigning*, p. 148.

13. WD, *ARofSG*, 1898, pp. 117, 197–98, 212–13; *Dodge Commission Report*, 1:645, 5:1824.

14. Senn, *Aspects*, p. 320; Kennan, *Campaigning*, pp. 86, 114, 148; in Shafter Papers, SU: Ltr, Shafter to AG, 6 Jul 1898, Mf Reel 3, and Ltr, B. Pope to SG, 5 Jul 1898 (first quotation), in Pope Rpt, plus Com Rpt, p. 72, both Mf Reel 6; WD, *ARofSG*, 1898, pp. 198, 212 (remaining quotations), 213, 226.

15. WD, *ARofSG*, 1898, pp. 215 (fourth quotation), 216 (first two quotations), 222 (third quotation), 223, and 1899, pp. 305, 311–14; Senn, *Aspects*, p. 341; Ltr, Shafter to AG, 6 Jul 1898, Mf Reel 3, Shafter Papers, SU.

16. WD, *ARofSG*, 1898, p. 198, and 1899, pp. 235–36, 305, 308–14; idem, *ARofSW*, 1898, 1(pt.1):5, 150, 273, 786, and 1(pt.2):59, 124.

17. William C. Borden, "Conservatism in Military Surgery," pp. 250, 256; idem, *The Use of the Rontgen Ray by the Medical Department of the United States Army in the War With Spain*, pp. 29, 32–33; Valery Havard, "The Krag-Jorgensen Bullet-Wound," p. 1413; Nicholas Senn, "Recent Experiences in Military Surgery After the Battle of Santiago," p. 1164; idem, "Surgical Diseases of the Spanish-American War," p. 1419; WD, *ARofSG*, 1898, pp. 209, 221, 233; Com Rpt, p. 76, Mf Reel 6, Shafter Papers, SU; *Dodge Commission Report*, 1:616, 8:146–47; Bigelow, *Reminiscences*, p. 146; Narrative, Esther V. Hasson, Entry 230, Record Group (RG) 112, National Archives and Records Administration (NARA).

18. First quotation from Ltr, Shafter to Wilson, 9 Feb 1899, Mf Reel 6, Shafter Papers, SU. In loc. cit., on Mf Reel 3, see Ltrs, Edward J. McClernand to Joseph Wheeler, 1 Jul 1898, to SW, 3 and 5 Jul 1898, and to Henry W. Lawton, 12 Jul 1898; Henry M. Duffield to Shafter, 10 Jul 1898; Leon S. Roudiez to McClernand, 10 Jul 1898; Charles G. Starr to McClernand, 10 Jul 1898; J. C. Gilmore to J. Wheeler, 12 Jul 1898; and Lawton to AG, 12 Jul 1898. Second quotation from Senn, *Aspects*, p. 173. See also William R. Shafter, "The Capture of Santiago de Cuba," p. 625; Hermann Hagedorn, *Leonard Wood*, 1:212; War Department, *Correspondence Relating to the War With Spain . . .*, 1:196. Senn was initially assigned as chief surgeon of the VI Corps, but on 22 June, when he realized that this corps would not be organized, he asked for active duty. See idem, *ARofSG*, 1899, p. 65.

19. The famous Rough Riders were the 1st Cavalry, U.S. Volunteers.

20. Quotations from Henry Cabot Lodge, ed., *Selections From the Correspondence of Theodore Roosevelt and Henry Cabot Lodge, 1884–1918*, 1:322, 327. See also ibid., p. 323; Victor C. Vaughan, *A Doctor's Memories*, pp. 336–37, 340; in Shafter Papers, SU: Ltr, Roosevelt to Shafter, 12 Jul 1898, Mf Reel 3, and Ltrs, W. W. Calhoun to AG, V Army Corps, 16 Jul 1898, and B. Pope to SG, 19 Jul 1898, in Pope Rpt, Mf Reel 6.

21. First quotation from Ltr, Shafter to J. C. Gilmore, 1 Aug 1898, and second quotation from Ltr, Roosevelt to Joseph Wheeler, 5 Aug 1898, both Mf Reel 4, Shafter Papers, SU. In loc. cit., see Ltrs, Charles F. Humphrey to Edward J. McClernand, 20 Jul 1898, Joseph T. Ch[?]pe to Adj, 22d Inf, 31 Jul 1898, and Shafter to QMG, 22 Jul 1898, and to AG, 23 Jul 1898, and, on Mf Reel 6, Ltr, Shafter to AG, 30 Sep 1898. See also WD, *ARofSG*, 1898, p. 197; Vaughan, *Memories*, pp. 334, 336–37, 340; Kennan, *Campaigning*, p. 216.

22. Quotation from Ltr, B. Pope to Asst AG, 22 Jul 1898, Mf Reel 4, Shafter Papers, SU. In loc. cit., see on Mf Reel 3: Ltrs, AG to Shafter, 3 and 5 Jul 1898, SW to Shafter, 4 Jul 1898, Shafter to AG, 5 Jul 1898, and J. C. Gilmore to COs [various], 14 Jul 1898, and V Army Corps SO 35, 11 Jul 1898; on Mf Reel 4: Ltrs, C. Humphrey to E. McClernand, 20 Jul 1898, Shafter to AG, 25 Jul and 6 Aug 1898, John D. Miley to E. McClernand, 27 Jul 1898, and E. McClernand to Henry W. Lawton, 28 Jul 1898, plus V Army Corps GO 27, 23 Jul 1898, and Ch Surg, 5th Army Corps, Cir (to Volunteers), n.d.; on Mf Reel 5: Telg, Shafter to AG, 13 Aug 1898; and on Mf Reel 6: Encl to Ltr, Charles D. Rhodes to William H. McKittrick, Nov 1931. See also *Dodge Commission Report*, 6:3044; WD, *Correspondence*, 1:217; idem, *ARofSG*, 1898, pp. 137–38, 200, 228, 230; Nelson A. Miles, *Serving the Republic*, p. 285; Charles H. Alden, "Roster of Volunteer Medical Officers Who Served During the Spanish-American War of 1898 in the Military and Naval Services," p. 58; "The Heroes at the Rear," p. 235; John Duffy, *The Sanitarians*, pp. 152, 194, 222.

23. *Dodge Commission Report*, 8:151; WD, *ARofSG*, 1899, pp. 236–39; in Shafter Papers, SU: Rpts, Shafter to AG, 27 Jul–23 Aug 1898, Mf Reels 4–5, and Shafter Autobiography, ch. VII, p. 6, Pope Rpt, 19 Jul 1898, Ltr, Shafter to J. Wilson, 7 Feb 1899, and Shafter Speech, all Mf Reel 6.

24. WD, *ARofSG*, 1898, pp. 199, 203, 235, and 1900, p. 74; in Shafter Papers, SU: Ltr, J. Ch[?]pe to Adj, 22d Inf, 31 Jul 1898, Mf Reel 4, and Telgs, Shafter to AG, 8 and 9 Aug 1898, Mf Reel 5; Joseph Wheeler, *The Santiago Campaign, 1898*, pp. 357, 359–60; Lodge, *Selections*, 1:332; Roosevelt, "Rough Riders," pp. 677, 680; *Dodge Commission Report*, 8:135; Fielding H. Garrison, *An Introduction to the History of Medicine*, p. 526; "Mosquitoes and Malaria," p. 324.

25. WD, *ARofSG*, 1898, pp. 199, 218–19, 229, 233 (quotation); Risch, *Quartermaster Support*, p. 534; Russell A. Alger, "The Food of the Army During the Spanish War," p. 58. See also in Shafter Papers, SU: Ltr, Henry W. Lawton to AG, V Army Corps, 24 Jun 1898, and V Army Corps GO 23, 10 Jul 1898, and Ltr, Roosevelt to Shafter, 12 Jul 1898, all Mf Reel 3; Ltrs, G. Creighton Webb to AG, 1st Div, V Army Corps, 16 Jul 1898, and J. Ch[?]pe to Adj, 22d Inf, 31 Jul 1898, Mf Reel 4; and Ltr, Shafter

to Charles P. Eagan, 24 Dec 1898, and Com Rpt, pp. 51–55, 72, both Mf Reel 6.

26. WD, *ARofSG*, 1898, pp. 114, 196, 205, 216 (quotation), 228–29, 234, and 1899, p. 690; Ltr, Edward J. McClernand to Charles R. Greenleaf, 15 Jul 1898, Mf Reel 4, Shafter Papers, SU; Walter Millis, *The Martial Spirit*, pp. 346–47; *Dodge Commission Report*, 1:645; Hagedorn, *Wood*, 1:201; Miles, *Serving*, p. 282; Risch, *Quartermaster Support*, p. 532; William N. Bispham, *Malaria*, pp. 68, 74; Vaughan, *Memories*, p. 347; Roosevelt, "Rough Riders," p. 679.

27. WD, *ARofSG*, 1898, pp. 117, 230, 234 (quotation), and 1899, p. 251; Miles, *Serving*, p. 287; Kennan, *Campaigning*, p. 162; Ltrs, Shafter to AG, 6 Jul 1898, Henry M. Duffield to E. McClernand, 6 Jul 1898, and Charles S. Humphrey to QMG, 12 Jul 1898, Mf Reel 3, Shafter Papers, SU; *Dodge Commission Report*, 5:2104, 6:3049, and 8:151.

28. *Dodge Commission Report*, 1:588 (quotations), 614; WD, *ARofSW*, 1898, 1(pt.1):33–34, 37; idem, *Correspondence*, 1:303; idem, *ARofSG*, 1898, pp. 145, 234–35, and 1899, p. 92; Hagedorn, *Wood*, 1:262; Miley, *In Cuba*, pp. 216–17; Roosevelt, "Rough Riders," p. 680. See also in Shafter Papers, SU, on Mf Reel 3: Ltrs, J. Wheeler to Asst AG, Cuba, 28 Jun 1898, B. Pope to Asst AG, 10 Jul 1898, and AG to Shafter, 13 Jul 1898; on Mf Reel 4: Ltrs, Miles to Shafter, 15 Jul 1898, and to AG, 1st Div, V Army Corps, 16 Jul 1898, G. Creighton Webb to AG, 1st Div, V Army Corps, 16 Jul 1898, and SW to Shafter, 2 Aug 1898; and on Mf Reel 6: Shafter Autobiography, ch. VII, pp. 5–6.

29. WD, *ARofSG*, 1898, pp. 144, 196 (quotation); idem, *ARofSW*, 1898, 1(pt.1):30–31; *Dodge Commission Report*, 1:645; Miley, *In Cuba*, p. 155; in Shafter Papers, SU: Ltrs, H. Duffield to E. McClernand, 6 Jul 1898, and C. Humphreys to QMG, 12 Jul 1898, Mf Reel 3, and Ltrs, E. McClernand to C. Greenleaf, 15 Jul 1898, and Ch Surg, 1st Div, V Army Corps, to AG, 1st Div, V Army Corps, 16 Jul 1898, Mf Reel 4; Nicholas Senn, *War Correspondence (Hispano-American War)*, pp. 81–82.

30. Miles, *Serving*, p. 293; WD, *ARofSG*, 1898, pp. 196, 213, 217; WD, *ARofSW*, 1898, 1(pt.1):35; in Shafter Papers, SU: Ltr, Edward J. McClernand to Henry V. Boynton, 11 Jul 1898, Mf Reel 3, and Ltr, Boynton to Henry M. Duffield, 28 Nov 1898, Mf Reel 6.

31. Ltrs, Shafter to AG, 21–23, 25–26 Jul 1898, Mf Reel 4, Shafter Papers, SU; *Dodge Commission Report*, 1:645; Vaughan, *Memories*, p. 346; WD, *ARofSG*, 1899, p. 60.

32. WD, *ARofSG*, 1898, pp. 194–95, 212–13, 216; *Dodge Commission Report*, 5:1829 and 8:145, 150–51.

33. Quotations from WD, *ARofSG*, 1898, pp. 216–17; ibid., pp. 144–45, 196, 203, and 1899, pp. 145, 250; Miles, *Serving*, pp. 287, 292–93; Marie D. Gorgas and Burton J. Hendrick, *William Crawford Gorgas*, pp. 67–68; in Shafter Papers, SU: Ltrs, Ch Surg to Asst AG, V Army Corps, 26 Jun 1898, and McClernand to Shafter, 11 and 13 Jul 1898, Mf Reel 3, and Ltr, H. Boynton to H. Duffield, 28 Nov 1898, Mf Reel 6; WD, *ARofSW*, 1898, 1(pt.1):30–31, 35; Vaughan, *Memories*, p. 346; Miley, *In Cuba*, p. 155; Senn, *War Correspondence*, pp. 81–82; *Dodge Commission Report*, 1:645, 5:1840; "The First Battle Against Yellow Fever," p. 126; Orlando Ducker, "The Troops in Santiago," p. 669.

34. Quotation from *Dodge Commission Report*, 1:573; ibid., 1:574, 616; Vaughan, *Memories*, pp. 345, 347; Esmond R. Long, *A History of American Pathology*, pp. 156–57; WD, *ARofSG*, 1898, pp. 115, 117, 145, 150, 170, 195–96, 216–17, 220, 234, and 1899, p. 170; Ltrs, J. C. Gilmore to Shafter, 18–19 Jul 1898, Maj Commanding to Asst AG, V Army Corps, 23 Jul 1898, and Edward J. McClernand to Louis A. LaGarde, 31 Jul 1898, Mf Reel 4, Shafter Papers, SU.

35. The detention camp was also referred to as a detention hospital.

36. WD, *ARofSG*, 1898, pp. 115, 195–96, 209, 220, 234 (quotation), 240, and 1899, p. 60; *Dodge Commission Report*, 6:3049.

37. *Dodge Commission Report*, 1:400–403; WD, *ARofSG*, 1898, pp. 185, 197, 209, 236–37, and 1899, pp. 57, 170; Telg, Shafter to AG, 10 Aug 1898, Mf Reel 5, Shafter Papers, SU.

38. Quotation from Ltr, McClernand to Tait, 3 Oct 1898, Mf Reel 6, Shafter Papers, SU (see also idem to LaGarde, 31 Jul 1898, Mf Reel 4); WD, *ARofSG*, 1899, pp. 60, 155, 170; idem, *Correspondence*, 1:140, 196.

39. First quotation from Telg, SW to Shafter, 9 Aug 1898, Mf Reel 5, Shafter Papers, SU. In loc. cit., see Telgs, Shafter to AG, 8 and 10 Aug 1898, and, on Mf Reel 4, Ltr, E. McClernand to H. Lawton, 20 Jul 1898. Second quotation from WD, *Correspondence*, 1:241. See also ibid., 1:217; idem, *ARofSG*, 1898, p. 209, and 1899, p. 170.

40. Quotations from WD, *ARofSG*, 1898, pp. 214–15; ibid., pp. 145, 207, 213, 216, 238; idem, *Correspondence*, 1:140, 197; idem, *ARofSW*, 1(pt.1):35; *Dodge Commission Report*, 1:400–403, 8:145. See also in Shafter Papers, SU, on Mf Reel 3:

Ltrs, Shafter to AG, 6 Jul 1898, and to Henry L. Turner, 10 Jul 1898; on Mf Reel 4: Ltrs, McClernand to Greenleaf, Greenleaf to AG, V Army Corps, and Miles to Shafter, all 15 Jul 1898, plus Shafter to AG, 18 Jul 1898, and Alfred C. Markley to AG, 5th Army Corps, 1898; and on Mf Reel 6: Ltrs, Pope to SG, 10 and 19 Jul 1898, in Pope Rpt.

41. WD, *ARofSG*, 1898, pp. 117, 196 (first quotation), 217, 238 (fourth quotation); *Dodge Commission Report*, 5:1833, 6:3052 (second quotation); in Shafter Papers, SU: Ltr, AG to Shafter, 13 Jul 1898, Mf Reel 3, and Ltr, Miles to Shafter, 15 Jul 1898, Mf Reel 4, and Telg, Shafter to AG, 16 Aug 1898 (third quotation), Mf Reel 5; WD, *Correspondence*, 1:225, 231; idem, *ARofSW*, 1898, 1(pt.1):34; Statement, [Anita Newcomb McGee], p. 9, Entry 230, RG 112, NARA; "The Yellow Fever," p. 128.

42. Quotation from Ives End to Ltr, Morrison, 3 Aug 1898, Mf Reel 4, Shafter Papers, SU. In loc. cit., see Ltrs, Leon S. Roudiez to Edward J. McClernand, 20 Jul 1898, and Shafter to AG, 1 Aug 1898, and to SW, 4 Aug 1898. See also WD, *Correspondence*, 1:197; idem, *ARofSG*, 1898, pp. 237–38; *Dodge Commission Report*, 8:135.

43. Senn, *Aspects*, p. 318 (quotation); *Dodge Commission Report*, 1:645.

44. WD, *ARofSG*, 1898, pp. 108–09, 217, 225, and 1899, p. 170; *Dodge Commission Report*, 1:645, 6:2897; in Shafter Papers, SU: Ltrs, Shafter to AG, 25 Jun 1898, and to William T. Sampson, 26 Jun 1898, Ch Surg to Asst AG, V Army Corps, 26 Jun 1898, and Sampson to Shafter, Mf Reel 3, and Ltr, Edward J. McClernand to Ch QM, 30 Jul 1898, Mf Reel 4.

45. WD, *ARofSG*, 1898, pp. 107–09, 145, 215, and 1899, pp. 202–03; *Dodge Commission Report*, 1:330, 339; WD, *Correspondence*, 1:196, 199; Ltr, Louis A. LaGarde to Shafter, 2 Aug 1898, Mf Reel 4, Shafter Papers, SU; Vaughan, *Memories*, p. 347; "War Articles," p. 39; Statement, Esther V. Hasson, Entry 230, RG 112, NARA.

46. WD, *Correspondence*, 1:197, 237; idem, *ARofSW*, 1898, 1(pt.1):128; Ltr, AG to Shafter, 4 Jul 1898, Mf Reel 3, Shafter Papers, SU; *Dodge Commission Report*, 1:573.

47. Ralph C. Williams, *The United States Public Health Service, 1798–1950*, pp. 85–86, 559 (hereafter cited as *USPHS*); *Dodge Commission Report*, 1:571, 573, 646; in Shafter Papers, SU: Memo, J. C. Gilmore, 22 May 1898, Mf Reel 2, and V Army Corps GO 32, 7 Aug 1898, Mf Reel 4, and Telgs, AG to Shafter, 9 and 12 Aug 1898, Mf Reel 5; WD, *Correspondence*, 1:237; idem, *ARofSG*, 1899, pp. 59–60; Vaughan, *Memories*, pp. 358–59, 366.

48. Millis, *Martial Spirit*, p. 347; WD, *ARofSG*, 1898, pp. 118 (quotation), 197–98, 226; *Dodge Commission Report*, 1:646; Senn, *Aspects*, p. 173.

49. First quotation from WD, *ARofSG*, 1898, p. 197; second quotation from "The Medical Department of the Army Again," p. 178; third quotation from Ltr, SW to Shafter, 2 Aug 1898, Mf Reel 4, Shafter Papers, SU. In loc. cit., on Mf Reel 6, see Com Rpt, p. 39. See also WD, *Correspondence*, 1:141; *Dodge Commission Report*, 8:153.

50. WD, *ARofSG*, 1898, pp. 235–36 (quotation); "The Soldier and the Medical Department of the Army," p. 233; "The Responsibility of the Army Medical Department," p. 451; *Dodge Commission Report*, 1:143, 186–87, and 5:2108; WD, *Correspondence*, 1:141, 197, 241; "A Case for Investigation," p. 127. See also in Shafter Papers, SU, on Mf Reel 3: Ltrs, Edward J. McClernand to Charles F. Humphrey, 11 Jul 1898, and Humphrey to McClernand, 13 Jul 1898; on Mf Reel 4: Ltrs, AG to Shafter, 2 Aug 1898, and Louis A. LaGarde to J. C. Gilmore, 2 Aug 1898; on Mf Reel 5: Telg, Shafter to AG, 20 Aug 1898; and on Mf Reel 6: Com Rpt, p. 39.

51. WD, *ARofSW*, 1898, 1(pt.1):129; Scheffel H. Wright, "Historical Issue; Medicine in the Florida Camps During the Spanish-American War," pp. 24–25; in Shafter Papers, SU: Ltrs, AG to Shafter, 26 Jun and 5 Jul 1898, and Shafter to AG, 5 Jul 1898, Mf Reel 3, and Ltrs, SW to Shafter, 1 and 6 Aug 1898, and Shafter to AG, 7 Aug 1898, Mf Reel 4.

52. WD, *Correspondence*, 1:213 (quotation), 360; idem, *ARofSG*, 1898, pp. 118, 145, 235; in Shafter Papers, SU: Ltrs, Shafter to AG, 31 Jul 1898, SW to Shafter, [1 Aug 1898], and Joseph Wheeler et al. to Shafter, 3 Aug 1898, Mf Reel 4, and Shafter Autobiography, ch. VII, p. 6, Mf Reel 6; Miley, *In Cuba*, p. 223; Lodge, *Selections*, 1:332; Wheeler, *Santiago Campaign*, pp. 359–60.

53. First quotation from Shafter, "Capture," p. 629; second quotation from Ltr, Roosevelt to J. Wheeler, 31 Jul 1898, Mf Reel 4, Shafter Papers, SU. In loc. cit., see V Army Corps SO 40, 17 Jul 1898, and Ltrs, Shafter to AG, 31 Jul and 3 Aug 1898, AG to Shafter, 1 Aug 1898, J. Wheeler et al. to Shafter, 3 Aug 1898, and Valery Havard to AG, V Army Corps, 3 Aug 1898; and on Mf Reel 3: Ltrs, AG to Shafter, 13 and 14 Jul 1898. See also Williams, *USPHS*, pp. 85–86; WD, *Correspondence*, 1:360, 396.

54. WD, *Correspondence*, 1:204, 218, 224 (quotation); Ltr, AG to Shafter, 5 Aug 1898, Mf Reel 4, Shafter Papers, SU; *Dodge Commission Report*, 8:157.

55. Martha L. Sternberg, *George Miller Sternberg*, p. 178; WD, *ARofSG*, 1898, pp. 235–36; Roosevelt,

"Rough Riders," p. 688; Nicholas Senn, "The Medical Department of the Army," p. 215. See also in Shafter Papers, SU, on Mf Reel 4: Ltrs, Shafter to William H. Bisbee and to SW, both 4 Aug 1898, SW to Shafter, 4 and 5 Aug 1898, and J. C. Gilmore to CO, 8th Ohio Vols, 5 Aug 1898; and on Mf Reel 5: Ltr, AG to Shafter, 9 Aug 1898, and Telgs, Shafter to AG, 13 and 15 Aug 1898.

56. *Dodge Commission Report*, 1:135–36; "Echoes and News," p. 402; Leonard Wood, "Santiago Since the Surrender," p. 515; WD, *ARofSG*, 1898, p. 198; idem, *Correspondence*, 1:196, 204; George G. Lewis and John Mewha, *History of Prisoner of War Utilization by the United States Army, 1776–1945*, p. 45. See also in Shafter Papers, SU, on Mf Reel 4: Ltrs, Jose Toral to Shafter, 17 and 21 Jul 1898, and to C-in-C, 24 Jul 1898, AG to Shafter, 25 Jul 1898, and Edward J. McClernand to Alfred C. Markley, 27 Jul 1898; and on Mf Reel 6: Shafter Autobiography, ch. VII, p. 7.

57. James A. Huston, *The Sinews of War*, p. 284; WD, *ARofSW*, 1898, 1(pt.1):6–7; Senn, *War Correspondence*, p. 86; Lodge, *Selections*, 1:330.

58. WD, *ARofSG*, 1898, pp. 145–46; *Dodge Commission Report*, 1:574–78, 623; Nicholas Senn, "The Invasion of Porto Rico From a Medical Standpoint," p. 595; idem, *War Correspondence*, p. 86.

59. *Dodge Commission Report*, 1:592, 624; WD, *ARofSG*, 1898, pp. 171–72, and 1899, p. 184; idem, *Correspondence*, 1:373, 381.

60. WD, *ARofSG*, 1898, pp. 135–36, 171, and 1899, pp. 184–85; *Dodge Commission Report*, 1:600; Senn, *War Correspondence*, pp. 129–30.

61. WD, *ARofSG*, 1898, p. 146, and 1899, p. 185 (quotation); *Dodge Commission Report*, 1:137, 599, 601.

62. *Dodge Commission Report*, 5:1741; WD, *ARofSG*, 1898, pp. 171, 176.

63. WD, *ARofSG*, 1898, p. 146 (quotation), and 1899, p. 174; *Dodge Commission Report*, 1:578, 620, 625; WD, *Correspondence*, 1:373.

64. *Dodge Commission Report*, 1:578 (quotation), 591, 593, 623; WD, *ARofSG*, 1899, pp. 174, 180; Borden, *Rontgen Ray*, pp. 11–12, 29; Bigelow, *Reminiscences*, p. 146; Senn, *War Correspondence*, pp. 97, 99; Thomas C. Biddle, "Typhoid Fever in the Tropics," pp. 104–05.

65. *Dodge Commission Report*, 1:577, 581, 622, 624; Biddle, "Typhoid Fever," pp. 104–05; WD, *ARofSG*, 1898, pp. 124–25, 147, and 1899, pp. 174, 179–80, 185.

66. "The Hospital Ship 'Relief'," p. 310; WD, *ARofSG*, 1898, pp. 124–25, 146–47, 152; *Dodge Commission Report*, 1:575, 577–78, 594, 619, 621–23, 625, 629; Nicholas Senn, "Typhoid Fever in the Porto Rican Campaign," pp. 599, 604; idem, "Invasion of Porto Rico," pp. 597–98; idem, *War Correspondence*, p. 87.

67. Frederica M. Bunge, ed., *Philippines*, pp. 22–23; WD, *ARofSW*, 1898, 1(pt.2):58–59, 124.

68. WD, *ARofSG*, 1898, pp. 125, 263–64 (first quotation), and 1899, pp. 99, 122, 126, 133, 136–37; Huston, *Sinews*, p. 302; "Medical and Sanitary History of Troops in the Philippines," pp. 828 (second quotation), 830; Henry Lippincott, "Reminiscences of the Expedition to the Philippine Islands," p. 171.

69. WD, *ARofSG*, 1898, p. 264, and 1899, pp. 118, 133–34 (quotations), 135; Telg, Elwell S. Otis to AG, 5 Jan 1899, Harlan E. McVay Papers, Entry 561, RG 94, NARA.

70. The 2d Division was composed of two brigades at this time. See WD, *ARofSW*, 1898, 1(pt.2):42.

71. WD, *ARofSW*, 1898, 1(pt.2):123 (first quotation); idem, *ARofSG*, 1899, pp. 99, 118, 126–27, 135, 138 (second quotation); "Medical and Sanitary History," p. 826.

72. WD, *ARofSG*, 1899, pp. 102, 122, 124, 137.

73. WD, *ARofSG*, 1899, pp. 121 (quotation), 123; idem, *ARofSW*, 1898, 1(pt.2):58–59, 71, 503; "Medical and Sanitary History," p. 826. Exact figures on the number of wounded in August vary slightly, probably because, as Lippincott explained, "a few slight wounds" were not initially reported (idem, *ARofSG*, 1899, p. 124).

74. WD, *ARofSG*, 1898, pp. 263–64, and 1899, pp. 127, 135 (quotation), 138; "Medical and Sanitary History," p. 830.

75. "Medical and Sanitary History," p. 829 (quotations); WD, *ARofSG*, 1898, p. 263, and 1899, pp. 99, 124, 137–38; idem, *ARofSW*, 1898, 1(pt.1): 273, 851, and 1(pt.2):58–59, 60–61, 81–82, 124, 503.

Chapter 7

DISEASE AND DEATH IN U.S. CAMPS

While U.S. troops were defeating the Spanish in Cuba, Puerto Rico, and the Philippines, disease was devastating those who remained in the United States. The greatest threat was not an exotic ailment imported from tropical lands but typhoid, carried by volunteers to huge and crowded camps where few understood the necessity for high standards of sanitation. The disease and death rates eventually climbed so high that, in a precedent-setting move, Surgeon General Sternberg appointed a board of medical officers to investigate the cause of the epidemic and to make recommendations that would guarantee that the horrors of the summer of 1898 were never repeated.

When the number of sick initially began to mount, the Medical Department had had less than two months in which to train new personnel and create hospital and evacuation systems. The department was only beginning to enter the era of laboratory medicine, and equipment was in very short supply. Thus, physicians were unable to determine that the first few scattered cases among troops pouring in from the state camps where volunteers initially assembled were typhoid rather than malaria, which was common in the South. Some physicians still believed in the existence of a hybrid disease known as typho-malaria, a fever born during the Civil War as a result of the inability to distinguish definitively between malaria and typhoid fever. Unaware that a disease spread by human waste was already threatening the troops, "officers, military and medical, having no experience of military life in the field, assumed that the deplorable condition in which they were living was the usual mode of life of soldiers situated as they were, and that their duty as true soldiers was to endure, not only without complaint, but with a certain pride, the hardship of their camp life." Most of the National Guard enlisted, like the soldiers of the Regular Army, came from cities and large towns and thus were accustomed to relatively crowded living conditions but not to relatively primitive sanitation. Volunteer officers and physicians, who had little understanding of sanitation, saw no reason to interfere when the men pitched their tents much too close together and crowded four to seven soldiers in a space seven by eight feet. They allowed the troops to place tents too near the latrines and at sites that were badly drained and to use nearby "shady spots under trees of the surrounding ground" rather than latrines that had been set up at an appropriate distance. Typhoid was soon sweeping the camps. Not surprisingly, volunteers died of the disease at almost twice the rate characteristic of the regulars.[1]

The epidemic, together with escalating disease rates in Cuba, forced many changes

in the Medical Department's approach to caring for the Army's patients. Dire necessity eventually dictated a modification of the policy that forbade the assignment of female nurses to other than general facilities. Often field hospitals became so overburdened with typhoid patients as to lose their mobility; assignment to them was little different from assignment to a general hospital. By mid-August 6 female nurses were also working on the hospital ship *Relief*, and 18 had been assigned to Santiago. The demand for their services escalated so rapidly that by 15 September, in addition to Red Cross and other volunteer nurses, 1,158 women held contracts to care for Army patients, working twelve-hour days for salaries of $30 a month. When, because of a shortage of qualified applicants, several chief hospital surgeons eventually had to hire nurses on an emergency basis, some who had received no formal training were signed on specifically because of their supposed immunity to yellow fever.[2]

The typhoid epidemic, which gained in force as troops from many areas of the country gathered at a few large camps, greatly exacerbated initial problems with hospitals. By forcing division facilities to grow quickly to twice their intended size, the high disease rate made it necessary to retain regimental facilities to care for the growing number of sick. The pressure on division hospitals was so great that Colonel Greenleaf, as chief surgeon of the Army in the field, recommended sending some patients to general hospitals. Sternberg initially postponed creating such facilities because he was unsure of when and whether the various Army corps would be sent overseas and of whether division hospitals would be able to meet the Army's needs.[3]

In mid-July, with disease rates climbing in both the U.S. and the Caribbean, Surgeon General Sternberg realized that he could wait no longer. The general hospitals he ordered set up in connection with post hospitals at Forts Myer and Monroe in Virginia, McPherson in Georgia, and Thomas in Kentucky, as well as at Key West, Florida, and Washington Barracks, were usually managed by regular medical officers. These institutions ran more smoothly than division hospitals and were less subject to criticism, but since their capacity was soon exceeded, he also had to open and expand several post hospitals on both coasts. Division hospitals at one camp were eventually converted into general hospitals. In this capacity they came under the surgeon general's direct authority and, according to Sternberg, "were promptly provided by me with the best available medical service, with trained nurses, with all permissible medical and hospital supplies, and with funds for special purchases." New hospitals could not be opened fast enough; vacancies at Marine Hospital Service facilities, normally used to shelter sick and injured merchant seamen, were made available to Army patients, and many others were sent to civilian hospitals. By 30 September 1898 almost 6,000 patients had been cared for in seven of the general hospitals and another 2,490 in six post hospitals, including one in Honolulu and another in San Francisco, in locations from Maine to Florida and from New York to Hawaii.[4]

The food provided the patients in these hospitals was a source of much complaint. Funds to buy more than a very few basic items of the special invalid diet were lacking, although charitable organizations set up diet kitchens at the major camp hospitals to provide foods that would tempt flagging appetites without upsetting fragile digestive systems. On 10 August 1898

Adjutant General Corbin remedied the situation by allowing the creation of a special fund to buy the food needed by the sick and convalescent. The ravages of disease, however, and the restricted diet required for its victims left the survivors of typhoid or severe bouts of malaria thin, and convalescents returning to their commands often continued to look emaciated as a result of having to eat the regular ration too soon during their recovery, when they could not yet properly digest it. The gaunt appearance of so many men triggered rumors that the Army was starving its sick.[5]



ALBERT HARTSUFF

Camp Thomas

The most glaring example of the horrors of the camps in the United States was the largest, Camp George H. Thomas at Chickamauga, Georgia, where the I and III Corps, an "enormous army of inexperienced and undisciplined soldiers" accompanied by equally inexperienced doctors, arrived in the spring of 1898. Each corps averaged about 40,000 men, some of whom were not fit for service when they joined the Army, and both were already infected by typhoid. The ultimate responsibility for their health belonged to Lt. Col. Albert Hartsuff, surgeon in chief at Chickamauga and senior surgeon on the staff of Maj. Gen. John R. Brooke, commanding the I Corps and commander of the entire camp. Since even Colonel Hartsuff himself had no command authority over the line as far as sanitation was concerned, he and his medical officers could only observe and make recommendations. Hartsuff later complained about his authority over medical personnel, maintaining that no legal provision had ever been made for the position of chief surgeon to a command and that the chief surgeon of the corps reported not to him but rather through him to the surgeon general. Furthermore, because the disease rate increased slowly at first and the seriousness of sanitation problems became apparent only with time, even high-ranking officers of the Medical Department were unconcerned as late as the first week in July.[6]

As the typhoid epidemic spread, it placed an ever greater burden on the medical staff at Chickamauga. Overworked physicians began to break down on duty and soon had little time to urge improved sanitation upon reluctant commanding officers. Some concluded that making recruits follow sanitary regulations was, at best, "almost impossible." The soil of the surrounding woods became covered with excrement until it was impossible to walk there without stepping in it, while "myriads and myriads" of flies buzzed from

woods to food supplies, carrying "on their wings, legs and bodies the typhoid germs from the sinks and elsewhere, over the camp, infecting the food and drink." Proper latrines were hard to dig in the heavy clay soil that, lying over a layer of rock, held water "like a barrel." The rains that began at Chickamauga at the end of June lasted for two weeks, causing sinks to overflow and contaminating water sources. A medical officer familiar with the situation stated that he believed the camp's water supply was polluted by the end of July. Since filters, easily clogged, very slow, and very fragile, were impractical for use on a large scale, orders were given out to boil all water, filtered or unfiltered. In the one regiment that followed them, the precautions proved to be worthwhile, for as late as 7 August it was still free of typhoid fever.[7]

By early August, with the soil at Camp Thomas becoming "more and more charged with filth," almost 3,000 officers and men were sick, a figure that did not include those sent to general hospitals. Some cases were "virulent," suggesting to one surgeon that "large quantities of toxins" had been taken in, but many of the earlier cases had been mild, and many patients continued to mingle with their healthy comrades, thus spreading the disease further. The sick rate continued to grow beyond August's 6.83 percent, and the disease became increasingly virulent with time, presumably because victims were taking in heavier doses of the typhoid bacillus as the disease became more widespread and exposure more frequent. Because of the crowding at the hospitals, convalescents were often sent to recuperate with their units, a step that, unknown to physicians of the time, helped to spread the disease, since many remained carriers for months or longer.[8]

Stemming the tide became all the more challenging because typhoid was apparently an unpopular diagnosis and one that was difficult to make without either laboratory equipment or training in its use. Some higher-ranking medical officers maintained that malaria rather than typhoid was the real culprit. Eventually, the Medical Department's few expert Army pathologists, among them, contract surgeon Charles F. Craig, using cultures and the recently developed Widal test for typhoid, finally verified the fact that typhoid was the principal problem. Craig also concluded that the housefly played an important role in the transmission of this disease.[9]

The slow response of the supply system, partially the result of the failure of the Quartermaster's Department to provide enough wagons to unload supplies at rail depots, contributed to a rapidly deteriorating situation at Camp Thomas. Overstrained officers took to quarreling as they attempted to stretch inadequate supplies. Surgeons called frantically for tents to expand their facilities. A few patients had to lie for a brief period on the ground. In one division, where 1,225 of 11,000–12,000 men were ill, some had to be retained in their quarters at least temporarily. There were not enough doctors. There were not enough attendants. Pleas for assistance produced results, but, as the cases multiplied, never soon enough. Inexperienced medical officers gave up all attempts to maintain order and discipline. Regulations designed to prevent the transmission of disease within hospitals were ignored. Typhoid patients sometimes lost control of their bowels and soiled their bedding or the floor by their beds. Medical officers treated typhoid fever symptomatically. Sponging with cold water or cold baths reduced fever; small doses of a purgative, perhaps calomel,

relieved constipation; strychnine and alcohol lowered a rapid pulse; and a drug called sulphonal (sulfonal), presumably a hypnotic, was prescribed for sleeplessness. Although exaggerated stories of neglect abounded, apparently the drugs deemed most important were usually available either through the Medical Department or by local purchase.[10]

Confusion obscures the facts concerning the supply shortages at Chickamauga. Some may have been more apparent than real. One surgeon at Camp Thomas later claimed that no one who had made "the proper effort" had had a problem obtaining what he needed. On the other hand, Colonel Greenleaf maintained that a large quantity of supplies had been shipped to Colonel Hartsuff, but never received. Many surgeons suggested that Hartsuff had the supplies but rejected requisitions on frivolous grounds. On at least one occasion the I Corps chief surgeon, Lt. Col. Rush S. Huidekoper of the U.S. Volunteers, appealed over Hartsuff's head to General Brooke, who in turn telegraphed Surgeon General Sternberg to get what was needed. Hartsuff countered the attacks by explaining that he was not receiving complete cooperation from the Quartermaster's Department in obtaining such items as tents and that, with supplies meager, he was forced to distribute what he had according to the greatest need. He also insisted that many hospital patients were not really sick and that he should not have to provide for such men. In any event, drug shortages apparently did not last beyond 1 August, and Hartsuff contended that no one at Camp Thomas really suffered because of shortages.[11]

The typhoid epidemic undermined the hospital system at Camp Thomas, forcing the regimental facilities that were to have been abandoned to take more patients. Since all but one physician with each regiment had been absorbed into the division organization, regimental hospitals were in no position to handle large numbers of patients. Thus the rule that no patient should remain in one more than forty-eight hours was not likely to be protested.[12]

When the number of patients exceeded the capacity of both regimental and division facilities, Sternberg had a general hospital set up in a converted modern hotel used by summer vacationers in Chickamauga Park, Georgia, near both the camp and the rail line to Chattanooga, Tennessee. Although "well managed," the new Leiter General Hospital, too, was "sadly overcrowded" by August, with 255 beds in a space that should hold no more than 130. Under such circumstances, even a staff that included a hospital director, a volunteer medical officer, five contract surgeons, two Hospital Corps stewards, an acting steward, thirty Hospital Corps privates (who were described as "ill disciplined" and "very poorly clothed"), thirty female contract nurses ("said to be efficient"), ten Red Cross nurses, and two "excellent volunteer nurses" could not keep it thoroughly clean. In great need of assistance, the medical director told Lt. Col. Alfred Alexander Woodhull, who was inspecting the camp's facilities at the request of Secretary of War Alger, that he would particularly like to have the help of an executive officer, a line officer to handle quartermaster and commissary duties, and "more and better clerks." Tents were soon added to increase Leiter's capacity, and the number of medical officers doubled, but Colonel Woodhull noted that the "vicious system of regimental hospitals [had to be] tolerated as a makeshift" because of the great number of sick.[13]

A second general hospital, named after Sternberg and, like all general hospitals,

under the surgeon general's direct authority, was opened at Camp Thomas in August with a 750-bed capacity and a staff more than double that of Leiter's. Here, too, the medical officers responsible for the hospital were generally inexperienced and, like the rest of their colleagues serving Camp Thomas, were all too often reassigned before they had had a chance to become completely familiar with the problems that faced them. Nevertheless, the hospital achieved a fine reputation.[14]

The rapid increase in the disease rate, coupled with the departure of some of the troops, caused once-mobile division facilities at Camp Thomas to grow roots as a result of General Brooke's decision to remove them from under the division commanders and place them directly under Sternberg. Brooke's motives in doing so are unclear; he may have wished to take the physicians that were in charge of the division hospital with him when his command left Camp Thomas, or he may have merely distrusted Colonel Hartsuff. When the 1st Division of the I Corps left for the ports from which they would sail for Puerto Rico in late July, its hospital had to remain behind because space could not be found for its 153 patients at Leiter. Another 500-bed division hospital that also remained behind at Chickamauga became the Sanger General Hospital (later renamed after Alexander H. Hoff).[15] In recognition of the loss of mobility, division hospital tents now received frames and floors. Bathtubs were installed and, with the aid of donations from private citizens and the Red Cross, diet kitchens as well. Despite all efforts, more than 40 percent of the over 4,000 men at Camp Thomas hospitalized by typhoid remained in regimental facilities, where 79 of the 263 fatalities from typhoid at Chickamauga occurred, a rate comparable to that in division hospitals. Sanitation at Camp Thomas continued to be poor after the departure of the 1st Division of the I Corps, but in late August and early September units remaining there were gradually dispersed.[16]

Camps in Florida

Time and experience taught the same lessons at other camps that they did at Chickamauga. At Miami and Jacksonville, where most of the 30,000 men of the VII Corps camped during the entire campaign in Cuba, the soil was absorbent and most units were supplied with city water that was considered safe. The proximity of a lumber yard made the construction of privies and bathhouses easy; the VII Corps commanding general, Maj. Gen. Fitzhugh Lee, insisted on attention to sanitation; and the men were reasonably well disciplined. The corps' chief surgeon, Louis M. Maus, who held a volunteer commission of lieutenant colonel, was aware, however, that the high water table made contamination of local water sources a constant danger. Once again, some men brought typhoid fever with them from the state camps, soldiers drank from nearby wells, and in August 1898, when the epidemic at Chickamauga had already been under way for several weeks, typhoid reached epidemic proportions at the Florida camps as well. By the end of September 5,072 men of the VII Corps had become ill enough to be sent to division hospitals and 109 had died.[17]

In the VII Corps, as elsewhere, the division/regimental hospital controversy remained alive in spite of an attempt to pacify those who supported the latter by sheltering men from the same regiment together. Each regiment was allowed to retain only two hospital tents, one to be used as a dis-

pensary and a second for sick call, with a single medical officer, a hospital steward, and a Hospital Corps private caring for the ill and injured. On 31 August Colonel Maus asked that each regimental surgeon set up a third tent with six cots, to be used as a "hospital tent of observation" for cases not yet diagnosed. No patient would be allowed to remain here more than three days. A few physicians retained under their own care patients who should have been sent to the division hospital, some of whom were in serious condition, at times as the result of a misdiagnosed illness. The presence of these men in camp only helped spread typhoid further among their comrades. The restriction on the use of the regimental facility also led some sick officers and enlisted men to seek medical care in Jacksonville from private physicians, who insisted that the illness involved was malaria rather than typhoid; their error was established by blood tests that suggested that only 2 percent of fever cases were suffering from malaria and by a study of 50 patients sent north from Florida for testing at Fort Myer.[18]

Although typhoid fever was the predominant disease in the Army's camps, medical officers also had to deal with other health problems, some calling for the services of specialists. Noticing that many of his patients had very "bad teeth, and other troubles of the mouth," Colonel Maus assigned Hospital Steward J. W. Horner to work as the corps dentist, with an acting hospital steward to assist him. The demands made upon Horner's time were so great that he could care for only a fraction of the men who sought his aid. The dentist was the only Hospital Corps specialist to be obtained for the VII Corps, but Maus found it wise to designate one of his brigade surgeons, Maj. William S. Bryant,



LOUIS M. MAUS

to function as the corps "aurist" (ear specialist) and a contract surgeon, John Ling, as "oculist." Maus believed that through the aid of these specialists, many men were returned to duty who otherwise would have been discharged from the Army. Maus' appeal for the appointment of a veterinarian and a veterinarian's assistant to the corps was apparently less successful.[19]

So many of the VII Corps survivors of the typhoid epidemic were debilitated that a convalescent hospital was finally established for them in July at Pablo Beach, a resort sixteen miles from Jacksonville. Despite instructions to regimental surgeons that no one who was actively ill was to be sent there, some who were not yet convalescent arrived at the new hospital. A few more came down with typhoid while there, necessitating the renting of a 20-bed cottage and the assignment of a surgeon from the volunteers to run it. In October, when



MEDICAL CARE AT JACKSONVILLE, *where Sisters of Charity nursed patients*

a hospital train became available to take convalescents back to their hometowns, the popularity of the Pablo Beach facility began to wane. It was closed in November, after sheltering a total of 1,400 men.[20]

While preparations for the invasion of Cuba were under way, the VII Corps experienced supply problems as had the I and III Corps at Chickamauga. In this instance, delays in meeting VII Corps needs resulted from the prior claims of the V Corps, about to embark from Tampa. The VII Corps filled the requirements of its first field hospital from Tampa and thereafter from purveyors in New York, St. Louis, and Washington, D.C. After mid-June, with supplies coming in when needed and in abundance, Colonel Maus rented a building in Jacksonville to serve as a corps supply depot. The Red Cross and other "benevolent societies and individuals" provided some aid, always in the form of supplies; Maus did not believe that the Red Cross would keep the necessary records properly if it were to follow Civil War precedents and establish its own hospital.[21]

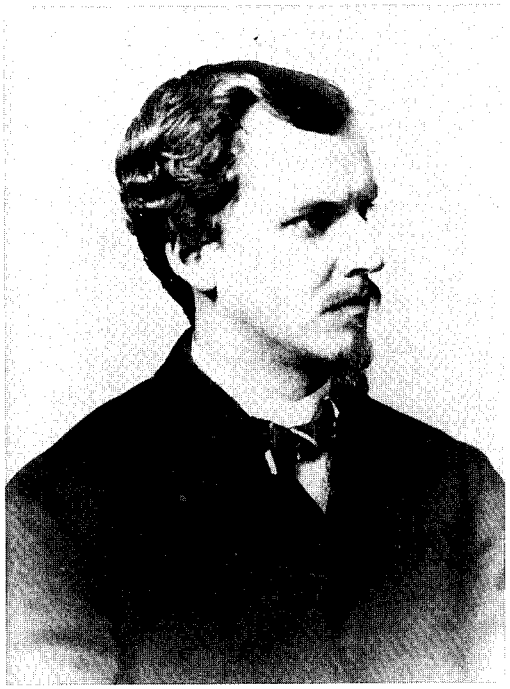
The first trainload of sick from Tampa arrived at the Fort McPherson general hospital near Atlanta on 14 May and was housed with the evacuees from camps in the Deep South in a barracks and the post hospital. By the end of August 1,244 patients, most of them from Tampa, had gone through this hospital, which eventually held 922 beds. Ironically, the influx of sick and of medical staff to care for them set the stage for a typhoid epidemic at a post that might otherwise have escaped it, for sanitation problems grew as the population of the fort increased. Sewers became clogged with "paper of all kinds, socks, handkerchiefs, and even drawers. . . . The woods became full of deposits made on the surface of the ground and these were washed

into the brook which supplied water to the bathing pool." Despite warnings, men drank from the pool, and disease was soon running rampant.[22]

Camp Alger

Camp Alger, established in mid-May 1898 in Virginia seven miles from Washington, D.C., was farther north than any of the other training sites and much smaller than Camp Thomas, but conditions there resembled those in camps farther south. Because II Corps units came and went throughout the summer, the number of men serving there under Maj. Gen. William M. Graham,[23] the corps' commanding general, varied from roughly 18,000 in May to a peak of more than 23,500 in June. For most of the time Camp Alger was in operation, the II Corps was divided into but two divisions; a brigade formed on 2 August was designated "the Second Brigade, Third Division," but was ordered to report for temporary duty with the 1st Division.[24]

Girard, now a lieutenant colonel of the volunteers and the chief surgeon of the II Corps, and, except for short periods of time, the only Regular Army physician at Alger, was confronted with a "Herculean task." He reported that he had to teach the raw troops that crowded into the camp "how to procure food, water, fuel, clothing; to carry out ordinary principles of hygiene; in addition to this, to organize two large division hospitals, equip the hospital department of several large commands for active campaigns; to transfer, organize, clothe and equip a hospital corps of about seven hundred men, and to put them through some instruction." His problems were magnified by a water shortage and the



ALFRED C. GIRARD

fact that, once again, many regimental surgeons were careless about sanitation and their colonels often ignored any recommendations they might make. The suggestion that each soldier in the II Corps cover his feces was for the most part ignored until early August, when an order was issued "enforcing this necessary sanitary measure." Many soldiers did not bother with the latrines, and thus "by the careless and filthy habits of the men the woods surrounding the camp became generally the receptacle of fecal matter. Sentinels who were placed to prevent this use of the surroundings of the camp failed to report their own comrades." [25]

Colonel Girard's initial problems were exacerbated by the fact that many regiments reported to Camp Alger without hospital tents or medicines, even though Surgeon General Sternberg had warned state governors that he could not provide

adequate supplies for volunteer units on short notice. Girard was thus forced to establish a division hospital immediately and to obtain an order from General Graham, compelling all units to contribute to its supplies. The complaints of regimental surgeons angered at having to deplete their stores drew newspaper reporters. As a result, like so many other Army surgeons, Girard was, in his words, "held up to the horror of mankind." [26]

Among the other handicaps under which Girard was working was his mistaken impression that the entire II Corps was to go overseas at once. Unaware that Camp Alger was to be a training camp, he initially did not attempt to provide the division hospital with all the equipment it would need if it were not to serve as a field hospital. In his haste to prepare field hospitals, he also ignored the unsanitary location of tents and privies. In late June, when three of the corps' nine brigades began moving from Camp Alger to the Caribbean, Girard was able to send a hospital with them only by once again depriving regimental hospitals temporarily of much of their supplies.[27]

After an inspection of Camp Alger early in July, Lt. Col. Charles Smart, head of the Sanitary and Disbursing Division of the Surgeon General's Office, concluded that the disease rate was low, but typhoid broke out soon after his visit. Colonel Girard stated that cases were soon so numerous that he was never sure of their exact number. Some who felt ill went on leave before their condition could be evaluated, and others were removed to the nearby Fort Myer hospital before an accurate diagnosis could be made. Here, too, some physicians believed that the prevailing disease was malaria, while others apparently resorted to the old Civil War diagnosis, typhomalaria. Girard, however, insisted that typhoid was the principal problem and that the troops here, like those of other camps, had already been infected with it when they arrived. A careful but belated study of the diseases afflicting the II Corps suggested that Girard's diagnosis was correct.[28]

The evacuation to Fort Myer, only ten miles from Alger, was initially made by ambulance, but the toll eventually became so great that the Medical Department had two hospital cars placed on the local trolley line to move the sick. Although a vacant barracks was added to the Fort Myer hospital, which was then upgraded to a general facility, it was not ready for such a sudden influx of patients. After 200 patients had been sent there, Colonel Girard was ordered to refrain for a week from sending more. At some point the Red Cross came to his aid, establishing both a hospital at Camp Alger and a diet kitchen at Fort Myer and providing trained female nurses whose care was, in Girard's opinion, "far superior to any which could be given . . . by untrained men of the Hospital Corps." Thereafter, since he never had more than 600 sick at any one time, Girard believed that he had enough equipment to care for patients satisfactorily in camp. He therefore sought and obtained Surgeon General Sternberg's permission to retain his patients, despite an initial shortage of medical supplies resulting from the inadequacy of regimental resources.[29]

Colonel Girard devoted much time while at Camp Alger to dealing with the problem of hospital attendants. He had no ambulance company, and because of the difficulties involved in obtaining hospital corpsmen by details from the line, General Graham allowed him to recruit outside the Regular Army. Having managed to win over the colonel of an Ohio unit to his

point of view, Girard received that officer's complete cooperation in assigning men from his regiment to hospital service and in employing some of his noncommissioned officers in a recruiting program. This effort was so successful that Girard was able to form a reserve company of corpsmen after he had filled the regular quota for the units at Alger. Having observed that few regimental medical officers were capable of commanding a Hospital Corps unit, Girard obtained Graham's permission to have the Quartermaster's Department officer routinely assigned to each division hospital assume this responsibility. He also established a training program for his new hospital corpsmen, but in late July the II Corps was in flight from the diseases of Camp Alger, Girard later reported, "frustrat[ing] this design." [30]

Retreat From Disease: New Camps

The camps set up initially for the army gathering to fight the Spanish had been regarded as temporary. The campsites had been chosen with little forethought—but, it was rumored, with considerable attention to political considerations—and the accommodations had been located with little appreciation for the sanitary requirements of large groups of men and without any notion that these men would be remaining there for any length of time. No plans had been laid for the management of units that did not go overseas when these camps were created. Many difficulties originated in the haste with which these camps were established, and the mere passage of time eased those caused by supply shortages or a lack of familiarity with Army routines. Furthermore, the typhoid epidemic was gradually burning itself out as increasing numbers of men acquired temporary immunity through contracting the disease. Perhaps most important was the fact that the disaster that had resulted from ignoring the advice of Army physicians concerning sanitation had given added force to their opinions.[31]

The end of the fighting in Cuba on 17 July and the formal surrender of the Spanish at Manila on 14 August did not lead to immediate demobilization, since troops were needed to serve as an occupation force. Furthermore, when the volunteers who responded to the call for men in the spring of 1898 were mustered out, camps had to be established for the equally green volunteers who replaced them.[32] None of these men could be kept at the disease-ridden camps in the United States, and thus, as the summer progressed, many units were sent in some haste to new ones. All officers involved in these efforts attempted to put the lessons of the preceding weeks to work; they prepared for the arrival of troops well ahead of the event, chose sites with greater consideration for the size and purity of water supplies, had tents more widely spaced and latrines located farther from kitchens and mess halls, and more strictly enforced sanitary discipline. "Time and experience," as one surgeon concluded, had at last taught "officers and men the best methods for caring for themselves." [33]

Those responsible for the initial move of the II Corps' 2d Division from Camp Alger apparently made the decision to leave in mid-July after concluding that the camp, the site, and the equipment were thoroughly infected. "Suddenly. . . one night" these men received orders to march the next morning to Thoroughfare Gap, Virginia, which they did in spite of inadequate food supplies. As they progressed, those who fell ill were sent back to a field

hospital set up at Bristow, Virginia. By the time they reached their new camp in Pennsylvania, Camp Meade, they appeared to have left typhoid behind.[34]

The II Corps' 1st Division marched to Dunn Loring, Virginia, when it left Camp Alger, sending diagnosed cases of typhoid back to Fort Myer with twenty-five men of the reserve Hospital Corps company detailed to assist in their care. When the decision was made on 14 August to move those of the command who were still healthy to Camp Meade, the men benefited from greater forethought than had those of the 2d Division. They went by train, and before they left, an advance party that included Colonel Girard went ahead to inspect the area. The inspection revealed that water supplies were "precarious" in quantity but pure—fortunately, Girard believed, because once the men arrived, most of them ignored orders to use filters. By the time the move had been completed, the disease rate in the 1st Division had also begun to drop, although in the confusion and with patients scattered in hospitals from Fort Myer to Camp Meade, Girard had to abandon his training class for hospital corpsmen.[35]

Colonel Girard had reason to hope that the disease rate would remain low at the new camp, which was designed with the experiences of Camp Alger in mind, and that his troubles would be at an end. General Graham transformed every one of Girard's recommendations into an order. All tents had been boiled and all blankets used by typhoid patients disinfected by steam. Rules concerning sanitation were strictly enforced, and a contract surgeon was assigned responsibility for inspecting latrines on a regular basis. Nevertheless, despite the fact that conditions here were almost ideal, the new and inexperienced volunteers who replaced those mustered out from Camp Meade brought typhoid with them from their state camps, and the sick rate once again began to climb. It is likely, too, that among the troops from Alger were seemingly healthy typhoid carriers. The hospitals were soon filled, and new cases were transferred to civilian hospitals in and near Philadelphia. The II Corps' 1st Division, which reported 893 admitted to field hospitals at Camp Alger, had 687 admitted to the division hospital in October, and the 2d Division, which had a total of 594 admitted to the hospital while it was in Virginia and at Camp Meade up until the end of September, had 668 in October. The mustering out of so many regiments and their replacement with new units also brought a return of Girard's problems with untrained hospital corpsmen.[36]

The IV Corps, created to organize the various regiments left behind by the V Corps, also moved many times in the summer of 1898 without escaping disease. When its first hospital, a 200-bed division facility, opened in Mobile, Alabama, among its patients were nine typhoid victims. Once the corps moved to Tampa, Florida, where sanitation was poor, the sick rate was soon soaring. In July, after some IV Corps units sailed for the Caribbean, the remaining men were moved to Fernandina because of their continuing high disease rate, but since physicians were still powerless to enforce sanitary regulations, sinks there were soon "in an indescribably filthy condition." To relieve the division hospitals, many patients had to be evacuated by hospital train to Fort McPherson. In August the IV Corps was ordered to Huntsville, Alabama, where a second hospital was established. The hospital train then periodically ran from Huntsville to Fort McPherson to remove the sick and wounded.[37]

By contrast, the move from Camp Thomas in late August and September of those men of the I and III Corps who were not sent to the Caribbean apparently attracted little unfavorable comment. Once again, those who were obviously sick were left behind in the old camp's hospitals. Even though for a while men continued to fall ill, conditions at their new and smaller camps in Tennessee, Alabama, and Kentucky were regarded as excellent, and disease rates began to drop. The camp at Lexington, Kentucky, in particular, became known for the strict standards of sanitation maintained there.[38]

With cold weather approaching, steps had to be taken to prepare for winter housing for all troops remaining in the United States. This had to be accomplished with the full knowledge that diseases easily spread in the summer might be even more easily spread among men forced by the weather to spend more of their time together in a closed space, where the desire to keep warm might take precedence over ventilation. While the new camps to which so many troops had been moved during the summer had represented improvements over the original camps, they were not always what could have been wished for. In September 1898, therefore, a military commission was named to study potential campsites for the troops still awaiting service as part of the occupation army in the Caribbean. Appointed to the commission were Theodore Schwan, a brigadier general in the volunteers, as its head and future surgeon general Robert M. O'Reilly, now a lieutenant colonel in the volunteers. Among the concerns of the commissioners were water supplies, sanitation, drainage, and the climate.[39]

In early October, while the commission was still at work, the Army reorganized the various corps created for the Spanish-American War, discontinuing the III, V, and VI Corps,[40] and reassembling the remaining men as the I, II, and IV Corps. Secretary of War Alger then ordered the movement of these corps to their new southern camps to begin on the twenty-seventh, with the move to be carefully managed so that no more than one regiment arrived at a camp in any one day. The need to take "the necessary measures for placing the camp in good sanitary condition . . . in advance of the arrival of the troops" was emphasized.[41]

The high disease rates that had, to varying degrees, afflicted the camps to which the various corps retreated in the late summer did not reappear at the new southern sites. I Corps troops found their camps in Georgia, where they moved in November, an improvement even over those at Lexington. The only typhoid cases encountered appeared among men being sent to Charleston to embark for Cuba who drank water at a Georgia railroad station.[42]

Concern for the health of the 30,000 men of the II Corps was so great that they were not allowed even to begin their move south from Camp Meade until mid-November, when the threat of yellow fever had passed and the camps and their hospitals were entirely prepared to receive them. No time was found to give systematic training to the men of the II Corps' Hospital Corps company, and thus they had to learn by working with the female nurses assigned to the II Corps hospitals at the new camps in Georgia and South Carolina. Great attention was devoted to sanitation and, once again, typhoid disappeared as a major problem. Preparations to receive these men were not perfect; the pavilion hospital at Augusta, Georgia, proved to be of flimsy construction. The wall of one pavilion collapsed and another

took on a distinct list after a windstorm. The boards shrank, and during the winter the cold blew through the crevices that resulted. By December, however, the disease rates of each division were under 150, where they remained.[43]

The VII Corps, unlike the other corps serving in the East, did not leave the campsite in Jacksonville, Florida, until late October 1898, when it moved to Savannah, Georgia, whence it would embark for occupation duty in Cuba. In spite of wet, cold weather the camps set up in Savannah, like the others opened in the fall of 1898, proved to be healthy. When the VII Corps shipped out in December and January, its camps were kept open, and when men began to return from Cuba and Puerto Rico in February 1899, they were sheltered at the same sites. The VII Corps was not mustered out until the following May, when the service of the volunteers of the summer of 1898 came to an end.[44]

The few members of the I Corps that remained in the United States when most of the corps left for Cuba had been assigned to the II Corps, and the I Corps was discontinued in January 1899. By spring, almost all of the men of the II Corps had also been mustered out. After having been organized into two divisions in the October reorganization and then ordered from Huntsville to Anniston, Alabama, the IV Corps, like the I Corps, was discontinued in January 1899.[45]

The experiences of the summer of 1898 led to major changes in overall policy for the Medical Department. Regimental hospitals again became respectable, and division hospitals were established principally to take their overflow. Camp medical officers were allowed to order freely from all items on the standard supply table, and individual preferences were given consideration according to their merit rather than being dismissed out of hand. Because a shortage of microscopes had made early and accurate diagnosis of typhoid fever impossible, Surgeon General Sternberg ordered that every hospital, regardless of size, be issued one to ensure that this disease would in the future always be identified before it reached the epidemic level. The disasters of the camps of 1898 would never be repeated.[46]

Camp Wikoff

One final camp was established at Montauk Point, Long Island, in August 1898 to receive the V Corps after its flight from Cuba. The fact that yellow fever cannot be spread without the presence of the *Aedes aegypti* mosquito was still unknown, and the epidemics that afflicted various U.S. ports earlier in the century had not been forgotten. As a result, authorities agreed that all troops returning from Cuba and Puerto Rico in the late summer of 1898 were to be isolated at the new Camp Wikoff until physicians could be sure that yellow fever would not break out among them and threaten the health of those who came into contact with them. Fear that tropical diseases no one could prevent would destroy the entire corps was widespread. Since all concerned were apparently convinced that the only way to avoid such a calamity was to ship the men back to the United States immediately, the evacuation, like the invasion, was hastily planned and hastily executed. When these "wan, sallow, and greatly reduced" veterans began their return to the United States in mid-August, an estimated 80 percent were to some degree ill, and thus the need for hospitals and medical personnel would be great.[47]

No time was allowed for a careful and thorough preparation of the site where Camp Wikoff was to stand. Nor was time allowed for dealing with the myriad problems that might arise. Among the greatest difficulties experienced from the outset was supply. The arrival of the cars was often delayed because the Long Island Railroad line to the site was single track and, according to Wikoff's chief surgeon, Colonel Forwood, initially lacked "switches, side ways, platforms, storehouses, or other facilities for landing . . . thousands of carloads of freight, passengers, and material." The Army had had to agree to rely exclusively on this railroad for all transport and to refrain even from using steamers to bring in supplies in order to obtain the 5,000 acres on Montauk Point as a campsite. The railroad company did not begin to lay switches and sidetracks until 6 August, a day before the arrival of the first of the camp's new occupants, V Corps cavalry troops that had been left behind in Tampa, and neither lumber nor other materials were available to build the necessary accommodations.[48]

More than half of the men to occupy Camp Wikoff would require hospitalization, but the Medical Department's attempts to prepare for their arrival were frustrated both by the poor transportation system and by the inept management of shipping by the Quartermaster's Department; although railroad cars carrying medical supplies were properly marked, many containers were so large that they required more than two men to move them, and none were labeled as to their contents. The result was long and tedious searches to obtain supplies that were within reach.[49]

On 29 July, ordered to establish a 500-bed "temporary tent hospital" at Montauk and to advise line officers on the selection of campsites and water sources, Colonel Forwood worked frantically to make the best of a bad situation. When lumber was finally obtained, carpenters failed to start to work because they wished to return to their homes each night and feared that they might be subject to the quarantine. Reassured on this subject, they struck for higher wages. No sooner was this problem solved than rain began to pour down, turning the area into a quagmire that threatened to swallow the wagons hauling supplies.[50]

When the 4,000 cavalry troops from Tampa, fleeing their typhoid-ridden camps in haste, arrived at Montauk Point, no shelter or food was available except that which they brought with them. After authorizing Colonel Forwood to telegraph his orders, Surgeon General Sternberg personally ordered the purveyor to fill them with great care, dispatched tents and hospital corpsmen to Wikoff, and forwarded funds to alleviate the shortage of food, especially of food of good quality. On the eleventh the Red Cross started bringing in supplies for the general hospital, from which other hospitals, including the division facilities accompanying returning troops, would be supplied. In a short time an entire 15′ by 113′ storage pavilion was filled. Other charitable organizations sent cooks and supplies of every kind. The Marine Hospital Service supplied Forwood with a steam sterilizer and a barge equipped to disinfect clothing and bedding from infected ships, while the president of the Long Island Railroad Company personally guaranteed the prompt delivery of the sterilizer.[51]

Although matters had improved somewhat by 13 August, when the first 50 patients from Cuba landed, a representative of the Massachusetts Volunteer Aid Association, who arrived two days later to assist in the care of returnees, was impressed by the confusion at the Wikoff hospitals. He re-



STERNBERG *(left)* AT CAMP WIKOFF, *conducting an inspection with chief surgeon William H. Forwood (right)*

ported that "there were few physicians, fewer nurses, and fewer still hospital-corps men." Regular medical officers were neither trained nor experienced in hospital administration. The laundry was yet to be established, and dirty linen was piling up. Some wards were badly overcrowded, others sparsely populated. When physicians were transferred, wards were left without medical supervision for hours, and new patients were sometimes temporarily ignored. Visitors began to pour in, complicating patient care, occasionally misinterpreting what they saw, and adding to the confusion. The Massachusetts volunteer concluded that "the absence of a firm, controlling hand always within reach" contributed to the difficulties and that Colonel Forwood was sadly lacking in administrative talent. He also blamed some delays in correcting shortages upon the fact that Forwood, who, he believed, lacked the power to delegate authority, felt compelled to sign every order personally.[52]

Transportation also continued to present serious problems. At one point no fewer than 220 railroad cars awaited unloading at the Montauk depot. Many of them had been there two or more weeks, and the supplies needed by the physicians at Camp Wikoff continued to be "buried" in them. Moreover, items held in storage could not be promptly moved to the hospitals when needed because of a lack of transportation within the camp. Not surprisingly, Colonel Forwood, in defending himself later before the investigating Dodge Commission,[53] struck out at the Quartermaster's Department for the inadequate nature of the support he received.[54]

In describing those aspects of the situation at Wikoff that were his responsibility, Colonel Forwood tended to paint a rosy picture. He reported that on 12 August, with four wards of the general hospital completed, "90 patients [were already] in bed under care of nurses, with all kinds of medical and hospital property in abundance." With the weather good and carpenters numerous, construction was proceeding rapidly. The 210 patients in the general hospital on the fifteenth were enjoying a superfluity of both beds and supplies. Forwood had assigned a surgeon to supervise the unloading of patients from their ships, and since transportation remained a problem, he had placed a second surgeon at the railroad station to make sure that Medical Department supplies were unloaded and forwarded as expeditiously as possible. By the nineteenth the general hospital held 250 vacant beds, and Forwood had been able to guarantee each patient "as he landed from the ambulance . . .

hot soup and milk punch from the hands of the female nurses." [55]

The general hospital was originally planned to include only eighteen pavilions, each consisting of six tents on wooden frames with wooden floors, but because of the large numbers of sick, two annexes were also eventually built. Although some complaints arose about overcrowding, understaffing, and poor sanitation, Colonel Forwood maintained that he always had enough tents and cots and that his only problem in that regard was having tents set up and beds put in place. So sturdy was the construction of this facility that even extraordinarily heavy rains and high winds failed to cause damage.[56]

Within a few weeks the general hospital staff more than doubled in size. When the hospital population was at its greatest, it included 40 physicians, 133 hospital corpsmen, 50 male nurses, 329 female nurses, and 15 civilian cooks. Most of the nursing staff, both male and female, were under contract. The surgical wards, the operating tent, and the hospital annex were run by the Sisters of Charity, some of whom were specially trained in the care of surgical patients. Although physicians sometimes complained that female nurses "could not appreciate that the doctor was supreme in his ward," most of them regarded these women more highly than their male counterparts. Colonel Forwood's efforts to increase the number of physicians assigned to him were often frustrated when those ordered to Wikoff never arrived, having managed to have their orders changed "for some reason or other." Nevertheless, the medical staff at Wikoff had, for the most part, a good reputation. The work done at Wikoff's surgical facilities, organized and directed by Colonel Senn, was much admired.[57]

The fear that hospitalized patients among the returning troops might introduce yellow fever into the United States led to the establishment of a second hospital at Wikoff, a detention facility where the sick and wounded from ships suspected of carrying yellow fever infection could be held. This facility received its first patient on 15 August, and by the seventeenth 3 physicians and 6 hospital corpsmen were caring for 60 patients. As its population grew, its tents were put on frames, given wooden floors, and organized into pavilions like those in the general hospital. By the thirty-first, when its capacity reached 400 beds, fourteen such structures had been built, and another forty separate tents stood ready for convalescents. The number of patients sent there tended to vary widely, and it was difficult to meet sudden and large influxes, especially when the delivery of supplies was slow. Despite the aid of the Red Cross, Colonel Forwood had to admit that in this hospital "the wants of patients, in spite of the best efforts of all, were not always promptly met." The only 5 patients ever suspected of actually having yellow fever were released from quarantine on the twenty-fifth, and by mid-September, when roads, wells, electric lights, and telephone and telegraph lines were all in place and when no new patients were being admitted, the size of the staff could be reduced. On the eighteenth only 60 patients remained of the 1,850 men who had passed through the detention hospital since 28 August, more than 1,100 of whom had been either furloughed or returned to their regiments and only 62 of whom had died.[58]

The sick continued to come to the other hospitals serving Camp Wikoff in overwhelming numbers throughout August. Although by the end of the month patients

were being furloughed home at the rate of 200 a day and the general hospital's capacity had been increased to 2,500 beds, it became necessary to organize three division hospitals with beds for another 600. As September progressed and even these most recently established facilities filled up, more and more soldiers had to be cared for in regimental hospitals.[59]

Because of the congestion at the Camp Wikoff hospitals, Surgeon General Sternberg permitted their patients to be sent to civilian hospitals in such cities as New York, New Haven, Connecticut, and Providence, Rhode Island, which were more comfortable than "the bleak, temporary hospitals at Montauk." To expedite the transfers, he sent Colonel Greenleaf to the camp on 8 September, returning Colonel Forwood to his prewar assignment at the Soldiers' Home in Washington, D.C. Greenleaf assembled twenty-two ambulances to take patients to the train or boat that would carry them to their destinations. Long waits at the railroad depot by men weakened by disease led to many complaints, but finally an arrangement was made that forbade the sending of patients from the hospital until the chief surgeon had been informed that a car awaited them at the station. Two private citizens paid to have railway cars specially equipped for convalescents, while the Red Cross and such organizations as the Massachusetts Volunteer Aid Association provided boats to move patients from Montauk. By transferring patients and granting furloughs, the Medical Department so reduced the hospital population at Camp Wikoff that on 10 September 1,000 beds were vacant. Two of the three division facilities and all but the main section of the general hospital were then closed.[60]

Pressure upon the Medical Department to send patients home or to institutions near their homes was great, but when convalescents collapsed on the way, criticism was loud. Colonel Greenleaf decided to appoint medical boards to determine which patients were strong enough to endure the journey. Relapses were also frequent among patients who had returned to their homes in apparent good health, only to fall seriously ill after too much welcoming celebration. Even on the trains taking them home, some of these men were offered food they should not eat, and families and friends were warned that "many soldiers who had escaped the danger of the battlefield have been killed by kindness at home." Several physicians commented on the dangerous type of malaria afflicting so many returnees, one Massachusetts physician blaming these fatal and near-fatal relapses on "what we call aevisto [*sic*] autumnal malaria," caused by the highly dangerous falciparum parasite, one rarely encountered in New England.[61]

As autumn approached, Surgeon General Sternberg was forced to consider a new problem, the protection of the sick remaining at Camp Wikoff against "the chilly nights and high winds of September." Acting on a plan to winterize the tent pavilions, he ordered "window sash, stoves, hardware, etc.," for five wards. Construction was promptly undertaken and apparently completed by 24 September, but the population of both camp and hospital was already dwindling rapidly. All but seven regular regiments had left Montauk Point before the end of September, and fewer than 400 patients remained hospitalized. On 3 October, when the V Corps was disbanded, less than 300 sick, all seriously ill, remained in the camp's hospitals, to be transferred when well enough to

withstand the journey. On the sixth Colonel Greenleaf left to inspect military camps in the South, and on 16 November the general hospital finally closed.[62]

Despite the hardships experienced at Montauk Point and the harsh criticism that some civilians leveled at it, up to 30 September only 257 of the 21,870 who had gone through Camp Wikoff, of whom more than 17,500 were returnees from Cuba, had died. Although 10,000 patients had been cared for in the general, division, and detention facilities and another 4,000 in regimental hospitals, no major epidemics had developed among its weakened inhabitants.[63]



VICTOR C. VAUGHAN

The Typhoid Board

The devastating nature of the epidemics that had swept Army camps in the summer of 1898 could not be ignored. Surgeon General Sternberg's response to the challenge involved initiating a new approach to the study of disease. In August he named the first of a series of boards that would be appointed in the decades to come to investigate the diseases that threatened the Army. The new Typhoid Board would study the way in which typhoid fever spread and means of preventing its transmission. To head it, Sternberg named Major Reed, whose preparation for the task he was about to undertake dated back to the days of his graduate studies at Johns Hopkins (1890–1891), which included the effects of typhoid fever upon the human body. Sternberg had recognized Reed's expertise by appointing him to teach bacteriology at the Army Medical School in 1893. The 47-year-old Reed, "a man of charming personality" as well as "a polished gentleman and a scientist of the highest order," according to a colleague, was joined on the Typhoid Board by two surgeons of the U.S. Volunteers, Major Vaughan, a professor of medicine at the University of Michigan who had survived yellow fever in Cuba, and Maj. Edwin Shakespeare, who had studied tropical diseases in India and Spain.[64]

On Sternberg's instructions, the three physicians inspected all the major campsites in the United States. After examining such matters as sanitation, tent placement, and conditions in general hospitals, and after interviewing the medical officers involved, the members of the board returned to Washington in October to begin their detailed examination of camp records. They traced the progress of each soldier who might have had typhoid through every hospital, military or civilian, that cared for him. Among the camps they studied was Camp Alger, where the surgeons

caring for the troops had no microscopes and thus had been unable to examine the blood of their patients for evidence of malaria parasites. Medical officers had, therefore, found it easy to diagnose dubious cases as malaria rather than typhoid, even though the prevailing disease had not responded to quinine. Vaughan concluded that medical officers at Alger might have been frightened by the idea that the disease was typhoid, and he pronounced their suggestion that dengue was the principal disease at some camps to be "too absurd to receive serious attention." [65]

The Typhoid Board set up laboratories at each camp and sent experienced bacteriologists to work in them. As a result, the board could achieve far greater accuracy in its disease identifications than had been possible for camp surgeons. Although the Widal test often failed to indicate the presence of typhoid until the case was far progressed (the immune response developed strength with time) and a diagnosis of malaria could be missed if only a few plasmodia were present in the blood, the board was able to conclude that malaria had never been a serious problem for U.S. troops in the United States. The board's research also suggested that as many as 82 percent of the sick in the Army in the United States had typhoid, that the disease was often present in units before they reported to federal authorities, and that the failure to diagnose it correctly and promptly had contributed to the epidemic.[66]

The Typhoid Board decided that, popular opinion to the contrary, polluted water played only a minor role in the spread of typhoid. While acknowledging that water "always [had to] be kept in mind" as a vehicle for the disease, Reed and his colleagues confirmed Sternberg's theory that flies moving from latrines to kitchens and food supplies posed a greater danger. Men who emptied bedpans for sick comrades and did not wash their hands before handling food transmitted disease, and those who dipped water from streams with contaminated hands endangered their own health and polluted the stream as well. Spread of the disease also resulted from the failure to segregate those diagnosed as having typhoid from other patients. Those who were responsible for sanitation in the camps were all too often poorly trained, too few in number, and lacking adequate authority to enforce the necessary measures. Reed recognized the phenomenon of the typhoid carrier when he pointed out that "the individual who . . . acts as host for the introduction of the bacillus need not necessarily develop the disease himself, he may at the time be immune and yet his excretions may be infectious." [67]

The board despaired of ever being able to prevent epidemics by sanitation alone. Vaughan noted that he could not "help but feel that the engineer corps was largely responsible for the 1898 tragedy at Chickamauga, but the ignorance of camp sanitation at that time displayed by the army engineer was surpassed only by that of the line officer." Realizing that practices that favored the spread of typhoid would continue as long as line officers treated the warnings of medical officers with contempt, the Typhoid Board concluded that immunization might be a more effective approach to preventing typhoid in the Army than sanitation alone.[68]

By the spring of 1899, although the money allotted for this work had run out and Reed had been given another assignment, Vaughan and Shakespeare continued to organize the data they had collected on their own. They brought out a preliminary report in 1899, but in 1900, before

the final version could be issued, Shakespeare died. Reed worked on the report only briefly in the summer of 1900, since he was by then involved in his study of yellow fever, and thus Vaughan alone was available to complete a summary of the board's conclusions. Since the summary showed both that typhoid was too widespread throughout the general population for the Army to be able to prevent the appearance of isolated cases and that the disease could be spread in many different ways, the full report with supporting data was eagerly awaited. An abstract was published in 1900 and the complete report four years later. By this time Reed, too, was dead, and the definitive document detailing the findings of the Typhoid Board was largely the work of its only surviving member, Victor Vaughan.[69]

The Dodge Commission Investigation

By the late fall of 1898 almost all the men once inhabiting the huge training camps had been sent to other camps and stations or to homes, families, and civilian life, and Secretary of War Alger had been sufficiently impressed by their sufferings to require weekly inspections of all camps. More time was allowed commanders to choose their campsites, and care was taken to avoid massing large numbers of men at one location. In Colonel Greenleaf's opinion, postwar division hospitals were for the most part well run, and some were "models of neatness." Supplies were plentiful, and the sick were well cared for.[70]

But well-run, well-supplied, and clean hospitals were far more easily achieved in time of peace than in time of war. The lesson about the possible consequences of hostilities lightly entered into had cost dearly. The inroads that disease had made among the men of the Army's camps of the summer of 1898, increasing the Army's death rate more than fivefold over the peacetime rate, would not be forgotten, especially at a time when more was expected of medicine and of those who practiced it than had been the case during the Civil War. The question of how this disaster came about would long be the subject of debate and speculation far beyond the boundaries of the Army Medical Department.

Criticism centered upon what was perceived as administrative incompetence or callous neglect. The competence of the Army's physicians was not called into question. The collection of so many men in camps during the summer months for so long a period led to scenes encountered during the Civil War only at the worst prison camps. Those who throve on sensationalism found much to feed upon at the disease-ridden camps and especially at Camp Wikoff, where relatives sought to comfort the newly returned veterans. In addition to the disease rate and the occasional lack of bare necessities, a general failure to understand the way in which the military operated led to public outrage. In civilian life, hospitals were still used mainly by the extremely poor, and presumably few of those who could visit their relatives at an Army facility were familiar with the nature of hospitals of any kind or with the care provided there. Some problems that led to the loudest outcry resulted from the failure of well-intended civilians to understand that their husbands and sons simply could not be cared for in a military situation as they would be if they were injured or fell ill at home.

President McKinley responded to the tumult raised by the management of the war and the horrors of the camps by appoint-

ing a commission, chaired by Maj. Gen. Grenville M. Dodge,[71] to "investigate all charges of criminal neglect of soldiers . . . and to make the fullest examination of the administration of the War Department in all of its branches." After several months of inquiry, the commission concluded that the nation's leaders in both the legislative and executive branches were to a large extent responsible for the situation that led to so much unnecessary suffering and death. Congress had not granted the funds necessary to prepare for war until the war was under way. A majority of the commission, including Dodge himself, did not believe that Secretary of War Alger was to blame for the failures of the Spanish-American War. To present a united front, they compromised with the dissenters and stated in their official report: "In the judgment of the commission there was lacking in the general administration of the War Department during the continuance of the War with Spain that complete grasp of the situation which was essential to the highest efficiency and discipline of the Army." [72]

The commission went on to highlight specific problems and, in some instances, to make recommendations for their solution. After noting that the lack of funds to prepare for war before it was declared had made it impossible for the Medical Department to accumulate sufficient supplies to meet a demand that proved to be higher than anticipated, the commission recommended that enough for four years be kept in reserve. It also pointed out that the department's inability to control the transportation of its supplies had contributed to the supply shortage. It observed that the shortage of trained physicians had prevented the necessary frequent and thorough inspection of camps and hospital sanitation. The commission urged that a reserve of trained nurses be created to prevent a recurrence of the shortage experienced in the summer of 1898 and that plans be laid to create a volunteer Hospital Corps in the event of another war. All physicians, in the commission's opinion, should be able to draw whatever food their patients needed without regard to the commutation of rations. Since administrative confusion had also contributed to the department's problems, attention should be given to simplifying routines and eliminating unnecessary red tape.[73]

Surgeon General Sternberg's preoccupation with details that could have been handled by his subordinates may have limited his ability to deal with the difficult situation that had been imposed on him from above. He may not have fully appreciated either the magnitude of the problems medical officers in the field were experiencing or the possible benefit that might have resulted from his using the weight of his position and personal reputation to increase their influence with the line. The issuance of circulars was certainly no substitute for personal inspection trips, which the surgeon general apparently frequently assigned to his subordinates. Nevertheless, in creating the pioneering Typhoid Board, Sternberg demonstrated his ambition to utilize the new medicine in the war against traditional army diseases and his deep concern for the devastation they caused in 1898.

Most of the Medical Department's problems in the camps of the summer of 1898 within the United States, however, had been too complex for any surgeon general to cure. Too many men totally unfamiliar with military life were gathered too rapidly by a government as heedless of the desirability of planning as a schoolboy playing

with his toy soldiers. Too little time and effort were devoted to impressing upon masses of overenthusiastic young men the importance of sanitation. Too few Army surgeons were both trained in the newly developed techniques by which typhoid could be distinguished from malaria in the living patient and provided with the equipment necessary to this work. With an understanding of the role of the typhoid carrier still in the future, proper precautions to limit this means of spreading the disease could not be taken. In addition, few in positions of authority seemed to have any appreciation for the fact that hospitals for thousands of patients could not be created overnight, nor competent hospital staffs gathered to run them in an instant. Under such conditions, a small group of professional medical officers, no matter how great their dedication and skill, could not hope to overcome the zealous and impulsive enthusiasm of a mass of amateur soldiers who seemed to regard sanitation as unpatriotic or, at least, an unmilitary concern. The Army Medical Department, because of its direct responsibility for the prevention and treatment of disease, became a convenient and popular scapegoat in this "splendid little war." [74]

NOTES

1. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1898, pp. 110–12 (first quotation), 169 (second quotation), and 1899, p. 38 (hereafter cited as WD, *ARofSG*, date); "Some of the Medical Lessons of the War," p. 485; Walter Reed, Victor C. Vaughan, and E. O. Shakespeare, *Reports on the Origin and Spread of Typhoid Fever in U.S. Military Camps During the Spanish War of 1898*, 1:42–43, 106–07; United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 6:2988 (hereafter cited as *Dodge Commission Report*); Victor C. Vaughan, *A Doctor's Memories*, p. 390; Dale C. Smith, "The Rise and Fall of Typho-Malaria," pp. 316–19; Martha Derthick, *The National Guard in Politics*, p. 19; John Duffy, *The Sanitarians*, pp. 128, 131–32, 190.

2. WD, *ARofSG*, 1898, p. 102, and 1899, pp. 24–25; Dallas Bache, "The Place of the Female Nurse in the Army," p. 316; *Dodge Commission Report*, 7:3168–72; Nicholas Senn, *Medico-surgical Aspects of the Spanish American War*, p. 320; in Record Group (RG) 12, National Archives and Records Administration (NARA), Washington, D.C.: Anita Newcomb McGee Journal, Apr–May 1898, Entry 229, Extract from *American Monthly Magazine*, Entry 229, and Narratives, [Anita Newcomb McGee], pp. 9–12, Margaret Dunn, and Margaret Berry, Entry 230.

3. WD, *ARofSG*, 1898, pp. 120–21, 126, 151, and 1899, p. 40; Bache, "Female Nurse," pp. 312, 314, 316; Percy M. Ashburn, *A History of the Medical Department of the United States Army*, p. 171 (hereafter cited as *History of MD*); Report of Commission To Investigate the Conduct of the War, pp. 67, 76, Microfilm Reel 6, William R. Shafter Papers, Stanford University, Palo Alto, Calif. (hereafter cited as Com Rpt, Mf Reel no., Shafter Papers, SU); *Dodge Commission Report*, 1:643–44, 648, and 4:1139–41; Charles R. Greenleaf, "The Organization of the Medical Department of the Army in the Field," p. 200.

4. WD, *ARofSG*, 1898, pp. 9, 127 (quotation), 128–31, 151, and 1899, pp. 9–10; Bache, "Female Nurse," pp. 312, 314, 316; Massachusetts Volunteer Aid Association, *The Work of the Massachusetts Volunteer Aid Association During the War With Spain, 1898*, pp. 15, 82–83 (hereafter cited as MVAA, *Work*); Ralph C. Williams, *The United States Public Health Service, 1798–1950*, p. 559.

5. Senn, *Aspects*, pp. 193, 267–68, 325; WD, *ARofSG*, 1898, pp. 258, 260–61.

6. R. Stansbury Sutton, *A Story of Chickamauga*, pp. 6–7, 13 (quotation); War Department, *Correspondence Relating to the War With Spain . . .*, 1:36; idem, *ARofSG*, 1898, pp. 163, 167–68, 174–75, 177, 179–81; Reed et al., *Reports*, 1:42–43, 106–07; *Dodge Commission Report*, 1:607–08, 612–13, 3:183, 4:860, 1135, 1354, and 6:2968–69, 2982–83; Senn, *Aspects*, pp. 44–45.

7. Sutton, *Story*, pp. 1, 8, 10–11 (first quotation), 12; *Dodge Commission Report*, 2:773, 3:261 (second quotation), 545, 547 (remaining quotations), and 4:834–35, 1136–37, 1147, 1305; WD, *ARofSG*, 1898, pp. 163, 173–74; H. A. Haubold, "The Medical Aspects of Camp Management at Chickamauga," p. 585; Reed et al., *Reports*, 1:265, 267; Com Rpt, p. 66, Mf Reel 6, Shafter Papers, SU; Vaughan, *Memories*, pp. 377, 384.

8. WD, *ARofSG*, 1898, pp. 169, 173, 175 (first quotation), 180–81, and 1899, p. 40; Haubold, "Medical Aspects," p. 585 (remaining quotations); Sutton, *Story*, p. 11; Reed et al., *Reports*, 1:265, 267; *Dodge Commission Report*, 3:194–95, 4:1314.

9. Joseph J. Curry, "On the Value of Blood Examinations in the Diagnosis of Camp Fevers," p. 515; George Dock, "Clinical Pathology in the Eighties and Nineties," p. 679; *Dodge Commission Report*, 3:191, 194–95, and 4:832; Ashburn, *History of MD*, pp. 168–70, 178; Ltr, Charles F. Craig to *The Constitution*, Atlanta, 29 Oct 1898, Papers From the Letterpress of Charles Franklin Craig, Walter Reed Army Institute of Research, Washington, D.C.

10. WD, *ARofSG*, 1897, pp. 66–67, and 1898, pp. 122, 176–80; *Dodge Commission Report*, 1:181, 3:187, 264–65, 4:831, 1308–09, 1316, 1380, 1405, 5:1735, 1817, and 6:2819, 2988; Haubold, "Medical Aspects," p. 584; Com Rpt, p. 69, Mf Reel 6, Shafter Papers, SU; Erna Risch, *Quartermaster Support of the Army*, pp. 539–40.

11. *Dodge Commission Report*, 1:587; 3:191 (quotation); 4:1145, 1311, 1364, 1385, 1387–88, 1402–03, 1732–33; and 6:2802, 2888, 2976–77, 2979, 2990, 2999.

12. Ibid., 3:187, 4:1307.

13. Quotations from WD, *ARofSG*, 1898, pp. 181–82; ibid., pp. 173, 183; *Dodge Commission Report*, 4:1308–09.

14. WD, *ARofSG*, 1898, pp. 123, 128; Sutton, *Story*, pp. 7–8; *Dodge Commission Report*, 4:859.

15. Alexander H. Hoff was an assistant surgeon in the Army Medical Department after the Civil War and John van R. Hoff's father.

16. WD, *ARofSG*, 1898, pp. 40, 122–23, 127, 177; *Dodge Commission Report*, 1:73, 5:1732–33, and 6:2990, 3005–06; Bache, "Female Nurse," p. 314; Reed et al., *Reports*, 1:41.

17. WD, *ARofSG*, 1898, pp. 123–24, 128, 150, 183–84, and 1899, pp. 69–70, 90–91, 93; idem, *Correspondence*, 1:43; *Dodge Commission Report*, 1:612–13, 8:81; Scheffel H. Wright, "Historical Issue; Medicine in the Florida Camps During the Spanish-American War," pp. 20–23; William M. Straight, "Camp Miami, 1898," pp. 504, 510–11; John A. Holmes, *The Raw Deal*, p. 8; Vaughan, *Memories*, pp. 372–73; Smith, "Rise and Fall," p. 318.

18. WD, *ARofSG*, 1898, pp. 123–24, 183–84, and 1899, pp. 66–67, 69–70, 72, 79, 83–84, 86 (quotation), 89–90, 97; Smith, "Rise and Fall," pp. 317–19; Curry, "On the Value of Blood Examinations," p. 515; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 51 (hereafter cited as WD, SGO, *SGO*).

19. WD, *ARofSG*, 1899, pp. 87 (quotations), 88.

20. Ibid., 1898, p. 124, and 1899, pp. 81–83; *Dodge Commission Report*, 1:108. Immunity conferred by typhoid fever is not usually long lasting.

21. WD, *ARofSG*, 1899, pp. 67–68, 76–78 (quotation); *Dodge Commission Report*, 1:211.

22. WD, *ARofSG*, 1898, p. 129, and 1899, p. 32 (quotation); *Dodge Commission Report*, 1:657.

23. Graham held a volunteer commission of major general from 8 May to 30 November 1898.

24. The reported number of officers and men at Camp Alger was: in May, 17,406; in June, 23,511; in July, 22,175; and in August, 21,454. See War Department, *[Annual] Report of the Secretary of War*, 1898, 1(pt.2):476, 482–83, 498 (hereafter cited as WD, *ARofSW*, date).

25. Alfred C. Girard, *The Management of Camp Alger and Camp Meade*, pp. 1–2 (first two quotations), 3–6; WD, *ARofSG*, 1898, pp. 153–54, 155–56 (final two quotations), 160–61, and 1899, p. 54; Rpt, Ch Surg, Second Army Corps, pp. 2, 4, 12, Entry 219, RG 395, NARA; *Dodge Commission Report*, 3:106, 8:56.

26. Girard, *Management*, pp. 3–4 (quotation); WD, *ARofSG*, 1898, p. 154.

27. WD, *ARofSG*, 1898, pp. 154, 157; Girard, *Management*, pp. 3–4; *Dodge Commission Report*, 4:1248.

28. WD, *ARofSG*, 1898, p. 156; Girard, *Management*, p. 6; Reed et al., *Reports*, 1:xv; Vaughan, *Memories*, pp. 370–71; Smith, "Rise and Fall," p. 317; Rpt, Ch Surg, Second Army Corps, p. 13, Entry 219, RG 395, NARA.

29. Rpt, Ch Surg, Second Army Corps, p. 15 (quotation), Entry 219, RG 395, NARA; WD, *ARofSG*, 1898, pp. 130, 153–54, 156; *Dodge Commission Report*, 4:1249, 8:69.

30. WD, *ARofSG*, 1898, pp. 158–59 (quotation); Rpt, Ch Surg, Second Army Corps, pp. 21–23, Entry 219, RG 395, NARA; WD, SGO, *SGO*, p. 51.

31. WD, *ARofSG*, 1898, pp. 150–51; "Some of the Medical Lessons," p. 485.

32. After the end of the war, even though volunteers who had served the longest were being mustered out, new volunteers were still coming in.

33. *Dodge Commission Report*, 3:117.

34. Rpt, Ch Surg, Second Army Corps, pp. 7 (quotation), 8, 10, 15, Entry 219, RG 395, NARA.

35. Ibid., pp. 7–8 (quotation), 9–10, 21–23, Entry 219, RG 395, NARA; WD, *ARofSG*, 1898, pp. 114, 155, 158, 160, and 1899, pp. 42–43.

36. WD, *ARofSG*, 1898, p. 127, and 1899, pp. 43–44, 49, 54; Reed et al., *Reports*, 1:480; *Dodge Commission Report*, 4:1252; Vaughan, *Memories*, pp. 378, 387; Rpt, Ch Surg, Second Army Corps, pp. 22–23, Entry 219, RG 395, NARA.

37. *Dodge Commission Report*, 4:1330–31, 1334, 1337, and 8:89 (quotation); WD, *ARofSG*, 1898, p. 124, and 1899, pp. 54–56; idem, *Correspondence*, 1:534–35; Reed et al., *Reports*, 1:500–501.

38. *Dodge Commission Report*, 3:117, 258; Jefferson D. Griffith, "Hospital Experience in the War With Spain," pp. 164–65; WD, *ARofSG*, 1898, pp. 171, and 1899, pp. 40–41, 54; idem, *Correspondence*, 1:510, 530; Ashburn, *History of MD*, p. 181.

39. Telgs, George D. Meiklejohn to Theodore Schwan and AG Corbin to Schwan, both 12 Sep 1898, file 121918, RG 94, NARA.

40. The VI Corps existed only on paper; no men had ever been assigned to it. See Graham A. Cosmas, *An Army for Empire*, p. 133.

41. WD, *Correspondence*, 1:257–58 (quotation).

42. Ibid., 1:510; WD, *ARofSW*, 1899, 1(pt.3):193.

43. WD, *ARofSW*, 1899, 1(pt.2):396, 400–401; idem, *ARofSG*, 1899, pp. 44–54; idem, *Correspon-*

dence, 1:257–58, 510–20; Telgs, AG Corbin to Asst AG Corter, 14 Oct 1898, file 299587, and S. B. M. Young to AG, 10 Dec 1898, file 175230, RG 92, NARA.

44. *Dodge Commission Report*, 1:211; WD, *Correspondence*, 1:248; idem, *ARofSW*, 1898, 1(pt.2):640–41; Rpt, J. B. Bellinger to QMG, 30 Jun 1899, file 133396, RG 92, NARA.

45. WD, *ARofSW*, 1899, 1(pt.2):407; idem, *Correspondence*, 1:529, 534–35, 510.

46. WD, *ARofSW*, 1899, 1(pt.2):364, 396, 400–401, 407.

47. WD, *ARofSG*, 1898, pp. 242, 259 (quotation), and 1899, pp. 60–61; Ltr, Valery Havard to Shafter, 9 Aug 1898, Autobiography, William R. Shafter, ch. VII, p. 7, and Encl to Ltr, Charles D. Rhodes to William H. McKittrick, Nov 1931, all Mf Reel 6, Shafter Papers, SU; *Dodge Commission Report*, 1:78, 2:742; Seabury W. Allen, "The Conditions at Camp Wikoff," pp. 326–27. See Mary C. Gillett, *Army Medical Department, 1775–1818*, and *Army Medical Department, 1818–1865*, for details of earlier yellow fever epidemics that affected the Army.

48. WD, *ARofSG*, 1898, pp. 241 (quotation), 242; Senn, *Aspects*, pp. 174, 176; *Dodge Commission Report*, 1:78.

49. WD, *ARofSG*, 1898, pp. 249–50.

50. Ibid., 1898, pp. 240 (quotation), 241–42, 246–47, 250; *Dodge Commission Report*, 5:1893.

51. WD, *ARofSG*, 1898, pp. 241–43, 245, 254; *Dodge Commission Report*, 1:78, 114–15.

52. MVAA, *Work*, pp. 177 (quotations), 180; Wickes Washburn, "Montauk Point and the Government Hospitals," pp. 802–03; WD, *ARofSG*, pp. 243, 246; *Dodge Commission Report*, 1:78–79, 114–15, and 6:2586–87, 2589, 2590, 2597, 2801; Allen, "Conditions at Camp Wikoff," p. 326; Theodore Roosevelt, "The Rough Riders," p. 688; Statement, Esther V. Hassen, Entry 230, RG 112, NARA; Frank Donaldson, "A Refutation of False Statements Concerning Camp Wikoff," pp. 334–35.

53. The work of the Dodge Commission is discussed later in the chapter.

54. *Dodge Commission Report*, 1:535, 5:1888, 1900, and 6:2588 (quotation), 2601, 2732–33; WD, *ARofSG*, 1898, p. 250.

55. Quotations from WD, *ARofSG*, 1898, pp. 243, 245; ibid., pp. 241, 244, 246, 249; *Dodge Commission Report*, 6:2736

56. *Dodge Commission Report*, 5:1888, 1891, and 6:2500, 2570; MVAA, *Work*, p. 178; WD, *ARofSG*, pp. 119, 243–45, 250–51; Bache, "Female Nurse," p. 327; Senn, *Aspects*, p. 177; Allen, "Conditions at Camp Wikoff," p. 327.

57. *Dodge Commission Report*, 6:2592 (first quotation); WD, *ARofSG*, 1898, pp. 250 (second quotation), 251; Senn, *Aspects*, p. 324; Bache, "Female Nurse," pp. 176–77, 327; MVAA, *Work*, p. 179.

58. WD, *ARofSG*, 1898, pp. 118, 243–44, 251–52 (quotation), 253; MVAA, *Work*, p. 179; *Dodge Commission Report*, 2:740, 4:818–20, 823, and 6:2570; Allen, "Conditions at Camp Wikoff," p. 326; Nicholas Senn, "The Returning Army," p. 653.

59. WD, *ARofSG*, 1898, 245, 253, 255–57; Ltr, Shafter to AG, 30 Sep 1898, Mf Reel 6, Shafter Papers, SU; MVAA, *Work*, p. 179; *Dodge Commission Report*, 6:2598.

60. WD, *ARofSG*, 1898, pp. 150, 244–45 (quotation), 246, 261–62; *Dodge Commission Report*, 1:528, 5:1971, and 6:2599, 2876; Ashburn, *History of MD*, p. 171.

61. Quotations from MVAA, *Work*, pp. 97–98. See also ibid., pp. 96, 180–81; WD, *ARofSG*, 1898, pp. 120, 261–62; *Dodge Commission Report*, 6:2530–31; Allen, "Conditions at Camp Wikoff," pp. 326–27; Ltr, Shafter to AG, 7 Sep 1898, Mf Reel 5, Shafter Papers, SU; E. M. Buckingham, "Tropical and Camp Disease," p. 433.

62. WD, *ARofSG*, 1898, pp. 128, 150, 246 (quotations), 262; in Shafter Papers, SU: Telg, Shafter to AG, 24 Sep 1898, Mf Reel 5, and Ltrs, Shafter to AG, 27–28 Sep and 1 Oct 1898, and V Army Corps GO 50, 3 Oct 1898, all Mf Reel 6; *Dodge Commission Report*, 8:120; Joseph Wheeler, *The Santiago Campaign*, pp. 207–08.

63. *Dodge Commission Report*, 1:183, 219.

64. Smith, "Rise and Fall," p. 316; William B. Bean, *Walter Reed*, pp. 3, 48–49, 64–68; United States, Congress, Senate, 61st Congress, 3d Session, *Yellow Fever . . .*, p. 8; Aristides Agramonte, "The Inside Story of a Great Medical Discovery," p. 214 (quotations); Ashburn, *History of MD*, p. 259; Robert S. Henry, *The Armed Forces Institute of Pathology*, pp. 134–36 (hereafter cited as *AFIP*); Edgar Erskine Hume, *Victories of Army Medicine*, pp. 100–101; Reed et al., *Reports*, 1:xv.

65. Victor C. Vaughan, "Some Remarks on Typhoid Fever Among Our Soldiers During the Late War With Spain," pp. 63–64, 66–67 (quotation); WD, *ARofSG*, 1899, pp. 273–74, 278–80; Reed et al., *Reports*, 1:xv–xvi; Henry, *AFIP*, pp. 134–35.

66. WD, *ARofSG*, 1899, p. 280; Vaughan, "Some Remarks," pp. 64–65, 68–69; Henry, *AFIP*, pp. 134–36; "Value of Blood Examinations in Malarial and Typhoid Fevers," pp. 746–47.

67. WD, *ARofSG*, 1899, pp. 205, 216 (first quotation), 270–71, 276; Henry, *AFIP*, pp. 137–38; Vaughan, "Some Remarks," p. 71; idem, *Memories*, pp. 376, 384–86, 393–94; Reed et al., *Reports*, 1:206; SGO Cir 1, 25 Apr 1898, Entry 66, RG 112, NARA; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, pp. 126–27. See also in Ms C48, Walter Reed and William C. Gorgas Papers, National Library of Medicine, Bethesda, Md., the following reports: Filters and the Sterilization of Water; Preliminary Report on Typhoid Fever in Military Camps, 1899; Disposal of Excreta, 1898, p. 6 (second quotation); and Walter Reed to AG, 15 May 1899, in Orders, 1899.

68. WD, *ARofSG*, 1899, p. 95; "Antityphoid Vaccination in the Army," p. 728; Hume, *Victories*, p. 101; Frederick F. Russell, "The Prevention of Typhoid Fever by Vaccination and by Early Diagnosis and Isolation," pp. 482, 485; Vaughan, *Memories*, pp. 369–70, 376 (quotation); Ashburn, *History of MD*, pp. 272–73.

69. WD, *ARofSG*, 1899, pp. 273–74, 1900, p. 53, and 1903, pp. 49–56; Henry, *AFIP*, pp. 133, 135–36; Harry F. Dowling, *Fighting Infection*, pp. 14–15; Agramonte, "Inside Story," p. 219; Bayne-Jones, *Preventive Medicine*, pp. 125–26.

70. WD, *ARofSG*, 1898, p. 151.

71. Dodge held a volunteer commission of major general from 7 June 1864 to 30 May 1866, when he resigned.

72. Quotations from *Dodge Commission Report*, 1:107, 116. See also ibid., 1:113; "The One Great Blot of the War," p. 279; "The Surgeon General of the Army and His Critics," p. 822.

73. *Dodge Commission Report*, 1:113, 116, 188–89; WD, *ARofSG*, 1908, p. 126.

74. Quotation by John M. Hay, the U.S. ambassador to Great Britain from 1897 to 1898, cited in Cosmas, *Army*, p. 245. See also *Dodge Commission Report*, 6:2838; Vaughan, *Memories*, p. 390; Smith, "Rise and Fall," p. 316; WD, *ARofSG*, 1900, p. 75.

Chapter 8

CAMPAIGNS OF THE NEW EMPIRE



The "splendid little war" was over almost as soon as it began, and in the United States even disease was defeated within a few months. But for U.S. forces in the Far East, the surrender of the Spanish was only the start of a long struggle. Beginning in the spring of 1900 and continuing for years thereafter, soldiers in the Philippines would be involved in guerrilla warfare, and the medical officers with them would face challenges rendered more demanding than those of the Indian wars both by the complexities of the campaigns and by the tropical climate and its diseases. American soldiers and marines would also be called upon to join troops from other major powers to end violence engendered in China by members of a secret organization, the Boxers, who, with the tacit approval of the Dowager Empress, sought to end foreign exploitation of their nation. The physicians with them would be required to deal with the consequences of generations of abysmally poor sanitation and of the diseases that inevitably resulted.

The Philippine Insurrection

The defeat of the Spanish brought in mid-August 1898 only a short respite for General Merritt's VIII Corps. During this period, beginning shortly after the surrender, a flurry of changes took place at the highest level of command in the Philippines. On 25 August the 1st Division of the VIII Corps was organized under the command of General Anderson, who was recently promoted to major general in the volunteers. On the twenty-eighth Anderson was relieved as commander of the 2d Division by Arthur MacArthur, now too a new major general in the volunteers, and General Merritt as commanding general of the VIII Corps by Elwell S. Otis, also a major general in the volunteers. On the twenty-ninth Otis also relieved Merritt as military governor and commanding officer of the Department of the Pacific.[1]

Thus General Otis was in command of U.S. forces in the Philippines when, in February 1899, the Filipinos, suspicious about the motives of their liberators, turned to violence, initially in the form of warfare as orthodox as it could be among the narrow jungle trails and waterways that surrounded Manila. U.S. units, and the medical officers accompanying them, gained their first taste of what was to come when they attempted to defeat their new enemy and found themselves struggling to penetrate the mountains northwest of Manila—essentially impassable for vehicles—and, once beyond the mountains, to progress along bad roads and across "insecure" bridges. These early efforts were success-

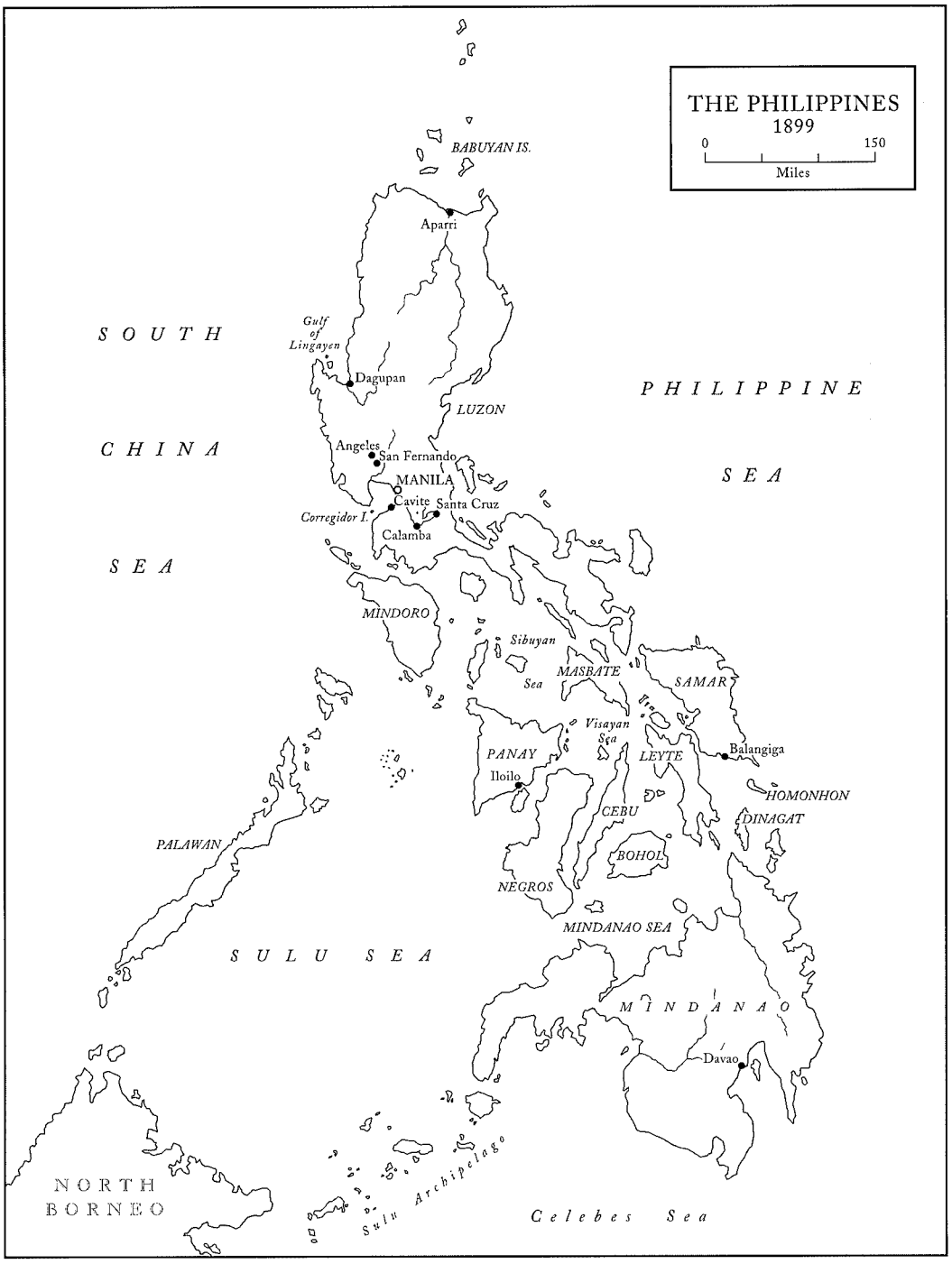
ful, but U.S. troops were not yet ready to seize and retain control of any extensive area, because all the volunteers and a third of the regulars in the VIII Corps were entitled to return home in the spring of 1899. When the volunteers of 1898 were mustered out, they were replaced by 35,000 men of new United States Volunteer regiments. By the autumn of 1899, with the arrival of new troops, U.S. forces in the Philippines numbered 66,000, more than 30,000 of them volunteers.[2]

The Americans now moved to take control of the islands, beginning with Luzon and a three-pronged push north of Manila (*Map 4*). In this campaign too, as Secretary of War Elihu Root noted in his report for 1899, "all . . . movements were accomplished under great difficulties owing to the almost impassable condition of the country." By the end of November the resistance was abandoning its attempts to conduct conventional warfare, and U.S. troops in northern Luzon were "actively pursuing the flying and scattered bands of insurgents, further dispersing them. . . ." American forces soon extended the drive to take complete control of the Philippines to the east and south of Manila as well, into another area of difficult terrain. So successful were these efforts that by the spring of 1900 General Otis concluded that the insurrection had been defeated and in May asked to be relieved. Nevertheless, troops under General MacArthur, who replaced Otis as commanding general in the Philippines, still faced guerrilla attacks and had to remain in the field and establish what would eventually be more than 500 posts to hold what they had taken.[3]

During the earliest and most conventional stage of the Philippine Insurrection, a single military department formed the basis for the government of the islands. The organization of VIII Corps medical personnel still reflected that of the corps itself. A chief surgeon headed the medical service of the entire corps, and a chief surgeon was assigned to each division and brigade of the corps. The regimental staff, which normally consisted of three physicians, increased significantly after the change from more conventional warfare to a guerrilla conflict in early 1900 and the increase in the number of posts that resulted. Eventually, although as many as seven medical officers sometimes served on a regimental staff, their numbers could still be too small to provide a physician for each garrison in its district. As a result, hospital corpsmen might be assigned to assume the physician's role for the smallest detachments and subposts.[4]

At the end of March 1900 the complexities involved in dealing with the guerrillas and governing the islands led to the transformation of what had been the Department of the Pacific into the Division of the Philippines with four geographical departments, each of which was, in turn, divided into military districts. This step brought an end to the VIII Corps.[5] The corps chief surgeon become the chief surgeon of the Division of the Philippines. The position of the chief surgeon of a military division was transformed into that of the chief surgeon of a department and that of the chief surgeon of a brigade into that of the chief surgeon of a district. The district form of organization was dropped late in 1901 and replaced by an organization by brigade.[6]

The government of the Philippines changed again in the spring of 1901, after U.S. forces captured the chief guerrilla leader, Emilio Aguinaldo. Although minor guerrilla activity would continue for many years thereafter, a successful effort to reduce expenses by concentrating resources


THE PHILIPPINES
1899
0
150
Miles
BABUYAN IS.
Aparri
Gulf of Lingayen
Dagupan
LUZON
SOUTH CHINA SEA
PHILIPPINE SEA
Angeles
San Fernando
MANILA
Cavite
Santa Cruz
Corregidor I.
Calamba
MINDORO
Sibuyan Sea
MASBATE
SAMAR
Visayan Sea
PANAY
LEYTE
Balangiga
Iloilo
HOMONHON
CEBU
DINAGAT
PALAWAN
BOHOL
NEGROS
MINDANAO SEA
SULU SEA
MINDANAO
Davao
NORTH BORNEO
Sulu Archipelago
Celebes Sea

MAP 4

was initiated, and the four departments were consolidated into two. President McKinley confidently appointed a civilian government for the islands in the form of a commission with legislative and limited executive power and a civilian governor. By November fewer than 45,000 U.S. soldiers remained of the 100,000 who at one point were serving in the Philippines.[7]

Although the organization and size of the medical service in the Philippines was adjusted to conform with the organization of the Army and the needs of forces spread out over an increasingly large area, the basic nature of the challenge facing medical personnel in the field changed only gradually. In this primitive land, the terrain controlled medical evacuation, while the number of sick and wounded and the difficulties experienced in moving them dictated the nature of the hospital system. The change of the conflict from conventional to guerrilla warfare in the space of a few months had less direct influence on the demands placed on the Medical Department than did the gradual isolation in well-nigh inaccessible locations of the small units that were sent to fight the guerrillas.

Hospitals and Evacuation

Initially, the Medical Department's chief responsibility was establishing a system of base hospitals in the Manila area to care for the sick, for those recovering from wounds sustained in the brief hostilities with the Spanish, and for convalescents. The department then expanded the size of this system and extended it geographically to care for those disabled during the insurrection that followed. In a former Spanish military hospital, Major Crosby set up the first division hospital to be established in Manila. Before the first patients arrived on 17 August 1898, the building of the newly created First Reserve Hospital was thoroughly cleaned and the necessary repairs were made. To avoid crowding, Crosby erected tents to handle the overflow. The unsatisfactory state of the hospital's plumbing and the poor drainage of the land nearby initially caused the Medical Department to be uneasy about using this structure, despite its electric lights and excellent ventilation. In time, the sewer system was replaced, water closets were installed, and each ward was given its own bathroom with showers. The city water works provided ample supplies, from which drinking water was distilled.[8]

The First Reserve soon became the keystone of the Army's hospital network in the Philippines.[9] Its surgical facilities, which included three operating rooms, were the most important in Manila. A two-ward smallpox unit was established 1,200 yards from the main building; another ward, consisting of two tents erected over raised platforms, was added later for those suspected of having smallpox; and a third tent was set up to isolate patients suffering from bubonic plague, if that disease ever afflicted the Army. All patients arriving in Manila by boat came through a First Reserve unit established near the docks, where the victims of accidents on the city streets or on the railroad also received emergency treatment. The hospital laboratory, set up by Captain McVay, was well equipped to handle all pathological examinations for the Manila area. This entire division hospital, including the smallpox facility, eventually held 400 beds. Sixteen mules drew four ambulance wagons around the Manila area to pick up patients in response to telegraphed requests for their services.[10]

Two more hospitals were established not long after the fall of Manila. The Sec-



SECOND RESERVE HOSPITAL, MANILA, PHILIPPINES



ond Reserve Hospital opened in September 1898 in a modern and attractive building that had been built to serve as a young women's school. With its eight porcelain bathtubs and its acres of walled gardens, complete with fountains and flowering trees, this facility was "a really fine establishment." Initially most of its 300 beds were assigned to convalescents who were transferred from the First Reserve Hospital or from regimental hospitals; but, as time went by and the disease rate rose, the seriously ill were also sent there. Convalescents did not have to share yet another facility, which was set up on Corregidor Island, a site only thirty miles from Manila that was chosen in November because of the city's poor health record. The climate was more pleasant than that of the city, the natural drainage of the soil was good, the sea air was mild, and many trees tempted those whose health was still fragile to rest in their shade. This hospital initially occupied tents and a few old buildings, where 250 beds were placed. In September 1899, with activity against the Filipinos intensifying, the first of a series of new structures was completed to replace the old ones, and by June 1900 the facility held 220 beds. As described by the surgeon in charge of the Corregidor facility, "The first dental office ever fitted out officially by the United States government" was also set up, to be managed by a hospital corpsman who in private life had been a professional dentist. Plans to expand this hospital had to be suspended because of high construction costs that resulted in part from a conspiracy among lumber dealers.[11]

In May 1899 another hospital, known simply as Hospital No. 3 or the supplementary hospital, was opened just outside the city walls in barracks once belonging to the Spanish infantry. An enormous amount of work was necessary to make it fit for use. One medical officer noted that "only one who has seen the filth can appreciate what that labor was." Among its 285 patients were those scheduled for disability discharges. No civilian nurses served on its staff, since the surgeon in charge regarded them as neither necessary nor desirable.[12]

In November 1899, in response to the mounting disease rate and growing activity against guerrillas, the Medical Department increased the number of available beds by taking over a former barracks at Santa Mesa, a suburb of Manila, for a new 1,000-bed unit. The staff of this new facility, eventually the largest in the Philippines, included 10 physicians, 25 female nurses, 4 hospital stewards, 2 acting hospital stewards, and 122 Hospital Corps privates. As late as June 1900, however, the laboratory of Santa Mesa was regarded as completely inadequate, and earth closets had not been replaced by more modern equipment. By 15 August the hospitals in Manila, together with that on Corregidor, held a total of more than 2,200 beds. Space was also available at a 600-bed Navy hospital in Yokohama, Japan, and in Hong Kong.[13]

The Medical Department used the hospital ships *Scandia*, *Missouri*, and *Relief* both to supplement its hospitals on land and to move patients by water to and from locations within the Philippine Islands. The *Scandia*, a transport fitted out to serve as a hospital ship and carrying with her 5 medical officers and 139 hospital corpsmen, was dispatched from California on 27 August 1900. Although in the fall of 1899 the *Missouri* briefly joined the transports in taking invalids back to the United States, the *Relief*, which had arrived in the Philippines on 8 April, rarely took patients all the way to San Francisco because of her light construction and the limited amount



WARD ON HOSPITAL SHIP *RELIEF*

of coal she could carry. Except for service during the China Relief Expedition and trips to Hong Kong for repairs, she remained for the most part in Philippine waters. As she cruised up and down the coast of the Philippines, rendezvousing with units on the march, leaving off supplies, and picking up the seriously ill or wounded from regimental surgeons or post hospitals, the *Relief* provided her passengers with a "sea trip and good food." The restorative effect of such a journey upon the debilitated caused the Medical Department in March 1901 to put 140 patients on board the *Relief* merely to enjoy the trip from Manila up the coast. More than half her invalid passengers, including the 51 she picked up on the way, improved markedly because of their sea voyage, and she was assigned to make several more such journeys. Because the *Relief*'s deep draft prevented her from entering shallow waters and because a transport that picked up patients from south of Manila was equally handicapped, the Medical Department also employed shallow-draft vessels to move patients, including a hospital launch that took patients from Manila on three- to four-hour sea jaunts.[14]

The need for hospital beds dropped significantly following the capture of Aguinaldo in March, although some resistance, especially in the form of terrorism, continued for several months, and disease remained an enemy even after much of the countryside had been pacified. A one-third reduction in the number of hospital beds was planned early in 1901, but the mass evacuation of patients to the United States upon which the reduction depended progressed more slowly than had been anticipated because of a shortage of transports. Only in July, when the effort to concentrate the Army's resources in the Philippines was

under way, could one of Manila's facilities, the Second Reserve Hospital, be closed. The remaining patients and staff were sent to the Santa Mesa hospital, which, in turn, was closed before the end of the year. A 125-bed hospital was established on Nozaleda Street in Manila on 18 December to shelter patients still hospitalized at Santa Mesa when it was closed. On its attractive grounds a 20-bed isolation facility was set up in six tents for the victims of tuberculosis.[15]

Although from the outset the Medical Department relied heavily on the major hospitals of Manila and Corregidor, supplemented by those on hospital ships, much smaller facilities on the transports returning patients to the United States were also available. The Army Transport Service, established in November 1898, was responsible for seeing that each ship had the proper facilities for its passengers, whether they were en route to the Philippines or on their way home. The larger vessels of the Transport Service carried hospitals complete with isolation wards and diet kitchens, and even smaller ships carried medical personnel to care for the sick. Two Regular Army surgeons served as medical superintendents for the Transport Service, one in New York and the other in San Francisco. Their duties included advising the service's general superintendent in each city, supervising the work of the contract surgeons on service ships, and inspecting each vessel. A contract surgeon who was chosen by examination from among applicants who were graduates of "regular reputable" medical schools accompanied each transport, as did a hospital steward or acting hospital steward and one to three Hospital Corps privates. Thus, by relying on transports equipped with hospital facilities, the Army could return the sick and wounded to the United States without using hospital ships.[16]

Establishing the system of base hospitals, hospital ships, and transports was not as great a challenge as caring for the sick and wounded when troops were pushing through the jungle, far from good roads and intact portions of the rail line. Initially, medical officers did not anticipate the difficulties they would soon be encountering in the struggle with the Filipinos. As chief surgeon of the VIII Corps, Colonel Lippincott had planned a system of field hospitals in which he had great confidence. In the winter of 1899 he rejoiced that the medical service in the Philippines had been "in fine condition at the moment of first fire" and had "continued to improve from day to day, so that there was never a delay in securing excellent attention for the wounded." [17]

In the early spring of 1899, when troops began pushing as much as thirty miles beyond Manila, they encountered terrain that made evacuation very difficult, regardless of the size of the units involved or the nature of the operation. When the Army began working in smaller units to deal with the guerrillas and the number of posts more than tripled during the first six months of 1900 to "embrac[e] the furthermost limits of the islands," the lightly equipped field hospitals that accompanied the men had to become both smaller and more numerous. The nature of the problems involved in moving the disabled first to such small facilities and then from them to the rail line or to a major hospital did not change.[18]

To carry litters for these units in the field, natives of the area, and sometimes even prisoners, were hired or impressed into service, but for a time the most successful bearer was the Chinese coolie. If assured of his pay and rations, the coolie proved to be, according to some authorities, "patient, tireless, and brave" and better able to bear great heat than American

hospital corpsmen. Others were considerably less enthusiastic about this practice. General Schwan, who commanded forces involved in the campaign in southern Luzon in late 1899 and early 1900, considered "the use of coolies, either for company or hospital use on a campaign, . . . injurious to discipline and of no value to the service." He regarded them as "great looters," noting that "about all they do after a few days' march is to carry their own food and what they have stolen out of houses and churches." Early in 1900, when the end of the conflict seemed near and an awareness of the threat that cheap Chinese labor posed to local workers was growing, the Army forbad the hiring of Chinese for this type of work in the Philippines.[19]

Evacuation demanded much from those responsible for moving the wounded, especially from the many areas that were inaccessible to wheeled vehicles. The poorest lines of communications were in the Camarines area of southeastern Luzon. An officer leading two of the four companies involved in an operation in late February and early March 1900 reported:

> The trails on either side . . . are something that language can not describe. In all my experience in the mountains of Colorado, in the Bad Lands of Montana, in Cuba, and other parts of the world where I have traveled, I have never seen worse. They are single-file trails the greater part of the way, closely hedged in by a dense jungle of trees and undergrowth, with mud and mire on the sides. Then every few hundred yards a mountain stream must be forded, the banks of these streams being precipitous, with a drop of 40 to 70 feet. The cut down these banks resembles a tunnel, except that it is open at the top. . . . Nor is it possible to flank these positions, on account of the dense growth, nor can anything be seen except directly to the front, and then only for a short distance.

Because units fighting in the countryside could not take large amounts of equipment with them, corpsmen sometimes had to improvise litters from bark, bamboo, or items of clothing just as surgeons had done in the Indian wars. Some trails were too narrow and twisting to permit the use of travois, and each litter had to be carried by four men.[20]

Even in areas from which wheeled vehicles could carry the disabled directly to a hospital or to a train or vessel that would take them the remaining distance to a hospital, difficulties arose. Native carts, including one described as "distantly related to the one-horse buggy," sometimes had to be substituted for the few available ambulances, which tended to be both old and fragile. The animals that pulled these wagons were usually either mules or native ponies so small that they had to be unhitched to swim across deep streams, leaving the larger mules to make several trips back and forth with the carts. Major Cardwell, now chief surgeon of the 1st Division, noted while with an expedition to the north of Manila in the spring of 1899 that ponies that were often "balky and vicious" forced "the hardest kind of physical labor" upon all the men with an ambulance train. In April of that year, another kind of problem arose when a bridge north of Manila proved too badly damaged for use. The chief surgeon of the 2d Division, Maj. Henry F. Hoyt of the U.S. Volunteers, reported that ambulances had to disgorge four dead and twenty-six wounded on one side of a river. A small canoe then picked them up, going back and forth until all had been deposited in a second set of vehicles on the far shore. Patients brought to the coast near Manila might be spared further land travel if they could reach a hospital launch to take them to one of the city's facilities. But reaching the launch from the shore was complicated

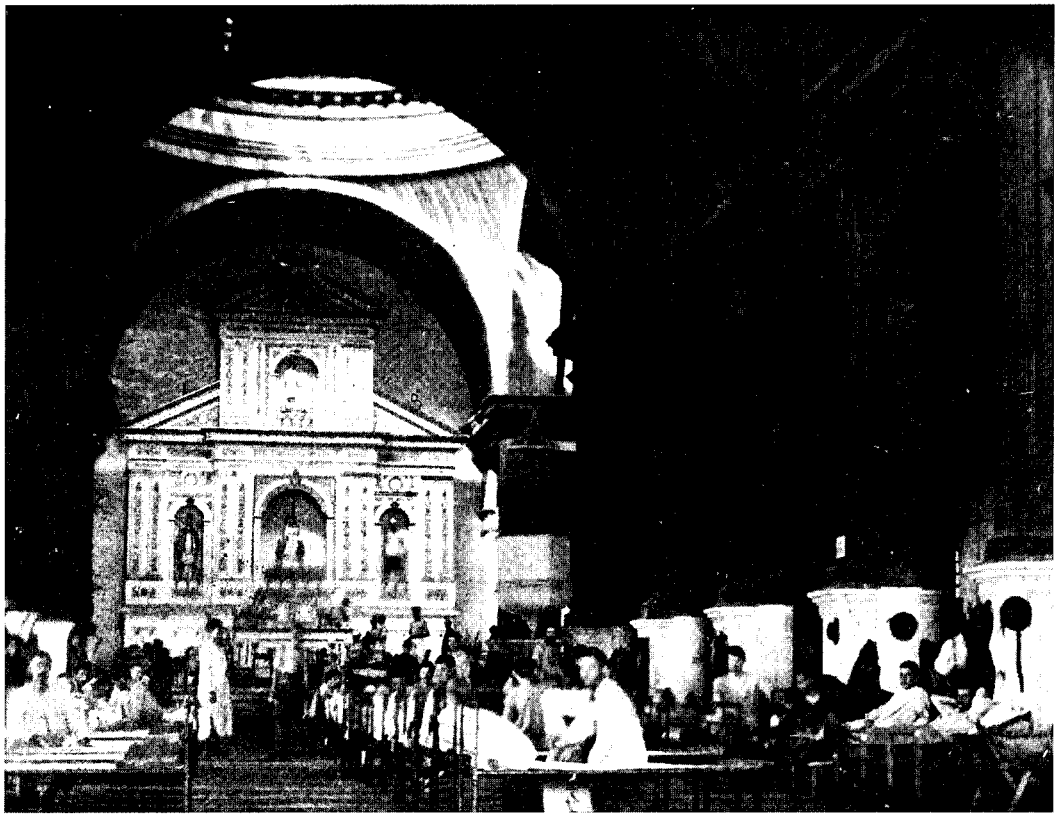
when the water was so shallow that only "a fair size flat boat" could move supine patients out to the larger vessel.[21]

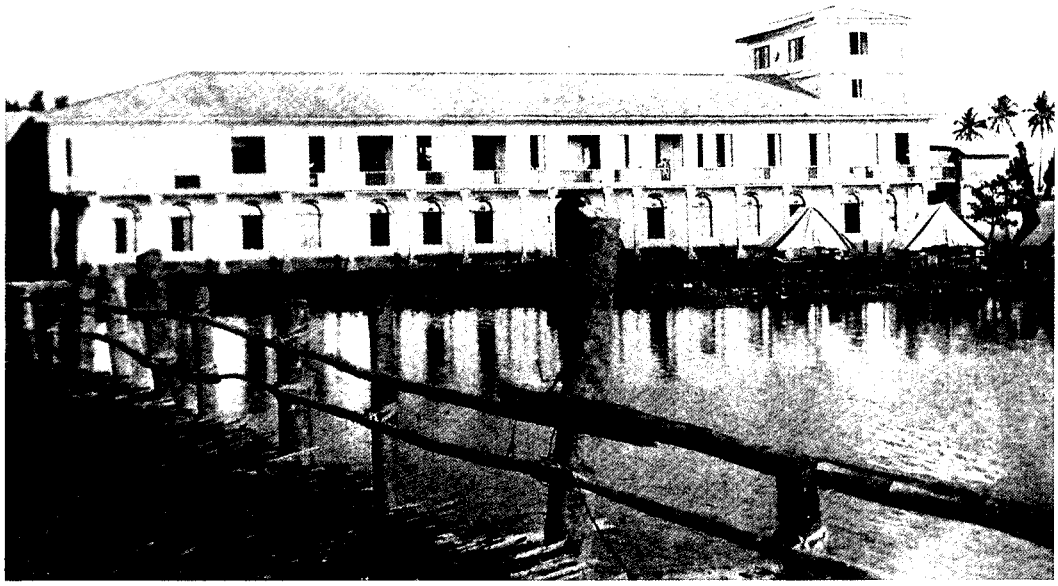
Advancing along the rail line was also difficult when roads were lacking and the track was in poor condition. Initially, only portions of the rail line that ran north of Manila were open for use, and patients were sometimes evacuated in handcars operated by Filipino prisoners or, at best, in boxcars equipped with cots. The ability to use the railroad greatly eased the problems involved in evacuation. By mid-1900 cars specifically equipped to move patients were part of a train sent along the complete length of the line each day.[22]

The hospitals that lay along the line of evacuation varied greatly in size and number, according to the distance from the major facilities of the Manila area, the difficulties involved in evacuation, and the nature of the campaign under way. For men who were only slightly injured, the application in the field of an initial dressing taken from the first aid packet often eliminated entirely the need for hospitalization. From the beginning of the insurrection, dressing stations, sometimes referred to as light field hospitals, accompanied troops in the field to care for the sick and wounded until a more permanent facility could be found or set up for them. When units were serving in the jungle far from roads and navigable waterways, dressing stations sheltered those who might have to accompany their units for several days before evacuation became possible.[23]

Since small hospitals lightened the load of larger institutions and patients could be returned to duty more expeditiously if they remained nearer the front, regimental facilities were occasionally utilized in the field. As Colonel Greenleaf, who became chief surgeon for the troops in the Philippines in January 1900,[24] noted in his report of 15 August, they were "for emergency purposes only." Here, as many as 14 percent of the sick and wounded in the Philippines might be receiving care at any one time. Surgeons with troops on the move also set up camp hospitals, where those who were only slightly ill could rest for a brief period before returning to duty. These small hospitals were often housed in native dwellings, and native beds were used if the five to ten cots issued for this purpose proved insufficient. In areas where the troops could be cut off from large facilities by the weather and deteriorating roads, camp hospitals were organized before the rainy season. The Medical Department preferred to avoid relying on small hospitals, however, because they represented an inefficient use of personnel and caused administrative confusion. Thus, as the campaign progressed, larger ones were established in the field, sometimes in abandoned Spanish facilities of major towns, for the care of those with more than trivial injuries.[25]

As U.S. forces advanced, the network of larger hospitals set up in the countryside was extended to spare patients the ordeal of evacuation. Although the journey south to Manila by rail from San Fernando, captured in the spring of 1900, was less than fifty miles, it might take twelve hours. Before hospital cars became available, the move could be particularly trying for the sick and wounded. Thus 2d Division surgeons at San Fernando, which was directly on the railroad line, set aside five buildings for a 200-bed field hospital. In October 1899, when the campaign to take northern Luzon was just getting under way, this facility was moved further north to a church in Angeles, also on the rail line, where by mid-August it still held more than 100 beds. By then





CONVERTED HOSPITAL FACILITIES AT ANGELES *(top)* AND DAGUPAN *(bottom)*

the largest base hospital on northern Luzon was the approximately 350-bed facility established in December 1899 at Dagupan, ideally located at the northern end of the rail line from Manila and on the coast as well. Patients from advanced units were brought to Dagupan for care or for evacuation back to Manila or to the United States. A wood and masonry building once belonging to a Dominican college housed this hospital. By the spring of 1900 fifteen trained nurses there had earned the praise of the surgeon in charge, who reported that he found it "a satisfaction to have in immediate charge of the sick persons trained to do the work" and that he was unhappy that the only lodging he could offer these women was native houses.[26]

The establishment of many small post hospitals reminiscent of those once scattered about the American West, some merely dispensaries, or subpost hospitals, precipitated many of the same problems that Surgeon General Sternberg's predecessors had come to know so well during the Indian wars in the United States. The shortage of medical officers was chronic as long as these small posts were required, and keeping each facility adequately supplied with medicines and equipment was difficult. As the area under U.S. control expanded, however, smaller hospitals could be consolidated, and the need for a multitude of extremely mobile or very short-lived hospitals also diminished. The Medical Department continued to establish larger and more permanent institutions, variously classified as field, brigade, and base hospitals, usually of 50 or more beds, where men with typhoid, malaria, chronic dysentery, or wounds requiring skilled surgery could be cared for without being evacuated back to the Manila area. Such facilities were located where they could be easily supplied, along the rail line or the coast. When necessary, patients could be easily evacuated from them, either to Manila or to transports that would take them home.[27]

Representative of Medical Department field organization as it had developed by the spring of 1900, six months after the initiation of the drive to control Luzon, was the hospital system in the most northern district of the island. It consisted of a fifty- to sixty-bed unit on the northern coast at Aparri and five post and camp hospitals, all housed in buildings considered comfortable. The ten medical officers who accompanied the one regular regiment and two battalions of a volunteer regiment stationed in the district had to be divided among the hospitals, and their supplies and equipment also had to be parceled out among six institutions. Forty-one hospital corpsmen, including a graduate dentist, were required to care for the patients at Aparri and to handle the clerical work. Because the facility was likely to be needed for some time to come, the surgeon in charge also requested contract nurses, obtained permission to acquire an ice plant, and sought to obtain a small steam laundry and iron bedsteads.[28]

The hospital network serving 1st Division forces fighting in southern Luzon resembled that of the 2d Division north of Manila, but on a smaller scale. By mid-August 1900 the largest hospital was the base facility at Calamba, on Laguna de Bay, which was rivaled for size by the brigade hospital at Bacoor, on the coast south of Manila, each of which held more than 100 beds. A 60-bed hospital stood at Santa Cruz, on the eastern side of the Laguna, while two smaller base hospitals were also located along the seacoast south of Manila. Since almost every town in this area had a substantial church building that could be

taken over to serve as a hospital, here, too, even the smallest facilities were well housed. In the absence of a rail line, ambulance wagons had to be used to move patients from mobile and temporary facilities to base hospitals, from which water transportation could be used, if necessary, to reach Manila.[29]

The Bacoor facility, established in July 1899, before the beginning of the guerrilla phase of the insurrection, was for some time the largest in southern Luzon. Since it was only twelve miles from Manila by sea and fourteen by land, it was a good point through which to deliver supplies and evacuate patients. Although in the spring of 1900 tents at Bacoor held 85 of a total of 125 patients, surgeons were pleased with the situation because the tents were cool. The Calamba hospital, set up in a former Spanish convent in February, was initially smaller than that at Bacoor. Located in an area swarming with mosquitoes carrying dengue or malaria, it eventually grew to shelter more than 150 patients, with hospital corpsmen assisting the eight female nurses who were responsible for patient care.[30]

Hospitals were also established where needed on the various smaller islands of the Philippines, with a particularly large facility set up as a brigade hospital in February 1899 at Iloilo, on Panay in the Visayan Islands. Originally located in a private home, one of the few buildings that had not been burned by the insurgents, the hospital grew by taking over other private homes until by February 1900 it had 300 beds. The use of several separate buildings, however, made for an inefficient use of staff, since more hospital corpsmen were required to care for patients than would have been necessary in one structure. The shortage of medical personnel was also demonstrated in the spring, when twenty-five posts in these islands, which included those of Samar, Leyte, Cebu, and Bohol as well as Panay, lacked a medical officer. The surgeons circulating between inland substations often encountered almost impassable roads and guerrilla attacks, while those visiting coastal positions required the services of a hard-to-find steamer or sailboat.[31]

Medical Personnel

The shortage of physicians and hospital corpsmen was one of the greatest challenges to those responsible for the care and evacuation of the sick and wounded of occupation troops in the Philippines. The Washington Barracks program for training hospital corpsmen had been for a time suspended because of the demands of the war, but it was resumed shortly thereafter. A similar school for corpsmen was opened at Angel Island, California, so that men could be taught while they awaited embarkation for the Philippines. In the twelve-month period ending in June 1900, 692 trained at Angel Island and 726 at Washington Barracks, with most of both groups sent to the Pacific. The first class from a fourteen- to eighteen-week course for future acting hospital stewards taught at Manila's Hospital No. 3 graduated in June. In spite of the establishment of these schools, many corpsmen in the Philippines had little experience or formal training, although they seem to have been wisely selected. One surgeon reported that "he never knew of a hospital corps man who failed in his duty in any way under fire." Another later commented that the Hospital Corps had much improved since the Spanish-American War, many stewards and even some privates being "capable of rendering very valuable assistance

to the surgeons." Keeping the proportion of corpsmen to the number of wounded high so as to guarantee casualties adequate attention on the field caused the demand for attendants to remain greater than the supply. Nevertheless, by August the Army was preparing to cut back the number of hospital corpsmen in the Philippines from 2,356 to 2,000, as required by Congress. The Medical Department warned that many problems could be anticipated as a result unless a greater number of Filipinos could be found to replace them.[32]

With some hesitation, Secretary of War Alger allowed female nurses to be sent in from the United States to supplement the work of hospital corpsmen. According to Colonel Greenleaf, they became known in the Pacific for their "good work," which was "much appreciated by all." By mid-August 1900, 140 of these women had served in hospitals in the Philippines and 120 were still on duty there, along with 7 male contract nurses. Improving conditions in the interior of the Philippines eventually made it feasible to send American women to some of the facilities located further out into the countryside.[33]

The need to provide medical coverage for a multitude of posts increased the demand for physicians and caused a shortage of medical officers so severe that Surgeon General Sternberg had to send in doctors who were unfamiliar with military medicine and who created confusion as a result. He again used the latest edition of the *Manual for the Medical Department* in his attempt to indoctrinate the new physicians. Ironically, many of them were contract surgeons whose contracts would run out just at that point when they were becoming most effective and who might leave even earlier, as soon as the novelty of the situation began to pale. Because of the shortage, at various times a contract doctor from the *Relief* was brought ashore, Navy physicians were pressed into Army service, or hospital corpsmen were left to assume responsibilities usually managed by physicians. Corpsmen often had to be responsible for reports and administrative duties when camp surgeons had no time for such things, but in one instance two corpsmen had to perform an amputation. Unfortunately, because more hospital corpsmen were also needed—when General MacArthur requested the "immediate dispatch" of 100 more medical officers in July 1900, he also asked for 300 more corpsmen—having them fill in for physicians merely exacerbated one problem in the attempt to ease another.[34]

The need for physicians increased so rapidly that Colonel Greenleaf could not keep up with the demand. On 31 December 1899, when 257 physicians were serving in the Philippines, the chief surgeon concluded that he should have 360. By 31 May 1900, when he reported that 364 were serving under him, medical officers were lacking for 20 new posts that had been recently established and 5 to 10 more were needed to accompany two transports returning to the United States from the Philippines. As a result, in June Greenleaf called for 75 more surgeons and for 20 more to be sent each month thereafter. Although as many physicians as could be spared were sent in, by the end of the fiscal year 1900, 120 posts out of the almost 400 then in the Philippines still had no surgeons, leaving 10,000 men without a source of adequate care. Concerned that the situation in the Philippines might be misunderstood, General MacArthur emphasized to the adjutant general that as long as the number of posts in the Philippines remained constant, the number of medical officers required would



MEDICAL OFFICER CARING FOR A WOUNDED FILIPINO INSURGENT

also remain constant, regardless of the number of troops serving there. By 31 May 1901, although the situation had improved, 479 posts lacked medical attendance and only 423 surgeons were available for assignment. Greenleaf maintained that because of the need to have a reserve against the possibility of epidemic, the figure should be at least 500.[35]

In the 2d Division, difficulties engendered by the shortage of physicians were exacerbated by confusion over the responsibility for the assignment of surgeons and the granting of their leave in 1899. Communications between the headquarters and the units strung out from Manila to the Gulf of Lingayen were poor. Orders given to medical officers at many levels were rarely reported back to Colonel Greenleaf at corps headquarters. Local commanding officers granted leave to surgeons and then requested the assignment of another surgeon when no replacements were available. Early in 1900 orders were issued requiring that the division chief surgeons be informed whenever leave was granted to a medical officer and that each brigade surgeon keep a current roster of the medical officers and hospital corpsmen in his unit. Changes of assignment were to be reported to the brigade surgeon as soon as they were made.[36]

Medical officers assigned to the Philippines experienced their share of danger because of the guerrilla war, still further reducing the number available to care for the sick and wounded. A surgeon was one of the thirty-six men killed and horribly mutilated by bolo knife-wielding guerrillas in September 1901 in a surprise attack upon the garrison at Balangiga, on Samar. Yet another surgeon barely escaped death when he was ambushed during his attempt to bring ambulances to the aid of wounded insurgents. The shortage forced many physi-

cians to spend much time riding through the hostile countryside from post to post, each five to fifteen miles from the other.[37]

In spite of the difficulty medical officers experienced in providing adequate care for American soldiers, some had the time to care for Filipinos. Unfortunately, in at least some instances they may have been involved in extracting information from captured Filipinos, who were considered to be waging "irregular warfare against the only constituted authority" and therefore were, in theory, "merely bandits, . . . and as such . . . not entitled to treatment as prisoners of war." Americans serving in the Philippines evidently did not always regard torture as reprehensible; but, to prevent serious or permanent injury to the victim, a medical officer was apparently often present when torture was being used. Army surgeons did not take their scorn for the guerrillas as far as to neglect Filipino casualties, though they were more difficult to care for than American soldiers because they tended to remove dressings and touch their wounds. Even with the best of intentions, medical officers were unable to achieve as good results with Filipino wounded as with their own men, although their attempts nevertheless contributed to pacification efforts.[38]

Health of the Troops

For troops fighting in the Philippines, as it was for those in the Caribbean, disease was the cause of most disability and death. Combat injuries took only 10.6 percent of the command out of action in the first half of 1900, for example, and rarely caused difficulties for American surgeons treating their own men, even when wounds were caused by bolo knives, daggers, knives, bamboo spears, and clubs. The surgical operations performed on U.S. soldiers in the Philippines more often involved hernias, appendicitis, liver abscesses, malignancies, and other problems unrelated to war wounds.[39]

The real challenge resulted from the cumulative and debilitating effect of physical exhaustion, inadequate diet, temperatures of well over 100 degrees, and malaria and the various forms of dysentery upon men already working under great stress. Medical officers became the victims of diarrhea, dysentery, typhoid, malaria, and sheer exhaustion; Lippincott himself was among those felled by disease. Soldiers at the front suffered the highest disease rates, as much as three times those experienced by the garrisons of even the most unsanitary towns, where rates were usually under 10 percent. Attention to personal hygiene and the use of screens and nettings to prevent mosquito bites were almost impossible for soldiers fighting guerrillas in the jungle. "The terrible nervous exhaustion which results from long continued exposure to great heat and moisture," as one Army surgeon put it, severely undermined effectiveness, although with time many men became better able to tolerate the heat. For the 1900–1901 fiscal year period the disease rate among the volunteers, who were for the most part new in the country, rose by almost 50 percent, while among acclimated regulars it fell by 10 percent. The gradual end of active campaigning contributed to a drop in the disease rate, but physicians concluded after months of experience that many patients would never entirely recover if they remained in the Philippines.[40]

Although typhoid was endemic and the troops arriving in 1898 came from camps where typhoid had been a problem, careful attention to sanitation reduced its inroads

markedly. Despite its high death rate, this disease was never the serious threat to the Army's effectiveness in the Philippines that it had been both in the United States and in the Caribbean in the summer of 1898. New volunteer units coming in from the United States to replace state volunteer units returning home continued to bring typhoid with them, and from time to time medical officers feared an epidemic. Occasional cases were acquired at local restaurants or from streams so "clear and sparkling" that the troops drank directly from them until the appearance of typhoid made them realize the error of their ways. Heat exhaustion, an ever-present threat, added to the typhoid danger. In moments of desperation when extreme heat led to the rapid emptying of canteens, soldiers were willing to drink "from ditches and holes when the water looked green and tasted very badly," though they knew that it was hazardous to do so. Renewed attention to sanitation and to the accuracy of diagnoses, however, limited the spread of this disease.[41]

Return to the United States was believed particularly necessary to the complete recovery of the victim of dysentery, which, together with diarrhea, caused much havoc to the health of those serving in the Philippines. Dysentery and diarrhea rates climbed until they were four or more times higher than the rate characteristic of the peacetime Army in the United States, and, as time went by, dysentery seemed to become more virulent. The death rate rose from 2.52 per 1,000 troops in 1898 to 4.58 per 1,000 in 1899, perhaps because the stress of active campaigning lowered resistance. A few cases were identified as amebic, but at some hospitals the most commonly seen cases were those in which malaria was accompanied by dysentery. In these instances, good results in the treatment of dysentery were often achieved with quinine, and many physicians concluded that blood tests for malaria should be administered to all dysentery sufferers. An increase in diarrhea cases in the spring of 1899 was blamed in part on the indiscriminate consumption of the locally available fruits. Surgeons also noted that many of the men with diarrhea were also among the many serving in the tropics who had very bad teeth, and they blamed this apparent and unexplained coincidence on the climate.[42]

Although dysentery tended to peak in the summer, the rainy season in the Philippines, malaria caused much ineffectiveness from October through December, the coolest months of the year, and was more common inland than along the coast or in the area around Manila. The form of malaria seen in the Far East tended to recur but constituted no appreciable direct threat to life, even though, because of its chronic nature, it tended to wear out its victims. The time the malaria victim spent in the hospital was often lengthened because of the accompanying diarrhea, for which one gram of quinine twice a day proved to be a very successful treatment. Discretion was necessary in prescribing quinine, however. Attempts to give quinine by injection to increase the speed with which it acted tended to produce local abscesses. Too prolonged a course of quinine, moreover, was believed to lead to mental and nervous complications and even anemia.[43]

Among other threats to health, venereal diseases apparently posed the greatest challenge to physicians. Major Cardwell, then the 2d Division chief surgeon, reported in September 1898 that as the men became "habituated to the repulsiveness of the native women, sexual immorality [became] more common," as did syphilis and gonorrhea. In 1902 a medical officer noted

in an article in a professional journal that the rate of venereal disease in the Philippines was not unusual and that this fact was "a tribute to the Filipino women who, as a class, I do not hesitate to say, are fully as virtuous as their American sisters." An attempt to register and inspect prostitutes, hospitalizing those found to be diseased, was strongly opposed by a visiting missionary, who wrote the secretary of war that such a program was tantamount to licensing prostitution. The paucity of healthful amusements lowered morale, although the amount of drunkenness and alcoholism, so often associated with high venereal disease rates, seemed no greater than that usually found in the United States. Canteens where cool beer could be bought, together with hard work and hard play, were seen as minimizing the temptation to associate "with natives, of the lowest class" and as relieving any "craving for immoral pursuit." Authorities attempted to set up a resort for troops in the mountains of north Luzon, but the lack of roads held up the project. An order issued in 1901 requiring all men to be inspected weekly for signs of such diseases was, to some degree at least, successful in lowering the incidence.[44]

Among lesser threats to health and effectiveness were smallpox and bubonic plague epidemics that developed in the Filipino population of Manila. Although plague never became a problem for U.S. troops, the first case of smallpox was diagnosed early in September 1898. By 31 March 1899, when the danger was considered to be over, 236 American soldiers had contracted the disease and 77 had died of it. Fresh smallpox vaccine had proved difficult to obtain. The effectiveness of matter sent from San Francisco did not survive the long voyage, and new supplies obtained from Japan deteriorated in the heat. When a former Spanish vaccine farm was reactivated, it became possible to revaccinate the entire command—along with all 13,000 Spanish prisoners of war who had surrendered at Manila the previous summer—with matter fresh, not from the cow, but from the water buffalo.[45]

Skin problems were also often seen, since soldiers fighting in the Philippines were sometimes constantly wet for days. Ringworm, a fungal infection that usually responded to treatment with sulfur, was common. Sometimes, however, it was mistakenly diagnosed as the "doby itch," a form of contact dermatitis that could cause legs to swell "and large knots and tumors [to] cover them until walking [became] extremely painful." The most effective remedy against this condition proved to be having all clothes boiled during laundering. Doctors also encountered contagious pemphigus in a potentially fatal form most often found in the Philippines and characterized by blisters in the groin and armpits. It was apparently first encountered in troops en route to the Philippines when their ship stopped at Guam. When sodium hyposulfite became available, doctors were successful in curing most of these patients.[46]

Mental illness was also encountered in the Philippines, but the rate of psychoses was not high. Most often seen were cases diagnosed as "nostalgia," or homesickness, an understandable and predictable problem for young men far from home in a strange country with a difficult climate and a hostile population. This problem disappeared with arrival back in the United States, but it was considered by some to be "undoubtedly the most severe affection in the command, affecting officers as well as enlisted men. Some regimental medical officers are badly infected with this com-

plaint, and such naturally sympathize with the men. The result is a sick list wholly out of proportion to the real disease present." Some soldiers also apparently took up smoking opium while in the Philippines, although reports that many became addicted were disputed.[47]

Improved hygiene and sanitation were high among the measures favored in the effort to prevent many ills that afflicted men in the tropics. The debate over the virtues of woolen versus cotton underclothing in hot climates continued, and, in particular, the value of the woolen abdominal bandage in preventing diarrhea caused much argument. There was no disagreement over the need for lightweight uniforms. Such clothing was not available to the first arrivals in the Philippines, and the khaki cloth that was being issued by the Quartermaster's Department by the spring of 1900 was regarded as too heavy. Lippincott also urged in his 31 March 1899 report that the Army issue a "light, broad-brimmed, khaki-covered helmet," in addition to the campaign hat, which was highly regarded for wear in the rainy season. Even the troops' shoes failed them in the Philippines, where "the extremely plastic, adhesive mud" ripped soles apart, making both marching and resupply difficult. On one occasion 230 of 240 men in a battalion were without shoes. By July 1901 the official uniform for those serving in the Philippines was the khaki blouse and trousers, with the choice of underwear being left up to the individual.[48]

While medical officers debated the nature of the most appropriate clothing, they were agreed on the management of sanitation. Failures to maintain standards usually resulted either from overconfidence that led to neglect or from battlefield necessity, since local water sources often proved to be polluted. Much emphasis was placed upon the need to boil all water, even when it had been filtered. For the most part, earth closets continued to be the usual means of dealing with excreta, great care being taken in maintaining latrines and in disposing of their contents in a sanitary manner.[49]

Supply and Diet

In general, most supply shortages were temporary, and Army hospitals located on navigable waters or along the rail line rarely experienced problems, although the insurgents sometimes destroyed sections of track. Quinine was hard to find for a few weeks in early 1900, possibly because doctors were also treating sick Filipinos in the communities near their posts. Some temporary local shortages inevitably resulted from the inability of physicians to anticipate their needs well in advance, especially at the front. Investigation in one instance revealed that while hospitals were complaining of shortages, large supplies of many needed items had accumulated in Manila warehouses, presumably because of transportation problems. Delivering supplies became impossible when water levels fell and supply boats could no longer get through to troops serving along many rivers. When heavy rains washed out bridges, moving supplies by land became particularly difficult. In the rainy season in those areas where wheeled vehicles could not go, surgeons learned to accumulate supplies as much as six months ahead of the time they were needed to avoid shortages. At least one surgeon found himself for a time forced to rely upon "native leaves and roots for medicines," and soldiers fighting in the jungle occasionally had to exist on half rations.[50]

For a time in the summer of 1900, a misunderstanding developed concerning orders for supplies from the Philippines. The desire to respond to pleas for help from indigent Filipinos may have been behind what both the Medical and War Departments regarded as excessive demands. Surgeon General Sternberg threatened to halve Colonel Greenleaf's quarterly requisition for medical supplies and hospital stores, but General MacArthur strongly supported his chief surgeon's insistence upon the reasonableness of his orders, thereby apparently preventing any severe cutbacks.[51]

Problems with diet often resulted from difficulties with supply, although surgeons continued to debate the ideal amount of meat and fat in the tropical diet. Many authorities believed that a higher proportion of sugar would be advisable because of the energy it provided and that the usual allowance of meat and fat, basically intended for men serving in cold climates, was larger than was necessary in the tropics. Some concluded that to maintain health in the tropics the soldier must eat much less than he would in a cooler climate to avoid producing too much heat. Others disagreed strongly, saying that the U.S. soldier was a meat eater, that in the tropics he needed to eat more than ever, and that the problem of heat should be managed by increasing the ability to lose heat through wearing lighter clothing.[52]

Time made it apparent that the ration found acceptable in the United States would be satisfactory in the Philippines, but delivering meat, vegetables, and fruits unspoiled to the soldier in the field was at times "totally out of the question," according to one surgeon. Meat and even hard bread deteriorated rapidly in the climate of the tropics. Canned meat went "soft and disgusting" in the heat, and canned vegetables weighed too much to be carried far, although frozen beef could be sent fifty miles inland before it thawed out. Troops at the front, unable to carry adequate supplies with them without the use of wheeled vehicles, suffered from a shortage of food.[53]

The China Relief Expedition

In late June 1900, despite misgivings about weakening his force in the Philippines, General MacArthur ordered the 9th Infantry to prepare to embark for China as the first Army contingent of the China Relief Expedition, which sought to protect U.S. interests and citizens threatened by the Boxer Rebellion. With the later addition of the 14th Infantry and an artillery battalion from the Philippines, as well as still more units coming directly from the United States, the China Relief Expedition would eventually number 2,500 and include 800 marines with their Navy doctors. Adna R. Chaffee, who received his promotion to major general in the volunteers on 19 July, assumed command of the China Relief Expedition when he arrived in China on the thirtieth, three weeks after the landing of the first U.S. troops there. The expedition became part of an international force composed of troops from several major powers, including Great Britain, France, Russia, Germany, and Japan, that were seeking to subdue the Boxers, to intimidate the Dowager Empress, and to make China again safe for foreigners. Because most of the U.S. soldiers who eventually served in China were sent from the Philippines, the responsibility for the medical care of the expedition fell upon the shoulders of Army Medical Department leaders there.[54]

U.S. Volunteer surgeon Maj. William B. Banister, assigned to the 9th Infantry, served

as chief surgeon of the China Relief Expedition from the date of its formation until 25 September 1900 and assumed the ultimate responsibility for the medical care of U.S. troops going to China, although Navy surgeons serving under him did not submit reports to the Army Medical Department. Two contract surgeons were detailed to assist Banister in his preparations, but one did not report until 25 June, the day before embarkation, and the second never materialized. Thus the chief surgeon had to prepare for the expedition with little assistance, and only four medical officers, including regimental surgeons, initially accompanied the first 1,300 men to sail for China. Under these physicians served a hospital steward, three acting hospital stewards, and sixteen Hospital Corps privates, but the steward and four of the privates also arrived only the day before embarkation.[55]



WILLIAM B. BANISTER

The men of the 9th Infantry were already worn down by eighteen months of service in the Philippines. Since many were suffering from malaria and chronic dysentery, Major Banister concluded that the regiment was "in extremely bad condition for field service." Nevertheless, some were so eager for service in China that they did their best to conceal any ailment that might prevent their going.[56]

Although U.S. troops in China did not encounter humid and tangled jungles, they did face hot summers and familiar diseases presenting familiar threats. Hoping to reduce the incidence of malaria to a minimum, Major Banister prepared for the landing by dosing each man with a daily gram of quinine for three days before he set foot for the first time on Chinese soil. The traditional filth-borne diseases, too, again threatened U.S. troops. In Chinese communities, instead of a sewage system, "the pail system [was] generally in vogue," but because night soil was highly regarded as fertilizer for crops, it was piled up at selected sites outside the city, awaiting "its ultimate transportation to the country." The towns were in an "indescribably filthy condition" because of poor drainage and the tendency of the poorer male members of the population to relieve themselves wherever they were. Despite efforts to have soldiers drink only water known to be safe, dysentery took a high toll, and typhoid rates were higher than they had been in the Philippines.[57]

After arriving near Tientsin on 10 and 11 July, Army and Navy physicians worked together to unload their equipment and set up an operating room in the building they shared outside the city. Major Banister assigned an acting hospital steward and four privates to each of the two battalions that landed in time to take part in the first battle of the Boxer Rebellion, the Battle of Tientsin on 13 July. The multinational

force was rapidly successful in taking the city. Of the wounded, 77 were U.S. soldiers, some of whom received their initial care in ditches, where the polluted water soaked their injuries and caused a particularly high rate of infection among those with shrapnel wounds. Since none of the Army's ambulance wagons had yet arrived before the city, the casualties were evacuated by litter-bearers who were forced from time to time to put down their burdens to return fire. Banister himself went into the city with the most advanced units, and the two hospital corpsmen with him never left his side. Supplies were brought up to him after he had set up an aid station behind the city's inner wall. As soon as the enemy left the city, Banister and his Navy colleagues entered to set up their facilities. Some Army patients shared the Marine hospital, and Banister took over a hotel for the remainder. By midnight every wounded man had received care and been moved into a bed within the newly surrendered city.[58]

The interservice cooperation among U.S. units continued long after the battle had been won. With his sick and wounded divided among three locations, the regiment, the Marine hospital, and the hotel, Banister's hospital attendants were spread so thin that he was forced to supplement them with details from the line. He was soon able to concentrate his resources by moving all his patients from the Marine hospital, although the Army facility continued to receive occasional Marine casualties. After a few days Banister began to evacuate patients to the Navy hospital ship *Solace*; by 24 July she was sheltering 64 Army patients. She then departed for the United States via Japan, where the Japanese had made hospital space available at several cities, including 500 beds at Nagasaki.[59]

Not surprisingly, given the condition of the troops when they were sent to China, the number of ill among them grew as the summer continued. By 26 July 215 men were sick with their units and another 61 were ill on board a transport, most of them with diarrhea and dysentery. Major Banister decided to establish a base hospital in a private home surrounded by enough land to permit pitching tents. Here the wounded could also recuperate until the expected arrival of the *Relief*, then on her way to China, and supplies could be accumulated for the advance on Peking. By this point, more supplies, equipment, and personnel were coming in to Tientsin. Four acting hospital stewards and thirty-two Hospital Corps privates were sent to the Tientsin hotel. The arrival of six more physicians made it possible to assign three to the base hospital. The eleven female nurses who had volunteered for China service while en route to Manila arrived in early August. Five more and a professional male nurse, plus more contract surgeons, disembarked a short while later.[60]

A few days after General Chaffee took command of the China Relief Expedition, 2,500 U.S. soldiers joined British and French troops to march on Peking. The U.S. contingent now included the 14th Infantry with its four regular medical officers, two contract surgeons, twenty-one hospital corpsmen, and equipment. Each regiment had "Chino" litter-bearers, but they were trusted so little that they were kept "under guard to prevent their running away." A Regular Army assistant surgeon also accompanied the artillery battalion that was a part of the expedition. Marching with the soldiers were U.S. Marines with their three physicians, attendants, and litter-bearers. Although supply wagons were available for the Medical Department, Major Banister,

who continued in the position of chief surgeon, had his medical chests carried in his ambulances so that they would be immediately available.[61]

Shortly after leaving for Tientsin, the expedition encountered the enemy at Yangtsun, suffering an estimated 61 casualties in the engagement that followed. The ambulances moved forward just behind the troops, out of the line of fire, and picked up the wounded, taking them to the dressing station and then moving them forward to the campsite chosen for the night. Except for a surgeon who remained with the ambulances, all physicians stayed with the troops. A junk took 11 of the wounded back to the Tientsin base hospital that evening, with the rest of the wounded and several sick men making the same trip the next day. When the troops resumed their march, the heat took a heavy toll. Heatstroke and even convulsions were common, and ambulances were filled to overflowing. Fortunately, since it was impossible to keep all the disabled with the expedition as it moved forward, the number of surgeons with the troops was large enough to permit one to be left behind with the sick at each campsite.[62]

The pattern set at Tientsin was generally followed at Peking. A multinational force handled the attack, which began with an unsuccessful Russian assault on 13 August. On the fourteenth U.S. troops scaled the wall around the Outer City and provided cover for the British soldiers who followed them. The next day U.S. artillery destroyed the gates in the wall around the Inner City, opening the way to the occupation of the entire city. American doctors with the attacking force provided medical care at Peking as they had in Tientsin, setting up a 150-bed field hospital as soon as the city fell. Here the sick and the 30 wounded received excellent care until they were evacuated by water back to the Tientsin base hospital. Whenever possible, the wounded and the seriously ill were then placed on the *Relief* for evacuation to Nagasaki, which became a second-level base for the expedition. On 29 September a second Army hospital ship, the *Maine*, was assigned the responsibility for taking patients to Nagasaki, where the *Relief* was to pick them up for the trip to Manila, which remained the primary base for American forces fighting in China.[63]

The Peking hospital initially lacked an adequate supply of standard hospital bedding and furniture, but surgeons found Chinese bedding satisfactory on a temporary basis. In the fall a permanent hospital of 85 beds was established for the brigade to be garrisoned at Peking; existing Chinese buildings were used because the arrival of cold weather allowed no time for new construction. Some modifications were deemed necessary in these buildings, including lowering high ceilings and replacing many paper-covered lattice-work windows and doors with glass. For a few months a second and smaller hospital was set up at Peking, together with a residence for the female nurses who worked at the larger hospital.[64]

By the end of September 1900 almost 4,000 soldiers were serving in China. A second brigade was stationed at Tientsin, where, like the garrison at Peking, it was served by a large hospital in the city. Many detachments were serving at other locations, and two of them had their own small hospitals. Since the railroad from Peking to Tientsin was still not operative, supplies had to be moved by river, and because junks covered no more than twenty miles a day, garrisons also had to be stationed along the waterway until December, when the railroad was at last reopened. For troops thus scat-

tered about a land of almost nonexistent sanitation, typhoid remained a particular danger, even when the greatest of care was taken, since flies could carry the disease to food and water supplies that were otherwise safe. Fortunately for their health, many of the U.S. troops occupying China left in the spring of 1901, and many of the remaining men left the following autumn. By 1904 the only Army troops in China were the men of the company guarding the embassy at Peking, and the rates of typhoid, malaria, tuberculosis, venereal disease, and alcoholism among them were higher than those among men stationed in the United States.[65]

Service with the multinational force enabled medical officers to compare their work and equipment with that of the world's major military powers. Major Ives, who succeeded Major Banister in September 1900, commented unfavorably upon the transportation available to U.S. medical officers, blaming the situation largely upon the Medical Department's dependence on the Quartermaster's Department and the slow response time that resulted. He admired the Japanese litter as particularly well suited to battlefield use, though by no means as sturdy and comfortable as the American model. He was particularly enthusiastic about the disinfecting plants and laboratories of the German hospitals, but his observations led him to conclude that "the medical department of the United States Army is the best and most intelligently equipped of any service there represented." [66]

Although U.S. forces encountered astoundingly unsanitary conditions both in China and in the Philippines, the two campaigns were otherwise a study in contrasts. The refusal of the Filipinos to accept American occupation resulted in a prolonged guerrilla war that challenged medical officers to adjust to the demands of innumerable small-unit operations, most of which were conducted in a hostile environment, and at times to work in comparative isolation. The Boxer Rebellion, on the other hand, involved conventional warfare and required U.S. physicians to work in proximity with medical officers of other nations in a situation where they could observe firsthand the way in which the medical services of other nations functioned. The campaigns over, physicians with both occupation forces were swept up in the effort to prevent the destruction of U.S. garrisons by disease.

Like the Spanish-American War, the Philippine Insurrection and the Boxer Rebellion reacquainted the U.S. Army with the potentially devastating effects of disease upon the effectiveness of armed forces and also placed U.S. troops in the midst of disease-ridden civilian populations living under conditions of incredibly poor sanitation. Unlike the Filipinos and the Chinese, who, U.S. observers believed, had accepted widespread disease and the deaths that resulted as inevitable, Army physicians were convinced by what they already knew that high morbidity and mortality rates were preventable. This conviction gave added strength to their struggles to guarantee the benefits of modern medicine to American soldiers and also to the people of the lands they occupied.[67]

NOTES

1. War Department, *[Annual] Report of the Secretary of War*, 1899, 1(pt.4):ix (hereafter cited as WD, *ARofSW*, date).

2. Ibid., 1(pt.5):115 (quotation); War Department, *Five Years of the War Department Following the War With Spain . . .*, pp. 8–11; Brian McA. Linn, "The War in Luzon," Ph.D. diss., pp. 30–31.

3. WD, *Five Years*, pp. 11–14 (quotations), 79–85, 172–75, 207–08, 256; Linn, "War in Luzon," Ph.D. diss., pp. 33–34. MacArthur had been commanding officer of the 1st Brigade of the 2d Division.

4. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1900, pp. 94, 118–19 (hereafter cited as WD, *ARofSG*, date).

5. The departments were the Department of Northern Luzon (six districts), the Department of Southern Luzon (four districts), the Department of the Visayas (four districts), and the Department of Mindanao and Jolo (four districts). In December 1901 the Departments of Northern and Southern Luzon were consolidated as the Department of North Philippines and the remaining departments as the Department of South Philippines. See WD, *ARofSW*, 1900, 1(pt.3):26, 45–50; idem, *ARofSG*, 1902, p. 45; AGO GO 38, 29 Mar 1900, and GO 49, 13 Apr 1900.

6. WD, *ARofSG*, 1900, p. 117, and 1902, p. 45; WD, *Five Years*, p. 79.

7. WD, *Five Years*, pp. 173–75, 177, 207–08; Frederica M. Bunge, ed., *Philippines*, p. 27; Linn, "War in Luzon," Ph.D. diss., pp. 33–34.

8. WD, *ARofSG*, 1898, p. 264, 1899, pp. 99–100, and 1900, p. 109; "Medical and Sanitary History of the Troops in the Philippines," p. 828.

9. In addition to a network of division, base, brigade, field, post, and camp hospitals, five general hospitals were serving troops in the Philippines by February 1900: the First Reserve, the Second Reserve, Hospital No. 3, Santa Mesa, and the facility for convalescents on Corregidor Island. See WD, *ARofSG*, 1900, pp. 97–98.

10. Ibid., pp. 104, 109–10, and 1901, p. 128; idem, *ARofSW*, 1900, 1(pt.3):125; Henry Lippincott, "Reminiscences of the Expedition to the Philippine Islands," p. 172; Simon Flexner and L. F. Barker, "The Prevalent Diseases in the Philippines," p. 523.

11. WD, *ARofSG*, 1899, pp. 99–100 (first quotation), 110, and 1900, pp. 105, 111, 115–16; idem, *ARofSW*, 1900, 1(pt.3):124–25; William O. Owen, "Some of the Trials and Tribulations of a Medical Officer of the United States Army," pp. 388–89, 392 (second quotation); War Department, *Correspondence Relating to the War With Spain . . .*, 2:847, 1014; Flexner and Barker, "Prevalent Diseases," p. 523; "Medical and Sanitary History," p. 828.

12. Rpt, John Kulp, in United States, Army, 3d Reserve Hospital, "Manila Report," pp. 3 (quotation), 8, National Library of Medicine, Bethesda, Md.; WD, *ARofSG*, 1900, p. 112.

13. WD, *ARofSG*, 1900, pp. 97–98, 113–14; idem, *ARofSW*, 1900, 1(pt.3):125; idem, *Correspondence*, 2:756; United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 2:1318, 1320 (hereafter cited as *Dodge Commission Report*); N. N. Freeman, *A Soldier in the Philippines*, p. 32; William T. Sexton, *Soldiers in the Sun*, p. 148.

14. WD, *ARofSG*, 1899, pp. 110, 116, 195, 201–02, 1900, pp. 71–73 (quotation), 97, 106, and 1901, pp. 126–27; idem, *Correspondence*, 2:884, 1022, 1221; *Dodge Commission Report*, 2:1308–09, 1322; Ltr, H. O. Perley to Ch Surg, Div of Philippines, 30 Jun 1900, in Ms 4889, Entry 52, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; William J. L. Lyster, "The Army Surgeon in the Philippines," p. 32; Flexner and Barker, "Prevalent Diseases," p. 523.

15. WD, *ARofSG*, 1901, pp. 78, 135, and 1902, p. 145; John M. Gates, *Schoolbooks and Krags*, pp. 112, 128, 233–36; WD, *Correspondence*, 1:442, 455, and 2:1245, 1253; idem, *Five Years*, p. 177.

16. WD, *ARofSG*, 1899, pp. 193 (quotation), 194, and 1901, pp. 78, 136; idem, *Correspondence*, 2:766; Henry S. Kilbourne, "The Medical Department of the United States Army Transport Service," pp. 4–5, 8; Louis M. Maus, "Military Sanitary Problems in the Philippine Islands," p. 28.

17. WD, *ARofSG*, 1899, p. 109.

18. WD, *ARofSW*, 1899, 1(pt.5):26, 68, 78–79, and 1900, 1(pt.3):117 (quotation); "Medical and Sanitary History," p. 826; Gates, *Schoolbooks*, pp. 40, 76; Sexton, *Soldiers in the Sun*, p. 221.

19. WD, *ARofSG*, 1900, pp. 90 (first quotation), 149, 159; idem, *ARofSW*, 1899, 1(pt.5):114–16, 1900, 1(pt.3):509 (remaining quotations), and 1901, 1(pt.4):292–94; William F. Strobridge, "Chinese in the Spanish-American War and Beyond," in *The Chinese American Experience: Papers From the Second National Conference on Chinese American Studies, 1980*, ed. Genny Lim (San Francisco: Chinese Historical Society of America and Chinese Culture Center, n.d.), pp. 14–15; Questionnaire, Richard Johnson, in Spanish-American War, Philippine Insurrection, and Boxer Rebellion Veterans Research Project, Military History Research Collection, U.S. Army Military History Institute, Carlisle Barracks, Pa.

20. WD, *ARofSW*, 1900, 1(pt.4):679 (quotation); idem, *ARofSG*, 1900, pp. 90, 142, 147; Frederick Funston, *Memories of Two Wars*, pp. 329–30; Franklin M. Kemp, "Field Work in the Philippines," p. 77.

21. Funston, *Memories*, pp. 194 (first quotation), 329–30; WD, *ARofSW*, 1899, 1(pt.4):527–28 and 1(pt.5):115 (second and third quotations), 116, 565–69, and 1900, 1(pt.3):130 and 1(pt.4):522; idem, *ARofSG*, 1899, pp. 110, 112–13, and 1900, pp. 90–92, 107, 123; Ltr, H. E. Wetherill to Ch Surg, Div of Pacific, 13 Apr 1900, in Ms 4888, Entry 52, RG 112, NARA; "Medical and Sanitary History," p. 830.

22. WD, *ARofSG*, 1899, pp. 110, 112–13, and 1900, pp. 90–92, 107; idem, *ARofSW*, 1899, 1(pt.5): 566–68.

23. WD, *ARofSW*, 1899, 1(pt.4):385, 395; idem, *ARofSG*, 1900, pp. 90–91, 93.

24. Lippincott was replaced as chief surgeon in April 1899 by Colonel Woodhull, who was, in turn, replaced by Colonel Greenleaf in January 1900. See WD, *ARofSG*, 1900, p. 95.

25. WD, *ARofSW*, 1899, 1(pt.5):116, and 1900, 1(pt.3):124 (quotation); idem, *ARofSG*, 1900, pp. 97–98, 121–22, 138, 142, 163; Lippincott, "Reminiscences," p. 172; "Medical and Sanitary History," p. 826; Martha L. Sternberg, *George Miller Sternberg*, p. 232.

26. WD, *ARofSG*, 1900, pp. 97–98, 122, 132–33 (quotation), 138; idem, *ARofSW*, 1900, 1(pt.3):125; Sexton, *Soldiers in the Sun*, p. 198; Joseph I. Markey, *From Iowa to the Philippines*, pp. 241–42.

27. WD, *ARofSG*, 1900, pp. 97, 121; idem, *ARofSW*, 1900, 1(pt.3):124; Lyster, "Army Surgeon," p. 30.

28. WD, *ARofSG*, 1900, pp. 97–98, 133, 135–37; idem, *ARofSW*, 1900, 1(pt.3):125.

29. WD, *ARofSG*, 1900, pp. 97–98, 150; idem, *ARofSW*, 1900, 1(pt.3):125.

30. Glenn A. May, *Battle for Batangas*, p. 83; WD, *ARofSG*, 1900, pp. 150, 155–56; idem, *ARofSW*, 1900, 1(pt.3):125.

31. WD, *ARofSG*, 1900, pp. 98, 158–59, 161–62, 164–65.

32. Ibid., pp. 23 (first quotation), 24, 90, 105, 110, 134; idem, *ARofSW*, 1900, 1(pt.3):128–29; Gilbert E. Seamen, "Some Observations of a Medical Officer in the Philippines," p. 181 (second quotation); Lyster, "Army Surgeon," pp. 30–31; "A New Course of Instruction for the Army Hospital Corps," p. 375.

33. WD, *ARofSG*, 1899, pp. 21–23, 111 (quotations), and 1900, pp. 25, 106, 109–10; idem, *ARofSW*, 1900, 1(pt.3):129–30; idem, *Correspondence*, 2:837.

34. WD, *ARofSG*, 1899, pp. 111–12, and 1900, pp. 24, 95–96, 105, 120–21, 127–28, 134, 142, 151; idem, *Correspondence*, 2:1192 (quotation), 1261; idem, *ARofSW*, 1899, 1(pt.5):114–15, and 1900, 1(pt.3):117, 128.

35. John C. Brown, *Diary of a Soldier in the Philippines*, pp. 197, 210; Lyster, "Army Surgeon," p. 31; WD, *ARofSW*, 1900, 1(pt.3):117, 127–28; idem, *ARofSG*, 1899, p. 112, 1900, pp. 94–97, 105, 120, 129, 138, 144, and 1901, pp. 141–42.

36. WD, *ARofSG*, 1900, pp. 118–20.

37. Ibid., p. 95; Sexton, *Soldiers in the Sun*, pp. 268–72; Ltr, Clarence R. Edwards to George H. Penrose, 6 Nov 1899, in Ms 4888, Entry 52, RG 112, NARA.

38. Funston, *Memories*, p. 373 (quotations); Freeman, *Soldier in the Philippines*, p. 51; United States, Congress, Senate, *Charges of Cruelty, Etc., to the Natives of the Philippines*, pp. 3, 6, 19; WD, *ARofSG*, 1899, pp. 110–11, 1900, pp. 91, 93, 108, and 1901, p. 142; idem, *ARofSW*, 1899, 1(pt.4):512, and 1900, 1(pt.4):542; Sexton, *Soldiers in the Sun*, pp. 79–80, 81–83, 240–42; Thomas McD. Fairfull, "General Nelson A. Miles and His Charges of Army Brutality in the Philippine Insurrection, 1902," M.A. thesis, pp. 27, 53–54; Gates, *Schoolbooks*, p. 86; Lippincott, "Reminiscences," p. 173; Kenton J. Clymer, "Not So Benevolent Assimilation," p. 550; James H. Blount, *The American Occupation of the Philippines, 1898–1912*, pp. 202–05; Leon Wolf, *Little Brown Brother*, pp. 306–07; Linn, "War in Luzon," Ph.D. diss., p. 208.

39. WD, *ARofSG*, 1900, p. 102; Sexton, *Soldiers in the Sun*, p. 238; John M. Banister, "Surgical Observations in the Philippines," pp. 1118–19.

40. Charles E. Woodruff, "The Soldier in the Tropics," pp. 772 (quotation), 779; WD, *ARofSG*, 1898, pp. 114–15, 1899, pp. 100, 110–11, 114–15, 1900, pp. 89–90, 92, 102–04, 126, 141, and 1902, pp. 105, 107; idem, *ARofSW*, 1900, 1(pt. 3):119; Sexton, *Soldiers in the Sun*, pp. 58–59, 140, 152–54; Maus, "Military Sanitary Problems," pp. 22–23; "Medical and Sanitary History," pp. 826–27, 830; *Dodge Commission Report*, 2:1247; Flexner and Barker, "Prevalent Diseases," p. 525. See also in Entry 561, RG 94, NARA: Ltr, Edward T. Comegys to Mil Sec, U.S. Army, 23 Oct 1904; Telg, Elwell S. Otis to AG, 5 Jan 1899, and Statement, Edward J. Wagnitz, 11 Jun 1907, Henry Lippincott Papers; Med Certificate, H. O. Perley, 21 Dec 1899, William D. Crosby Papers; and Div of Philippines SO 322 (copy), 18 Nov 1900, Henry F. Hoyt Papers.

41. WD, *ARofSG*, 1899, p. 173, and 1900, pp. 151–52 (first quotation), 163; Freeman, *Soldier in the Philippines*, p. 52 (second quotation); Maus, "Military Sanitary Problems," p. 6; Sexton, *Soldiers in the Sun*, pp. 152–54, 162; in Entry 52, RG 112, NARA: Ltrs, Greenleaf to All Divs and Dists in Dept, 26 Mar 1900, and W. F. Lewis to SG, 17 May 1900, Ms 4888, and Ltr, D. Glennan to Ch Surg, Div of Philippines, 21 May 1900.

42. WD, *ARofSG*, 1899, p. 113, and 1900, pp. 87, 89, 114, 148, 163; R. W. Andrews, "Tropical Diseases as Observed in the Philippines," pp. 86–87.

43. Sexton, *Soldiers in the Sun*, p. 58; WD, *ARofSG*, 1900, pp. 92, 131, 143; Andrews, "Tropical Diseases," p. 21; United States, Bureau of the Census, *Census of the Philippine Islands . . .*, 1:371–73.

44. WD, *ARofSG*, 1899, p. 136 (first quotation), 1900, p. 141 (fourth quotation), and 1902, pp. 48–49 (third quotation), 94–96; Seamen, "Some Observations," p. 188 (second quotation); Louis M. Maus, "Venereal Diseases in the United States Army," pp. 131–32.

45. WD, *ARofSG*, 1899, pp. 106, 136, 141–42, 244, 249–50, and 1900, pp. 89, 125, 134; idem, *Correspondence*, 2:1247; Maus, "Military Sanitary Problems," pp. 16–18, 25, 28–29; William T. Sexton, *Soldiers in the Philippines*, pp. 34, 56–57; "Medical and Sanitary History," p. 827; Gates, *Schoolbooks*, p. 58; Lyster, "Army Surgeon," p. 33; Brief Summary of the Military and Civil Services of Colonel L. M. Maus, Medical Corps, United States Army, Retired, p. 5, Louis M. Maus Papers, Entry 561, RG 94, NARA.

46. Freeman, *Soldier in the Philippines*, p. 73 (quotations); Lippincott, "Reminiscences," p. 171; "Medical and Sanitary History," p. 829; WD, *ARofSG*, p. 131.

47. WD, *ARofSG*, 1899, pp. 100, 102–03 (quotations); "Insanity in the Army," p. 586; "Medical and Sanitary History," pp. 826–27; Maus, "Military Sanitary Problems," p. 19; Sexton, *Soldiers in the Sun*, pp. 184–85; Woodruff, "Soldier in the Tropics," p. 779; L. G. Anderson, "Notes of an Army Surgeon in the Recent War," p. 477; P. J. H. Farrell, "Our Sick and Wounded in the Philippines," pp. 334–35; David T. Courtwright, *Dark Paradise*, pp. 96n, 100–101, 202–03.

48. WD, *ARofSG*, 1899, pp. 111 (first quotation), 134–36, 229, and 1900, pp. 127, 134–35, 140; idem, *ARofSW*, 1900, 1(pt.4):523 (second quotation); Div of Philippines GO 1, 22 Jul 1901, file 6355/45, Entry 22, RG 159, NARA; Woodruff, "Soldier in the Tropics," p. 776; G. W. Richardson, "Intestinal Fever, Causes and Prevention," p. 817; Sexton, *Soldiers in the Sun*, p. 230.

49. WD, *ARofSW*, 1900, 1(pt.3):122; idem, *ARofSG*, 1898, p. 262, and 1900, pp. 89, 92, 103, 133–34, 136, 139, 152, 155–56.

50. Ltr, IG to SG, 10 May 1902, file 6355/106, and Newspaper Clipping, 1 May 1902, file 6355/107, both Entry 22, RG 159, NARA; WD, *ARofSG*, 1900, pp. 98, 107, 128 (quotation), 138, 164; Lyster, "Army Surgeon," p. 31; Sexton, *Soldiers in the Sun*, pp. 119, 180.

51. WD, *ARofSG*, 1900, p. 107; idem, *Correspondence*, 2:1180, 1198.

52. Louis L. Seaman, "The U.S. Army Ration, and Its Adaptability for Use in Tropical Climates," pp. 381, 389; Edward L. Munson, "The Ideal Ration for an Army in the Tropics," p. 343; Sexton, *Soldiers in the Sun*, pp. 85, 183; Woodruff, "Soldier in the Tropics," pp. 770–72, 775; Maus, "Military Sanitary Problems," p. 9; WD, *ARofSG*, 1900, pp. 140–41, and 1902, p. 50; United States, Philippine Commission, 1899–1900, *Report of the Philippine Commission to the President*, 2:238; "Medical and Sanitary History," p. 827.

53. Quotations from Woodruff, "Soldier in the Tropics," pp. 770–71; ibid., pp. 772, 775; WD, *ARofSG*, 1899, pp. 226, 228, and 1900, p. 127; Seaman, "U.S. Army Ration," pp. 387–88.

54. WD, *ARofSG*, 1901, pp. 150–51; idem, *Correspondence*, 1:421, 426; idem, *ARofSW*, 1901, 1(pt.6):434, 508; Percy M. Ashburn, *A History of the Medical Department of the United States Army*, p. 228.

55. WD, *ARofSG*, 1901, pp. 150, 152, 155; idem, *Correspondence*, 1:412, 418–19; William B. Banister, "Succinct Account of Services," n.d., William B. Banister Papers, Entry 561, RG 94, NARA; Fred R. Brown, *History of the Ninth U.S. Infantry, 1799–1909*, pp. 473–74.

56. WD, *ARofSG*, 1901, p. 152 (quotation); Banister, "Succinct Account of Services," Banister Papers, Entry 561, RG 94, NARA.

57. First quotation from Frederick M. Hartsock, "Military Medical Conditions Relating to the American Legation Guard in Pekin, China," p. 252; ibid., p. 253; remaining quotations from WD, *ARofSG*, 1901, pp. 158–59; ibid., p. 160.

58. William B. Banister, "The Medical Reserve Corps," pp. 34–35; WD, *ARofSG*, 1901, pp. 150–52; idem, *Correspondence*, 1:429; Rpt Extract, Charles A. Coolidge, 13 Jul 1900, Banister Papers, Entry 561, RG 94, NARA.

59. WD, *ARofSG*, 1901, pp. 151–52; idem, *Correspondence*, 1:427, 435, 442, 456; "Hospital Ship in Service at Taku," p. 276.

60. WD, *ARofSG*, 1901, pp. 152–55; idem, *Correspondence*, 1:444; Ltr, SGO [unsigned] to Miss Brennan, 4 Oct 1900, Entry 103, RG 112, NARA.

61. WD, *ARofSG*, 1901, p. 153 (quotations); idem, *Correspondence*, 1:426, 442; James A. Huston, *The Sinews of War*, p. 303.

62. Banister, "The Medical Reserve Corps," pp. 34–35; WD, *ARofSG*, 1901, pp. 153, 155; idem, *Correspondence*, 1:449.

63. William G. H. Carter, *The Life of Lieutenant General Chaffee*, p. 180; WD, *ARofSG*, 1901, p. 154; idem, *Correspondence*, 1:452, 455, 459–60; idem, *ARofSW*, 1901, 1(pt.6):518.

64. WD, *ARofSG*, 1901, pp. 157–58; idem, *ARofSW*, 1901, 1(pt.6):521, 539.

65. WD, *ARofSG*, 1901, pp. 155, 158, 161, 168, 1903, p. 113, 1904, p. 113, 1905, pp. 99–102, and 1917, p. 218; idem, *Correspondence*, 1:464, 480; Huston, *Sinews*, p. 303.

66. WD, *ARofSG*, 1901, pp. 161 (quotation), 162–65.

67. Ibid., pp. 150, 152; idem, *Correspondence*, 1:438.

Chapter 9

PUBLIC HEALTH IN CUBA

The diseases that defeated V Corps troops in Cuba would also threaten those serving under the occupation. Victory on the island ultimately came from the efforts of Army physicians to improve sanitation and from the discovery of how yellow fever was spread. Unimpeded by the need to obtain popular approval for their work that frustrated reformers in the United States, medical officers in the conquered territories waged a vigorous public health campaign, combining the new medical knowledge with the old rules of sanitation to create practical weapons for the fight against disease.

The period from 1875 to 1900 was a "*golden era of communicable disease control.*" As early as 1870 urban death rates in the United States had started to fall. In Memphis, Tennessee, which, according to the noted historian of the public health movement, John Duffy, was "one of the filthiest places in the United States" in 1872, one of the nation's highest annual death rates (46.6 per 1,000) was halved in seventeen years by an energetic campaign to install city sewers and a safe water supply. In other municipalities in the South, improvements came more slowly, and rural areas were yet to be affected by the public health movement. But by the time American troops occupied the former Spanish territories, "improved sanitation and a higher standard of living" had produced a drop in the death rate in New York City from 30 per 1,000 in 1873 to 26 in 1886. Although the population of Louisville, Kentucky, increased significantly from 1871 to 1874, the death rate fell from 23 per 1,000 to 16.5 per 1,000. From 1873 through 1886 in Cleveland, Ohio, the average death rate was 18–19 per 1,000. By fiscal year 1887–1888 the average death rate in San Francisco was 18.27 per 1,000; by 1891 in Seattle, Washington, it was 11.5 per 1,000.[1]

Physicians now knew that specific bacteria found in body wastes were responsible for the spread of such epidemic diseases as typhoid and cholera. The mosquito had just been identified as the carrier of the organism that caused malaria, and almost all those knowledgeable about yellow fever agreed that it, too, was caused by a microbe, although neither the responsible virus nor the way in which it spread had yet been discovered. Scientists still tended to look on yellow fever as a disease linked in some way with poor sanitation. Fortified by the benefits that had followed improvements in sanitation and public health in the United States, by confidence in what would be learned in the future, and by the strong backing of their surgeon general, Army medical officers faced their assignments in the tropics with enthusiasm as well as determination.[2]

Health of the Troops

Because of the widespread fear that followed the defeat of the victorious V Corps by disease, President McKinley wished to limit the number of U.S. troops sent into Cuba to replace the V Corps until the months of the highest disease rates had passed. As a result, the initial occupation force of seven new infantry regiments from the United States, four of them composed of men believed to be immune to tropical diseases, was sent only to the area around Santiago and Guantanamo. Most so-called immunes proved to be susceptible to tropical diseases once they arrived in the Caribbean, and thus even after the last of the V Corps left for Camp Wikoff on 26 August 1898, the Medical Department had to keep open the 150-bed yellow fever hospital in Santiago. An "observation station," apparently established to isolate suspicious cases after the closing of the yellow fever detention camp outside Santiago, also continued in use, while in late August a few patients remained at the Siboney yellow fever facility.[3]

To prepare for the occupation of the entire island during the late fall and winter months, the Military Evacuation Commission, named to plan the U.S. takeover of the rest of the island, worked with the Spanish to arrange the timing of the replacement of their troops by American forces. The formal turnover of power was to take place 1 January 1899, regardless of whether the Spanish had completed the removal of their troops. In anticipation of possible disorders following the departure of Spanish troops, as many as 43,000 U.S. troops arrived on the island in the winter months of 1899. But the transition went so smoothly that within a few weeks almost half of this number had departed the island, leaving only the volunteers of the VII Corps in Cuba. Most of these troops served in the Havana area, with the remainder scattered at key points about the island. On 31 March 1,207 officers and 25,197 men formed the occupation force, and the total dwindled still further when the volunteers began to leave Cuba in March—all volunteer troops were mustered out in May. By October the small force of regulars that assumed responsibility for the occupation upon the departure of the volunteers numbered less than 15,000 officers and men.[4]

From the outset, the occupation troops arriving in Cuba benefited from the growing awareness of the role played by the mosquito in malaria. Ronald Ross, the British scientist responsible for the discovery of the malaria vector, had written Surgeon General Sternberg in late August 1898 from India about the results of his latest work, hoping that they would be helpful to him in developing "a rational prophylaxis against malaria."[5] U.S. Volunteer surgeon Maj. Jefferson R. Kean, who came to Cuba in December with the VII Corps, recommended that the troops use mosquito netting, a step that, when followed, led to a marked decrease in the number of malaria cases. During the early months of the occupation, line officers failed to take the use of netting seriously, however, and detachments tended to leave nets behind when they moved, causing sharp increases in the number of men who fell victim to malaria. Finally, on 21 December 1900 general orders requiring the use of mosquito netting were issued from the headquarters of the Department of Cuba.[6]

While the Spanish were still being evacuated from Cuba in late 1898, Surgeon General Sternberg sent Colonel O'Reilly, the chief surgeon on the staff of the Military Evacuation Commission, to study the

problems encountered by the British on Jamaica and to consult with the departing Spanish on the difficulties that they had confronted while occupying Cuba. Impressed by the death rates from yellow fever, dysentery, and malaria, diseases that could devastate new arrivals in the tropics, O'Reilly recommended that the occupation troops be at least "thoroughly protected against smallpox" before leaving the United States and, once in Cuba, that they be kept from contact with the civilian population to the extent possible. Convinced that sanitation was the key to maintaining the health of the occupiers, he also emphasized that strict regulations should be enforced among the men.[7]

With the benefit of O'Reilly's advice, the information garnered by medical officers sent to inspect the various Cuban towns where U.S. troops would be quartered, and the ample funding that Congress had made available for wartime needs, Surgeon General Sternberg could make preparations for the occupation that were "of the most generous character." The regimental facility was welcomed back into the Army; each regiment arriving in Cuba brought a hospital with it. Division hospitals were ready to care for 1,000 patients each. Every camp on the island, no matter how small, was provided with its own carefully equipped hospital, and in each of the military departments into which occupied Cuba was divided, an additional facility was established to handle any overflow from the camp hospitals. Hospital ships and the general hospitals in the United States formed a further backup. By restricting the area within the United States that the New York supply depot—"our cheapest purchasing market," as Sternberg put it—was expected to serve, the Medical Department could rely upon it to meet easily all the needs of troops in the Caribbean. Supplies of all kinds, including microscopes, were thus available in quantity on the island, and Sternberg stood by to fill promptly the orders sent to his office. In the spring of 1899 U.S. Volunteer surgeon Major Ives reported that "never before in that respect was an army more completely equipped." Regular troops replaced the volunteers in April, and the number of U.S. troops on the islands became so few that the comprehensive system designed by Sternberg to serve the occupation force was no longer necessary. By June 1900 all general hospitals supporting these men had been closed.[8]

Sanitation on the somewhat modest scale required by military posts was a familiar challenge to medical officers, but the physicians given this assignment in Cuba had little knowledge of the island and its geography and geology. Attempts to prepare campsites before the arrival of the men who would replace both the V Corps and departing Spanish troops were not always satisfactory. When the first men of the VII Corps arrived in the Havana area in December 1898, water was scarce at their camp, tents lacked floors, and latrines were in poor condition. Although the surgeons advised commanding officers on such matters, supervised the disinfection of buildings taken over for barracks, and encouraged the maintenance of strict standards of camp sanitation, including protection of food supplies from flies, their arguments were apparently not always entirely convincing. Dysentery rates were higher than in the United States. Since some regiments coming to Cuba had been infected with typhoid before they arrived, occasional cases continued to appear, although this disease had not previously been a serious problem on the island. In

the Department of Matanzas and Santa Clara, soldiers were required "to avoid touching their lips before washing their hands" if they had touched anything that might be infected, to remain indoors after dark, and to disinfect their living quarters every week and their privies daily. These regulations, when strictly obeyed, did limit the spread of disease.[9]

A rash of typhoid fever cases appeared on one occasion in the spring of 1899, when latrines were not expanded to accommodate 1,000 Cuban laborers who arrived to construct new barracks near Havana. The outbreak occurred because the Cubans, permitted to ignore regulations, "defiled the surface at will." When the latrines were enlarged, the improvement in sanitation was followed by a drop in the number of cases. A flare-up of typhoid in the Puerto Principe area in February and March was not so easily managed. Major Reed, ordered to investigate, concluded that once again the misdiagnosis of early cases had permitted the disease to make considerable headway before the problem was identified as typhoid and that inept attempts to stem the spread of the disease had further contributed to the epidemic.[10]

The sanitary revolution had not reached the towns and cities of the former Spanish empire. The "environment [was] reminiscent of America in the early nineteenth century, if not Europe in the Middle Ages," according to historian Gaines M. Foster in his study of the Army Medical Department's role in disaster relief. After years of guerrilla warfare, Cuba's cities were, as military historian Graham A. Cosmas described them in his definitive work on the Spanish-American War, "filthy and war-ravaged," with some parts of Havana resembling "an outdoor cesspool." The shortage of food had brought hunger to the city's population. One eyewitness recorded that "dead animals abounded, garbage was encountered everywhere, gutters were foul, and open mouths of sewers running into the ocean or into the harbor were reeking." Another commented that the city was "practically untouched by real progress and . . . years behind in everything except natural and man-made beauty." In Santiago, where water mains had been seriously damaged during the siege, disease was already rampant. Much of the rural population had been gathered by the Spanish into villages, where they could be more effectively controlled. By devastating the countryside between these communities and killing off the livestock, the Spanish had reduced the inhabitants to a state of semi-starvation, while the guerrillas resisting them destroyed the improvements that the occupiers had initiated. The first U.S. troops sent to Cuba had to be stationed near towns and cities, especially seaports and rail junctions, to be able to respond promptly to the first signs of trouble, but conditions in Havana led authorities to caution against locating troops in the city.[11]

Improving Sanitation

The proximity of troops to Cuban communities made the problems involved in preventing disease among troops and in the civilian population interdependent. Because local authorities in the impoverished nation did not have the resources needed to conduct a thorough cleanup and disinfection of Cuban towns, "reclaiming towns from their present unsanitary condition" became the responsibility of the military government of the island, established in December 1898 and headed by General Brooke. On the recommendation of

Colonel O'Reilly, the chief surgeon of the Division of Cuba from January to November 1899,[12] Brooke initiated an island-wide campaign to improve sanitation. The effort was continued by Brooke's successor in December 1899, former medical officer Leonard Wood, newly promoted to major general in the volunteers, whose assignment as physician to the White House during the presidencies of Cleveland and McKinley had given him powerful supporters in his career as an officer of the line. General Wood was advised by O'Reilly's successors, Lt. Col. Calvin De Witt and, subsequently, Major Havard.[13] Throughout his rise to increasingly responsible positions in the military government,[14] Wood gave his unswerving support to efforts that he assumed would render the island a healthy place in which to live for Cubans, visitors, and occupying troops alike. Under him, medical officers strove to improve sanitation and educate the Cuban public, both medical and lay, about public health. By mid-1900 six Army surgeons were assigned as municipal sanitary officers, supervising civilian government workers. The management of Cuban charities, including city hospitals, being in a state of confusion, the military government created a department of charities under the supervision of a medical officer to restore order to this aspect of the island's life.[15]

The cleanup of some smaller Cuban communities was accomplished with considerable success. As early as September 1899 the commander of the Department of Matanzas and Santa Clara could proclaim that "the cities and towns, from a condition of filth and unhealthiness, have been perfectly cleaned and put in first class condition. Cesspools have been emptied; yards and foul places have been cleansed; holes and badly-drained localities have been filled and ditches and drains opened, until the sanitary condition of the towns and cities is as good as it is in cities of like size and situation in the United States or elsewhere." Nevertheless, the surgeon general still considered the disease rate in Matanzas to be too high.[16]

The greatest challenge for medical officers, however, was the responsibility for the sanitation of large civilian communities, whose inhabitants had been accustomed for generations to wholesale filth but not to taking orders. Large numbers of half-starving men, women, and children were crowded together in "dark and damp houses" under conditions of incredibly poor sanitation, where the threat of disease remained serious even after the prompt restoration of food supplies to the once-besieged Santiago and the provision of medicines for the sick in the cities. The formation of Anti-tuberculosis League chapters in Cuba was encouraged, and attempts were made to end the prevalent custom of spitting on the floor. Even though the death rate dropped, U.S. authorities became increasingly convinced that most public buildings were infected by yellow fever.[17]

In Santiago the siege had led to a serious deterioration in the health of the population, and "the very air seemed laden with death." Thus a public health campaign became necessary even before the V Corps left Cuba. General Wood ordered that cleanup of the city start as soon as its defenders capitulated, at a time when 2,000 Spanish soldiers lay sick within Santiago and another 2,000 were ill in their camps outside it.[18]

As military governor of Santiago, General Wood moved quickly in his effort to sanitize the city. He divided it into five sections, placing a medical officer in charge of each and assigning him a team of in-

spectors and street cleaners. This "paramilitary force attacked filth with . . . vigor," removing from the streets and burning 1,100 bodies of both humans and animals in barely more than two months and for a time handling as many as 200 loads of trash a day. Wood had the overflow from cesspools that had flooded the streets eliminated and ordered work on a modern sewage system to begin. Accompanied by a committee of surgeons, he personally visited each house to ensure that it was properly cleaned up, "almost working miracles with the dirty old town." He also reorganized both military and civilian hospitals in Santiago, hired Cuban physicians to staff them where necessary, and inspected these facilities personally. He had the former Spanish military hospital cleaned up and disinfected so that it could be used for U.S. military patients. Total deaths in the city dropped from 103 a day on 17 July 1898, the day the siege ended, to 37 a day only three weeks later, just as the V Corps began leaving Cuba. After the departure of the disease-ridden V Corps, several facilities were closed, among them two military hospitals that were shut down in September. The yellow fever hospital, which took in 35 patients in September, 22 in October, and 2 in November, all from supposedly immune troops, was optimistically closed in November. More than 1,100 patients remained ill within the city, half with fevers of one kind or another.[19]

Fighting Yellow Fever

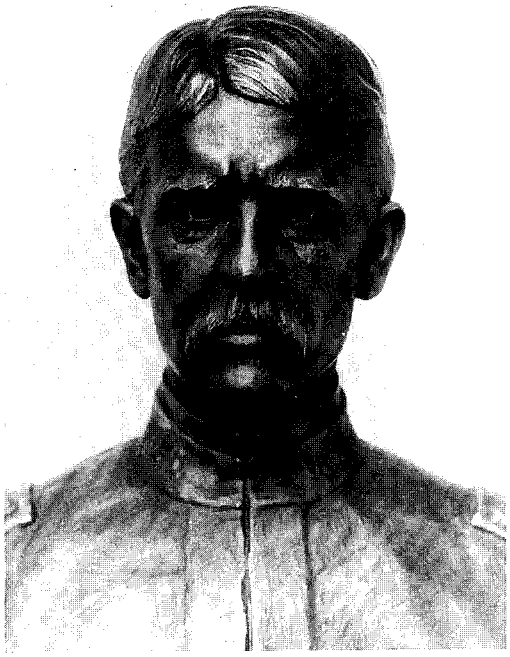
When yellow fever struck the island again in mid-1899, most of the sick were U.S. soldiers, since they formed the bulk of the nonimmune population on the island. Many other victims were civilians, presumably either employees of the Army or, since immigration was increasing after falling to near zero in 1896, newly arrived Spaniards. In spite of General Wood's energetic cleanup campaign, the disease took its heaviest toll in Santiago. The first soldier fell ill on 21 June, and by mid-July 158 cases had been reported. Military authorities were criticized for not acting more promptly, but they responded to the epidemic on 30 June by removing as many soldiers as possible from the immediate vicinity of buildings where yellow fever had appeared and by disinfecting barracks, clothing, and the men themselves. Two companies and the band were ordered to set up tents outside the parade ground while their barracks were fumigated. The clothing of the remaining two companies was sent to the Marine Hospital Service ship in the harbor to be disinfected, and a contract surgeon and several hospital corpsmen escorted the men through a disinfection process that apparently involved a "sublimate bath" ("sublimate" presumably meaning corrosive sublimate or mercury chloride) before they marched two miles into the countryside. Although 5 cases appeared shortly after their departure from Santiago, no more fell ill once the incubation period had passed. Of the 23 men stricken, 8 died. Yellow fever also struck patients in the general hospital, triggering an evacuation of the facility under the assumption that it was infected. More than 80 patients and almost 40 attendants were moved to the grounds. Cases continued to appear for several days after the move began, but no more occurred after 7 July, when the last patients were removed. On the twelfth the hospital was moved to a new site.[20]

Assuming that when yellow fever struck a private home the building became in-

fected, General Wood ordered that its inhabitants be removed while it was fumigated with sulphur fumes or formaldehyde. If the building could not be well sealed, he had it washed down with a disinfectant. He ordered corrosive sublimate to be spread around the ground outside. Each supposedly contaminated home was guarded by sanitary police to prevent entry for a week before immunes were allowed to return. Until 4 September, no one was allowed to remove furniture or bedding from an infected house, and even after this date such items had to be disinfected before being taken into a noninfected house. This routine was complicated in mid-September by the unexpected refusal of the Marine Hospital Service to handle any more disinfection.[21] After this point, therefore, civilian property was taken either to the steam room at the old Spanish military hospital or to a formaldehyde pressure room built earlier for the Army. After conferring with civilian doctors and some of the city's merchants, U.S. Volunteer surgeon Maj. Lawrence C. Carr, who had been placed in charge of all yellow fever patients, closed bars and hotels where yellow fever had appeared. The city's physicians agreed to report all suspicious cases to the Medical Department, a measure to which all but one adhered faithfully.[22]

Astounded by the magnitude of the outbreak, which eventually produced more than 200 cases and a 22.8-percent death rate, General Wood imposed a quarantine upon the entire city. Americans were forbidden to enter Santiago without the authorization of the city's military commander. Ships were denied permission to unload or take on passengers, or even to touch at a wharf. Pack trains were ordered out of Santiago to campsites at least five miles from the city and at some distance both from infantry camps and from the stream that constituted the municipal water supply. Those who were authorized to leave the city had to be disinfected before departing. Members of the staff of the yellow fever hospital in Santiago harbor were ordered to wear distinctive yellow armbands and not to leave that facility without both receiving permission and undergoing disinfection. Carr's experience with the epidemic led him to conclude that a health officer should be assigned by the city to guarantee that doctors reported possible cases of yellow fever within twelve hours and to supervise disinfection routines and quarantines. Since he regarded "the non-immune tramp element [as] a source of grave danger," he urged that each May, before the start of the yellow fever season, all in that category be deported from Santiago.[23]

More important than all other measures, however, was the isolation of yellow fever patients, whether military or civilian. Ambulances marked with a yellow flag and devoted exclusively to the transportation of yellow fever victims were kept at Carr's headquarters at the officers hospital. A detention camp with a staff of four surgeons was set up nearby, where all nonimmune inhabitants of infected houses were sent for five days of isolation. Since early diagnosis had assumed a critical importance, patients even suspected of having contracted yellow fever were taken to an observation facility guarded by a policeman who denied entrance to unauthorized personnel. If the diagnosis was confirmed, they were usually then moved by launch to the yellow fever hospital, but since yellow fever victims might become ill before their cases were diagnosed, some were apparently left at home until they had recovered sufficiently to be moved. Convalescents from yellow fever were sent to a



WALTER REED

detention ship in the harbor, where they remained for eight days, by which point most military patients were capable of performing light duty and could be sent ashore to become part of a guard of immunes for the city. By 13 August so few men were still convalescent that the detention ship was returned to its original owner. Following the imposition of these measures and the quarantine, the epidemic began to taper off, with only 74 additional cases recorded from 13 July to 15 October 1899. Carr noted with apparent surprise in October that none of the staff members at the observation and detention facilities, at the yellow fever headquarters, or among the patients in the detention camp ever contracted yellow fever.[24]

Although under the personal direction of the relentless Wood the public health campaign in Santiago may have been more effectively conducted than in any other community in Cuba, the Santiago experience was not unique. In other communities markedly increased municipal cleanliness might also result in a lower incidence of typhoid, but it failed to eliminate yellow fever. As far as sanitation was concerned, a miracle was performed in Havana, where 250,000 people lived in 26,000 buildings, a "great number of neglected male infants [were] often allowed, even in winter, to go naked or scantily clad," and decades of political upheaval had undermined sanitation. Havana's 30 hospitals, 6 of them military, were all inspected. Because of their poor sanitation and their widespread failure to thoroughly isolate their yellow fever and smallpox patients, these facilities were placed under the supervision of Major Gorgas, who had been appointed chief surgeon of the Department of Havana when it was created in January 1899. Major Reed was sent to Havana to test disinfectants in an attempt to learn how best to prevent the spread of disease by disinfecting water supplies, sewers, streets, and households. Diligent efforts transformed the foul-smelling city, whose soil was saturated by cesspool effluent and whose disease rate was comparable to that of a seventeenth-century European city, into a community that for health and cleanliness rivaled any in the United States. Dysentery, malaria, and typhoid rates dropped markedly.[25]

In spite of both improvements in sanitation and attempts to prevent the importation of the disease from other ports, yellow fever also struck Havana in 1899. As in Santiago, removal of potential victims from infected sites and disinfection of clothing and quarters failed to prevent the spread of the disease. In the course of the year 28 soldiers and 32 civilians in the Havana area contracted yellow fever. Of the total, 14 died, a death rate that was regarded as low.[26]

General Wood and the Department of Havana commander, Brig. Gen. William Ludlow,[27] eventually became involved in a quarrel over yellow fever statistics. Wood publicly implied that Ludlow had suppressed these figures, especially those for 1899–1900. Ludlow appealed to his chief surgeon, who was thereby placed in a very awkward position, since he felt that Ludlow did not "appreciate the importance of the work." Gorgas diplomatically replied that he believed that the physician in charge of reporting all cases of yellow fever tended to avoid classifying possible cases as actual yellow fever, thus producing lower figures than might otherwise have been expected. He added that by the fall of 1900 the figures on yellow fever were also being more widely reported than they had been earlier.[28]

The successful efforts of smaller communities on the island to improve sanitation also failed to result in freedom from the onslaught of yellow fever, which struck 81 more victims and caused 22 deaths outside the major cities. Surgeon General Sternberg was obviously relieved that the toll had been no higher and attributed what he considered the minor nature of the outbreak in 1899 to prompt action by Army surgeons in diagnosing the disease, isolating its victims, and encouraging the prompt removal of garrisons from infected posts. None of the cases that developed among troops there could be traced to outside sources, and since removal from the post apparently brought the epidemic in its garrison to an end, medical officers concluded that the disease resulted from the infection of buildings. Apparently more strongly convinced than ever of the role played by poor sanitation, General Brooke concluded that installing complete sewer systems in various communities, despite the enormous expense that would be involved, would be necessary if yellow fever were to be finally defeated.[29]

Major Gorgas' success in dealing with the disease problems of Havana was so great that his appointment in 1900 to the position of chief surgeon for the Department of Santiago and Puerto Principe was greeted by protests. General Ludlow, whose opinion of Gorgas was obviously higher than Gorgas' opinion of him, pointed out to the adjutant general of the Division of Cuba that no one could replace Gorgas because he offered an unmatched combination of skill with a profound familiarity with conditions in Havana. Ludlow believed that the sanitation of Havana was "in a general sense, more important than all the rest of the Island put together." To the apparent satisfaction of all concerned, the transfer was promptly canceled, and on 4 April Gorgas "finally settled down as Chief Sanitary Officer of the City of Havana."[30]

Although the main concern of medical officers in Cuba was yellow fever, from the outset they also had to deal with a disease that, unlike yellow fever, was far more of a threat to the civilian population than to the military. Cuban law requiring all citizens to be vaccinated against smallpox was apparently often ignored, and when an epidemic broke out in a small area of the Department of Santiago in the fall of 1898, General Wood deemed it wise to launch an anti-smallpox campaign. He sent 100 sanitary workers out to disinfect buildings that had sheltered smallpox victims and had as many people as possible vaccinated. He assigned a few medical officers to supervise Cuban physicians in setting up an isolation hospital; cases were so numerous that from November 1898 to January 1899 it handled 1,185 cases. Doctors discovered that only 2 percent of those who contracted the disease had ever been vaccinated. None of the

10 percent who died had ever been immunized. Thanks to the warnings of medical officers like O'Reilly, none of the medical officers or soldiers who guarded the hospitals contracted smallpox. The success of the campaign was attributed to a large extent to the local doctors, who were able to overcome the distrust of the Cubans both for vaccination and for the hospitals where patients with potentially fatal contagious diseases were isolated. Although the U.S. military government managed to enforce the earlier legislation in some areas, it was not until 1901 that the law was revised to require that all children be immunized before their first birthdays.[31]

The occupying authorities, firmly convinced of the benefits to be derived from the great improvements achieved by their public health campaign in Cuba, apparently faced 1900 with some confidence as far as disease was concerned. Even so, faith in sanitation as the answer to the yellow fever problem was waning. The number of those not immune to yellow fever coming to the island was great. On the advice of Major Carr, now the chief surgeon of the Department of Santiago and Puerto Principe, a circular was issued in March 1900 outlining the usual precautionary steps, among them isolating or removing nonimmunes among the destitute, to be taken in the attempt to avoid a recurrence of the 1899 epidemic. Whether in spite of the precautions or because of them, yellow fever did not reappear in Santiago in 1900.[32]

Other communities were not so fortunate. One isolated patient with yellow fever was reported in January 1900, and in the spring a growing number of cases appeared scattered about the island. On 10 May a soldier at Santa Clara and another at Pinar del Rio Barracks contracted the disease, although the latter, who died six days later, was initially believed to have had malaria. A second case at the barracks was diagnosed as yellow fever on 14 June, and it was followed by four more cases that month, all but one of which ended fatally. In July twenty-seven cases were diagnosed, four among civilians, with eight fatal. At this point, the command at Pinar del Rio was ordered to leave the barracks. Since only two more cases occurred after the move, authorities concluded that this step should have been undertaken much earlier. At Santa Clara the disease eventually afflicted thirty-six officers and men, killing ten of them. The first case at Quemados, near Havana and the headquarters of the Department of Havana and Pinar del Rio, appeared on 19 May, and eleven officers and men eventually fell ill, but the nearby Columbia Barracks was spared. By 1900 yellow fever and the fear of its spread had led to the establishment of seven hospitals where yellow fever victims could be isolated—at Santa Clara, at Havana, at Quemados, and four in the Department of Santiago and Puerto Principe. Havana's Los Animas hospital, well staffed and equipped with ambulances to transport patients, handled the victims of all contagious diseases.[33]

Removal from the affected area seemed to bring epidemics at the various posts to an end, but the fear that the health of soldiers stationed near towns might be endangered if yellow fever erupted there led medical officers to continue their attempts to limit the spread of yellow fever among civilians. While discouraged at the failure of high standards of sanitation to eliminate yellow fever as a threat in towns and cities, military authorities continued the struggle. When the chief surgeon of the Department of Havana and Pinar del Rio, Major Kean, fell ill with yellow fever, the post surgeon at Columbia Barracks super-

vised the removal of the nonimmunes of the population of Quemados to a camp two miles away. Houses of prostitution, bars, and other public places of entertainment frequented by soldiers were then closed. On 1 July a circular was issued for the Department of Matanzas and Santa Clara similar to that issued in March for the Department of Santiago and Puerto Principe. Despite the most strenuous efforts, yellow fever caused more than 300 deaths in the civilian and military population of Cuba in 1900, the highest toll, according to Major Gorgas' wife, in the history of the island. Gorgas blamed this record in part on the growth of the nonimmune population of Spanish immigrants.[34]



ARISTIDES AGRAMONTE, *wearing the uniform of an acting assistant surgeon that was authorized for contract surgeons*

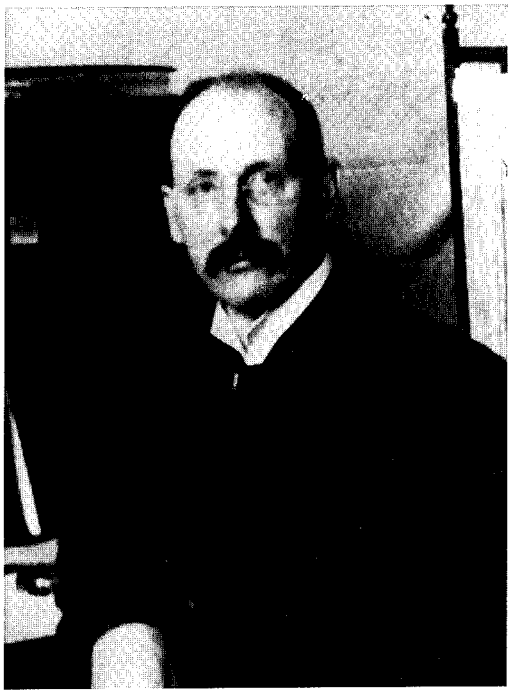
The Yellow Fever Board

Not surprisingly, given the failure of cleanup efforts to prevent the epidemic of 1899, yellow fever became the focus of intensive study in the spring of 1900. Apparently at the instigation of Commanding General of the Army Miles, Surgeon General Sternberg appointed a board to study infectious diseases in Cuba. From the outset this body concentrated on yellow fever and thus became known as the Yellow Fever Board or the Yellow Fever Commission.[35] Sternberg named Major Reed as chairman and assigned three contract surgeons—Aristides Agramonte, James Carroll, and Jesse W. Lazear—to work with him. Agramonte had been born in Cuba and was the only member of the board immune to yellow fever. He had been educated in the United States and was serving as a bacteriologist in the New York Health Department when the Spanish-American War began. Carroll, who had been one of the bacteriologists investigating the diseases of Army camps in the United States in 1898, had studied medicine while serving in the Hospital Corps and had taken laboratory courses at Johns Hopkins. According to Agramonte, he was "industrious and of a retiring disposition," while Lazear was "a thorough university man, . . . the type of old southern gentleman, kind, affectionate, dignified, with a high sense of humor."[36]

Discovering how yellow fever was transmitted would be important for the civilian population of the United States as well as for troops in Cuba, since the disease periodically afflicted U.S. communities, causing more than 100,000 deaths from 1793 to 1901. It had inspired the fear that had earlier precipitated the formation of the commission upon which Surgeon General Sternberg himself had served before the Spanish-American War. Although



JESSE W. LAZEAR



JAMES CARROLL

his research had led him to speculate that the responsible organism might be too small to be seen under the microscope, his chief accomplishment had been to prove current theories concerning yellow fever to be false.[37]

One theory retained credibility in 1900, however. A highly respected Italian bacteriologist, Guiseppe Sanarelli, maintained that yellow fever was caused by an organism he had dubbed *Bacillus icteroides*. Many highly respected authorities regarded his theory with favor, all the more so since he had followed Koch's postulates in assembling his evidence. Some maintained that they had found Sanarelli's bacteria in many yellow fever victims they had examined. By 1899 this scientist had become so sure of his theory that he mocked Surgeon General Sternberg for "not readily" conceding "success to another when he had himself failed." Everyone who was a true "man of science," Sanarelli announced, would rejoice with him that the riddle had been solved. Commenting that the surgeon general's work had been completed before the most recent progress made in bacteriology, he crowed that Sternberg's "primitive and defective technique" had resulted in "very serious lacunae" in his research.[38]

When Surgeon General Sternberg ordered the new board to concentrate on the various theories concerning yellow fever, Sanarelli's *Bacillus icteroides* seemed a good starting point for its research. Major Reed, Agramonte, and Carroll had all worked with the organism in the late 1890s, and when they arrived in Cuba and began their work in facilities at Columbia Barracks, near Quemados and several miles from Havana, they continued this work. The epidemic under way in the summer of 1900, both at Quemados and within Havana it-

self, provided plentiful material with which to work. They examined the blood of twenty-four patients with yellow fever and the internal organs of eleven who had died of it without finding any trace of *Bacillus icteroides* or of anything else upon which they could fasten blame, a result that surprised Agramonte, who had personally identified the bacillus in 33 percent of the autopsies he had performed in Santiago in the 1898 epidemic. Further research led the board to conclude that *Bacillus icteroides* was the cause of hog cholera.[39]

After disposing of Sanarelli's theory to its own satisfaction, the Yellow Fever Board looked to the work of other scientists for ideas about further research. Major Reed accepted the conclusions of Marine Hospital Service scientist Henry Rose Carter, who had demonstrated that twelve to fifteen days usually elapsed between the appearance of the first case of yellow fever in a community and the development of subsequent cases. Reed then turned to a much-disputed theory put forward by Carlos Juan Finlay, a U.S.-trained physician practicing in Havana who had long maintained that a specific mosquito, *Aedes aegypti*,[40] was the yellow fever vector—in actual fact, of course, only the female could serve as the vector because only the female mosquito bites. Unwilling to abandon his theory yet unable to prove it to anyone's satisfaction but his own, Finlay had become an object of ridicule. Among the nonbelievers in Finlay's theory, apparently, was Surgeon General Sternberg himself; when the surgeon general later maintained that he had known yellow fever to be mosquito-borne all along, he earned Reed's scorn and distrust. By 1900 Carter was sufficiently impressed by Finlay's theory to write Lazear that it was "more than plausible, although his arguments as I read them are not convincing."[41]



CARLOS JUAN FINLAY

After familiarizing himself with the work of both men, Major Reed concluded that in light of recent revelations about insects as disease vectors and of the data produced by Carter's research, Finlay's theory deserved further investigation. The pattern of the spread of yellow fever was quite different from those classified as filth diseases, and the cleanup campaign in Havana had had no effect upon yellow fever rates. The disease sometimes spread from one home to another without any contact between the families involved. Unlike the victims of typhoid, moreover, yellow fever patients did not usually give their disease to their nonimmune nurses. Reed's decision in the summer of 1900 to turn from the puzzling question of the causative organism to the more promising one of the vector led to the research that would make his name famous.[42]

Finlay was happy to provide the eggs and larva of the insect he suspected of

spreading yellow fever, but the small animals usually used in laboratory experiments did not contract yellow fever. To find the necessary human guinea pigs, Major Reed turned to U.S. citizens in Cuba, both soldiers and civilians, and to Spanish immigrants who had arrived so recently in Cuba that they had not yet contracted yellow fever. History would suggest that if these men remained long in the island they would, sooner or later, contract yellow fever. All those who came forward for the experiment were offered $100 after being warned of the potential consequences of taking part, and those who contracted yellow fever were offered another $100. Although Havana newspapers vigorously deplored the use of human guinea pigs, the Spanish consul gave his approval after receiving assurances that no minors would be used and that the unusual step (at the time) of obtaining written consent would be made in every instance.[43]

The Spanish immigrants rounded up by Agramonte were initially most enthusiastic, believing the notion that mosquitoes could spread yellow fever was ridiculous. When they learned that those bitten were falling ill, some, according to Major Reed, "suddenly appeared to lose all interest in the progress of science" and "incontinently severed their connection" with the experiments. Although no U.S. soldiers were asked to participate in this aspect of the board's work, fourteen, of whom eleven were hospital corpsmen, requested permission to do so, and one joined a U.S. civilian employee of the Army in refusing to accept payment. Thoroughly aware of the implications of what he was doing, Reed found the burden he had assumed a great one. In January 1901, when one of his subjects was very ill, he commented that "the responsibility for the life of a human being weighs very heavily, . . . and I am dreadfully melancholic." [44]

Because of his previous training in handling mosquitoes in Italy, Lazear was asked to take charge of the "rather striking-looking and handsome" insects, each with a "broad, semilunar silvery stripe" on the middle of her body, that would be vital participants in the work of the following months. He bred them, dissecting some of them and taking others to the nearby yellow fever hospital to feed on its patients to become infected. His charges failed at first to infect the nonimmunes they were subsequently encouraged to bite. Since Finlay had also been unable to transmit yellow fever in this way, the faith of Reed's team in his theory weakened. Like Finlay, these physicians had not realized that the mosquito did not become infective immediately upon biting a yellow fever patient and that the length of time the patient had been suffering from that disease at the moment the bite was inflicted was also critically important.[45]

The first experiments with mosquitoes were initiated on 11 August, after Major Reed had returned to the United States to work on the Typhoid Board report. When Carroll volunteered on the twenty-seventh to be bitten by a mosquito that had fed upon the blood of a patient in his second day of illness, no one had yet acquired yellow fever in this manner. Carroll did not anticipate dire consequences, and although he began to feel unusually tired two days later, he did not realize he was ill until the thirty-first. After an examination of his blood for signs of malaria parasites proved negative, on 1 September the official diagnosis of yellow fever was rendered. Nevertheless, because Carroll had been directly exposed to patients with yellow fever, his contracting the disease did not

prove conclusively that the mosquito was the vector. The insect that bit him was one of several that also feasted at the expense of a man who had not been exposed to yellow fever patients, and he also came down with yellow fever.[46]

In spite of the illness of his colleague, Lazear remained casual about the danger posed to him personally by his mosquitoes. Having already been bitten several times without ill effect and knowing that it was possible to have an attack of this disease so mild that it might not be recognized for what it was, he may have assumed that he had somehow acquired an immunity. (Finlay himself had suggested that the bite of a mosquito that had recently feasted upon a yellow fever patient could, as Surgeon General Sternberg put it, "confer an abortive attack of yellow fever.") Carroll and Agramonte agreed that when an insect that was flying about a yellow fever ward during one of his visits bit Lazear on 13 September, he made no attempt to interrupt her meal. Some concluded that Lazear had deliberately intended to infect himself. In any event, five days later, he, too, was ill. On 25 September, when Carroll was on his way to recovery, Lazear died.[47]

When Major Reed returned to Cuba shortly after Lazear's death, Agramonte was apparently on leave in the United States. Carroll, embittered by his conviction that Reed would deny him credit for the Yellow Fever Board discoveries and by what he insisted was Reed's flight to avoid contracting yellow fever, soon returned to the United States to complete his recuperation. The truth of the former charge was clearly a matter of definition, but evidence exists that the latter charge was unfair. Reed maintained that initially he and his colleagues had all agreed to experiment on themselves and that he personally would have done so had he not left Cuba. He evidently promised Surgeon General Sternberg as a condition of his return to the island that he would not allow himself to be bitten by an infected insect. Agramonte, on the other hand, maintained that after Reed returned to Cuba, he did not submit himself to a mosquito's bite because of the insistence of his colleagues there that the work they were doing was too important to "justify our taking risks which then seemed really unnecessary. . . . For this reason he was never bitten by infected mosquitoes."[48]

While Agramonte and Carroll were in the United States, Major Reed examined Lazear's carefully maintained notebooks and concluded that a mosquito could be infected only by biting a yellow fever patient in the first three days of the disease and that the insect could transmit the infection only after twelve more days had passed. Although Reed was now personally convinced that yellow fever was indeed mosquito-borne, only one of the three yellow fever victims in his study had acquired the disease under controlled circumstances. The theory was yet to be proved, and the scientific community in the United States remained unenthusiastic about the board's line of research.[49]

Using funds provided by General Wood, now military governor of Cuba, Major Reed undertook to prove that the mosquito spread yellow fever. At a site where no cases of yellow fever had ever been reported Reed established a camp named after Lazear. He had two frame huts built eighty yards apart in a well-drained and uncultivated open field, where he could control all access to the camp and thus eliminate outside sources of infection. The "Infected Mosquito Building," as Reed called it, was well ventilated and divided by a screen down the middle of the inte-

rior. The "Infected Clothing Building," on the other hand, was not divided. Its ventilation was strictly limited so that the resultant heat and humidity would foster the spread of infection and the occupants would be, as Reed's biographer William B. Bean described it, "thoroughly saturated with an agent known to be effectively malevolent." Both huts were designed to prevent penetration by uninvited insects. Among those running the camp were two contract surgeons, one of whom was immune; an acting hospital steward, also an immune; nine Hospital Corps privates, one of whom was immune; and an immune ambulance driver. These men were quartered in seven hospital tents, each set twenty feet apart from every other.[50]

Major Reed proceeded with great care to see that no cases of yellow fever appeared at Camp Lazear other than those that were deliberately transmitted. Two men who developed fevers before the initiation of attempts to infect them with yellow fever were removed from the camp. All those suspected of having contracted the disease were at once put to bed at the camp, in the belief that absolute rest was necessary to the care of the yellow fever patient, and then carried, still in those beds, to the isolation of the yellow fever hospital. Several physicians in Havana were available to examine them and to confirm a diagnosis of yellow fever.[51]

The experiments at Camp Lazear in the autumn of 1900 eventually involved a total of sixteen cases of yellow fever, twelve from mosquito bites. To keep their supply of insects alive and lively to make these experiments possible, the team at Camp Lazear had to become familiar with the life of *Aedes aegypti*. Major Reed undertook the study of entomology and maintained his contact with an authority on insects. Since even with devoted care, the scientists at Camp Lazear were unable to keep the average mosquito of this type alive more than five weeks in captivity, and since few survived even that long, they had to undertake a breeding program. Because Reed wanted to establish whether yellow fever, like malaria, could be acquired by the "injection of blood taken from the general circulation of a patient suffering from this disease," he injected another four with infected blood. He succeeded in giving the disease to all but one, whose failure to react to subsequent bites by infected mosquitoes proved that he had actually been immune. Reed's attempts to produce a case of yellow fever by the injection of the blood of a diseased patient were apparently not the first, since Surgeon General Sternberg said he had seen the experiment made, albeit unsuccessfully, several times at Vera Cruz, Mexico, in 1887. Further work by Carroll in the fall of 1901 resulted in six more cases. After Lazear's death, none of the cases produced by the Yellow Fever Board's experiments proved fatal.[52]

The first phase of the research at Camp Lazear called for mosquitoes known to be infected to bite men believed to be nonimmunes who had been isolated from all other possible contacts with yellow fever. Some insects used in this test had bitten several yellow fever victims at various stages of the disease, and some men were bitten by more than one mosquito. The first volunteer began to sicken on 8 December, less than four days after he had been bitten by five mosquitoes. The next day his case was diagnosed as yellow fever. All but one of the men involved in this phase of Major Reed's research eventually contracted yellow fever, thereby substantiating the theory that *Aedes aegypti* carried the dread disease. The test also provided more information on the re-

lationship of the time factor to the transmittal of the disease and demonstrated that the mosquito's role was merely that of the carrier and the injector of the blood.[53]

The next step required that two sets of subjects be placed in the Infected Mosquito Building. On one side of the screen a volunteer shared his quarters with infected mosquitoes, and on the other side two more volunteers breathed the same air but shared neither the insects nor the yellow fever he contracted. The fact that the bite of *Aedes aegypti* could spread yellow fever was again confirmed by this test, but the question of whether fomites (items exposed to vomit, urine, or feces) were a factor remained to be determined. To answer this question, volunteers slept in the Infected Clothing Building, in close contact with clothing and bedding that had been thoroughly saturated with the vomit, urine, and feces of yellow fever patients. Although at times their stomachs churned while so intimately exposed to such unappealing items, the supplies of which were several times renewed, the men did not become ill, nor did those participating in two repetitions of the experiment. When subsequently exposed to bites by infected mosquitoes, the first three men who had been involved in the fomite test, an acting assistant surgeon and two hospital corpsmen, fell ill, thus demonstrating that their failure to contract yellow fever from the infected items had not resulted from any immunity to yellow fever.[54]

Other questions remained to be answered. The fact that the mosquito spread yellow fever specifically by means of the infected blood she had drawn was established by further experiments involving the injection of blood from yellow fever patients into nonimmunes. To demonstrate that the symptoms of yellow fever were not caused by a toxin, Major Reed and Carroll heated blood from an infected patient to 55 degrees Centigrade for ten minutes, a procedure likely to kill bacteria but not to destroy toxin. Nonimmunes injected with this blood did not develop symptoms. Dr. Welch of Johns Hopkins called Reed's and Carroll's attention to work done by other scientists that had demonstrated that the organism responsible for foot-and-mouth disease in cattle would pass through a porcelain filter, and they decided to conduct the same experiment with the blood of a victim of yellow fever. Infected whole blood transmitted the disease even after going through the finest of filters, thereby demonstrating, as Reed and Carroll put it in a paper read before the Society of American Bacteriologists on 31 December 1901, that "yellow fever, like the foot-and-mouth disease of cattle, is caused by a micro-organism so minute in size that it might be designated as ultramicroscopic." Its minute size established that it was certainly not *Bacillus icteroides*.[55]

The work of the Yellow Fever Board in the fall and winter of 1900–1901 solved the mystery of how yellow fever was spread and laid many misconceptions to rest. It clearly established that eighteen days were required, if the weather was cool, for the virus to mature within the mosquito's body before she became capable of infecting, although the period was appreciably shorter in warm weather. It also demonstrated that to become infective a mosquito had to bite a patient within the first three days of his illness. Once infected, the mosquito remained capable of spreading the disease indefinitely. The incubation period from the time of the bite to the time the disease first appeared varied from forty-one hours to five days, seventeen hours.[56]

Perhaps the most significant finding of the board was the proof that while mosqui-

toes did spread yellow fever, fomites did not. The implications of this discovery were far-reaching. A house or a ship became infected only by the presence of infected insects, and their elimination removed the infection. Yellow fever was not a so-called filth disease, and improper sanitation played no role in its spread. The expensive and time-consuming disinfection of clothing, bedding, merchandise, and cargos served no useful purpose in preventing the spread of this particular disease because a ship could carry yellow fever to a foreign port only if a yellow fever patient or a living and infected mosquito were on board. *Aedes aegypti*, as the Reed team had learned, could live no more than five days without food and water. Thus, under normal circumstances, the insects in a ship's hold would all be dead by the completion of any but the shortest voyage. Medical historian James D. Goodyear suggested in 1978, however, that mosquitoes may be able to survive long voyages by feeding on molasses seeping from containers of raw sugar being exported from areas where yellow fever is endemic. Since *Aedes aegypti* never flew far from where it was hatched, a ship loaded in midstream was in no danger of infection from the shore. Only the passage of 16–21 days without the development of a case of yellow fever could prove that a ship loaded at an infected port carried neither infected mosquitoes nor infected passengers. The board recommended that if a passenger developed yellow fever during a voyage, nonimmunes on board be quarantined for five days. Only if another case of the disease appeared in this time, according to Reed, would it be advisable to fumigate the ship's quarters, where mosquitoes might have remained alive by feeding on passengers.[57]

The members of the Yellow Fever Board, satisfied about the way in which yellow fever was spread even though unable to find the organism responsible for it, dispersed in February 1901 to concentrate on what would be an unsuccessful search for the elusive virus in the laboratories of Havana. A somewhat embittered Reed predicted that, recognizing the importance of the board's discoveries, Surgeon General Sternberg would "of course, . . . at once, write an article and say that for 20 years he had considered the mosquito as the most probable cause of yellow fever. That would be just in order for him to do so." Those who were unable to accept all of the board's conclusions, on the other hand, began to publish their objections. One maintained that the board's research consisted of "very imperfect observations" and that the spread of yellow fever by mosquito was possible only when it occurred by accident or by "artificial inoculation." Another, while accepting the notion that mosquitoes spread yellow fever, noted that he knew of epidemics that had appeared in areas without mosquitoes or without any "precursory *case of yellow fever*" and concluded that the role assigned the mosquito by Major Reed left much still to be explained. The modern evaluation of the Yellow Fever Board's work is unequivocal. "This simple initial report," wrote a medical historian in 1978, "is a model in scientific literature."[58]

A Time of Trial and Triumph

The prevalence of yellow fever and other diseases in the Caribbean had inspired the work of Major Reed and his colleagues, but even after their discovery that a mosquito was the yellow fever vector, disease rates could not be significantly lowered until practical means of acting on what they had discovered had been devised. Major Reed,

however, was apparently confident as a result of his contacts with an expert entomologist in the United States that a successful approach to reducing the population of mosquitoes already existed and need only be applied. The Yellow Fever Board played no role in the translation of the board's research into practical measures, but the entire nature of the anti–yellow fever campaign was transformed because of its work. A directive issued by General Wood in December 1900 detailed the approach to be taken throughout Cuba and authorized Major Gorgas to mount both an anti-*Anopheles* campaign and an anti–*Aedes aegypti* effort. Gorgas, discouraged by the failure of sanitation to prevent yellow fever epidemics, found the facts revealed by Reed most welcome. Even though he was not yet convinced that the mosquito alone was responsible for the spread of yellow fever and was still more reluctant to rule out some role for fomites, the isolation of yellow fever victims from mosquitoes to prevent the spread of the disease and the destruction of *Aedes aegypti* now became the focus of Gorgas' efforts.[59]

The campaign initially centered on Havana, although Major Reed believed that because of the city's size and the ignorance of its physicians, the chances of success there were minimal. Major Gorgas was not optimistic about the possibility of killing a significant number of mosquitoes, but he encouraged the use of all approaches that would prevent breeding, kill the adult insects, or prevent the mosquito from biting patients. He set up three units, two to deal with the prevention of the breeding of *Aedes aegypti* and the third to destroy the adults. He also divided Havana into twenty sanitary districts, each with its own inspector, who was required to examine every house in his area each month, looking for conditions that might favor the breeding of *Aedes aegypti*. Any work required to cover cisterns, to pour oil over puddles, or in other ways to eliminate breeding places was done at public expense. The five men who accompanied each inspector on his rounds even unplugged blocked gutters and retrieved old bottles that might hold water. Possible breeding sites were common in Cuban homes, where a container full of drinking water was often kept in the house, to be replenished as needed without ever being emptied and cleaned out. The courts fined those who permitted water to stand uncovered, but the sum could be remitted by the inspector if the problem was eliminated. Cubans, accustomed to graft, assumed that the inspectors kept the fines for themselves and therefore were particularly impressed when the money was returned to them, since it seemed to be a personal gift from the U.S. official.[60]

The homes of yellow fever victims and houses near them were fumigated, usually with burning sulfur or pyrethrum, to kill adult mosquitoes that might have become infected. The patient's room was disinfected and his clothing sent to the Los Animas disinfecting plant, but these steps were soon abandoned as unnecessary. Carpenters were sent to the dwellings of patients who had remained in their homes to screen windows and construct double doors separated by a vestibule at the entrance, thus making it unlikely that any insect could enter. A sanitary officer was stationed near the doors to guarantee that the first door was closed before the second was opened. Adult mosquitoes were also sought out in tobacco warehouses, where burning tobacco stems were used to destroy this minute enemy. When it became apparent that yellow fever was being brought into Havana from a nearby com-

munity, a team began fumigating homes there in areas where cases of yellow fever had originated. The problem of the importation of yellow fever into Havana by sea was managed by a quarantine placed on all arriving ships. Any vessel carrying yellow fever victims was fumigated, and all nonimmune passengers were isolated for six days. The tedious disinfection of baggage that had been part of what Gorgas called "the mediaeval quarantines heretofore used" was no longer required.[61]

The promulgation on 27 April 1901 of a new circular based on the board's discoveries simplified the management of the hospitals where yellow fever patients were isolated. Major Gorgas' initial skepticism about Major Reed's determination that yellow fever could be spread only by the mosquito was apparently soon dispelled. Although the fumigation of rooms and clothing exposed to yellow fever victims was still required to be sure that all infected mosquitoes were killed, on 21 August he finally issued an order ending the required and tedious disinfection of clothing and other material that had come into contact with yellow fever sufferers. Medical officers were now allowed to move freely from yellow fever victims to their other patients and from one institution to another without fear of infecting the community. The movement of attendants caring for yellow fever patients was still limited because of the possibility that they might take infected insects with them. Because of Gorgas' campaign, within three months yellow fever had disappeared from Havana, although it was reintroduced from time to time thereafter from the outside. The ponderous routines used without success to combat this disease had been proved unnecessary. For most scientists, Gorgas' success may have provided proof of Reed's theory about how yellow fever was spread, but a few skeptics still insisted that while the mosquito obviously could spread yellow fever, other means must also be possible.[62]

Major Gorgas' only failure in his battle against yellow fever occurred at the very time that he was winning his campaign against the mosquito that spread the disease. In the summer of 1901 Gorgas and contract surgeon Guiteras, who had served as an adviser on tropical diseases to the unlucky V Corps in 1898, were conducting research to discover whether they could safely immunize volunteers against this disease by deliberately infecting them, as had been done with smallpox in the days before vaccination. They theorized that men inoculated with matter from mild cases of yellow fever could be given a mild case that would result in permanent immunity. Using principally Spanish volunteers, they gave yellow fever to ten. Unfortunately, three of their subjects, including Clara L. Maass, a nurse from the United States, died because of the attempts to immunize them, and the experiment was abandoned, partially because of the opposition of Major Reed, who was horrified by the fatalities. His own work with yellow fever had produced no deaths but that of Lazear, who had personally made the decision that resulted in his own demise. The deaths also made it more difficult to find volunteers for further experimentation.[63]

The campaign against yellow fever and *Aedes* was already well along when the less-publicized campaign against *Anopheles* began in Cuba. The use of mosquito netting had never been particularly successful, largely because line officers, presumably unconvinced that malaria was carried by mosquitoes, failed to realize its importance. The scientists working under Major Gorgas studied the habits of *Anopheles*,

learning, among other things, that it was extremely successful in locating holes in screens and that it was very selective in its choice of victims. The *Anopheles*, unlike the yellow fever mosquito, preferred fields and open places to human habitation, and thus the campaign against insects in the city was not as effective against malaria as it was against yellow fever. Gorgas assigned fifty men to trim banks and remove vegetation from slow-moving streams so that fish and tadpoles could feast on mosquito larvae as part of the campaign against *Anopheles*.[64]

Between the two campaigns, the incidence of both malaria and yellow fever in the Havana area dropped dramatically. Malaria deaths in Cuba as a whole numbered 325 in 1900 but fell to 151 in 1901 and to 77 in 1902. In Havana itself the malaria rate was reduced by 75 percent. Since, in addition, Havana had had no cases of smallpox since 1900, the death rate in that city reached its lowest in more than ten years. For the year 1901 the annual death rate of 22.1 per 1,000 compared favorably with that of such southern U.S. cities as New Orleans and Charleston, whose populations were also exposed to malaria and periodically to yellow fever as well. A jubilant but somewhat surprised Gorgas concluded that he had established that both malaria and yellow fever could be eliminated in the tropics and that U.S. troops could, as a result, serve as easily in the tropics as in temperate zones. Messages of congratulations were soon pouring in to the man who had made Havana as safe to live in as any of the cities of Europe.[65]

The success of the campaign against yellow fever inspired much enthusiasm for what preventive medicine could do. An Army engineer wrote Gorgas that he could think of "several communities" in the United States where public health would



CLARA L. MAASS

be improved "if military supervision could be exercised over them as has been done in Havana." The death rate in Havana from those diseases found in all large cities had also been high, that from tuberculosis averaging more than 7 per 1,000 per year from 1890 to 1899. After a cleanup campaign that saw all houses regularly inspected and more than half "overhauled by the cleaning brigades of the sanitary department," mortality from tuberculosis fell to barely more than 3 per 1,000 in 1900, a rate lower than that in Vienna or Paris. After Major Gorgas became chief surgeon of the Department of Cuba in December 1901, he undertook a campaign to eliminate this disease from Havana entirely, although he concluded that a longer time might be required to reach this goal than had been needed to eliminate yellow fever.[66]

In 1902, as U.S. forces prepared to end officially the occupation of Cuba, Major

Gorgas was left behind to serve as "District Surgeon for troops in Cuba." His principal assignment was apparently to be the continuation of his experimental work with yellow fever and mosquitoes. When Brig. Gen. William H. Forwood succeeded Sternberg as surgeon general in early June, official support of this aspect of Gorgas' work began to wane. Concerned about the possibility of fatalities resulting from Gorgas' attempts to find out more positively exactly when yellow fever patients became infective, Surgeon General Forwood consulted Major Reed, who advised him against "assuming such risks with human life" when the basic questions about yellow fever had already been resolved. Forwood forbade Gorgas to use mosquitoes longer than eleven days after they had become infected with yellow fever because he believed that after that point the risk of "fatal infection" was great. He did permit the use of mosquitoes whose infection was more recent, but even in granting this permission, the surgeon general added that such experiments were acceptable "at least so long as no accident occurs." Gorgas interpreted Forwood's orders as forbidding all experimentation.[67]

Before leaving Cuba in 1902, Wood, who as military governor appointed Cuban civilians to run the government, named a five-man board of health to oversee the administration of public health measures in the island. Finlay, "a most lovable man," Major Gorgas believed, a physician respected for his "scientific honesty and straightforwardness," was a member. His authority was apparently limited, and in the four years before disorders in Cuba resulted in the return of U.S. military government, yellow fever reappeared and sanitation in many communities, except Havana itself, deteriorated.[68]

The incidence of yellow fever grew with the influx of nonimmunes after a new occupation force of 4,000 U.S. soldiers—the Army of Cuban Pacification—arrived late in 1906. In Cienfuegos 12 soldiers contracted the disease in the summer of 1907 and 3 died. All 12 had been working in the hospital, which took in both military and civilian patients. Charles E. Magoon, appointed as provisional governor of Cuba in October 1906, theorized in a report to Secretary of War William H. Taft that a patient in the hospital with a mild and therefore undiagnosed case must have been bitten by a mosquito that in time transmitted the disease to the nonimmunes in that facility. After noting that sanitation outside Havana had been left to local authorities who did not cooperate with efforts to maintain appropriate standards, presumably including those calling for the elimination of sites where mosquitoes could breed, Magoon concluded that the sanitation service must be managed on a nationwide basis. Although Magoon and Major Kean, his chief adviser on sanitation, were in conflict over the desirability and even the possibility of moving the drive for improved sanitation out of the political arena, Magoon turned the administrative control of sanitation on the island over to Kean and four other medical officers detailed from the Army of Pacification. A sixth medical officer was assigned to work with the provisional government on the administration of hospitals and similar institutions.[69]

Many diseases still plagued the population, among them smallpox, malaria, dysentery, and typhoid, but Magoon's primary interest was apparently yellow fever, always a greater problem for strangers to the island than for Cubans. He sent Finlay, Guiteras, and Agramonte to Cienfuegos to take control of the situation there, which they

promptly succeeded in doing, and later sent Kean and a second medical officer to join them to enforce sanitary regulations. In fiscal year 1908 a total of eighteen soldiers, thirteen of them stationed in Cienfuegos, contracted yellow fever, of whom five died. The following year, however, only one case was diagnosed in the Army. When the troops again left Cuba in April 1910, no further cases had appeared. When the provisional government was dissolved in January 1909, the management of public health on the island had been reorganized and centralized. The responsibility for sanitation in all the island's towns and cities had been taken from local bureaucracies and given to the national government, thus making the administration and financing of public health uniform throughout the island. The result was a marked drop in the rate of those diseases considered preventable, among them infantile diarrhea and tetanus resulting from unsanitary care of the umbilical cord. The Army had restored Havana to such a high level of sanitation that an American visitor to that city hardly a year after the second occupation professed himself astounded by what medical officers had achieved in ridding the city entirely of filth and insects.[70]

The good health record of the men of the second occupation force was credited largely to the fact that only Regular Army physicians accompanied them to Cuba. Medical officers had been taken from several important posts within the United States to accompany the new army of occupation, and except for the brief epidemic of yellow fever, the health of the garrisons, though still linked with that of the civilian population, was generally maintained at a high level. Malaria rates were initially higher than those in the United States, but lower than that in the Philippines, a situation that in the early months was also true of dysentery. The rates of other digestive ailments was high, although no deaths occurred as a result. An outbreak of dengue, which is carried by *Aedes aegypti*, that accompanied the yellow fever epidemic, caused no deaths and was easily distinguished from the more fatal disease. The most serious health threat throughout the period of the new occupation was typhoid fever, which appeared in localized epidemics that caused occasional fatalities.[71]

The V Corps had been defeated by malaria and the fear of yellow fever, sent into headlong flight back to the United States by the inability of the Medical Department in 1898 to prevent either disease. But even as Surgeon General Sternberg devoted considerable energy to preparing the department to deal with potential epidemics in Cuba, he ordered the department's best scientists into the battle to reduce the likelihood that U.S. troops would ever again have to face such dangers. The Army's success in ridding Cuba of yellow fever would bring fame to Majors Reed and Gorgas and the Medical Department they served. The dramatic reduction of morbidity and mortality from both yellow fever and other diseases would have far-reaching consequences for other tropical lands. The return of yellow fever to Cuba when the campaign against mosquitoes was allowed to lapse after the departure of U.S. troops only provided additional proof of the value of this approach. For U.S. medical officers, this example of what the new, scientific medicine could do would be a continuing reminder that they were no longer helpless in the face of disease.

NOTES

1. First quotation from Wilson G. Smillie and Edwin D. Kilbourne, *Preventive Medicine and Public Health*, p. 9; see also pp. 5–6, 10–13, 241. Remaining quotations from John Duffy, *The Sanitarians*, pp. 145, 190; see also pp. 80, 126, 128, 139–44, 146–54, 175.

2. Margaret Warner, "Hunting the Yellow Fever Germ," pp. 361–63; Wesley W. Spink, *Infectious Diseases*, pp. 162, 165, 241–42, 368–69.

3. Quotation from War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1899, p. 170 (hereafter cited as WD, *ARofSG*, date); Ltr, AG to Shafter, 13 Jul 1898, Microfilm (Mf) Reel 3, and Telg, Shafter to AG, 16 Aug 1898, Mf Reel 5, William R. Shafter Papers, Stanford University (SU), Palo Alto, Calif.; Marvin Fletcher, "The Black Volunteers in the Spanish-American War," p. 51; Graham A. Cosmas, "Securing the Fruits of Victory," pp. 85–86.

4. Cosmas, "Securing," pp. 85–87; War Department, *Correspondence Relating to the War With Spain*, 1:138, 179, 225, 381, 548; idem, *[Annual] Report of the Secretary of War*, 1899, 1(pt.1):12 and 1(pt.3):4, 124 (hereafter cited as WD, *ARofSW*, date); idem, *ARofSG*, 1899, pp. 163–64.

5. R. A. Ward, "The Influence of Ronald Ross Upon the Early Development of Malaria Vector Control Procedures in the United States Army," p. 208. See also pp. 207, 209.

6. The geographical units into which Cuba was divided by the occupation forces government varied with time. On 10 August 1898 the Department of Santiago was created to include all of Cuba then under U.S. control. On 13 December the Division of Cuba was created. On 17 January 1899 the limits of the Department of Santiago were redefined to include only the Province of Santiago. On the twenty-fourth the Division of Cuba was divided into seven departments: the Department of Pinar del Rio, the Department of the Province of Havana, the Department of Havana, the Department of Matanzas, the Department of Santa Clara, the Department of Puerto Principe, and the Department of Santiago. On 19 April the Departments of Matanzas and of Santa Clara were merged into the Department of Matanzas and Santa Clara and the Departments of the Province of Havana and of Pinar del Rio into the Department of the Province of Havana and Pinar del Rio. On 1 July the Departments of Santiago and Puerto Principe were merged, leaving the Division of Cuba with four departments: the Department of Havana, the Department of Matanzas and Santa Clara, the Department of Province of Havana and Pinar del Rio (often referred to merely as the Department of Havana and Pinar del Rio), and the Department of Santiago and Puerto Principe. Both the Department of Havana and Pinar del Rio and the Department of Santiago and Puerto Principe were discontinued on 23 July 1900, when the Department of Western Cuba and the Department of Eastern Cuba were established. The Departments of Eastern Cuba and of Western Cuba were discontinued on 15 November, at which point the Division of Cuba became the Department of Cuba. See WD, *ARofSW*, 1899, 1(pt.3):122–24, 300, and 1901, 1(pt.3):282.

7. WD, *ARofSG*, 1899, pp. 145–50 (quotation), 151, 169; Ltr, AG to Shafter, 5 Aug 1898, Mf Reel 4, Shafter Papers, SU; R. S. Woodson, "Smallpox in Cuba," p. 1466; Duffy, *Sanitarians*, pp. 193–203.

8. WD, *ARofSG*, 1899, pp. 5–7, 150–54, 156, 162–63 (first quotation), 164, 168, 171, and 1900, pp. 7–8, 25 (second quotation), 168; idem, *ARofSW*, 1899, 1(pt.2):363–64, 498, 505 (third quotation); Cosmas, "Securing," p. 87.

9. WD, *ARofSG*, 1899, pp. 98, 146, 151, 168–69 (quotation), and 1900, p. 174; idem, *ARofSW*, 1(pt.2):450; Valery Havard, "Sanitation and Yellow Fever in Havana," p. 18; John H. Stone, "Remarks Suggested by Three Years' Service in Cuba," pp. 330–31.

10. WD, *ARofSG*, 1899, pp. 152, 163 (quotation), 164, 173, 275–80, and 1900, p. 174; idem, *ARofSW*, 1898, 1(pt.2):376–77.

11. First quotation from Gaines M. Foster, *The Demands of Humanity*, p. 27 (see also pp. 26, 28); fourth quotation from Franklin Matthews, *The New-Born Cuba* (New York: Harper and Bros., 1899), pp. 95–96, cited in ibid.; second and third quotations from Cosmas, "Securing," p. 87 (see also p. 86); fifth quotation from Wilfrid Turnbull, "Reminiscences of an Army Surgeon in Cuba and the Philippines," p. 31. See also WD, *ARofSG*, 1899, pp. 162–65; idem, *ARofSW*, 1899, 1(pt.3):132–33, 217–18, 301, 312, and 1(pt.6):7–8; Ltr, SW to John R. Brooke, 5 Jan

1899, file 243526, Record Group (RG) 94, National Archives and Records Administration (NARA), Washington, D.C.

12. O'Reilly was honorably discharged from the volunteers on 12 May 1899, at which time he reverted back to his permanent rank of major. He was promoted to lieutenant colonel on 21 February 1900, to colonel on 14 February 1902, and to brigadier general on 7 September 1902, when he became surgeon general.

13. The position was apparently vacant in December 1899, but O'Reilly was replaced by De Witt from January to April 1900 and then by Havard, who served through most of 1901. See WD, *ARofSG*, 1900, p. 172.

14. Wood took over as military governor of the city of Santiago immediately after the city's surrender. He was commander of the Department of Santiago and its successor agency, the Department of Santiago and Puerto Principe, from October 1898 to December 1899, when he became military governor of Cuba. He remained in this position until May 1902. Wood held various ranks in the volunteers: brigadier general from 8 July to 7 December 1898 and again from 13 April to 5 December 1899; major general from 7 December 1898 to 13 April 1899 and again from 5 December 1899 to 4 February 1901, when he reverted back to the permanent rank of brigadier general. On 3 August 1903 he was promoted to major general. See WD, *ARofSW*, 1899, 1(pt.3):300, 1901, 1(pt.3):282, and 1902, 1:9.

15. WD, *ARofSG*, 1899, pp. 145–46, 162, 165–67 (quotation), 168–69, 1900, pp. 172–74, 176, and 1908, p. 127; idem, *ARofSW*, 1(pt.6):5–6, 10, 129, 362, 367–68; Hermann Hagedorn, *Leonard Wood*, 1:260; "Public Health—Good Sanitary Results at Santiago de Cuba," p. 869; Carlos J. Finlay, *Sanitary Conditions in Cuba*, p. 4; Cosmas, "Securing," p. 87; "To Select Camps in Cuba for the Army of Occupation," p. 524; J. Hamilton Stone, "Our Troops in the Tropics," p. 364; Jefferson R. Kean, "Hospitals and Charities in Cuba," pp. 141–42; Woodson, "Smallpox," pp. 1466–68; Edward S. Petersen, "The Military Surgeon in the West," p. 2.

16. WD, *ARofSG*, 1899, p. 168; idem, *ARofSW*, 1899, 1(pt.6):340 (quotation), and 1900, 1(pt.1, vol.1–pt.1):7–8.

17. J. Hamilton Stone, "Remarks Suggested by Three Years' Service in Cuba," p. 329 (quotation); Duffy, *Sanitarians*, pp. 175, 205; WD, *ARofSG*, 1899, 1(pt.6):8–9, 128–29, 360–61.

18. Leonard Wood, "Santiago Since the Surrender," p. 517 (quotation); WD, *ARofSG*, 1899, p. 171; Hagedorn, *Wood*, pp. 186, 188–89.

19. Foster, *Demands of Humanity*, p. 28 (first quotation); "Public Health—Good Sanitary Results," pp. 868 (second quotation), 869; Wood, "Santiago Since the Surrender," pp. 515–17, 524; "Yellow Fever Hospital at Santiago Closed," pp. 628–29; Stone, "Our Troops," p. 364; Hagedorn, *Wood*, 1:190, 192, 202; WD, *ARofSG*, 1899, pp. 60, 170–71; idem, *ARofSW*, 1899, 1(pt.6):8–9, 366, 827–28.

20. Dept of Santiago and Puerto Principe Cir 22, 21 Dec 1899, p. 4 (quotation), William C. Gorgas Papers, Manuscript Division, Library of Congress, Washington, D.C. (hereafter cited as Gorgas Papers, LC); Rpt, P. S. Rossiter to SG, 1 Oct 1899, box 5–5, John W. Ross Papers, Tennessee State Library and Archives, Nashville, Tenn. (hereafter cited as Ross Papers, TSLA); Hagedorn, *Wood*, 1:188–89, 192, 242; Ltr, Shafter to QMG, 22 Jul 1898, Mf Reel 4, Shafter Papers, SU; United States (U.S.), Congress, Senate, 61st Congress, 3d Session, *Yellow Fever. . .*, pp. 224, 235; WD, *ARofSG*, 1899, pp. 98, 145, 171, 240, 251–55, and 1900, p. 175; idem, *ARofSW*, 1899, 1(pt.6):15.

21. The Marine Hospital Service was the ancestor of today's Public Health Service. Its progenitor was a series of government-owned hospitals for sick and injured merchant mariners, which were organized into the Marine Hospital Service in 1798. The name of the organization was officially changed to Public Health and Marine Hospital Service in 1902. The Marine Hospital Service part of the name was dropped in 1912. See Ralph C. Williams, *The United States Public Health Service, 1798–1950*, pp. 25–32, 166–67 (hereafter cited as *USPHS*).

22. WD, *ARofSG*, 1899, pp. 257–58; Hagedorn, *Wood*, 1:243.

23. WD, *ARofSG*, 1899, pp. 254–55, 260 (quotation); Hagedorn, *Wood*, 1:242.

24. WD, *ARofSG*, 1899, pp. 254–58; Ltr, Gorgas to "My Dearest" [presumably Mrs. Gorgas], 21 Nov 1899, and Dept of Santiago and Puerto Principe Cir 22, 21 Dec 1899, Gorgas Papers, LC.

25. Havard, "Sanitation," p. 17 (quotation); William N. Bispham, "Sanitary Work in the City of Havana," p. 1094; U.S., Congress, Senate, *Yellow Fever*, pp. 237, 244; Louis A. Perez, Jr., "Vagrants, Beggars, and Bandits," p. 1103; WD, *ARofSG*, 1899, pp. 155–63, and 1900, pp. 171, 177–78; idem, *ARofSW*, 1899, 1(pt.6):361, 366; William C. Gorgas, *Sanitation in Panama*, p. 73; Ltr, AG to C. S. Walton, 10 Jun 1899, Gorgas Papers, LC.

26. WD, *ARofSG*, 1899, pp. 261–62; William C. Gorgas, "Sanitation of the Tropics With Special Reference to Malaria and Yellow Fever," p. 1075; Ltr, Gorgas to "My Dearest," 15 Nov 1899, Gorgas Papers, LC.

27. Ludlow received his second volunteer commission of brigadier general on 13 April 1899 and his regular commission for the same rank on 21 January 1900.

28. Quotation from Ltr, Gorgas to John W. Ross, 30 Dec 1899, box 3–6, Ross Papers, TSLA; Ltrs, William Ludlow to Gorgas, 31 Oct 1900, and Gorgas to Ludlow, 7 Nov 1900, Gorgas Papers, LC; WD, *ARofSW*, 1899, 1(pt.1):59.

29. U.S., Congress, Senate, *Yellow Fever*, pp. 235, 237, 244; Hagedorn, *Wood*, 1:281; Perez, "Vagrants," pp. 1096, 1103; WD, *ARofSG*, 1899, pp. 155–62; idem, *ARofSW*, 1899, 1(pt.6):15; Stone, "Remarks," p. 329.

30. First quotation from Ltr, William Ludlow to AG, Div of Cuba, 4 Apr 1900, and second quotation from Ltr, Gorgas to Ludlow, 16 May 1900, Gorgas Papers, LC. In loc. cit., see also Telg, Henry Carter to Leonard Wood, 4 Apr 1900; Div of Cuba SO 44, 3 Apr 1900; and Ltr, Gorgas to Valery Havard, 11 Apr 1900.

31. WD, *ARofSG*, 1899, pp. 245–46; Hagedorn, *Wood*, 1:213; Foster, *Demands of Humanity*, pp. 32–33.

32. WD, *ARofSG*, 1900, pp. 168–69, 176, and 1901, p. 147.

33. Ibid., 1899, pp. 162–63, 1900, pp. 170–71, 173, 176, and 1901, p. 177; Ltr, Gorgas to Ed., *NY Med Journal*, 19 Oct 1901, Gorgas Papers, LC.

34. WD, *ARofSG*, 1900, pp. 168, 170–71, 177–86; Marie D. Gorgas and Burton J. Hendrick, *William Crawford Gorgas*, pp. 87–88; Edgar Erskine Hume, *Victories of Army Medicine*, p. 96; Robert S. Henry, *The Armed Forces Institute of Pathology*, p. 129 (hereafter cited as *AFIP*); U.S., Congress, Senate, *Yellow Fever*, p. 235; Ltr, Gorgas to William Ludlow, 16 Jun 1900, Gorgas Papers, LC. Jefferson R. Kean's March 1925 editorial in *Military Surgeon* (pp. 366–70) was highly critical of the autobiography of her husband that Mrs. Gorgas co-authored. He maintained that this volume gives Gorgas credit for accomplishments that Gorgas personally never claimed and that were not his.

35. Although the official name was Yellow Fever Commission, it was popularly known as the *Yellow Fever Board*, a term that is especially useful because it differentiates this organization from the earlier Havana Yellow Fever Commission and emphasizes the similarity with the tropical disease boards of the Philippines.

36. Aristides Agramonte, "The Inside Story of a Great Medical Discovery," pp. 214–15 (quotations); Henry, *AFIP*, pp. 113–31; WD, *ARofSG*, 1900, p. 22.

37. Hume, *Victories*, pp. 93–94; Henry, *AFIP*, p. 109; Walter Reed and James Carroll, "The Prevention of Yellow Fever," p. 641; U.S., Congress, Senate, *Yellow Fever*, pp. 131–32, 136, 161.

38. Guiseppe Sanarelli, "Some Observations and Controversial Remarks on the Specific Cause of Yellow Fever," pp. 193–94 (quotations), 201; U.S., Congress, Senate, *Yellow Fever*, pp. 25, 162, 208; Walter Reed, "The Propagation of Yellow Fever," pp. 201–02; George M. Sternberg, "Yellow Fever Etiology," p. 1040; "Tropical Diseases," p. 377; Warner, "Yellow Fever Germ," p. 375.

39. Warner, "Yellow Fever Germ," pp. 374, 376–78, 381; Ms, Carlos J. Finlay, n.d., Gorgas Papers, LC; Ltr (copy), W. Reed to W. Gorgas, 27 Jun 1901, Ms C48, Walter Reed and William C. Gorgas Papers, National Library of Medicine (NLM), Bethesda, Md.; U.S., Congress, Senate, *Yellow Fever*, pp. 161–63, 208; Walter Reed, James Carroll, Aristides Agramonte, and Jesse Lazear, "The Etiology of Yellow Fever," p. 790; George M. Sternberg, "The Bacillus Icteroides as the Cause of Yellow Fever," pp. 225–28; WD, *ARofSG*, 1901, p. 181; Walter Reed and James Carroll, "A Comparative Study of the Biological Characters and Pathogenesis of Bacillus X (Sternberg), Bacillus Icteroides (Sanarelli), and the Hog-Cholera Bacillus (Salmon and Smith)," p. 216.

40. *Aedes aegypti* was then known as *Stegomyia*.

41. Williams, *USPHS*, pp. 259–60 (quotation), 261; H. R. Carter, "A Note on the Interval Between Infecting and Secondary Cases of Yellow Fever From the Records of the Yellow Fever at Orwood and Taylor, Miss., in 1898," pp. 617–36; Esmond R. Long, *A History of American Pathology*, pp. 165–66; Ltr, Reed to Gorgas, 27 Jun 1901, Ms C48, NLM; WD, *ARofSG*, 1901, p. 182; U.S., Congress, Senate, *Yellow Fever*, p. 196; Carlos J. Finlay, "Mosquitoes Considered as Transmitters of Yellow Fever and Malaria," pp. 737–39, and other articles on this topic by Finlay listed in the Bibliography. Finlay was by no means the first physician to theorize that a mosquito might be behind the transmission of yellow fever (see Sigismund Peller, "Walter Reed, C. Finlay, and Their Predecessors Around 1800," pp. 195–200), but debates about what credit belongs to whom seem to be unending and sometimes farfetched (see, for example, Francois Delaporte, *The History of Yellow Fever*).

42. The yellow fever virus was not discovered for another twenty years. See Wilbur G. Downs, "The

Story of Yellow Fever Since Walter Reed," p. 723; William B. Bean, "Walter Reed and Yellow Fever," pp. 661–62; U.S., Congress, Senate, *Yellow Fever*, pp. 9, 17, 93, 201–03; Williams, *USPHS*, Reed to Carter, 26 Feb 1901, following p. 260; Hagedorn, *Wood*, 1:326; Juan A. del Regato, "Carlos Finlay and the Nobel Prize in Physiology or Medicine," pp. 2–3.

43. U.S., Congress, Senate, *Yellow Fever*, pp. 88–89; "The Etiology of Yellow Fever," p. 461; Hagedorn, *Wood*, 1:327; William B. Bean, "Walter Reed and the Ordeal of Human Experiments," pp. 75–92; idem, *Walter Reed*, pp. 146–48.

44. First and second quotations from U.S., Congress, Senate, *Yellow Fever*, p. 99 (see also pp. 21–22, 27–29); third quotation from Martha L. Sternberg, *George Miller Sternberg*, p. 227.

45. U.S., Congress, Senate, *Yellow Fever*, pp. 25–26, 135 (quotations), 176.

46. Ibid., pp. 18, 21, 26, 210; Agramonte, "Inside Story," pp. 210, 219; WD, *ARofSG*, 1901, pp. 183–84.

47. WD, *ARofSG*, 1900, p. 22, and 1901, pp. 187, 195 (quotation); U.S., Congress, Senate, *Yellow Fever*, pp. 16, 18, 26; Agramonte, "Inside Story," pp. 221–22; Bean, *Reed*, pp. 134, 137.

48. Bean, *Reed*, pp. 126, 134 (quotation), 136–38, 141–42; Henry, *AFIP*, pp. 120–21.

49. Bean, *Reed*, pp. 126, 136–38, 141–42; U.S., Congress, Senate, *Yellow Fever*, pp. 11, 26; Regato, "Carlos Finlay," p. 4.

50. U.S., Congress, Senate, *Yellow Fever*, pp. 71, 97 (first two quotations), 210–11; Bean, *Reed*, p. 151 (final quotation); idem, "Walter Reed and Yellow Fever," p. 660; WD, *ARofSG*, 1901, pp. 187–88.

51. WD, *ARofSG*, 1901, pp. 188, 195; Sternberg, *Sternberg*, p. 223; Henry, *AFIP*, pp. 122–24; Bean, *Reed*, p. 150; U.S., Congress, Senate, *Yellow Fever*, pp. 10, 26, 70–71, 80.

52. U.S., Congress, Senate, *Yellow Fever*, pp. 10, 19, 82 (quotation), 135, 140, 163, 196, 229; Bean, *Reed*, p. 144.

53. WD, *ARofSG*, 1901, pp. 178, 188–89; U.S., Congress, Senate, *Yellow Fever*, pp. 18–19.

54. Bean, *Reed*, pp. 150–53; WD, *ARofSG*, 1901, pp. 177–78, 199–200; U.S., Congress, Senate, *Yellow Fever*, pp. 19, 22–23, 82–84, 103.

55. U.S., Congress, Senate, *Yellow Fever*, pp. 149, 158, 164–65 (quotation); Bean, *Reed*, p. 154.

56. U.S., Congress, Senate, *Yellow Fever*, pp. 81, 100–101, 181; Walter Reed, James Carroll, Aristides Agramonte, "The Etiology of Yellow Fever," pp. 431, 439–40; WD, *ARofSG*, 1901, pp. 178, 195, 200–202; Henry, *AFIP*, p. 121.

57. WD, *ARofSG*, 1901, pp. 146, 198–99, 200–202; Reed, "Propagation," pp. 203, 209; U.S., Congress, Senate, *Yellow Fever*, pp. 83, 86–87; Reed and Carroll, "Prevention," pp. 648–49; Michael D. Malison and Stephen H. Waterman, "Dengue Fever in the United States," p. 498; James D. Goodyear, "The Sugar Connection," pp. 5–21.

58. Bean, *Reed*, p. 153 (first quotation); Eugene Wasdin, "The Etiology of Yellow Fever," pp. 951–52 (second and third quotations); A. N. Bell, "Fomites and Yellow Fever," p. 303 (fourth quotation); Spink, *Infectious Diseases*, p. 156 (fifth quotation); WD, *ARofSG*, 1901, p. 179, and 1902, p. 56. Shortly before his death, Brig. Gen. Jefferson R. Kean, who worked with Reed in Cuba and who reportedly was the first case of this disease that Reed had ever seen, reported that Reed's papers disappeared from his desk after his death. He stated that one of Carroll's sons was suspected of having taken them. Although proof of this fact was never found, the son refused to deny any involvement in the theft. See folders Interview, 1950, p. 13, and Biographical Data, Curriculum Vitae, Ainsworth, Ireland, Ms C14, Jefferson R. Kean Papers, NLM.

59. Hume, *Victories*, p. 96; U.S., Congress, Senate, *Yellow Fever*, pp. 235–36; Ltr, AG to C. S. Walton, 10 Jun 1899, Gorgas Papers, LC; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, pp. 137–38; Kean, "Editorial," pp. 366–68.

60. Joseph A. LePrince, A. J. Orenstein, and L. O. Howard, *Mosquito Control in Panama*, pp. 236, 240, 243; Ltr, Reed to Gorgas, 27 Jun 1901, Ms C48, NLM; Rpt, William C. Gorgas and John W. Ross, "Methods of Destroying Adult Mosquitoes by the Sanitary Department of Havana," box 5–6, Ross Papers, TSLA; Gorgas, *Sanitation*, pp. 40–43, 56–59, 63; Bean, "Walter Reed and Yellow Fever," p. 661; idem, *Reed*, p. 169; U.S., Congress, Senate, *Yellow Fever*, p. 11; Ltrs, Joseph A. LePrince to Gorgas, 28 Jun 1901, and Gorgas to Los Sres. Inquilinos y Duenos de Casa, 25 May 1901, Gorgas Papers, LC; Bayne-Jones, *Preventive Medicine*, p. 139.

61. Quotation from Ltr, Gorgas to W. A. McLaughlin, 12 Nov 1901, Gorgas Papers, LC. In loc. cit., see Ltrs, J. A. Lopez to Gorgas, 2 Jul 1901, and LePrince to Gorgas, 2 Jul 1901. See also LePrince et al., *Mosquito Control*, pp. 252–53; Gorgas, *Sanitation*, pp. 51–57, 63–64, 93, 102–03; U.S., Congress, Senate, *Yellow Fever*, pp. 223, 235–36, 247.

62. WD, *ARofSG*, 1901, pp. 145–46; Rpt, 31 May 1899, William C. Gorgas Papers, Entry 561, RG 94, NARA; U.S., Congress, Senate, *Yellow Fever*, pp.

225–26; in Gorgas Papers, LC: Treas Dept Cir, SG, Marine Hospital Service (MHS) to Med Offs, MHS, 20 Jun 1901, and Ltrs, Gorgas to Manuel Cuevas, 19 Feb 1901, and Stanford E. Chaille to Gorgas, 27 Jan 1902.

63. Bean, *Reed*, pp. 146, 160, 168; idem, "Walter Reed and Yellow Fever," p. 662; U.S., Congress, Senate, *Yellow Fever*, pp. 19, 29–30, 150, 169; Ltr, Gorgas to AG, Dept of Cuba, 1 April 1902, Gorgas Papers, Entry 561, RG 94, NARA; Helen Tigertt and W. D. Tigertt, "Clara Louise Maass," pp. 252–53; Ltr (copy), W. Reed to W. Gorgas, 4 Sep 1902, Ms C48, NLM.

64. Ltrs, Gorgas to AG, Dept of Cuba, 6 Apr 1901, and to L. O. Howard, 29 Jul 1901, and William Binckley to Gorgas, 29 Jun 1901, Gorgas Papers, LC; U.S., Congress, Senate, *Yellow Fever*, pp. 144, 237, 247–48; WD, *ARofSG*, 1899, p. 288.

65. See many letters of congratulations in boxes 3 and 4, Gorgas Papers, LC; Bayne-Jones, *Preventive Medicine*, p. 137; Henry, *AFIP*, p. 128; Hume, *Victories*, p. 161; LePrince et al., *Mosquito Control*, pp. 4–7, 90–92; United States, Bureau of the Census, *Census of the Philippine Islands . . .*, 3:74.

66. First and second quotations from Ltr, Lansing H. Beach to Gorgas, 14 Mar 1901, Gorgas Papers, LC. In loc. cit., see Dept of Cuba GO 32, 23 Dec 1901, and Ltr, Gorgas to Henry C. Baker, 21 Mar 1902. Third quotation from Havard, "Sanitation," p. 15; see also pp. 14, 20–21.

67. First quotation from Ltr, Gorgas to "Theo," 16 Apr 1902, and third and fourth quotations from Ltrs, SG to Gorgas, 15 and 20 Aug 1902, Gorgas Papers, LC. In loc. cit., see also Ltr, Gorgas to SG, 25 Sep 1902. Second quotation from Ltr, W. Reed to W. Gorgas, 4 Sep 1902, Ms C48, NLM. In loc. cit., see also Telg, SG to Gorgas, 15 Aug 1902, and Ltr, SG to Gorgas, 20 Aug 1902.

68. Gorgas, *Sanitation*, p. 15 (quotations); WD, *ARofSG*, 1909, p. 135; idem, *ARofSW*, 1900, 1(pt.11,vol.1–pt.1):6; Order 159, Mil Gov, Cuba, 17 May 1902, Gorgas Papers, LC.

69. WD, *ARofSG*, 1907, p. 80, 1909, pp. 86, 135–36, and 1910, p. 85; Ltr, Charles E. Magoon to SW, 19 Aug 1907, Ms 5324, Entry 52, RG 112, NARA; Allan R. Millett, *The Politics of Intervention*, pp. 208–10. Kean was promoted to the permanent rank of major on 2 February 1901.

70. WD, *ARofSG*, 1908, pp. 66, 68, 1909, p. 81, and 1910, p. 85; Ltr, Magoon to SW, 19 Aug 1907, Ms 5324, Entry 52, RG 112, NARA; Gorgas, *Sanitation*, p. 15; Charles F. Craig, "The Army Medical Service," p. 425; "The Army as a Sanitary Corps," p. 425; Foster, *Demands of Humanity*, pp. 45–46; Jose Antonio Lopez del Valle, *The Development of Sanitation and Charities in Cuba During the Last Sixteen Years*, pp. 4, 20; Millett, *Politics*, pp. 208–10; Charles E. Magoon, *Republic of Cuba*, 2:440–41; in Gorgas Papers, LC: Ltr, Gorgas to "Theo," 16 Apr 1902, and Hq Army SO 91, 17 Apr 1902, and Order 159, Mil Gov, Cuba, 17 May 1902.

71. WD, *ARofSG*, 1907, pp. 80–82, 1908, pp. 66–68, 1909, pp. 80–88, and 1910, p. 85; idem, *ARofSW*, 1906, p. 33.

Chapter 10

PUBLIC HEALTH IN OTHER CARIBBEAN AREAS

Like their colleagues in Cuba, U.S. medical officers in Puerto Rico and the Isthmus of Panama tackled the public health challenges that confronted them with the confidence and enthusiasm characteristic of those in the forefront of the medical revolution. In Puerto Rico a smallpox epidemic and a mysterious, chronic, and disabling anemia afflicted much of the native population without affecting U.S. soldiers. In the Panama Canal Zone, as in Cuba, yellow fever and malaria threatened newcomers more than long-time residents. The two insect-borne diseases had for years paralyzed efforts to dig a canal from the Atlantic to the Pacific Ocean. Unlike their colleagues in Cuba and Puerto Rico, however, those attempting to improve public health in the Canal Zone worked without the backing of a military government; their chief stumbling block as they attempted to apply the methods that had been so successful in Cuba proved to be the stubborn ignorance of the first members of the Isthmian Canal Commission.

Puerto Rico

In Puerto Rico,[1] as in the other newly conquered territories, a military government initially assumed power from the departing Spanish, who officially gave up control over the island on 18 October 1898. Until 1900, when the U.S. Congress granted Puerto Rico an elected civil government with a U.S.-appointed governor, U.S. Army medical officers were responsible for the health of both the handful of small garrisons scattered about the island and the civilians. In June 1899 the Ponce hospital, which had by then been modernized with new plumbing, a refrigeration plant, and other equipment, became a post hospital to serve the city's garrison. The newly established general hospital in San Juan became the island's only general facility, where the supply depot was also located.[2]

Since the Spanish board of health had been "almost purely ornamental," physicians were confronted from the outset with the island's dirt and stench, its "filthy small huts" and overcrowded "wretched hovels." Like their counterparts in Cuba, Puerto Rican communities were "in a filthy condition." A Marine Hospital Service physician wrote in 1900 that the inhabitants of Ponce, for example, were "a class of people of no great endurance, badly infected with ankylostoma (hookworm), living in unhygienic surroundings, always on the verge of sickness." Because barracks

were located in the midst of Puerto Rican communities, any disease that threatened the civilians was a potential threat to occupying troops as well, and public health on the island became a major concern for medical officers sent to Puerto Rico.[3]

By September 1898 disease rates were increasing among the soldiers stationed in Puerto Rico. The situation was particularly frustrating to General Brooke, commanding the troops on the island, since he had insisted that high standards of sanitation be maintained for camps. He blamed his soldiers' fondness for the island's fruits—and especially the mango—for the dysentery and diarrhea from which they were suffering, and stated that his medical officers had concluded that cases originally diagnosed as typhoid were actually malaria. A month later, the medical officer sent to inspect camps and hospitals in Puerto Rico concluded that their condition was improving and that sick rates would soon be dropping.[4]

So great was the perceived danger from disease in Ponce that a U.S. Volunteer surgeon Maj. John McG. Woodbury was named sanitary inspector of the town immediately after its occupation in the summer of 1898. With the assistance of civilian physicians, Woodbury organized a board of health and immediately set to work to have streets and buildings in which troops might be housed cleaned, disinfected, and fumigated. He had silt removed from the pond that provided the city's water supply and a filter applied at the city end of the aqueduct. Since bodies were already being buried in layers in the old city cemetery, he laid plans for a new one. He had the city prison disinfected and repaired, and he ordered vaccine from the United States in order to undertake a compulsory immunization of all citizens against smallpox.[5]

Smallpox proved to be a threat to the nonimmune not only in Ponce but throughout Puerto Rico. Spanish efforts to vaccinate the population had failed, U.S. Volunteer surgeon Maj. Azel Ames noted,[6] because of the Spanish "lack of purpose . . . and vim." The two small vaccine farms that had been established by the Spanish were "nearly moribund." As a result, few Puerto Ricans had been immunized, and when the Department of Puerto Rico was created in October 1898 with John van R. Hoff, now a lieutenant colonel in the volunteers, as the chief surgeon, smallpox was still a great concern. But before Hoff could mount an all-out campaign against this disease, he had to conquer a mass of administrative confusion and disorder, since when he arrived, as he put it, "nothing was and everything had to be." He noted that "the chief surgeon's office [was] without form and void" and there was "not a record, nor a book in which to keep it, not a desk, nothing, indeed, which would furnish any information about the existing organization of the medical department or the number, names, and location of its personnel."[7]

The chief surgeon had little time to deal with the confusion, however, because by February 1899, smallpox was epidemic. More than 3,000 of the island's 960,000 population had contracted the disease since the occupation began. Any campaign against smallpox would be handicapped because, except for a military road from San Juan to Ponce "and three more short pieces, there [was] not a good road on the island," and thus the many communities scattered about the countryside were virtually inaccessible. Moreover, since Puerto Ricans were generally fatalistic about the disease, they tended to conceal their sick rather than risk having them removed from their homes

and families, rendering the management of the epidemic still more difficult.[8]

To deal with the rapidly growing number of cases of smallpox, at Hoff's suggestion, orders were issued in January 1899 that all inhabitants of the island who were not already immune be vaccinated under his supervision. The island was divided into five areas of approximately 200,000 population and a medical officer assigned to each to manage the vaccination program. Since guaranteeing that shipments of vaccine from the United States would arrive with the virus still effective was almost impossible, providing sufficient fresh vaccine to immunize the island's population presented a considerable challenge. The responsibility for producing vaccine on the island fell to Major Ames, who was already managing a new vaccine farm, where 1,240 head of healthy young cattle were being tested for tuberculosis so that this disease would not be spread to those being inoculated for smallpox. Medical officers hoped to produce and send out to the vaccinators in the field 15,000 "points" (single dose containers of vaccine) each day. To do so, the farm's manager had to battle the screwworm, a constant threat to the health and vigor of the cattle. In addition, Army doctors had to obtain pack animals, the proper packaging to keep the points sufficiently cool during transportation to prevent the deterioration of the vaccine, and "foot-runners" to take the material into the more isolated communities. Medical Department efforts resulted in the production of a vaccine that proved to be more than 87-percent effective and in the delivery to the vaccinators of quantities sufficient to protect the entire island.[9]

Hoff, who by this point had returned to his permanent rank of major, described dealing with the epidemic as "an immense task and possible only through military agency." To immunize the entire population of the island, he, like Major Woodbury, worked closely with Puerto Rican authorities. He asked native leaders to appoint local physicians to do most of the vaccinating and to provide the necessary clerical support, the storage, and the runners to carry the vaccine. Those doing the vaccinating had to be impressed with the necessity for washing their hands frequently with soap, water, and a nail brush, and then soaking them in a bichloride solution. They also had to be trained to wash each arm with soap, water, and a bichloride solution before breaking the surface of the skin for the vaccination. U.S. contract surgeons were hired, as necessary, to complete the team, and the Army provided much of the equipment. Since hospital stewards who served as attendants, recorders, and disinfectors at the various vaccination stations assisted the medical officer in charge of each area, the release of many hospital corpsmen from the Army shortly after the end of hostilities made the campaign against smallpox more difficult and more costly; many of these experienced technicians then had to be hired as civilians at twice their Army salaries. Fortunately, frightened by the mortality the disease produced and its rapid spread and possibly inspired by the efficiency with which the Americans were conducting the work, the Puerto Ricans cooperated with the vaccination campaign. By 30 June 1899, 800,000 men, women, and children had been vaccinated. From that time on, all civilians on the island over the age of six months were required to be immunized against smallpox, and local government authorities were ordered to deny access to schools, theaters, and public transportation to all who had not undergone the procedure.[10]



BAILEY K. ASHFORD

Major Hoff decided early in 1899 that a board of health for the entire island should be created to oversee public health throughout Puerto Rico and to receive reports from the local boards of health. On 29 June 1899, with the immediate crisis at an end, Hoff was free to serve as president of the new body, which also included a Marine Hospital Service surgeon, a U.S. Navy surgeon, and three civilian physicians. One of the civilians, a public sanitarian with many years of experience in the field, became its permanent secretary. Within six months the board had appointed sanitary inspectors for the Department of Puerto Rico's two districts,[11] set up a laboratory to check food supplies, organized vaccine stations, started collecting health statistics, and published bulletins concerning various important diseases. It had also established license examinations for physicians, pharmacists, midwives, and nurses, and created a code of sanitary regulations. The board remained in existence until May 1900, when the territorial governor and executive council appointed by the United States joined an elected assembly to rule the island and the military government in Puerto Rico came to an end.[12]

The board apparently did not take particular alarm from the presence in Puerto Rico of a mysterious chronic anemia, often referred to as "tropical chlorosis," that subtly undermined the health of the population and had been traditionally and variously blamed on malaria, inadequacies in the diet, the climate, and "unsanitary habits of life." It regarded the problem as "a severe check to the physical and moral development" of the Puerto Rican population, but several years passed before the riddle was solved. The 26-year-old Lt. Bailey K. Ashford, although aware since his days as a student of Dr. Charles W. Stiles at the Army Medical School that the hookworm could cause anemia, nevertheless did not initially suspect this parasite, which apparently was not prevalent in Cuba. He had noticed, however, not long after his arrival on Puerto Rico with General Miles that many natives were abnormally pale and suffered from indigestion, edema, and general debility.[13]

No serious effort to discover the cause of the mysterious anemia was made until the summer of 1899, when the deteriorating health of the victims of a violent hurricane stimulated Lieutenant Ashford's interest. The storm killed more than 2,200, seriously damaged the hospital at Ponce, and so thoroughly devastated the banana and plantain crops vital to the diet of that island that the United States was at one point feeding as many as 183,000 Puerto Ricans a day. Ordered to establish a field hospital for the victims of the storm, Ashford discovered during the six months it

was in operation that the generally poor condition of his patients frustrated his best efforts to restore them to a state of health and vigor. In the last half of the year 28,700 died because of anemia and dysentery alone. The city of Ponce was "having an epidemic death rate without an epidemic," and Ashford concluded that some common disease or condition must underlie the failure of his patients to thrive.[14]

Lieutenant Ashford's attempts to solve the riddle first led him to examine the blood of the victims of the mysterious disease. The abnormal proportion of one type of white cell that he found triggered vague memories of having heard of a similar condition caused by internal parasites. While following up on this idea, he discovered on a fecal slide "four fluffy gray balls" resembling the eggs of a parasite that had been found in anemic Italian workers some time before. A patient heavily dosed with thymol expelled what Ashford later described as "a family of tiny worms" that differed from the European hookworm principally in having "no front teeth." Since both types of hookworm caused the same symptoms and responded to the same treatment, Ashford, working with Dr. Stiles, then on the staff of the Marine Hospital Service, determined that the new parasite was closely related to the European variety.[15]

Discovering the cause and cure of hookworm disease (uncinariasis) proved easier than launching a successful campaign to eradicate it from the island. The hookworm larva penetrates the skin and migrates to the small intestine. Since many inhabitants of the island worked barefoot in soil that was infected and reinfected by victims who relieved themselves in the fields where they were harvesting coffee, uncinariasis afflicted many inhabitants of the rural areas. Lieutenant Ashford's research suggested that perhaps as many as 80–90 percent of those whose work brought them into contact with the soil fell victim to the disease and that in the fiscal year 1901 more than 11,000 died as a direct or indirect result. Hookworm disease severely undermined the health and stamina of as many as 70 percent of those who survived, leaving many victims mere "ghost-like invalids," weakened by anemia and often suffering from diarrhea, headaches, listlessness, depression, and, sometimes, such complications as an enlarged heart. Although this problem adversely affected the island's economy as well as its population, Ashford was initially unable to gain the wholehearted support of Puerto Rican authorities for his work and, as a result, progress in dealing with hookworm disease was very slow.[16]

Sanitation in the island remained extremely poor, raising the question of whether the Puerto Ricans should be left to manage the problem by themselves when the civilian government took control. Although Lieutenant Ashford returned to the United States in 1900, the Army reassigned him to the island in 1902, when he was promoted to captain, to care for troops stationed there, and thus he could resume his efforts to inspire Puerto Ricans to fight the disease that was devastating the population. Ashford, who had married a native Puerto Rican in 1899, addressed local medical associations in Spanish. His reputation as a Spanish scholar enhanced his influence. The Puerto Rican Board of Health created by the new government made his report on hookworm disease into a circular and sent it out to local physicians and pharmacists. His growing affection and respect for the Puerto Rican people no doubt made it easier for him to work with them. In 1904 the

governor appointed Ashford, Public Health and Marine Hospital Service physician Walter W. King, and Pedro Gutierrez Igaravidez, a Puerto Rican physician whom Ashford came to regard highly, to a commission to undertake a campaign against hookworm.[17]

Ashford became convinced that the best approach to the hookworm problem would involve the treatment of all affected, a campaign to educate all Puerto Ricans on the nature of the disease and the way in which it was spread, and the careful, tactful application of laws against what he politely called "surface pollution." He also pointed out that eliminating the disease from the island would contribute significantly to its economy by making its workers more efficient. Ashford and those who worked with him cured approximately 22,000 in the first eighteen months, but he believed that Puerto Ricans should run their own affairs and was confident that many native physicians were capable of serving on the commission. In 1906, at Captain Ashford's urging, Gutierrez became head of what now became the Permanent Commission for the Suppression of Uncinariasis in Porto Rico. Commission members were all Puerto Ricans, but the Army detailed Ashford to assist in the anti-hookworm effort, which continued despite the administrative changes. As many as 89,000 patients were treated in a year at the height of the campaign, but many more were yet to be reached. Dispensaries for the victims of this parasite were scattered over the island, numbering thirty-five by mid-1908 and eventually reaching fifty-nine.[18]

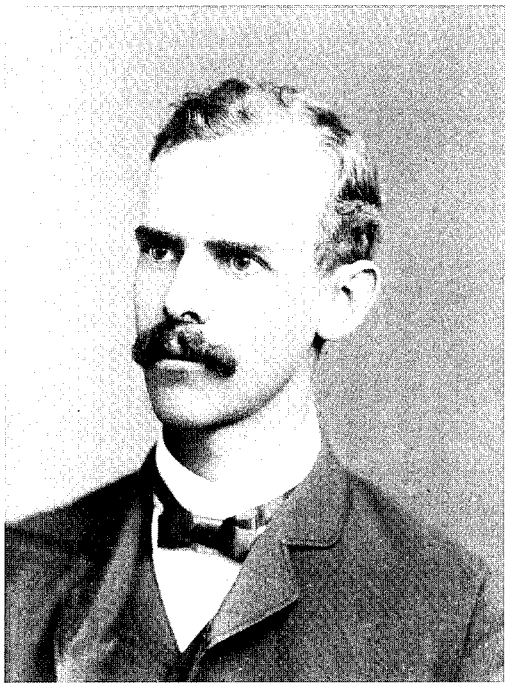
When, after some confusion, the U.S. Congress established a health service for Puerto Rico in 1911, the governor wished to have Ashford, now a major, serve as its head, but the judge advocate general ruled that Ashford could function only in an advisory capacity. Although the new Board of Health appeared at times less than eager to take Ashford's advice, he apparently felt committed to the island and its welfare in spite of his frustration. The Army relieved him of his military duties so that he could assist the Puerto Ricans, and since he obviously expected to remain for a long period on the island, he opened a private practice to help support his family. To his delight, the Puerto Rican legislature rewarded his efforts in 1912 by creating the Institute of Tropical Medicine and Hygiene that he had long sought. Through it, he was able to establish a teaching program for sanitary inspectors and to undertake research expeditions to study the island's diseases.[19]

Major Ashford's work had a significance that went well beyond the bounds of one island. The exact extent of his influence upon subsequent hookworm campaigns is debatable, but Ashford's "initiative" was responsible to a significant degree for the campaign against this disease in the southern United States and for that of the Rockefeller Institute. Research undertaken by medical officers in the United States now began to suggest that hookworm was also present in many recruits from southern states. In the Deep South as in Puerto Rico, the soil rarely froze far enough down to kill the hookworm's eggs. When the Army began checking recruits from the South for hookworm, medical officers discovered that 16 of the first 19 they examined at Fort Slocum, New York, were harboring the parasite. Further studies confirmed the finding that as many as 85 percent of recruits from the South had hookworm. Ashford's research concerning uncinariasis encouraged many other scientists, including those whose work to eradicate the parasite

on a worldwide basis was financed with Rockefeller funds.[20]

Still other diseases endangered the health of the island. With the hookworm problem under control, Ashford turned his attention to the problem of sprue, a tropical disease whose cause is still unknown. Sprue affected the digestion, causing diarrhea and leading to debilitation. He proved to his own satisfaction that the disease was not, as another researcher had suggested, caused by the fungus then known as *Monilia albicans* (*Candida albicans*). He noted that he had found a new species of *Monilia* in bread eaten in the area of Puerto Rico where the disease appeared to be endemic and speculated that this organism might be the cause of tropical sprue. Although by 1915 he had concluded that the increase in the number of cases had placed this disease "in the very front rank of the serious and fatal affections of our islands, especially dreaded by American residents," he was, like the scientists of the 1990s, unable to determine the exact cause.[21]

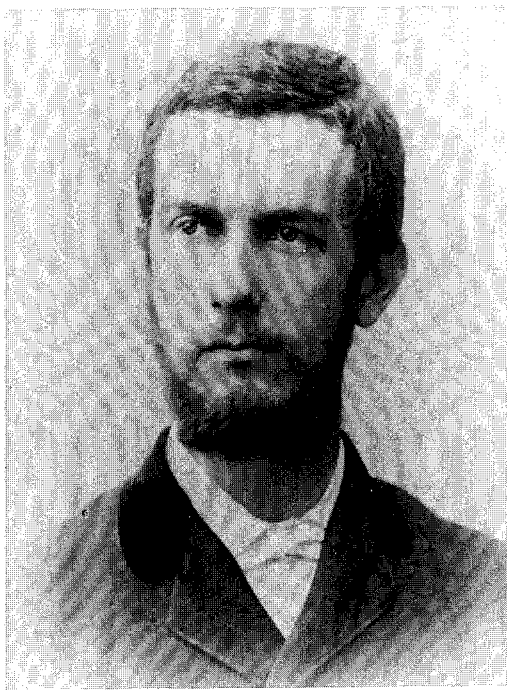
Among other diseases in Puerto Rico, yellow fever was not a significant problem, although a few cases might be seen in the course of a year. Brucellosis, or Malta fever, may have been endemic, and Ashford estimated that as many as 10 percent of the Puerto Ricans were suffering from filariasis, caused by a tiny internal parasite that could not be eradicated without the elimination of the mosquitoes that carried it. These ailments did not cause any great alarm, but when cases of bubonic plague were reported in San Juan in 1912, the Army created a special duty team to fight the disease. Lt. Col. Jefferson R. Kean and two other medical officers hastened to the island, accompanied by three hospital corpsmen and a field laboratory. By the time they arrived, 22 cases had been reported on the island. Although examination of dead rats picked up in the area revealed that only a small percentage was infected, the sampling could not indicate specifically how widespread the problem was. After less than two weeks, the effort against the dreaded disease was well under way, and the Army turned the laboratory over to Public Health Service physicians, who completed the campaign.[22]



JEFFERSON R. KEAN

Panama Canal Zone

Health problems in the Panama Canal Zone on the western shores of the Caribbean resembled those in Cuba more than those in Puerto Rico. Its primitive environment, where, as one physician put it, "eternal summer reigns and the diabolical mosquito goes on propagating descendants," made insect-borne disease a diffi-



WILLIAM C. GORGAS

cult enemy to conquer. Although interest in enabling ships to sail from the Atlantic to the Pacific without facing the dangers and delays of Cape Horn had taken root in both the United States and Europe decades before the Spanish-American War, yellow fever and malaria had been a major frustration to those trying to construct such a passage. During the eight years the French spent on the canal until they abandoned it in 1889, diseases endemic to the jungles of Central America had killed more than 20,000 men, representing as many as one-third of the workers brought in to handle the construction. Moreover, these deaths had come with terrifying promptness. Reportedly, 75 percent of the newcomers died within three months of their arrival, most often from malaria, regarded by some as "the commonest and most fatal disease"; yellow fever; or the several forms of dysentery prevalent in the area. The anonymous author of an article in the *Medical Record* for 1903, well aware of the role played by mosquitoes, raised the question of whether Asian workers on the canal might carry yellow fever from Panama back to Asia, where it had never been found.[23]

Having defeated yellow fever in Havana, Major Gorgas hoped for a new challenge. Still in Cuba in April 1902, he unhappily wrote a colleague: "My *canal scheme* does not seem to be materializing and [it] looks now as if I would have to settle down to post life again." Eager for a chance to apply the techniques the Army had developed in Cuba to Panama's "damp, tropical jungle, intensely hot, swarming with mosquitoes, snakes, alligators, scorpions, and centipedes; the home, even as Nature made it, of yellow fever . . . ," he urged that he be named to any commission chosen to oversee such a project. Encouraged by, among others, General Wood and Surgeon General Sternberg, who recommended that Gorgas be put in charge of sanitation when canal work began, he familiarized himself with the antimalarial efforts of the French at Suez while in Egypt attending a professional meeting and later studied the few records relating to their canal work that were available in Paris.[24]

Only in the spring of 1904, however, did Gorgas, now a colonel,[25] at last find himself on the brink of the challenge he had sought. The treaty granting the right to build the canal required the United States to assume responsibility for sanitation in both Panama City and Colon, communities outside the ten- by forty-five-mile Canal Zone and under the control of the Panamanian government, as well as in the Canal Zone itself. But, in spite of pressure from the American medical community, Gorgas was not appointed to the new Isthmian Canal Commission that President

Theodore Roosevelt named on 3 March, which would serve under War Department control. Named to the commission early that year were five civilians and two military officers, none of them physicians. Colonel Gorgas, Navy surgeon John W. Ross,[26] and Army surgeon Maj. Louis A. LaGarde were asked to accompany the commission on its first tour of inspection.[27]

Gorgas and the Opposition

Colonel Gorgas and his team soon found that they were working under a significant handicap. The commissioners lacked all respect for the research of Walter Reed and the Yellow Fever Board, an attitude that some members of the medical profession still shared. In spite of Gorgas' achievements in Havana, they rejected the notion that mosquitoes spread yellow fever and malaria. In an area where even the largest communities had neither sewers nor safe water supplies, they believed that cleanliness was the obvious answer to the problem of disease. Brig. Gen. Robert M. O'Reilly, who replaced Surgeon General Forwood on 7 September 1902 and who greatly admired Gorgas and his work in Havana, warned the commission that "a knowledge of Sanitary Engineering [was] not sufficient" for dealing with the problem of preventing disease among those working on the canal, but his admonition failed to impress them. The order that formally assigned Gorgas to the position of chief sanitary officer of the Canal Zone in June 1904 made him subordinate not only to his military superiors but to the commissioners as well. His insistence upon delaying the traditional cleanup to concentrate upon ridding the area of mosquitoes made his relationship to his immediate superiors awkward from the outset.[28]

Gorgas' medical team, like Hoff's Puerto Rican health board, came from the Army, the Navy, the Public Health and Marine Hospital Service and, most often, from civilian life. Many had worked with Gorgas in Havana. Ross became director of hospitals in the Canal Zone and Major LaGarde superintendent of the area's major hospital, a facility at Ancon originally built by the French. Henry Carter of the Public Health and Marine Hospital Service, whose research about the incubation period of yellow fever had been so valuable to the Yellow Fever Board, became chief quarantine officer. The Medical Department played a major role in "the sanitary regeneration of the Isthmus of Panama," since a total of six Army medical officers were detailed to public health work there. In recognition of the importance of their work, their salaries were markedly higher than those they drew in their regular assignments. Gorgas, who normally earned only $4,950 from the Army and would have received a 20-percent increase for tropical service, was paid $7,500 a year, a sum later increased to $10,000.[29]

Colonel Gorgas, Ross, and Major LaGarde organized the Department of Health for the Canal Zone.[30] Together with Joseph Le Prince, the chief sanitary inspector, who had been responsible for the destruction of mosquitoes in Havana and who arrived in Panama with them in June 1904, they formed the board that ran the new department. Many of those who served under them were contract physicians brought in from the United States, although a few additional Army, Navy, and Public Health and Marine Hospital Service officers held responsible positions in the Canal Zone as well. Among the U.S. physicians were hos-

pital interns, who received $50 a month for a year's service, in addition to transportation to and from one of the principal ports in the United States. Should they wish to remain longer, they were given contracts that paid them salaries smaller than those given Army contract surgeons. Trained female nurses were also brought in under three-year contracts and paid $50 a month for their services.[31]

Colonel Gorgas' problems began the moment he took up his duties as chief sanitary officer, bearing the ultimate responsibility for the care of the sick, street cleaning, and garbage collection, as well as for campaigns against mosquitoes. Supply caused him "insuperable difficulties," since little of what he needed was available in Panama and those in the United States responsible for supplying him were "slow in getting organized." The commissioners rarely left the United States to visit the Canal Zone, but they monitored its expenses from afar. Although they promptly authorized the creation of a research laboratory to be staffed by experts provided by Dr. Welch of Johns Hopkins and also allowed that facility to spend freely, Gorgas found it difficult to obtain even such basic items as screens and disinfectants. Economy was uppermost in the commissioners' minds, and many of his requisitions were for items they did not regard as necessary.[32]

The preoccupation with minor expenses was endlessly frustrating. Colonel Gorgas' attempts to have more men sent out to help him were also thwarted. Even after he returned briefly to Washington to plead his cause, he was ordered to hire his inspectors locally. The relationship between the commission and the medical team was so poor that, during a rare visit by some of the commissioners to the Canal Zone, Major LaGarde reportedly took his revenge on one, who was known to be particularly terrified of yellow fever. While this particular commissioner was inspecting a wharf, LaGarde made sure that six elaborate coffins were on prominent display. When asked why the six were so obviously more expensive than others being unloaded, LaGarde reminded him that one of the seven commissioners had not made the trip to Panama on this occasion.[33]

Ghoulish humor did not help to convince the commissioners that an anti-mosquito campaign would reduce the threat of disease faster than the removal of filth. They undoubtedly felt vindicated, when, months after Colonel Gorgas initiated his effort against disease but before serious work to clean the towns had started, an epidemic of yellow fever erupted. Gorgas was using the same approach to eradicate yellow fever in the isthmus as had been applied in Cuba. Since Panama City was less than one-tenth the size of Havana, it seemed obvious that if his solution to the problem were valid, he should have been able to prevent a reappearance of the disease. But 90 percent of the mosquitoes in Panama City were *Aedes aegypti*, while only 5 percent of those in Havana were capable of spreading yellow fever. Moreover, although Havana was much larger than either Panama City or Colon, the area involved in Havana was small, U.S. authorities completely controlled the government, and few restrictions were placed on expenditures. Gorgas' failure to duplicate his earlier success promptly was taken by those who did not understand the problem as proof that mosquito-hunting was a waste of time and that he had erred in delaying the Canal Zone cleanup.[34]

Only scattered cases of yellow fever developed among the foreigners in the Canal Zone before November 1904, but as the number slowly but inexorably increased in

spite of Colonel Gorgas' efforts, the lack of confidence in the chief sanitary officer grew. After a personal visit to Panama late in November, Secretary of War Taft joined the opposition. Shortly thereafter, however, Dr. Charles A. L. Reed, an outspoken former president of the American Medical Association and a close friend of Taft's, also visited the Canal Zone. His purpose in coming was concealed from the public, but he had been sent by Taft to investigate the situation there. His impressions of the management of sanitation and health there led him to mount an attack on the commission so vigorous that even Gorgas wished it had been "written more temperately." After examining the situation in the Canal Zone for fifteen days, Reed concluded that "very much has been accomplished in the way of sanitation under exceedingly adverse circumstances; that much remains to be done which can not be done unless better facilities are afforded; and that very much more ought to be done and would have been done if the facilities had been properly furnished." Reed maintained that the earliest plans for the Canal Zone had called for the chief sanitary officer to operate with considerable independence but that Gorgas had been made subordinate to layer upon layer of others, "subordinated in fact in the seventh degree from the original source of authority."[35]

Many of those through whom Colonel Gorgas had to work were ignorant of the problems that he had been asked to solve and upon which he was an authority. The commission, Dr. Reed reported, ignored or pushed aside Gorgas' suggestions and requests, one commissioner responding to a request for more latrines to improve sanitation with comments extolling the efficiency with which hogs and buzzards disposed of night soil. Since the commission insisted upon taking direct responsibility for the most minute matters and since many questions were "taken under advisement," decisions of any kind were extraordinarily slow in coming. Reed also noted that Gorgas' people were not even permitted to determine the suitability of the items available to fill their requisitions, which were handled by a tortuous and time-consuming process under the supervision of a purchasing agent "notoriously ignorant" of their needs.[36]

While Colonel Gorgas was enduring the turmoil of politics and personalities and the blame for the growing epidemic, he was also profoundly worried about his wife, whose health had been of concern for many months before their arrival in the Canal Zone. With her husband facing the greatest challenge of his career, on 17 January 1905 Marie Gorgas was forced to leave the Canal Zone for the United States to undergo a series of major operations that would eventually include two radical mastectomies, the removal of both ovaries, and "an X ray course in New York." Apparently at Marie's urging and despite his instinct to "throw up the whole job" to be with her during her ordeal, Gorgas remained at his post, telling himself that "in two or three weeks" he would "have yellow fever here under control" and be able to join her in Philadelphia for the second round of surgery. Time proved that while Gorgas' appraisal of the epidemic was tragically overoptimistic, Marie's "good hope of ultimate recovery" was justified. She lived to play the widow's tragic role in Gorgas' magnificent funeral in the summer of 1920.[37]

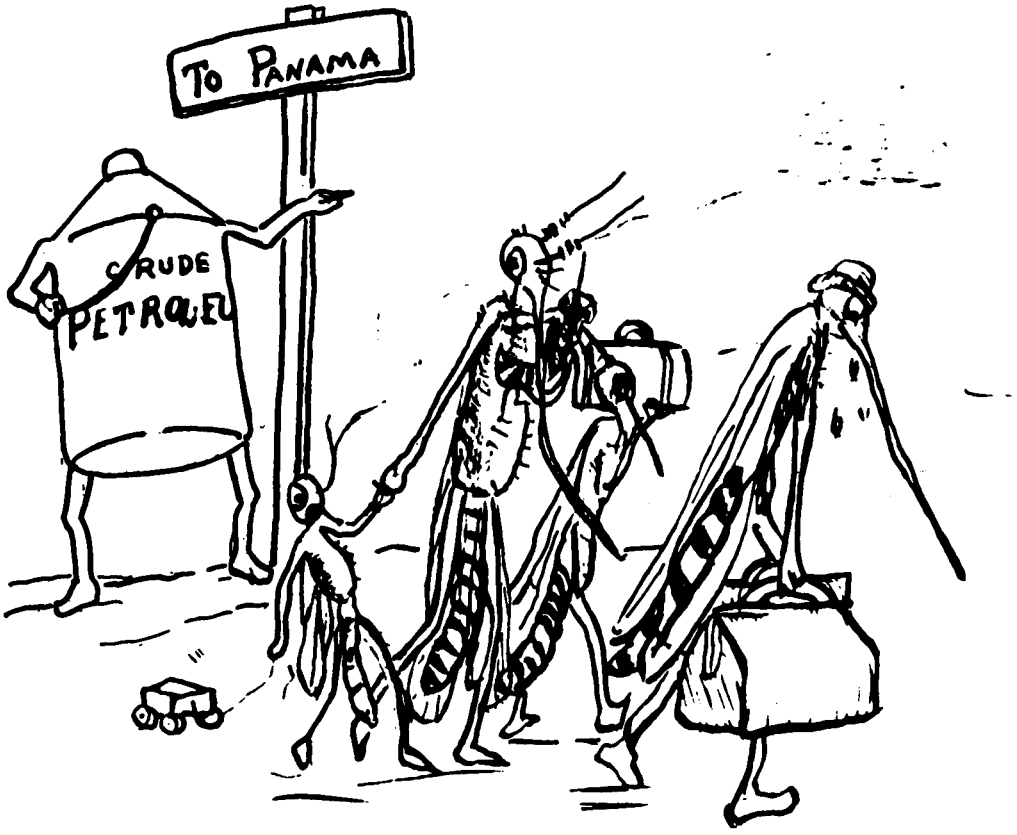
Leaders in Washington realized that the Canal Zone was not being well managed, but no solution to the difficulties encountered there was immediately forthcoming. Dr. Reed's obvious "personal animus" and

his "often extreme and somewhat flippant remarks" diminished the impact of his message. Although Colonel Gorgas concluded that the concept of rule by commission was inherently flawed, "seven men [being] too many to do executive work," Surgeon General O'Reilly believed that while "the Commission are going to have trouble," Gorgas might "go down with them." When changes were finally made in the management of Canal Zone affairs, Gorgas retained his position, but the commission concept was not abandoned. To achieve greater efficiency, President Roosevelt named three of the members to an executive commission, relegating the remaining four to a figurehead position. The administrative departments involved in managing the Canal Zone were divided up among the three members of the executive committee. The "high-minded and honorable men" who replaced the first commission in March 1905 proved to be almost as skeptical about the role of mosquitoes in the spread of disease as their predecessors. They did move to alleviate delays in obtaining medical supplies by arranging for the Medical Department to provide essential items and to be responsible for meeting Canal Zone requirements in the future. Thus, according to O'Reilly, the process of handling the area's needs was "rescued from confusion and delay." [38]

The epidemic's continued spread throughout the spring of 1905 did not improve the relationship of Gorgas and the new officials. By April several high canal officials had died of yellow fever. Piles of coffins appeared at railroad stations. Panic grew, spread in the United States by the tales of those fleeing the Canal Zone. Many deaths resulting from other causes were blamed on yellow fever. From April through June 500 fearful Americans working on the isthmus fled home, and when the canal's chief engineer joined them at the height of the epidemic, rumors became yet more desperate. Fortunately, by summer Gorgas' efforts to eradicate yellow fever in the Canal Zone were beginning to show results. June's 112 cases were followed by only 42 in July, and at last fears began to subside.[39]

Although the worst of the epidemic was behind him and he could hope that yellow fever would no longer threaten the Canal Zone, its history continued to haunt his thoughts. "The moonlight & the royal palms & the great Pacific are outside as quiet as the grave," he wrote one October evening in 1905, "& in the shadows of my room I can hear the rustle of the ghosts, along the edges of the light cast by my lamp, of the dozens of gallant French engineers who gave up their lives in their gallant fight down here. . . . I suppose more gentlemen have died of yellow fever in this building than in any other building now standing in the world." What would be the last case of yellow fever to originate in Panama City occurred not long after he penned this letter, but from 1 July 1904 through 31 January 1906, 64 of the 246 who were stricken joined the spirits in the dark corners of Gorgas' office. Only when he was sure that a case contracted in Colon in May 1906 was the last for the Canal Zone could Gorgas hope that the arrival of hordes of canal workers would not increase the volume of the rustle in the shadows and that his ghosts could rest in peace at last.[40]

New cases of yellow fever were still appearing when the newly appointed Canal Commission concluded that Gorgas and his supporters would have to go. After consulting Dr. Welch and Alexander Lambert, a personal friend and a physician, both of whom gave Gorgas their unqualified support, President Roosevelt ordered the com-



CARTOON BY GORGAS

mission to cease its opposition and cooperate fully with Gorgas. The chairman of the Canal Commission accepted this decision so wholeheartedly that he made Gorgas' organization into an independent bureau reporting directly to him. When yellow fever had been defeated in the Canal Zone, the president officially visited Panama in November of 1906 and, upon his return to the United States, made a speech in which he devoted much of his message to the praise of Gorgas and his accomplishments.[41]

Fighting Disease

In his campaign against disease in Panama, Colonel Gorgas relied on the same approach that he had found so successful in Havana. His first effort was directed against *Aedes aegypti*, the carrier of yellow fever. He divided the affected communities up into districts, placing in charge of each a Panamanian sanitary inspector familiar with the life cycles of the various types of mosquito. Every inspector had 20 to 100 workers under him and was responsible not only for inspections but also for the "actual direction and supervision of work for the extermination of mosquitoes and a general cleaning of premises and places and the disposal of night-soil and waste." Gorgas knew from the outset that because early diagnosis of yellow fever was difficult, it would be impossible to keep mosquitoes from biting victims during the first days of

their disease, when they were infective. He had some hope that the screens would keep mosquitoes from infecting the healthy and recommended for each house the construction of a screened veranda in which there was only one entrance. Very limited success greeted this aspect of his campaign, however, although many frame buildings were U.S. government property.[42]

The campaign against the sociable *Aedes aegypti* was concentrated in the larger communities, especially Panama City and Colon. Since Panama City was so much smaller than Havana, Colonel Gorgas decided that a house-to-house fumigation campaign to kill adult mosquitoes would be feasible. When yellow fever appeared in spite of a month of effort, he had his men repeat the process twice more. In a year Gorgas' teams consumed 300 tons of sulfur, 120 tons of insecticide, and the entire supply of newspaper they had acquired to seal openings in houses undergoing fumigation. To deal with the larval form of the insect, Gorgas launched another massive campaign. Teams drained standing water and, where this was not feasible, poured oil over the water to smother the larvae and covered containers, such as cisterns, with a screen. They even emptied pitchers and jars. As the more obvious breeding places of the *Aedes* were eliminated, inspectors filled and set out containers of the kind *Aedes* preferred to tempt the frustrated insect to lay her eggs in locations where they could be easily found and destroyed.[43]

A particularly severe yellow fever problem surfaced at the large hospital at Ancon in the suburbs of Panama City. Colonel Gorgas' investigation revealed that this facility, known for its "picturesque and delightful location," its gardens, its cleanliness, and its high yellow fever rate, had become a breeding place for the *Aedes* partly because of the care of its staff, rather than in spite of it. Nurses desiring to spare their patients the torment of ants that invaded the hospital placed the legs of each bed in small saucers of water, and even gardeners hoping to spare their plants damage from insects placed "hollow earthenware rings of semi-spherical section around each plant." These containers had become breeding places for the *Aedes*, a situation akin to one encountered by Major Reed in Cuba, where he had found mosquito larvae in cans placed under table legs to thwart invasions of ants. As a result, many patients hospitalized at Ancon with other health problems contracted yellow fever. Gorgas and Major LaGarde, who was directly in charge of this facility, had the saucers removed, the buildings screened, and the gardens cut down, to be replanted only when the mosquitoes of the area had been eliminated. Thereafter, any troublesome ants were followed to their nests, which were then poisoned, and the dishes of water were never again needed. Mosquito netting over the vehicles taking patients to Ancon prevented the infection of more mosquitoes and thus the further spread of yellow fever. At Ancon as elsewhere, Gorgas' campaign against the *Aedes* was, in time, successful.[44]

In spite of the vigor with which he fought yellow fever, Colonel Gorgas personally regarded malaria as an even greater threat to the health of canal workers, a belief others shared. Malaria, and particularly the more severe falciparum form of the disease, was so common in the Canal Zone that many older members of the population had gained a partial immunity to it. Since they carried the disease even though they had no symptoms, they became, in the words of one physician, "walking laboratories for the propagation of the plasmodia." When

at the end of 1905 Gorgas extended the anti-mosquito campaign to include the malaria-carrying *Anopheles*, he had to use a somewhat different approach. Although these insects were plentiful at night, even within the hospital where research was taking place, unlike the *Aedes*, they were "peculiarly a country mosquito." They favored wet grassy areas or fresh water well supplied with algae, both of which were plentiful in the Canal Zone, where an estimated 14,000 people lived between Colon and Panama City.[45]

Nevertheless, to some degree Colonel Gorgas' campaign against the *Anopheles* resembled that against the *Aedes*. He urged the screening of the boxcars in which some workers lived. Wherever possible, he had accumulations of water drained and water that could not be drained treated with a larvacide or covered with oil. Brush and grass and, when necessary, gardens were cut down. Because even wagon tracks and hoof prints could hold water long enough for a brood of *Anopheles* to mature, the eradication of this insect throughout the Canal Zone would obviously be an enormous undertaking. Since *Anopheles* mosquitoes did not usually fly far during their life cycle, Gorgas concluded that it would be feasible to concentrate his efforts within a radius of 200 yards around human habitation.[46]

Colonel Gorgas placed Le Prince, his chief sanitary inspector, in charge of the new campaign and provided him with three assistants and a clerical staff. He then divided the countryside into seventeen sanitary districts and assigned an inspector to each district to supervise the work of the forty to fifty laborers who dug drainage ditches and carpenters who installed screens. A district physician was also appointed to keep both the central office and the district inspector informed about the number of cases of malaria he encountered each day. Gorgas required that all anti-mosquito work be done in an inspector's presence and under his control, since the "ordinary engineer has no special knowledge of the life history of the mosquito," and therefore might not understand how to design and place drainage ditches to achieve a maximum beneficial effect. The drainage system eventually included 5 million feet of open, 1.5 million feet of concrete-lined, and 1 million feet of rock-filled ditches, plus 1 million feet of drain tile, all to drain 100 square miles of land. After discovering that grass tended to clog open ditches and that debris could dam concrete-lined ditches, Gorgas decided to rely more heavily on subsurface drainage tile. Because the *Anopheles* favored slow-moving water, he had vegetation removed from an entire mouth of a river to increase its flow. Gorgas also had the channel deepened and narrowed and the banks lined with stone. Leaving little to chance, when he learned that small fish, lizards, and even spiders could take a high toll in mosquito larvae, he had these natural predators bred and introduced into streams and areas of lush plant growth to increase still further the devastation among the mosquito populations.[47]

Because destroying all infected mosquitoes in the entire Canal Zone was impossible, the fight to reduce malaria rates required eternal vigilance and considerable ingenuity. Any time a district physician reported a significant rise in the number of malaria cases, Le Prince was required to send experts to assess the situation and pinpoint the cause of the increase. Sometimes it was determined that the mosquitoes were breeding in a swamp too large to be dealt with by ordinary methods. In one instance, investigation revealed that silt

was being dumped into a swamp from the canal construction and that the *Anopheles* were apparently very fond of the resultant brackish water. Colonel Gorgas had large quantities of salt water pumped from the canal into the swamp, producing a mixture that was too salty to suit these insects. A particularly severe problem developed despite precautions around a quarry from which stone for a set of locks was being taken. The malaria rate at nearby Porto Bello was high, but the town was outside the Canal Zone and beyond the Medical Department's authority. After consultation, the Panamanian government gave Gorgas the authority to manage sanitation in Porto Bello and to introduce whatever control measures he deemed necessary.[48]

Occasionally when inspectors were unsure about the origin of mosquitoes causing high malaria rates, they had a large number of *Anopheles* sprayed with aniline blue dye and then, since these insects seemed to "find a strong light repulsive," released at night from the area suspected of harboring the guilty mosquitoes. At the affected campsite, a man willing to serve as bait was set up for the night in an open tent near where workers were camped. In the morning the tent was closed, thus trapping the insects so that they could be examined. Should blue mosquitoes be found among them, the inspectors knew where they should concentrate their efforts against larvae. Jamaican workers were apparently often used to tempt the insects, Colonel Gorgas having concluded that they regarded being paid to sleep in the tent "as near complete bliss as was to be found in this world." In instances where no other means of prevention was available, Gorgas resorted to having the men take three-grain doses of quinine, although this precaution was not always effective. To guarantee as much success as possible in this endeavor, one or two men in each district were sent among the workers to offer pills, capsules, and a liquid quinine solution to all who would take it. Quinine was even placed on the table in all messes. An average of 45,000 employees took 20,000 doses a day.[49]

Despite the handicaps under which Colonel Gorgas worked, his campaigns against mosquito-borne disease were eventually successful. The yellow fever epidemic was over by the end of 1905 and never recurred in spite of an occasional isolated case that appeared thereafter. The rate at which men were hospitalized with malaria dropped as the population of the Canal Zone increased. The cases per 1,000 men, which reached a high of 821 in 1906, when Gorgas was just beginning his campaign against the *Anopheles*, dropped to 424 in 1907 and to 282 in 1908, and by 1913 was below 100. By 1913 the overall yearly death rate in the Canal Zone was 8 per 1,000, as compared to the French yearly average of 240 per 1,000.[50]

Insect-borne diseases were not the only ones with which Colonel Gorgas, as chief sanitary officer, had to deal, and his problems, though similar to those his colleagues faced in other tropical areas, were not identical with theirs. He had reason to believe, for example, that hookworm infestation was common, but since anemia was not, he saw no need to become involved in attempts to eradicate this disease. Beriberi, too, was frequently encountered, but apparently caused no great concern. Because of the understanding reached by the Canal Commission with the government of Panama, Gorgas' Department of Health was responsible for the care and housing both of the Canal Zone's lepers, who were placed in a colony under

Carter's supervision, and of the mentally ill of the entire nation of Panama.[51]

Like malaria and yellow fever, respiratory diseases were one of Colonel Gorgas' major concerns. For the canal workers, and especially for the black laborers from the Barbados who formed a large part of the work force, one of the most serious threats was pneumonia, sometimes complicated by tuberculosis. Physical examinations excluded many unhealthy men from the work force, and all new hires were vaccinated against smallpox when they were put on the rolls. Many were from the West Indies and immune to yellow fever, and since they often lived with their families outside the Canal Zone, they were found in its network of hospitals much less frequently than whites. The blacks were badly housed, and most had no resistance to pneumonia. Their death rate was initially two to three times that of white laborers. Wet for the eight months of the rainy season, too poor to own a change of clothing, crowded into cabins that were chill and damp, they were very vulnerable to respiratory ills, which spread rapidly among them, reportedly killing more than all other causes combined. Believing that crowding contributed to the problem, Gorgas had dwellings, each well separated from the others, built for the workers and their families. The incidence of pneumonia dropped markedly thereafter.[52]

Colonel Gorgas made a strenuous effort to avoid having infectious ills imported to the Canal Zone from the outside. He had a quarantine established at Porto Bello in an attempt to keep the local Indians from introducing disease when they entered the city to sell coconuts. The Public Health and Marine Hospital Service, which had been inspecting ships bound from Panama to the United States since 1893, set up a quarantine to protect the isthmus from imported disease. Ships arriving with yellow fever victims on board were fumigated and all nonimmune passengers isolated at a quarantine station for six days. The vessel and those on board who could prove their immunity to yellow fever were released from quarantine when the fumigation process had been completed. Quarantine officers also kept a particularly sharp watch for signs of plague, endemic in some areas of South America, after a worker on a wharf at La Boca died of this disease. A campaign against rats and the fumigation of ships and quarters in the wharf area prevented the appearance of any more cases. The quarantine stations established and run by the Public Health and Marine Hospital Service at either end of the canal were equipped with fumigating equipment, and hospital facilities were divided so as to be able to isolate patients with several different contagious diseases, one from the other.[53]

Gorgas did not deny the need for greatly improved sanitation in the Canal Zone, and the cleanup of local communities was not long delayed once the yellow fever threat had been removed. The treaty with the Panamanian government obligated U.S. authorities to install sewage and water systems in the Zone. Both were duly established in Panama City and in Colon, where cisterns had been collecting water that drained from roofs swarming with "vultures [that] cover the roofs with fecal matter." Eventually smaller communities, where even "the most rudimentary ideas of cleanliness [were] unknown," acquired sewers and water systems, to which increasing numbers of homes were hooked up. The elimination of cisterns and standing water containers was then possible, further reducing the number of places where mosquitoes could breed. Gorgas had homes whose occupants were



STREET IN COLON, PANAMA, *before and after paving*

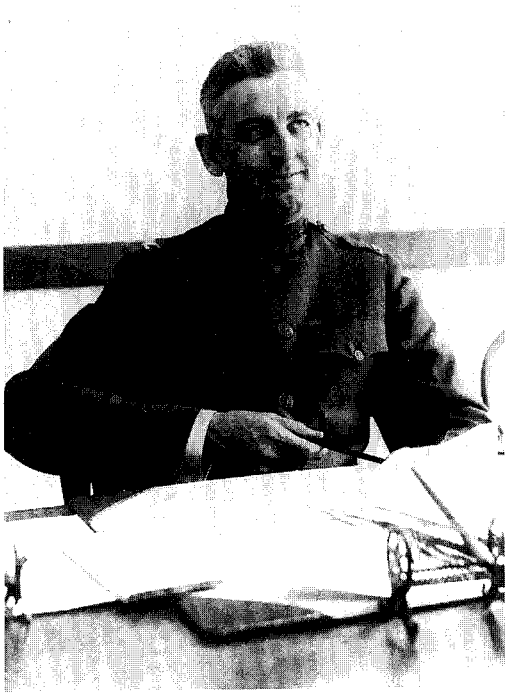


suffering from dysentery, pneumonia, or typhoid disinfected. To reduce the typhoid threat, he had latrines made "fly proof," foods screened in mess tents, and ditches and drains disinfected. Other measures included paving streets in Colon and Panama City and the start of garbage collection; in Panama City in 1907 this responsibility was turned over to the Panamanian government. Where no sewers existed, night soil by the bucket was also collected daily. Overflowing privies were cleaned up or closed down, and public facilities opened where needed. As sewer connections were completed, the size of the staff devoted to garbage collection and similar duties began to diminish, and Gorgas' empire began to shrink.[54]

The Hospital System

In time, Colonel Gorgas' success in reducing the incidence of disease also reduced the need for hospital beds in the Canal Zone. In setting up the hospital system in Panama, he had originally estimated that the sick rate might run 50 per 1,000 or more at any one time—about half that of U.S. soldiers in the Spanish-American War. Thus he initially concluded that he would need a minimum of 2,500 beds and possibly considerably more. Starting with three and expanding the network as construction of the canal progressed, he established in each sanitary district one or more 20- to 100-bed hospitals, sometimes referred to as "sick camps."[55] Many such facilities held dispensaries for outpatients, and at least one in each sanitary district could handle emergency surgery. Patients whose condition made moving unwise could also receive care in these small facilities. Since each district physician was responsible for the health of all who lived in his district, whether or not they worked on the canal, he knew about prevailing diseases and could act promptly at the first sign of an impending epidemic. Gorgas also had "rest camps," or hospitals with 5 to 15 beds, set up in each worker village, where those with minor ills could rest for a day or two until able to return to work. Regardless of the size of the facility they served, all physicians had to be medical school graduates and eventually were also required to pass a civil service examination. Because they were paid a salary, they received no fee from the sick, and the medicines they dispensed were also free of charge to workers who could not pay for them.[56]

Colonel Gorgas preferred to have patients treated, when possible, at the Ancon and Colon facilities, which he was determined to make "first-class in every respect." In June 1905 he had a hospital car put into daily service on the railroad that ran from one end of the Canal Zone to the other, retrieving patients to be deposited at one of these hospitals. He brought in more than 100 of what he regarded as the best young physicians from the United States to care for the sick and injured and, by using the buildings that had housed French facilities, could devote most of his hospital budget to bedding and supplies. The largest hospital, the 700-bed Ancon facility, achieved a fine reputation once yellow fever had been routed from its premises, flush toilets had been installed, and connections had been made to the new sewer system of Panama City. Its staff numbered more than 400 and increased in size even when Gorgas' Department of Health was otherwise growing smaller. Because private patients used this hospital instead of going to the United States or Europe, it became a profit-making organization; Gorgas esti-



THEODORE C. LYSTER

mated private patients produced $50,000 in revenues for every $30,000 the hospital spent for their care. Nonemployees paid $2 a day to stay at Ancon, with extra charges being made for private rooms and private nurses. The charge the hospital made for families of employees (employees themselves received free care) varied according to income, from $1 a day for the families of employees earning $50 or more a month to 30 cents a day for those with an income of less than $50 a month. Most of the insane of Panama, who had previously been jailed, were now sheltered at Ancon for 75 cents a day. The sums collected from private patients did not go to help finance Gorgas' work, but were rather fed into the general funds of the Canal Zone government.[57]

Colonel Gorgas could take pride in the staff at Ancon, among whom was Maj. Theodore C. Lyster, Marie Gorgas' nephew. Lyster set up an eye, ear, nose, and throat department, whose fine reputation drew patients in from a great distance. The hospital laboratory was well enough equipped to enable hospital physicians to conduct original research. After discovering that the French Sisters of Charity "did not possess the technical knowledge necessary for this work," Gorgas replaced them with American nurses. The care at Ancon was so highly regarded that, in spite of the drop in the number of workers in the Canal Zone and in the incidence of disease among them, by 1909 the hospital was required to expand, adding two new buildings and 150 beds to its capacity. By the end of 1907, when Gorgas' campaign against mosquitoes was beginning to show results, the need for hospital beds was already lower than had been originally anticipated, and by 31 December fewer than 1,200 remained in the institutions serving the Canal Zone.[58]

A Worthy Rivalry

As a reward for his successes, Colonel Gorgas also finally became a member of a new commission, consisting entirely of military officers, that was appointed in 1907. Ironically, by this point the Canal Commission's power was rapidly disappearing as the determined Col. George W. Goethals, the new chairman, consolidated his authority over the construction of the canal and all that pertained to it.[59]

The rivalry between Colonel Gorgas and Colonel Goethals was intense almost from the outset. Even though Goethals had no quarrel with Gorgas over the need to eliminate mosquitoes, he would not grant Gorgas full credit for eliminating yellow fever in both Havana and the Canal Zone and for reducing the incidence of malaria. Goethals insisted that Gorgas had merely been fol-

lowing a program that had been worked out in full by Walter Reed, who had made specific suggestions about the use of screens, fumigating houses, and similar matters in 1901, and, before Reed, by the English military surgeon Ronald Ross, who proved that mosquitoes spread malaria. Aristides Agramonte, one of Reed's colleagues on the Yellow Fever Board, quickly pointed out that the board had never been concerned with the practical application of the results of its research and that Gorgas had personally devised the methods that he had used to defeat mosquito-borne disease in both Havana and the Canal Zone. Indeed, before his death in 1902 Major Reed himself had recommended the procedures that Gorgas had developed. Apparently unmoved, Goethals further irritated Gorgas by removing from the surgeon's authority the responsibility for such anti-mosquito activities as grass cutting and ditch digging, placing them under the Quartermaster's Department, though subject to Gorgas' instructions. This logical move reduced the number of men in Gorgas' organization assigned to "Zone Sanitation" and thus appeared threatening to him. Neither the praise Gorgas was receiving nor his election as president of the American Medical Association in 1908 seemed to impress Goethals, who continued until Gorgas left the Canal Zone in 1913 to belittle the chief sanitary officer and his department.[60]

Despite his adversarial relationship with Goethals, Colonel Gorgas never developed the single-minded intensity of the dedicated feuder. Obviously aware of the humor in the situation, Gorgas reported to his family just when his rival was at the peak of his power, that "Goethals & I are getting along most lovingly. We seldom meet but write daily. And are just as polite as two dancing masters." Woodrow Wilson's election as president in 1912 brought a delightful change in Goethals' attitude, Gorgas concluded in September 1913. He reported: "Everything is running along here smoothly. Goethals is as mild as a lamb. He does not feel quite as certain of this good Democratic administration as he did of the former." In October Goethals asked Gorgas to tell Mrs. Gorgas "that he would gladly do anything he could for her and that she had no better friend than he was." He even unexpectedly and "warmly" approved several requests that Gorgas made, including one that he be permitted "to go to South Africa for a sanitary inspection" in November 1913, all of which led Gorgas to conclude that "the old villain is up to something."[61]

Colonel Gorgas' appointment as surgeon general on 16 January 1914 brought an end to his confrontations with Goethals in Panama. In the spring of 1914, when the death rate was less than half that in the United States, the Isthmian Canal Commission was abolished, and Goethals was appointed governor of the Canal Zone.[62]

The work of medical officers in both Puerto Rico and the Panama Canal Zone in the years immediately following the Spanish-American War had significance well beyond those two small portions of the globe. Captain Ashford's work in reducing the toll taken by hookworm disease in Puerto Rico ultimately led to successful campaigns against that disease in many other parts of the world. Gorgas' achievements as chief sanitary officer in the Panama Canal Zone went beyond his claims of saving more than 70,000 lives, of preserving the health of three times that number, and of saving the Canal Commission a total of $80 million, half in hospitalization costs alone. Gorgas had proved to his own satisfaction that those of European extraction could live and

thrive in the tropics. In doing so, he likened himself to Columbus because he had thrown "just as large an area of the earth's surface open to man's settlement" as had that explorer when he discovered America. This part of the world no longer need be a green hell. In the future, all who knew the land that Gorgas regarded as "my Panama" could remember it as he did, "a beautiful mountainous country. . . , the hills covered with deep green verdure & the valleys filled with clear & sparkling streams." [63]

NOTES

1. Although the name of the island was spelled Porto Rico in contemporary documents, the modern spelling has been used throughout this volume.

2. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1898, p. 147, and 1899, pp. 174, 178–79, 181, 184–85 (hereafter cited as WD, *ARofSG*, date); idem, *[Annual] Report of the Secretary of War*, 1899, 1(pt.3):320–21; Ltr, John R. Brooke to Alger, 18 Oct 1898, file 155700, Record Group (RG) 94, National Archives and Records Administration (NARA), Washington, D.C.

3. First quotation from William F. Smith, "Sanitation in Puerto Rico," p. 171; second and third quotations from United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 1:628 (hereafter cited as *Dodge Commission Report*); fourth quotation from WD, *ARofSG*, 1898, p. 146 (see also 1899, p. 188); fifth quotation from Walter W. King, "Report on the High Mortality on the Island of Porto Rico," p. 2723.

4. Ltrs, John R. Brooke to AG, 8 Sep 1898, file 128803, and Rush S. Huidekoper to AG, 7 Oct 1898, file 221633, RG 94, NARA.

5. *Dodge Commission Report*, 1:628; WD, *ARofSG*, 1898, pp. 146, 152–53, and 1899, pp. 188, 191.

6. Ames was initially a contract surgeon and was "appointed brigade surgeon . . . while the work [of vaccination] was in progress." See WD, *ARofSG*, 1899, pp. 191–92.

7. Azel Ames, "The Vaccination of Porto Rico," pp. 301 (first quotation), 302, 305–07, 310; WD, *ARofSG*, 1899, pp. 173, 177 (remaining quotations); Charles H. Alden, "Porto Rico," p. 19.

8. Alden, "Porto Rico," p. 19 (quotation); Ames, "Vaccination," pp. 300–301, 313; WD, *ARofSG*, 1899, p. 176.

9. Ames, "The Vaccination," pp. 301–02, 305 (first quotation), 306–07, 310; WD, *ARofSG*, 1899, pp. 191, 246.

10. Alden, "Porto Rico," p. 21 (quotation); WD, *ARofSG*, 1899, pp. 191–92, 246–48; Ames, "Vaccination," pp. 302–04, 306–07, 310, 313; John van R. Hoff, *Military Government of Porto Rico From October 18, 1898, to April 30, 1900*, p. 131.

11. The Department of Puerto Rico was divided into the District of San Juan and the District of Ponce. See WD, *ARofSG*, 1899, p. 177.

12. Ibid., p. 189; Alden, "Porto Rico," p. 22; John van R. Hoff, "The Share of the 'White Man's Burden' That Has Fallen to the Medical Departments of the Public Services of Porto Rico," p. 798; idem, *Military Government*, p. 134.

13. Alden, "Porto Rico," p. 20 (first quotation); Bailey K. Ashford and Pedro Gutierrez Igaravidez, *Uncinariasis (Hookworm Disease) in Porto Rico*, p. 23 (second quotation); Bailey K. Ashford and Walter W. King, "A Study of Uncinariasis in Porto Rico," p. 391; "Uncinariasis: An Economic Question for Porto Rico," p. 422 (third quotation); Edgar Erskine Hume, *Victories of Army Medicine*, p. 158; *Dictionary of American Biography*, supp. 1, s.v. "Ashford, Bailey Kelly"; Martha L. Sternberg, *George Miller Sternberg*, p. 212; William G. Morgan, "Contributions of the Medical Department of the United States Army to the Advancement of Knowledge," pp. 784–85; Rpt, John van R. Hoff, FY ending 30 June 1900, Ms 4890, Entry 52, RG 112, NARA; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine*, p. 136; J. Hamilton Stone, "Remarks Suggested by Three Years' Service in Cuba," p. 330; Charles W. Stiles, *Report Upon the Prevalence and Geographic Distribution of Hookworm Disease (Uncinariasis or Anchylostomiasis) in the United States*, Hygienic Laboratory Bulletin no. 10 (Washington, D.C.: Government Printing Office, 1903), p. 33.

14. King, "Report," pp. 2724, 2726 (quotation); Gaines M. Foster, *The Demands of Humanity*, pp. 48–49; Ashford and King, "Study," p. 391; "Uncinariasis," p. 422; "Editor's Table," p. 281; Alden, "Porto Rico," p. 22; Hoff, "Share," p. 796; idem, *Military Government*, p. 140.

15. Quotations from Bailey K. Ashford, *A Soldier in Science*, pp. 3, 45. Ashford maintained that vague memories of having encountered an article on "pork measles" led him to consider the possibility of an intestinal parasite (ibid., pp. 42–43). John Ettling, however, suggests that the article recalled by Ashford was probably on trichinosis (idem, *The Germ of Laziness*, pp. 29–30). See also Ashford and King, "Study," p. 392.

16. Bailey K. Ashford, "Where Treatment of All Infected Is the Surest Prophylactic Measure," p. 42 (quotation); Ashford and King, "Study," p. 391; WD, *ARofSG*, 1903, p. 49, and 1906, p. 131; Rpt, B. H. Dutcher, 13 Oct 1915, Ms 5367, Entry 52, RG 112, NARA; Ashford and Gutierrez, *Uncinariasis*, pp. 8, 11, 16–17, 25, 27–28, 40–43, 109–10.

17. WD, *ARofSG*, 1900, p. 274, 1905, p. 159, and 1913, pp. 177–78; Ltrs, Bailey K. Ashford to Gorgas, 15 Nov 1903 and 13 Mar 1906, William C. Gorgas Papers, Manuscript Division, Library of Congress (LC), Washington, D.C.; Ashford and Gutierrez, *Uncinariasis*, p. 28; Ltrs, Ashford to Albert K. Smiley, 26 Sep 1905 and 12 Oct 1908, and to Henry Haskins, 6 May 1913, Albert K. Smiley Papers, Quaker Collection, Haverford College (HC), Haverford, Pa.; Ralph C. Williams, *The United States Public Health Service, 1798–1950*, pp. 261–62. In RG 112, NARA, see Ltr, W. A. Jones to Jefferson R. Kean, 31 May 1910, Entry 231, and Rpt, B. H. Dutcher, 13 Oct 1915, Ms 5367, Entry 52. See also in Bailey K. Ashford Papers, Entry 561, RG 94, NARA: Individual Svc Rpts, 1 Jul 1903 and 29 Sep 1906; Ltrs, William P. Craighill to SG, 14 Mar 1904, and Ashford to Merritte W. Ireland, 12 Mar 1906.

18. Bailey K. Ashford, "Notes on Medical Progress in Porto Rico," p. 727; idem, "Where Treatment of All Infected," p. 47 (quotation); Ashford and Gutierrez, *Uncinariasis*, pp. 1–2, 230; WD, *ARofSG*, 1906, p. 131, and 1908, p. 127; Individual Svc Rpt, 29 Sep 1906, Ashford Papers, Entry 561, RG 94, NARA; Rpt, Dir, Anemia Dispensary Svc, p. 329, and Summary of Anemia Work, Entry 231, RG 112, NARA.

19. WD, *ARofSG*, 1914, p. 129; Ashford, *Soldier in Science*, p. 131; Ltr, Ashford to Henry Haskins, 3 Sep 1911, Smiley Papers, HC; Ltr, O. W. Underwood to Ashford, 25 Jul 1911, Gorgas Papers, LC. In Ashford Papers, Entry 561, RG 112, NARA, see Telg, George R. Colton to SW, 11 Mar 1911; Memo, C. R. Edwards to AG, 13 Mar 1911; Memo, Arthur Murray to AG, 7 Jul 1911; Memo, General Staff to Capt Graves, 17 Mar 1911; and Ltr, AG to CG, Eastern Dept, 15 Sep 1915. See also in Entry 231, RG 112, NARA: Ltrs, Ashford to Jefferson R. Kean, 29 Mar 1911 and 7 Feb 1912, and W. Lippitt to Kean, 5 Feb 1912.

20. Quotation from *Dictionary of American Biography*, supp. 1, s.v. "Ashford, Bailey Kelly"; Bayne-Jones, *Preventive Medicine*, p. 136; Ashford and Gutierrez, *Uncinariasis*, p. 26; Ltrs, J. F. Siler to SG, 7 and 26 Dec 1908, Ms 5345, Entry 52, RG 112, NARA; WD, *ARofSG*, 1904, p. 89, 1909, p. 123, and 1910, pp. 122–23; Sternberg, *Sternberg*, p. 212; Ashford, "Notes on Medical Progress," p. 727; Wilson G. Smillie, *Preventive Medicine and Public Health*, p. 167; Weston P. Chamberlain, "Is the Poor Physical Development of Southern Recruits due to Uncinariasis?," pp.49–50; Marie D. Gorgas and Burton J. Hendrick, *William Crawford Gorgas*, p. 296; Victor C. Vaughan, *Epidemiology and Public Health*, 2:508, 513; Stiles, *Report*, p. 33. For a discussion of the Ashford/Stiles rivalry, see Ettling, *Germ of Laziness*, pp. 29–32, 124, 127.

21. Bailey K. Ashford, "Studies in Moniliasis of the Digestive Tract in Porto Rico," pp. 681 (quotation), 690.

22. Alden, "Porto Rico," p. 20; WD, *ARofSG*, 1904, p. 92, 1912, p. 103, and 1913, pp. 177–78; Foster, *Demands of Humanity*, p. 51; Richard H. Creel, *Outbreak and Suppression of Plague in Porto Rico*, pp. 3, 9.

23. Ltr, John W. Ross to Ed., *The Independent*, 23 Jul 1904 (first quotation), box 3–13, John W. Ross Papers, Tennessee State Library and Archives (TSLA), Nashville, Tenn.; H. Goldthwaite, "Matters of Sanitary Interest on the Isthmus," p. 56 (second quotation); "Yellow Fever and the Panama Canal," p. 580; Miles P. DuVal, Jr., *And the Mountains Will Move*, p. 126; Hume, *Victories*, p. 97; Richard F. Nyrop, ed., *Panama*, pp. 3, 22; Hugh G. Miller, *The Isthmian Highway*, pp. 26–27; Richard L. Sutton, "The Diseases of the Isthmian Canal Zone," p. 43; P. Desfosses, "Canal de Panama et fievre jaune," pp. 731–32, 732n.

24. Bayne-Jones, *Preventive Medicine*, p. 139; Sternberg, *Sternberg*, pp. 266–67; Gorgas and Hendrick, *Gorgas*, pp. 140 (second quotation), 146–47; William C. Gorgas, *Sanitation in Panama*, pp. 138–42, 149; David McCullough, *The Path Between the Seas*, pp. 159, 415; Hermann Hagedorn, *Leonard Wood*, 1:104. In Gorgas Family Papers, W. S. Hoole Special Collections Library, University of Alabama (UA), Tuscaloosa, Ala., see Ltrs, Gorgas to Dick [brother], 9 Jan 1903, and to mother, 7 Mar 1903 (copy). In Gorgas Papers, LC, see Resolution, Assoc Mil Surgs, 20 May 1903; Ltrs, Gorgas to Valery Havard, 14 Apr 1902 (first quotation), to SG and AG, both 28 Jun 1902, to Harry F. Hodges, 14 Jul 1902, to Harper & Bros., 17 Jul 1902, and to Philippe Bunau Varilla, 19 Aug 1902; and Ltr, Charles A. L. Reed to Theodore Roosevelt, 24 Feb 1904.

25. Gorgas was promoted from major to colonel by an act of Congress. As Gorgas put it, "It is the first time an Army Medical Officer has been directly recognized by Congress. It places me in a rank that would have taken me about fifteen years to reach in the ordinary course of promotion." See Ltr, Gorgas to mother, 7 Mar 1903, Gorgas Family Papers, UA.

26. According to the inventory for the Ross Papers, TSLA, Ross received the rank of medical director in 1903 by a "special act of Congress" (p. 3), and in 1904 he signed himself in that fashion. Ross is also inexplicably referred to as "Major Ross" for a time period when he was serving in Cuba but apparently was still in the Navy (pp. 2, 5). See also Ltr, Ross to Ed., *The Independent*, 23 Jul 1904, box 3–13.

27. McCullough, *Path*, p. 407; John W. Ross, "Outline of the Organization of the Department of Health of the Isthmian Canal Commission, Isthmus of Panama," p. 419; Gorgas, *Sanitation*, pp. 142–43; Congressional Research Service, Library of Congress, *Background Documents Relating to the Panama Canal* . . . (Washington, D.C.: Government Printing Office, 1977), p. 504; in Gorgas Papers, LC: Resolution, Assoc Mil Surgs, 20 May 1903, and Ltr, C. Reed to T. Roosevelt, 24 Feb 1904, and Memo for Col Gorgas' Efficiency Rpt, 18 Jul 1904.

28. Quotation from Memo, SG to SW, 24 Feb 1904, William C. Gorgas Papers, Entry 561, RG 94, NARA. In loc. cit., see SO 125, 27 May 1904, and Ltr, John C. Walker to SW, 16 May 1904. See also Ross, "Outline," pp. 418–19; H. W. Austin, "Retrospect of Co-Operative Work of the Medical Services of the Government," p. 455; WD, *ARofSG*, 1903, pp. 48–49; Gorgas, *Sanitation*, pp. 142–43, 146–47, 152–53, 156–57; Gorgas and Hendrick, *Gorgas*, pp. 150, 161–65, 188; DuVal, *And the Mountains Will Move*, p. 311; McCullough, *Path*, pp. 421–22; Draft Article, Oct 1908, Gorgas Papers, LC; Ltr, Gorgas to Dick, 9 Jan 1903, Gorgas Family Papers, UA.

29. WD, *ARofSG*, 1903, pp. 48–49, and 1908, p. 127 (quotation); Rpt, "Organization of the Department of Health for the Isthmus of Panama," p. 1, box 5–8, Ross Papers, TSLA; "News of the Service," p. 141; Ross, "Outline," pp. 418–19, 426; Ltr, Gorgas to [Kia?], 15 Aug 1904, Gorgas Family Papers, UA; Weston Chamberlain, *Twenty-five Years of American Medical Activity in Panama, 1904–1929*, p. 65.

30. The organization headed by Colonel Gorgas is variously referred to as the Department of Health, the Department of Sanitation, and the Sanitary Department. An examination of the letterheads of Gorgas' letters in the Gorgas Family Papers at the University of Alabama suggests that the term *Department of Health* was used in the early period and that it was replaced by *Department of Sanitation* sometime after 1906. The term *Sanitary Department* is used in Marie Gorgas' biography of her husband.

31. Rpt, "Organization of the Department of Health," pp. 2, 9–10, box 5–8, and Ltr, John W. Ross to Edward R. Marshall, 21 Oct 1904, box 3–13, Ross Papers, TSLA; Ross, "Outline," pp. 419–20, 423–24; William C. Gorgas, "Sanitary Conditions as Encountered in Cuba and Panama and What Is Being Done To Render the Canal Zone Healthy," p. 163; Charles A. L. Reed, "Isthmian Sanitation," pp. 815, 818; Chamberlain, *Twenty-five Years*, p. 66; McCullough, *Path*, pp. 416, 419.

32. Gorgas, *Sanitation*, p. 148 (quotations); DuVal, *And the Mountains Will Move*, p. 150; Ltr, Gorgas to Valery Havard, 7 Feb 1908, Gorgas Papers, LC; Gorgas and Hendrick, *Gorgas*, pp. 150–52, 162, 164–65.

33. Gorgas and Hendrick, *Gorgas*, pp. 166–67; Draft Article, Oct 1908, Gorgas Papers, LC.

34. Miller, *Isthmian Highway*, pp. 23–24; Goldthwaite, "Matters of Sanitary Interest," pp. 59–60; Roland G. Curtin, "Medical Conditions of the Isthmus of Panama, With Other Notes," p. 345; William C. Gorgas, "Mosquito Work in Relation to Yellow Fever on the Isthmus of Panama," pp. 322–24.

35. First quotation from Ltr, Gorgas to mother, 3 Apr 1905, Gorgas Family Papers, UA; remaining quotations from Reed, "Isthmian Sanitation," pp. 812–13; ibid., pp. 814, 817; Gorgas and Hendrick, *Gorgas*, pp. 190–92; Jefferson R. Kean, "Editorial," p. 368.

36. Reed, "Isthmian Sanitation," pp. 812–13 (quotations), 814–18; Gorgas and Hendrick, *Gorgas*, pp. 162–63, 189–92, 194–97; Gorgas, *Sanitation*, pp. 152–53; Ltr, SW to Roosevelt, 17 Mar 1905, Entry 231, RG 112, NARA; DuVal, *And the Mountains Will Move*, pp. 151, 190.

37. First quotation from Ltr, Gorgas to mother, 3 Apr 1905, and remaining quotations from Ltr, Gorgas to Dick [brother], 16 Jan 1905, Gorgas Family Papers, UA. In loc. cit., see also Ltrs, Gorgas to [Kia?], 15 Aug 1904; Richie to Jessie, 18 Aug 1920; and Aileen Gorgas to Marie Gorgas, 25 Jan 1905.

38. First two quotations from John G. Leigh, "Sanitation and the Panama Canal," p. 1531; following three quotations from Ltr, Gorgas to Dick, 16 Jan 1905, and sixth quotation from Ltr, Gorgas to mother, 3 Apr 1905, Gorgas Family Papers, UA; final quotation from WD, *ARofSG*, 1908, p. 127. See also ibid., 1905, p. 148; McCullough, *Path*, pp. 449–50.

39. DuVal, *And the Mountains Will Move*, pp. 176–77, 179–80; Gorgas, *Sanitation*, p. 154.

40. Ltrs, W. W. Keen to Gorgas, 12 Oct 1904, 2 Feb 1905, and 6 and 17 Mar 1905, Gorgas Papers, LC; Ltrs, Gorgas to mother, 17 Oct 1905 (quotations) and 19 Jun 1906, Gorgas Family Papers, UA; DuVal, *And the Mountains Will Move*, pp. 164–65; Gorgas, *Sanitation*, pp. 275–76.

41. Gorgas, *Sanitation*, pp. 136, 142–43, 148, 154–55, 172–73, 183, 197–98; Gorgas and Hendrick, *Gorgas*, pp. 196–97, 204; Percy M. Ashburn, *The History of the Medical Department of the United States Army*, p. 266; DuVal, *And the Mountains Will Move*, pp. 175, 190, 240; McCullough, *Path*, pp. 447–48, 468, 500; Miller, *Isthmian Highway*, pp. 23–24.

42. Rpt, "Organization of the Department of Health," p. 19 (quotation), box 5–8, Ross Papers, TSLA; Gorgas and Hendrick, *Gorgas*, pp. 172, 175–76, 180; Gorgas, *Sanitation*, pp. 182, 192–93, 195–97; McCullough, *Path*, p. 448.

43. Gorgas, *Sanitation*, pp. 150–51; Gorgas and Hendrick, *Gorgas*, pp. 176–81.

44. Goldthwaite, "Matters of Sanitary Interest," p. 58 (first quotation); Joseph A. LePrince, A. J. Orenstein, and L. O. Howard, *Mosquito Control in Panama*, pp. 18–19 (second quotation); Gorgas and Hendrick, *Gorgas*, pp. 183–85; Gorgas, *Sanitation*, pp. 224, 230–32, 236–37; Walter Reed and James Carroll, "The Prevention of Yellow Fever," p. 119; Curtin, "Medical Conditions," p. 346.

45. Sutton, "The Diseases of the Isthmian Canal Zone," p. 41 (first quotation); Gorgas, *Sanitation*, p. 159 (second quotation); McCullough, *Path*, p. 419; Goldthwaite, "Matters of Sanitary Interest," p. 56.

46. LePrince et al., *Mosquito Control*, pp. 17–18, 22; Goldthwaite, "Matters of Sanitary Interest," pp. 56–57; Gorgas, *Sanitation*, pp. 159–60; idem, "Sanitary Conditions," p. 162; Gorgas and Hendrick, *Gorgas*, pp. 225–32; Miller, *Isthmian Highway*, pp. 25–26; Draft Article, Oct 1908, Gorgas Papers, LC; Monthly Rpts, Sanitary Dept, May 1907 and Feb 1908, RG 185, NARA.

47. William C. Gorgas, "The Sanitary Organization of the Isthmian Canal as It Bears Upon Anti-malarial Work," pp. 263–64; idem, *Sanitation*, pp. 183–90, 192–93, 195 (quotation); Gorgas and Hendrick, *Gorgas*, pp. 180, 230–31; McCullough, *Path*, p. 448; Draft Article, Oct 1908, Gorgas Papers, LC; Monthly Rpts, Sanitary Dept, May 1907, RG 185, NARA.

48. Gorgas, *Sanitation*, pp. 160, 166–67, 202–05; Monthly Rpts, Sanitary Dept, May 1907, RG 185, NARA; Draft Article, Oct 1908, Gorgas Papers, LC.

49. LePrince et al., *Mosquito Control*, p. 94 (first quotation); Gorgas, *Sanitation*, pp. 199–200, 203–04 (second quotation), 205; idem, "Sanitary Organization," pp. 263–64; Draft Article, Oct 1908, Gorgas Papers, LC.

50. Gorgas, *Sanitation*, pp. 156, 205, 275; DuVal, *And the Mountains Will Move*, pp. 199–200; Annual Rpts, Sanitary Dept, 1905–1914, esp. 1907, 1:6–7, RG 185, NARA; Fullerton L. Waldo, "Panama," p. 773; Louis A. LaGarde, "Relation of the Civilian Physician to National Preparedness," p. 238.

51. Gorgas, *Sanitation*, pp. 256–57; Ltr, Gorgas to Bailey K. Ashford, 8 Jun 1905, Gorgas Papers, LC; LePrince et al., *Mosquito Control*, pp. 24–25.

52. McCullough, *Path*, pp. 405–06, 501, 577, 585; Gorgas and Hendrick, *Gorgas*, pp. 266–68; Michael L. Conniff, *Black Labor on a White Canal*, pp. 3, 27, 30; Annual Rpt, Sanitary Dept, 1904, 1:13, and Monthly Rpts, Sanitary Dept, 1905–1914, RG 185, NARA.

53. Rpt, "Organization of the Department of Health," pp. 16–19, box 5–8, Ross Papers, TSLA; Gorgas, *Sanitation*, pp. 166–67, 261–62 (quotation), 263, 271–73, 276; DuVal, *And the Mountains Will Move*, pp. 135–36; McCullough, *Path*, p. 454; Annual Rpt, Sanitary Dept, 1908, 1:6–7, RG 185, NARA.

54. Curtin, "Medical Conditions," p. 343 (first quotation); Goldthwaite, "Matters of Sanitary Interest," p. 57 (second quotation); Monthly Rpts, Sanitary Dept, 1906–1914, esp. May 1907 (third quotation), and Annual Rpts, Sanitary Dept, 1907–1909, RG 185, NARA; William C. Gorgas, "Sanitation on the Isthmus of Panama," pp. 37–38; Chamberlain, *Twenty-five Years*, p. 13; DuVal, *And the Mountains Will Move*, p. 247.

55. There is some confusion in the records of this period about the nomenclature used to classify the various hospital facilities. The term *sick camp* is frequently used to describe many of the smaller district units, but in some reports individual facilities are called sick camps and in others hospitals.

56. Gorgas, *Sanitation*, pp. 206–07, 209 (quotation), 210–11, 213–14, 223; Rpt, "Organization of the Department of Health," p. 14, box 5–8, Ross Papers, TSLA; Miller, *Isthmian Highway*, p. 23; Gorgas and Hendrick, *Gorgas*, p. 247; Monthly Rpts, Sanitary Dept, 1905–1914, and Annual Rpts, Sanitary Dept, 1906, 1:26–27, 32–33, 1907, 1:28, 30, and 1908, 1:28–29, RG 185, NARA; Ross, "Outline," pp. 421–22.

57. Gorgas, *Sanitation*, pp. 209 (quotation), 210–12, 223–24, 229–30, 241–43, 247; DuVal, *And the Mountains Will Move*, p. 179; Rpt, "Organization of the Department of Health," p. 7, box 5–8, Ross Papers, TSLA; McCullough, *Path*, p. 501; Monthly Rpts, Sanitary Dept, 1906–1914, esp. May 1907, and Annual Rpts, Sanitary Dept, 1907, 1:77, and 1909, 1:31, 71, RG 185, NARA; Reed, "Isthmian Sanitation," p. 816.

58. Gorgas and Hendrick, *Gorgas*, p. 185 (quotation); Gorgas, *Sanitation*, pp. 213–14, 226, 242, 245; *The Canal Record*, 15 Sep 1909, p. 19, Entry 231, RG 112, NARA; J. F. Siler, "Major-General

William Crawford Gorgas," p. 162; Annual Rpt, Sanitary Dept, 1906, 1:26–27, and Monthly Rpts, Sanitary Dept, 1905–1907 and Feb 1908, plus Rpt, Caldwell, Jan 1912, RG 185, NARA; Ltr, Stephen C. Craig to Author, 5 Apr 1990, Historian's file, U.S. Army Center of Military History, Washington, D.C.

59. Draft Biography, Gorgas, n.d., Gorgas Papers, LC; Ltrs, Gorgas to mother, 11 Oct 1912, to Mamie, 27 Oct 1912, and to Jessie, 2 Jul 1913, Gorgas Family Papers, UA; Gorgas and Hendrick, *Gorgas*, pp. 213–14.

60. Annual Rpts, Sanitary Dept, 1907, 1:77 (quotation), and 1909, 1:71, RG 185, NARA; Gorgas, *Sanitation*, p. 155; Gorgas and Hendrick, *Gorgas*, pp. 184, 220–21, 232–38; DuVal, *And the Mountains Will Move*, pp. 240, 260–61, 270, 309–11, 330; McCullough, *Path*, p. 572; Draft Biography, Gorgas, and Ltr, E. Striver to Gorgas, 2 Dec 1904, Gorgas Papers, LC; Ltr, Gorgas to mother, 5 Jun 1908, Gorgas Family Papers, UA; Reed and Carroll, "Prevention," p. 123; George W. Goethals, "The Building of the Panama Canal," p. 721; Henry S. Wellcome, "Observations on the Medical and Sanitary Department of the Panama Canal Commission . . . ," pp. 3, 10.

61. Ltrs, Gorgas to Mamie, 27 Oct 1912 (first quotation), 20 Sep 1913 (second quotation), 16 Oct 1913 (third, fourth, and sixth quotations), and 27 Aug 1913 (fifth quotation), Gorgas Family Papers, UA; Siler, "Gorgas," p. 167; Chamberlain, *Twenty-five Years*, pp. 65–66; Robert E. Mitchell, Jr., "Notes on the Medical History of the Panama Canal," p. 89.

62. LaGarde, "Relation," p. 238; Ltr, Gorgas to Mamie, 1 Jan 1914, Gorgas Family Papers, UA; Siler, "Gorgas," p. 167; Chamberlain, *Twenty-five Years*, pp. 65–66; Mitchell, "Notes," p. 89.

63. Gorgas, *Sanitation*, pp. 280, 282–83, 291–92 (first quotation); Speech, Gorgas to American Med Eds., 5 Jun 1907 (remaining quotations), Gorgas Papers, LC; Gorgas and Hendrick, *Gorgas*, p. 259; Ltr, Gorgas to [Kia?], 15 Aug 1904, Gorgas Family Papers, UA.

Chapter 11

PUBLIC HEALTH IN THE PHILIPPINES

When U.S. soldiers arrived in the Philippine Islands in 1898, they encountered another green hell, another hot and humid country seething with disease. Malaria-bearing mosquitoes haunted the jungles, and the drinking water and fruits and vegetables carried organisms that inflicted dysentery upon the careless or unsuspecting. The Spanish had been quickly defeated, and the victory left "the Philippine Islands, with their teeming millions of inhabitants, . . . on our hands . . . ," a physician noted in the *Journal of the American Medical Association.* The resistance of Filipinos to occupying U.S. forces made it necessary to keep American soldiers in this hostile environment, where they were exposed to all the afflictions from which the native population suffered. Thus Army surgeons in the Philippines, inspired both by what has been termed an effort to "bestow the spiritual and material blessings of [America's] exceptional society on the new possession" and by a new understanding of disease, took up a sweeping challenge. To meet it, they began to study the health problems of the country and to use both traditional approaches and new methods suggested by their research to lower the incidence of disease. Following the pattern set in Cuba, however, those conducting research in the Philippines did not manage the public health campaign that attempted to put their discoveries to practical use.[1]

Research and Disease Boards

Research into the diseases of the Philippines was conducted by members of two tropical disease boards (*see Table*), as well as by other medical officers in the islands working independently of the boards. Except for the period 1902–1906, the two boards served through 1914, with many medical officers rotating through them. Unlike the scientists who worked with Major Reed, the members of the Philippine Tropical Disease Board investigated a wide range of diseases and health problems, those that posed a significant threat to the civilian population as well as to the military and those of interest principally because of their exotic nature. Members often worked separately, submitting individual reports. In at least one instance they investigated a disease that affected large animals rather than human beings. Their discoveries were not as spectacular as those of the Reed board. The value of their work lay principally in the accumulation of information rather than in any single discovery. Most of their research took place in Manila, where until 1902 laboratory space and equipment were available at the First Reserve Hospital and later at the Manila Board of Health as well. After that date, both the Army's and the Board of

TABLE—PHILIPPINE TROPICAL DISEASE BOARD MEMBERS

1899–1900
Lt. Jere B. Clayton
Lt. Richard P. Strong
Contract Surgeon Joseph J. Curry

1900–1902
Lieutenant Strong
Lt. William J. Calvert
Contract Surgeon Curry

March–December 1906
Capt. Percy M. Ashburn
Lt. Charles F. Craig

December 1906–July 1909
Capt. James M. Phalen
Lt. Henry J. Nichols

July 1909–January 1910
Captain Phalen
Capt. Edwin D. Kilbourne

January–March 1910
Maj. Weston P. Chamberlain
Captain Phalen
Captain Kilbourne

March–December 1910
Capt. Horace D. Bloombergh
Major Chamberlain
Captain Kilbourne

December 1910–February 1911
Capt. Edward B. Vedder
Captain/Major Bloombergh
Major Chamberlain

February 1911–January 1912
Lt./Capt. John R. Barber
Captain Vedder
Major Bloombergh

January 1912–April 1913
Lt. Ernest R. Gentry
Captain Vedder
Maj. Percy M. Ashburn

April–June 1913
Major Ashburn

June–July 1913
Major Ashburn
Capt. Ferdinand Schmitter

July 1913–October 1914
Captain Schmitter

Source: Based on Vedder, "Synopsis," in *Army Medical Bulletin* and WD, *ARofSG*, 1900, p. 21. The first board functioned from 1899 to 1902 and the second board from 1906 to 1914. Except where indicated, all members of these boards were medical officers.

Health's facilities were replaced by the Bureau of Government Laboratories, where separate chemical and biological facilities were established, together with a serum institute to handle the manufacture of immunizing serums.[2]

Although the facilities were adequate, the heat and humidity of the tropics imposed a considerable handicap on the work of researchers from the United States. The mental concentration possible in a temperate climate was unattainable in the Philippines, and the speed with which cadavers deteriorated made it difficult to obtain uncontaminated cultures from them because of the "rich and varied" nature of the thriving "bacterial flora" of the area. When rinderpest, or cattle plague, became so prevalent in the islands that researchers had to resort to water buffalo for cultures requiring milk, contamination of the culture medium also became a significant problem.[3]

First among the researchers' concerns was dysentery, a historic enemy of military forces whose cause was still a subject of controversy. It precipitated so many diffi-

culties for the soldiers fighting the Filipino guerrillas that two of the first members of the Tropical Disease Board, contract surgeon Joseph J. Curry and Lt. Richard P. Strong,[4] started investigating it as soon as they arrived in the Philippines late in 1899. Although, unlike some in the medical profession at the time, both physicians had accepted the fact that dysentery could be caused by either a bacterium or an amoeba, they found the disease puzzling. Curry's research added to the confusion, for it apparently led him to the erroneous conclusion that the organism now known as *Entamoeba coli*, one of six species of non-disease-causing intestinal amoebas that parasitize man, and the amoeba causing dysentery (*Entamoeba histolytica*) were essentially identical. Under these circumstances, he could not account for the fact that *E. coli* could be found in healthy men as well as in those suffering from dysentery. Curry correctly concluded that *E. histolytica* could be present in drinking water and developed statistics that suggested the extent of the threat posed by amebic dysentery, which he maintained was responsible for 66 percent of the deaths caused by dysentery in cases that he had autopsied.[5]

In spite of Curry's interest, Lieutenant Strong was the board member initially assigned responsibility for the study of dysentery, although he resigned on 5 December 1902 to continue his research for another eleven years as a civilian working for the Philippine government. Assisting Strong was a talented hospital steward, physician, and pathologist, William E. Musgrave, who would soon sign a contract with the Army Medical Department to work as a contract surgeon. The First Reserve Hospital,[6] where Strong and Musgrave worked, offered the two scientists a rich field in which to conduct their research, since in the ten months preceding the submission of their 17 June 1900 report to the surgeon general, more than 1,300 patients, almost 15 percent of the total number, had dysentery. Fewer than 600 of those who survived the disease were able to return to duty, and 125 died. Postmortems on 111 cases established that 79 deaths resulted from amebic dysentery. Although Strong and Musgrave were able to isolate bacteria in 19 more postmortems, they inexplicably did not look for bacteria in 56 cases. They noted, however, that the bacillus they found resembled that first recorded by the Japanese scientist Kiyoshi Shiga.[7]



RICHARD P. STRONG

The great difficulty experienced by Lieutenant Strong and Musgrave in isolating and precisely identifying the organisms that caused dysentery is a problem still experienced by scientists more than seventy-five years later. Unlike Curry, Strong con-

cluded that *E. histolytica* was not identical with *E. coli*,[8] which he described as "apparently harmless." He held in 1910 that even though the incidence of bacillary dysentery was at that time increasing, amebic dysentery was "by far the commonest form of the disease met with in the Philippine Islands" and that many other organisms could also be involved, including the malaria parasite. Simon Flexner and Lewellys F. Barker, leaders of a civilian team of scientists who brought their own equipment with them from the Johns Hopkins medical school to join the study of diseases in the Philippines, also experienced great difficulty in determining which of the hordes of organisms in the specimens they examined actually caused the problem.[9]

While Lieutenant Strong and Musgrave were seeking to gain a greater understanding of dysentery in Manila, in the general hospital at the Presidio in San Francisco, to which many of their patients were sent, contract surgeon Charles Craig, reassigned after his work at Camp Thomas during the typhoid epidemic in 1898, was beginning the research concerning this disease to which he would devote much of the remainder of his distinguished career. Craig, who joined the Medical Department as a lieutenant in 1903, noted that in four cases of dysentery he found large numbers of "pear-shaped organisms, possessing a nucleus and from 2 to 8 slender, hair-like flagella, which propel the parasites. . . ." He referred to these protozoa as "Cercomonas intestinalis," but they are all too familiar to modern travelers and backpackers as *Giardia lamblia*. Although Craig had never seen them in healthy patients, he was not entirely sure of their role in dysentery and concluded that "they apparently thrive in a diseased intestine and probably cause diarrhea and perhaps ulceration." He was sure, however, that they "aggravated the intestinal condition." Craig's interest in the subject inspired him to years of research and the publication in 1911 of *The Parasitic Amoebae of Man*.[10]

In March 1906, when Surgeon General O'Reilly succeeded in having the Tropical Disease Board reconstituted on a permanent basis with Lieutenant Craig and Capt. Percy M. Ashburn as its members, these physicians continued the board's study of dysentery, as did their replacements, Lt. Henry J. Nichols and Capt. James M. Phalen. Nichols and Phalen decided that they could not with confidence distinguish between the two varieties of *Amoeba* and that therefore all amoebas should be considered potentially harmful. Lieutenant Strong's conclusions concerning the identity and harmlessness of the *E. coli* was later confirmed by work undertaken by other scientists working in the Philippines, although even ten years later the role of this organism was still not completely understood.[11]

Research into the question of the identity of dysentery-causing organisms in the Philippines continued for many years. Initially, work with the bacterial form of dysentery proved more fruitful than that with the amebic type. Attempts to infect monkeys with amebic dysentery generally failed, but the discovery that the medium used in studying typhoid also favored the growth of the *Shigella* organism made bacillary dysentery research much easier. The examination of stool specimens in the attempt to detect typhoid carriers also revealed the possibility that bacillary dysentery, too, could be spread by healthy carriers.[12]

Because of the prevalence of dysentery, doctors in the islands gained experience with many types of treatment. Although ipecacuanha (ipecac) was to some degree successful in the treatment of amebic



CHARLES F. CRAIG



PERCY M. ASHBURN

dysentery when carefully used, the fact that it was an emetic made it difficult for the patient to retain. Since in the Philippines men with dysentery often had malaria as well and since falciparum malaria could cause dysentery-like symptoms, quinine was also widely used. Because even ipecac did not kill all amoebas in every part of the body, the medical treatment of dysentery remained frustrating for doctor and patient alike.[13]

The liver abscesses that could result from amebiasis occupied the attention of medical officers in the various army hospitals scattered throughout the Philippines. Although nine of the sixteen cases upon which he operated died, Lt. Edward W. Pinkham was satisfied by the autopsy results that indicated death had been inevitable in eight of them. He also concluded that none of the cases would have survived without surgery and that the true reason for the opposition of physicians who were not surgeons to surgical treatment for liver abscesses was the intrusion upon their domain.[14]

Among other insect-borne diseases studied by the Tropical Disease Board in the Philippines was dengue, a problem with which medical officers in both the United States and the Caribbean had become familiar. Also known as breakbone fever, dengue, while rarely fatal, was both painful and debilitating. Brig. Gen. George H. Torney, O'Reilly's successor as surgeon general, reported that it caused a "small constant non-effective rate" among troops in the island, serving as "an inconvenience" rather than "a sanitary danger." When the Tropical Disease Board renewed its work in 1906, a dengue epidemic was sweeping the garrison of Fort McKinley, located on a low damp site near Manila, and the study of this disease quickly be-

came part of the board's responsibilities. The erratic pattern characteristic of its spread at that post quickly convinced Captain Ashburn and Lieutenant Craig that dengue was mosquito-borne, but much remained to be learned.[15]

To conduct their research into the causes of dengue, Captain Ashburn and Lieutenant Craig, like Major Reed, resorted to human guinea pigs, although, because the disease was as a rule not fatal, the risk to the volunteers in their experiments was not serious. When all four corpsmen who volunteered had contracted the disease from the initial experiments and had thus become immune, Ashburn and Craig turned to volunteers from the line, encouraging their altruism with $25 gold pieces and the promise of favorable assignments. Unable to find parasites in dengue patients, the medical officers resorted to injecting their blood into the volunteers. Upon discovering that, whether filtered or unfiltered, the blood transmitted the disease, they assumed that dengue, like yellow fever, was caused by an "ultramicroscopic" organism. They also concluded that the minimum incubation period for dengue was three days and that the disease was carried by the *Culex fatigans* mosquito. The latter conclusion proved to be in error, however, since the principal vector for dengue is *Aedes aegypti*, the insect that also carries yellow fever.[16]

Except for the attempt to discover more accurate means of diagnosis, malaria did not inspire as intense a research effort in the Philippines as might have been anticipated in view of the fact that the disease had afflicted so many soldiers through the years. In writing the history of the Army Medical Department some years later, Ashburn reported that almost 300 soldiers of every 1,000 in the Army in 1902 were suffering from malaria. In fiscal year 1900, when Craig was assigned as a contract surgeon to the general hospital in the Presidio at San Francisco, he noted that the blood of 13 percent of the patients entering that hospital showed evidence of malaria, in most cases the tertian form, caused by the vivax form of the malaria parasite and characterized by a fever that returns every third day. Craig was obviously most interested in learning more about the appearance, behavior, and life cycles of the various malaria parasites and was developing improved techniques to use in this effort. In the Philippines the work of the Tropical Disease Board along these lines was limited to the use of mosquito netting to determine the size of the mesh that would exclude the *Anopheles*.[17]

In 1900 the officers of the Tropical Disease Board found themselves investigating plague, yet another insect-borne disease in the Philippines, without being sure that it was, indeed, insect-borne. Although the organism that caused plague had been discovered in 1894 and physicians were aware of a connection between the disease and rodents, the precise means by which it was spread would remain in the realm of conjecture for several years longer. Even such an authority as zoologist Charles Stiles was still convinced as late as 1901 that if rat fleas did play a role in the spread of the plague, it was not by biting. At this time, with his usual caution, Surgeon General Sternberg avoided actually taking a stand on the subject.[18]

Lieutenant Strong, Curry, and Lt. William J. Calvert, who replaced Lt. Jere B. Clayton,[19] began studying the dread disease in the laboratories of the First Reserve Hospital in Manila in the first months following the appearance of plague, moving to the facilities of the Manila Board of

Health as soon as the laboratories there were properly equipped. Curry was particularly intrigued, as the epidemic continued, by the fact that while the death rate among Filipinos was 81 percent, it was only 72 percent among the Chinese who, because of the impoverished circumstances in which they lived, might have been expected to have a higher mortality. Lieutenant Calvert, however, credited what he called "racial immunity" to lifestyle, including clothing and cleanliness, but somewhat paradoxically blamed the Chinese for the spread of plague, both through their persons and their merchandise. He noted that "poverty, poor food and dwellings, and ignorance" were the breeding grounds for the disease and that ignorance was the most important factor.[20]

Lieutenant Calvert based these conclusions upon his study of plague both in the Manila laboratory and in Japan and Hong Kong. In Manila he carried out physical examinations of plague victims, grew cultures that proved capable of killing laboratory rats in three to five days, and conducted autopsies. When he was sent to Japan and Hong Kong to study the way in which plague was handled in nations long familiar with the disease, he visited a serum farm near Tokyo, where an antitoxin was being prepared. This type of serum impressed Surgeon General Sternberg more than Lieutenant Strong, who worked for months without notable success to develop a more effective means of immunization. In 1901 Calvert prepared a circular on the subject of plague that was promptly issued by the surgeon general. In it he covered all aspects of the disease, its history, its symptoms, its pathology, the climates where it was most prevalent, the types of people it most often afflicted, and the means by which it was transmitted. Because he had observed that it could appear where no rats were present, Calvert concluded that plague could be spread in two ways. The bite of an infected flea transmitted the bubonic form, while the inhalation of germs present in bedding, feces, and urine, or coughed up by bubonic plague victims with pneumonia as a complication spread the pneumonic type, which was particularly fatal.[21]

Unlike bubonic plague, an object of interest and study for centuries and a swift and legendary killer, one of the diseases that drew the attention of the Tropical Disease Board was relatively unknown, especially in the United States. In the Philippines, however, beriberi, now known to result from thiamine deficiency, soon became familiar to medical officers who were responsible for the health of Filipino scouts. Heart problems, edema, nerve pain, difficulties with gait and vision, weakness, mental deterioration, and paralysis severely reduced the effectiveness of scout and police units and thus limited the support they could provide the Army in its struggle with the insurgents. Very few American soldiers ever suffered from this disease, but in Bilibid prison, where many captured guerrillas were held, beriberi sickened more than 2,000 prisoners in a six-month period in 1902 and caused 77 deaths.[22]

Although vitamins as such were still unknown in the early 1900s,[23] physicians knew that a deficiency of certain elements in the diet could seriously undermine the health. Scurvy, however, had been placed in the category of a deficiency disease long before the members of the Tropical Disease Board were born, and in their initial uncertainty as to the cause of beriberi, Medical Department researchers could only speculate, as their predecessors had speculated about scurvy, about the effects of ex-



EDWARD B. VEDDER



WESTON P. CHAMBERLAIN

posure to dampness, or to the cold, or to wide temperature changes. They also considered the possibility that "germs . . . in the soil," polluted water, or malaria was at the root of the problem. In 1901 a medical officer maintained confidently that "diet had little to do with the propagation" of beriberi, which he believed was most probably spread by germs. Even as late as 1911 some were still not convinced, but diet was increasingly regarded as a possible factor. Many experiments with different diets established that those who ate unmilled rice (rice from which the hulls had not been removed) did not get this disease. Largely because of the efforts of the Tropical Disease Board and in spite of difficulties experienced in persuading the scouts to abandon their customary diet, beriberi had almost entirely disappeared from among the native troops by 1911, when only three cases were recorded.[24]

U.S. medical officers conducted much research into the possible causes of beriberi, initially using animal subjects. In 1911 Capt. Edward B. Vedder and Maj. Weston P. Chamberlain, who became members of the Tropical Disease Board in 1910, began experimenting with the treatment of infantile beriberi with an extract of rice polishings. Other physicians had already tried feeding the polishings to nursing mothers; believing the problem to be a poison in the mother's milk, they required that each baby be exclusively bottle-fed until the mother's treatment had been completed. Vedder and Chamberlain cured fifteen infants whose mothers had symptoms of beriberi by supplementing each mother's milk with an extract of rice polishings and allowing nursing to continue. In every case, regardless of the seriousness of the baby's condition, the cure was rapid and complete. The experiment

demonstrated conclusively that beriberi was a deficiency disease rather than the result of a toxin in the mother's milk. In 1913 Vedder capped his work in this field with the publication of a book on the subject.[25]

A disease familiar to Filipinos and far more familiar to medical officers than beriberi was cholera, which struck the Philippines in 1902. In the course of their research Army surgeons tried new approaches to both prevention and treatment; results were disastrous in one instance, when a bottle of bubonic plague serum was mixed in with bottles of a cholera serum destined to be tested as a vaccine on prisoners at Bilibid prison, and the ten men who received the plague serum died. Strong, who was working with the cholera serum now in a civilian capacity, had been reserved in his reaction to the preparation of cholera vaccine from the outset because of questions about its safety and his belief that years might be required to produce a strain of the organism sufficiently attenuated for safe use. By 1903 the Japanese had developed both a vaccine to prevent cholera and an antitoxin to treat it, and the results achieved in a few tests of the antitoxin impressed U.S. Army contract surgeons whose patients received it on an emergency basis when they fell ill on a transport. But it was initially not for sale and was hard to obtain. Although the work of the Japanese had promise, that of the Tropical Disease Board was of little, if any, practical value to those responsible for attempts to stem the cholera epidemic in the Philippines.[26]

Attempts to cure cholera by injecting a saline solution under the skin or into the veins were more successful. A medical officer in charge of two cholera hospitals in the Manila area not long after the start of the epidemic reported to Surgeon General Sternberg that he was using a normal salt solution by vein, having learned that "in collapse it gave the most gratifying results." Many patients, however, were apparently so near death at the time they arrived at the hospital where this treatment was used that nothing could save them. Two physicians reported using intravenous injections to save 80 percent of their cholera patients when cholera again became epidemic in 1908.[27]

Skin diseases also drew the attention of the Tropical Disease Board while Captain Phalen and Lieutenant Nichols were members. Yaws, caused by an organism similar to that responsible for syphilis, was no threat to U.S. soldiers, but the huge skin ulcers it caused in many Filipinos, especially children, were hard to ignore. Although Captain Ashburn and Lieutenant Craig confirmed the identity of the organism causing this disease, first revealed in 1905, Strong discovered in 1910 that it could be successfully treated with a drug newly found effective with syphilis, arsphenamine, a compound of arsenic. Fungal infections, however, were often difficult both to diagnose and to cure. In the hope of preventing this type of problem, the board encouraged experiment with different types of clothing to reduce excess sweating.[28]

Organizing the Campaign

While the officers of the Tropical Disease Board continued their work, the remaining Army surgeons joined the effort to reduce disease rates in the Philippines. As far as could be ascertained from studying Spanish records, the occupying U.S. troops had come to a land where death rates had been averaging 50 percent or more above those in many major cities in the United States and usually more than 30 per 1,000

per year even in non-epidemic years. The attempt to devise practical means to improve public health could not wait for the new discoveries that might be made by the medical officers who were conducting laboratory research. Knowledge of the specific organisms that caused specific diseases was not at this point as important as an awareness of the fact that, as historian Ken de Bevoise has put it, "poverty, crowded and unhygienic living conditions, and lack of education" were associated with the spread of many diseases, among them cholera, plague, dysentery, and smallpox. Medical officers leading the effort to improve public health in the Philippines would soon discover that the spread of disease was also related to "the gregarious nature of the culture," which "required that those stricken by disease be attended constantly by family and friends." [29]

The Philippines "presented nearly ideal conditions for the propagation of all infectious disease." "A cycle . . . in which poverty was reinforced by undereducation, malnutrition, and disease" was already well under way when the Americans first arrived. Years of conflict between Filipinos and Spanish, then between Spanish and Americans, and finally between Americans and Filipinos only exacerbated an already tragic situation. The deprivations and dislocations accompanying the armed struggle contributed to the spread of disease. As far as sanitation was concerned, Manila resembled a fifteenth-century European city. Reconcentration policies aimed at gathering Filipinos into communities that the occupiers could more easily control favored the spread of disease, and the customary diet of polished rice favored high rates of beriberi. Many Filipinos were especially vulnerable to epidemics because their resistance had been undermined by such endemic problems as chronic malaria, amebic dysentery, tuberculosis, and hookworm infection. What de Bevoise has described as the Filipino "dysfunctional concepts of health and illness" still further complicated the situation. Cholera, malaria, the diarrhea-like illnesses, and tuberculosis caused the greatest number of deaths, which in 1902, the first postwar period for which reasonably accurate statistics could be obtained, reached an annual death rate of 63.3 per 1,000.[30]

For U.S. physicians newly arrived in the Philippines, the discovery that even well-to-do Filipinos were not impressed by the value of sanitation came as a shock. By 1900 U.S. cities generally required, one observer maintained, "garbage collection, sewage disposal, street sweeping, universal vaccination, the proper disposition of fecal matter." In Manila, on the other hand, Army medical officer Lt. Col. Louis M. Maus, who had arrived in the Philippines in December 1899 to serve as chief surgeon of the 2d Division, VIII Corps,[31] reported in 1902 that "until quite recently some of the best houses . . . were provided with a seat on the second story, on the outside of the house, and the deposit allowed to drop in the yard below, where it was finally scraped up and carried away." Other homes were equipped with indoor latrines located in a tower at the top of the building, whence the waste fell through a hole into a pit. After a century or so of use, "a solid column of . . . decayed filth" accumulated. Rich and poor alike built latrines over waterways, usually "above low-water mark, [so that] when the tide is out, the deposits are left high and dry, . . . being exposed to the action of flies and other insects for from eight to twelve hours daily." The surface of the ground occupied by many of the poorer houses was so badly drained that, Maus noted, "during heavy rains the accumulation of filth and

garbage is floated out into the streets and deposited over the district, thus spreading the germs of disease far and wide." The challenge that faced Army surgeons attempting to improve public health was still further complicated by the fact that it was difficult to make even the need for soap and hot water apparent to natives who spoke a multitude of dialects.[32]

The main responsibility for the effort to improve public health in Manila was borne by U.S. Army medical officers or former medical officers from the time of the Spanish surrender in 1898 until 1904. The military government created a board of health, composed of six Army surgeons assisted by two Filipino physicians as honorary members, making it responsible to the provost marshal general for the city's public health. The campaign "of cleaning and sweeping, so characteristic of the American sanitarian," that the Manila Board of Health initiated, doing "what it could in the face of an overwhelming problem," was limited for the most part to the city of Manila. To facilitate the board's public health efforts, the chief of the its sanitary division, Lt. Harry L. Gilchrist, worked from January to April 1901 to conduct what was probably Manila's first accurate census.[33]

Shortly after taking over the government in July 1901, the new civilian Philippine Commission created a second board of health, officially the Board of Health for the Philippine Islands and the City of Manila,[34] to monitor health in all of the Philippines, requiring it to function as the board of health for Manila as well. The first two commissioners of public health who ran this new board and its chief sanitary officer were, once again, Army medical officers.[35] Regulations required that officers serving the civilian government resign from the military, but the Army skirted the problem by making serving under the Philippine Commission a duty assignment. Other Army surgeons and even, on at least one occasion, a hospital steward, were detailed from time to time to assist the new organization in dealing with its mission, which was principally "the prevention and suppression of diseases." A laboratory that slowly grew in size was initially established on a small scale and managed for the board by Tropical Disease Board member Lieutenant Calvert. Medical officers were permitted to work with the Philippine Board of Health without examination if the commissioner of public health recommended their exemption and his decision was approved by the Philippine Civil Service Board. The qualifications of all others who wished to practice medicine in the Philippines had to be established before a board that the commissioner appointed for the purpose.[36]

The responsibility for sanitation in each area of the countryside was initially borne by the military officers stationed there. The challenge involved was great, for, according to a surgeon stationed three years in the provinces, "the people had no faith in preventive or any other medicine and relied solely on nightly religious processions and on prayer, fighting all our efforts tooth and nail. . . ." In 1901, under the organization devised by the new civilian government, a network of subordinate boards assumed the responsibility for health in all parts of the provinces not under direct military control, supported by the Bureau of Government Laboratories in Manila with former medical officer Richard Strong, who was already gaining considerable prominence in the field of tropical medicine, at its head. The provincial boards that worked under the Philippine Board of Health were composed entirely of civilians and headed by local doc-

tors, for whom the board established a training course in Manila in 1903. U.S. Army surgeons could advise the local boards but could not serve on them as voting members. Large communities were also permitted to form their own municipal organizations, subordinate to the provincial board of health. Finding an adequate number of "sufficiently intelligent" citizens and qualified civilian physicians interested in serving in the field of public health was often difficult, although Filipino and Spanish doctors were numerous. If needed, physicians serving in the U.S. Army could still be sent out into the provinces to check on sanitation, epidemics among either humans or animals, and economic conditions, a practice favored by the Medical Department because the experience gave these physicians a greater opportunity to study disease and the conditions that contributed to its spread.[37]

The military role in public health began to wane when the Philippine Board of Health was replaced by a bureau of health in 1904. The eleven divisions of the new organization were apparently all headed by civilians under the Army medical officer who was briefly detailed to run it until replaced by a medical officer of the Public Health and Marine Hospital Service. Steps were under way to abandon provincial boards of health in favor of a system of district health officers. Although the Medical Department's dominance of public health efforts in the Philippine Islands was thus brought to an end, in some areas, post surgeons often continued to function as the health officer of communities near their stations.[38]

The Campaign

The challenge faced by those involved in the campaign to improve public health in the Philippines was formidable from the outset. Although accurate figures were not available until many months after the U.S. occupation began, a review of the death rates of Manila conducted by medical officers revealed a dismal picture. Available Spanish figures for the twenty years preceding the war did not separate the city's figures from those of the surrounding province, but the statistics for both areas ranged from a low of 28.8 deaths per 1,000 per year to a high of 63.1, with a fifteen-year average of 38 per 1,000. In 1900, 44.5 of every 1,000 inhabitants of Manila died. In 1901 the rate was 42.6, while in the first nine months of 1902, when cholera began to rage in the city, the annual death rate rose to 64.81 per 1,000. Infant deaths formed the major part of the toll, however, even in cholera years; convulsions from unspecified causes killed 2,038 children from 1 September 1902 to 1 September 1903, during a period when a total of 894 men, women, and children died of cholera and 789 from pulmonary tuberculosis.[39]

Many of the fatal diseases, whether they afflicted adults or infants, could be linked directly or indirectly to the garbage and human wastes decaying in the hot and humid streets and the overcrowding that characterized Manila. The challenge involved in attempting to clean up the city was made all the greater by the fact that, in the fall of 1898, when presumably disease and death rates were high, the Manila Board of Health lacked adequate funding, the city had no municipal government with which the board could work, and conditions were generally unsettled.

Sanitation seemed a logical approach to reducing the inroads of disease in the Philippines. In the United States, where epidemics of such filth diseases as cholera were a thing of the past, the benefits of improved sanitation had become apparent on an empiri-

cal basis even before germs were accepted as the cause of so many devastating epidemics. The Manila Board of Health established fines for those who relieved themselves in the streets or failed to correct problems that had been pointed out to them, as well as a system of inspections to detect violations of sanitary laws and supervise their elimination. The first inspection apparently came in response to the specific threat of bubonic plague, first diagnosed late in December 1899. Once plague had been identified, a team of a hundred inspectors, most of them medical students, was quickly gathered with the aid of the chief of police and sent out on house-to-house inspection tours throughout all of the city, except for the Chinese sections, where community leaders of a population of more than 51,000 ran the inspections. A surgeon of the U.S. Volunteers assumed responsibility for a cleanup campaign that involved poisoning rats and for such markedly less useful efforts as whitewashing homes inside and out. The Marine Hospital Service inspected all those leaving Manila to ensure that no one who was coming down with the disease went out into the provinces.[40]

Recognizing that plague was by no means the only serious danger to public health in the Philippines, the Philippine Board of Health continued to refine the system of sanitary inspections when it assumed responsibility for the city of Manila. The inspections were the responsibility of one of the board's members, Franklin A. Meacham, who had resigned from the Army to serve as chief sanitary inspector. The board gave Meacham an interpreter and appointed a chief inspector to serve under him. Also part of Meacham's team were sixty inspectors, ten of whom were Chinese, with the balance Filipino. Each



FRANKLIN A. MEACHAM

of the ten districts into which Manila was now divided was served by a district inspector, who was assisted by three subdistrict inspectors, and by a medical officer, usually a contract surgeon awaiting transportation back to the United States, who became responsibe for public health.[41]

Repeated frustrations greeted efforts in Manila to reduce disease rates significantly. The Manila Board of Health started its work with little equipment, having neither ambulances nor wagons equipped to handle disinfection on a large scale. Native inspectors, accustomed to the ways of their people, had to be closely supervised by Americans lest they ignore the very failings they had been hired to report. Because there was no better alternative immediately available, for a time the board had no choice but to allow the use of drainage ditches as latrines to continue, consoling itself by the fact that the heavy rains of the wet season



A SEWAGE-CLOGGED DRAINAGE DITCH, *used by Filipino vendors and families*

would eventually flush them out. The most fundamental problem, however, was the fact that inadequate funding threatened the much needed permanent solutions to the city's health problems: the construction of a city sewage system; the establishment of a safe and ample water supply; and the cleaning of the sewage-clogged moats and drainage ditches that crisscrossed the city, the breeding grounds of multitudinous mosquitoes. The challenge remained when the Philippine Board of Health assumed responsibility for Manila. Within a few months, Meacham's unceasing efforts to improve the health of the city's population in the face of these frustrations had completely exhausted him. In April 1902 he succumbed to heart failure after refusing to leave his desk despite the fact that he was running a high fever.[42]

Even as late as 1907, only eighteen miles of the new sewer system had been completed. Long before this point, the lack of a modern sewage network in Manila had forced the Philippine Board of Health to resort to the Chinese night soil system for removing excrement. Pails were provided to each household for this purpose, and indoor toilets were required to be emptied and cleaned twice a week. The contents of the pails joined all other forms of human wastes and garbage on barges, which dumped their unattractive cargoes in the bay at a spot where the current flowed away from the land. Since even after the pail system had been installed, the sanitation in poor homes was defective, the board decided to begin establishing public latrines where attendants would be responsible for cleanliness day and night.[43]

Other steps taken to improve Manila's sanitation early in the U.S. occupation included drawing up a sanitary map of the city and sanitary plans of each dwelling in

it as part of the census done early in 1901, in order to facilitate the work of the inspectors. The Philippine Board of Health also resorted to the prosecution of a few wealthy landlords for putting too many tenants in the tenements they owned, a step that inspired noticeable improvement in conditions in many similar buildings. The selling of food by vendors in the streets was also strictly regulated, with netting required to keep flies from the items for sale and forks required to avoid the handling of food with bare hands. By the fall of 1903 the system of sanitary inspection was in full operation, even though the size of the inspection force had been cut by 75 percent in June of that year with the discharge of inspectors hired to help with the cholera epidemic. Almost 2 million homes were inspected or reinspected in the twelve months following 1 September 1902. As a result, more than 241,000 houses and almost 162,000 yards were cleaned, and more than 11,000 cesspools and similar sewage systems were emptied.[44]

Since Manila took its water from a river often contaminated by the urine and feces of the 20,000 people who lived along it, either directly or through rain water that washed wastes into the river, the poor sanitary habits of some Filipinos who lived upriver continued to threaten the city's drinking water. Keeping these people entirely away from its banks was impossible, for traditionally they washed both themselves and their clothing in it and watered their livestock there as well. Furthermore, since they did not live in the city, they were little interested in changing their habits for the benefit of those who did. The river was also polluted by as many as 15,000 people who lived on boats and used it as both laundry and latrine, even though it was their only source of drinking water. The boat people were so hostile to interference that on occasion they attempted to avoid attracting visits from inspectors by throwing the bodies of their cholera dead, suitably weighted, into the river. Even within the city itself, hundreds of bamboo huts lay close to the water, where the occupant, "his carabao and his pigs, his hens, and his family bathed and often drank in the same stream. The few dishes and pots he possessed, together with the family wardrobe, his dutiful wife habitually cleaned in this common water, and as it saved labor, the nearer the shack was to the stream the better; and so it very often was placed right in it." [45]

Relying on the city's wells, however, was not the answer to the problem of polluted water, since they were shallow and their openings so badly encased that the run-off from the city streets drained into them after every rain. Thus when cholera hit Manila in 1902, the Philippine Board of Health had no choice but to close all of the city's shallow wells and have a few new ones driven to a depth of 700–1,000 feet. It had distilling plants set up to produce 10,000 gallons of pure water a day, but since more extensive measures were clearly called for, the board also made long-range plans to dam the river between its source and the area where people had located their homes so that water could be piped thence around the sources of pollution and into the city. The building of this new water system was almost complete by the end of 1906. Medical officers also urged, but with only partial success, that public lavatories and laundries be established in areas along the river near where the boat people were anchored and that good water be piped to locations where they could easily use it. These measures would both improve their health and reduce the threat to the city's water supply.[46]

Manila's hospital system was particularly important when the rates of communicable diseases were so high among the indigent, yet in 1898 apparently only one public hospital, one of the Philippines' two facilities for lepers, existed in the capital. Work had been started on a new general hospital for patients with noncontagious diseases, but the building was never completed within the lifetime of the Manila Board of Health. High smallpox rates, resulting from the fact that compulsory vaccination laws had been ignored here as in other Spanish colonies, necessitated the hasty erection of tents—the only type of shelter that could be afforded—to serve as a "pest hospital." The Chinese community, which had its own hospital, built a facility for contagious diseases as well. By the end of 1901, however, barracks with a capacity for 3,500 beds had been constructed and divided into two hospitals, where patients with plague or cholera could be isolated. Late in 1901 an 80-bed hospital was created for civil servants and their families. Nevertheless, the shortage of hospital beds continued; in 1903 the Philippine Board of Health was both urging the creation of more beds for the insane and deploring the closing of two women's hospitals.[47]

Initially when cholera invaded the city in March 1902, hospital space was available for its victims. Even though cholera patients could be treated in their homes if the proper precautions were taken to prevent them from infecting others, the Philippine Board of Health was soon experiencing considerable difficulty in supplying beds for those who could not be kept in their own houses and in finding adequate space in which to isolate those who had come in contact with them. When the 100 beds set up at Santa Mesa, along with a detention camp for 6,000 contacts, proved to be so far from Manila that the trip caused the condition of the patients moved there to deteriorate, a third hospital was opened in the city. Here it shared space with a privately operated facility for the Spanish community in buildings that had housed the Second Reserve Hospital. Medical officers were in charge of both the facility at Santa Mesa and that in the Second Reserve buildings.[48]

In 1903, with the need for beds for cholera patients still great, a rapidly spreading fire destroyed both the cholera hospital in Manila and the detention facility set up nearby for suspected cases. The corral for the Philippine Board of Health's horses and the buildings of the pail collection system that handled the city's night soil were also burned down. Although its facilities had been heavily damaged, the board had tents and temporary latrines erected for those rendered homeless by the conflagration, thereby avoiding the marked rise in disease rates that might otherwise have been expected to follow a disastrous fire in such an overcrowded and unsanitary city. Fortunately, the board was given a large increase in funds for the fiscal year 1904.[49]

One of the motivating factors for the creation of the Manila Board of Health had been the customary conviction that the maintenance of public health required the isolation of lepers from the rest of the public. The facility for these unfortunates had a capacity of 150–200 beds, but U.S. medical officers initially estimated that as many as 30,000 of them remained unsegregated in the islands, a figure later lowered to 6,000. One of the first duties of the board, therefore, was to locate an island that could be developed into a leper colony. While the investigations necessary to deal with this problem were being made, the board had a door-to-door search conducted to ascer-

tain who and where in Manila the lepers were. This inspection, started in January 1900, revealed more than 100 unhospitalized victims of this horrible disease in the city. By 1904 Culion Island (*see Map 4*) had been chosen for the leper colony and work to establish the facility was well under way. The Philippine Bureau of Health appointed a former medical officer as the colony's first director.[50]

The Most Dangerous Threats

In addition to the struggle to limit the spread of disease through improved sanitation and to create facilities where those with contagious diseases could be isolated, U.S. medical officers directed considerable effort against specific epidemic diseases that threatened the Philippines. Smallpox was a concern from the moment of the Spanish surrender in August 1898. The Filipinos took the disease casually. On the island of Luzon (*see Map 4*) it was prevalent in every village, yet no attempts were made either to isolate the victim or to disinfect his home. Despite the immunization that was mandatory for U.S. troops, American soldiers occasionally acquired the disease from the Filipinos, making its eradication doubly desirable. The Manila Board of Health promptly initiated a campaign later described by Colonel Greenleaf, then the Army's chief medical officer in the islands, as "forcible vaccination and revaccination, where that was necessary." The effort was eventually extended to all inhabitants of the islands over the age of three months. Medical officers in the provinces received authority to hire Filipinos and to send them from door to door within the city to perform the actual vaccinations, with the proviso that they supervise the procedure and consult local authorities to ensure their cooperation. The success of the board's efforts in this instance was marked. In March 1899 smallpox deaths numbered 75 in Manila alone; from October 1899 through July 1900, however, the disease killed only 7 in that city. In the provinces, where local boards of health were responsible for the immunization program, the campaign against smallpox was not under way until February 1900 and was handicapped by the fact that the insurgents occasionally kidnapped the vaccinators. Despite these problems, in the twelve months preceding 1 September 1903 almost 1.2 million units of vaccine were used in the effort to eradicate smallpox in the Philippines.[51]

The Manila Board of Health supervised the preparation of the smallpox virus for all of the Philippine Islands, but when the long trip seemed to be reducing the effectiveness of the vaccine sent to some of the islands, vaccine farms were also set up in the Visayas and on Mindanao (*see Map 4*). In Manila the board established a vaccine institute to prepare both smallpox vaccine and any other serums that might be called for to immunize or treat other diseases of man and beast. As the campaign progressed into the provinces and grew in both magnitude and complexity, developing a formal organization under a chief of vaccination to manage all aspects of the immunization program became necessary. Nevertheless, despite the care exercised, all too often the smallpox vaccine proved to be ineffective; in 1905 less than half of those vaccinated earlier were determined to have actually been rendered immune. In 1904, however, when no deaths from smallpox occurred among those who had been vaccinated, the problem appeared to be under control.[52]

The Manila Board of Health had scarcely launched the campaign against smallpox before it found itself confronted with the plague epidemic. Although U.S. medical officers were experienced in dealing with smallpox and vaccination and could manage the problems of the campaign against that disease with confidence, they were much less familiar with plague. Believing that the rat might be in some way connected with its spread, the board included within the generalized campaign to clean up the city a specific plan to eliminate rats by trapping or poisoning them. These rodents were killed at the rate of 5,000 to 10,000 or more a month and as many as possible were examined in the laboratory to determine if they were infected. Strenuous efforts were also made to detect and isolate plague victims and those exposed to them and to disinfect their homes and possessions. Whenever possible, those who died from plague were cremated, but if their families had religious scruples against this method of disposing of infected bodies, the board had the coffins filled with disinfectants and quick lime.[53]

Although the incidence of plague in Manila in 1900 officially dropped from a high of 49 identified cases in March to 11 by May, these statistics were not all-inclusive, since an average of 40 to 80 Chinese were apparently dying of the disease each month without medical attendance. Even after the epidemic ended in Manila in 1902, it continued to haunt the rest of the Philippines. From 1 January 1900 to 1 September 1902, 772 cases were identified and 646 deaths noted. In the following year 198 cases and 166 deaths occurred. The rate continued to drop, with 94 cases and 87 deaths from 1 September 1903 to 1 September 1904 and another 24 cases and 23 deaths in the eight months from 1 September 1904 to 30 April 1905. Moreover, by July 1902, only three American soldiers had contracted the disease and the rates in other cities in the Far East were far worse than in Manila.[54]

After the outbreak of plague had lasted two years, the epidemic of cholera, like plague most often found in communities with poor sanitation, diverted the attention of the harried and harassed Philippine Board of Health. This disease inspired growing concern from the moment it was first diagnosed in Manila in March 1902. Once again, the board had no weapon but a more extensive effort to improve sanitation. Going beyond the attempt to create safe sources of water, it also forbade the sale of fruits and vegetables that could be eaten raw. In addition, inspectors made house-to-house visits within the city at all hours of the day and night to make sure that no case of cholera went undetected, and a quarantine was placed on the city to limit the spread of disease. But the natives of the island, including Filipino physicians, were not always cooperative. As one Army surgeon noted, the Filipinos tended to take alarm only at the appearance of some spectacular disaster and otherwise accepted suffering and death with "a curious indifference." The board could take some consolation in the fact that few Americans contracted the disease, and those who did were usually men who had "visited or lived with native women" or who had made the mistake of assuming that adding alcohol to water would make it safe to drink.[55]

In spite of the efforts of the Philippine Board of Health, cholera soon escaped from Manila into the countryside, where it was more difficult to control. At the request of the commissioner of public health, Colonel Maus, thirty-one medical

officers were detailed to assist him in dealing with the epidemic. The board also asked to have medical officers placed on the municipal boards of health of the towns where their posts were located. The campaign included requiring medical officers to form municipal boards where they did not exist, to prevent the pollution of streams, and to report all cases of cholera to their division chiefs. The Philippine Board of Health urged American school teachers serving on the municipal boards to educate Filipinos on the nature of cholera and the steps to take to avoid its spread. It also encouraged the appointment of American civilians as inspectors so that soldiers would be given this assignment only as a last resort.[56]

Superstitions about the source of the disease were more widespread in the provinces than in the city, and the efforts of military authorities to stem the epidemic in the countryside were often thwarted. The hundreds of posts throughout the islands became centers from which medical help was rendered to the surrounding populations, but the opposition to the work of medical officers in some areas was so strong that they were accused of causing the epidemic by poisoning the water. Maj. Charles E. Woodruff, an Army surgeon serving in the Philippines in the summer of 1902, believed that the Filipinos were unable "to understand such abstruse matters. To their mystic minds," he noted, "the disease is carried by the air, and even the most intelligent are so fatalistic that they believe if their time has come to die it is futile to try to ward it off." Moreover, a pamphlet first issued by the Spanish in 1888 that maintained that cholera was an air-borne disease was still in circulation, reaffirming popular belief on the subject and encouraging Filipinos in their refusal to abandon the customs and habits of generations to cooperate with a campaign against a water and insect-borne disease.[57]

Shallow and easily polluted wells were the ordinary source of drinking water in the provinces, and crops were fertilized with human excrement. Natives relieved both bladder and bowel in the immediate vicinity of their homes, further facilitating the spread of disease. The Army surgeon working in one community reported that "everywhere there were carabao wallows and other pools of stagnant water, where the amphibious Filipino motive power [the water buffalo] lies dormant the greater part of the time, sunken up to his nostrils in the muddy water." Natives instructed to dig drainage ditches piled the earth on either side of the trenches they had just dug, thereby preventing water from entering. Run-off carried cholera to the drinking water, uncooked vegetables added the disease to the food, and flies transported the infection from fields and yards to food, water, and dishes, both within the native villages and at Army camps nearby. Women laundered the soiled linen from the beds of cholera victims in the stream whence came their drinking water. Guards posted around the homes and villages of cholera victims to guarantee their isolation, vigorous efforts to disinfect the premises, and the use of smudge pots to drive away flies and other insects were of no avail to stem the tide of the epidemic.[58]

Even where the local population seemed "peaceably inclined toward" the Americans and "disposed to obey the laws without questioning them," a basic problem remained in the form of what one Army physician regarded as a "lack of energy, improvidence and inability to ad-

minister public affairs" on the part of the Filipinos. A Philippine Board of Health publication on the subject of cholera was apparently largely ignored, and the efforts of medical officers to protect the civilian population too often came to nothing. "It is perfectly useless," one medical officer reported, "for any health officer to attempt to check an epidemic unless he can rule with a rod of steel." Furthermore, he added, "orders ought not to emanate from a central bureau. The officer in immediate command must be able to control his own movement. A chief cannot understand conditions in a town he has never visited." Sending medical inspectors to afflicted areas seemed to help, but these physicians were too few to reach all communities. Thus, because the rod of steel could not be used, people "died just as they used to die years ago and will continue to die for years to come." [59]

On 27 April 1904 the epidemic was declared to be at an end. A total of 166,252 cases had been officially reported, of which 109,461 had resulted in death. Perhaps as many as a third more victims had not been reported. Thanks to the military discipline that guaranteed adherence to preventive measures, only 305 U.S. soldiers died of cholera, in addition to 81 Philippine Scouts (their formal designation as of 1901), for whose health Army surgeons were also responsible. Mortality was highest among Filipino victims, their death rate being more than 80 percent, while fewer than 49 percent of the Chinese patients died, less than 56 percent of the Europeans, and barely more than 47 percent of all the Americans in the islands. Almost 96 percent of the infants under one year contracting cholera died. Few Chinese, it was remarked, even came down with the disease, a fact that was credited to their custom of cooking almost all of their food and drinking principally tea. One medical officer also noted that cholera seemed to grow more virulent with the passage of time. Significantly, however, despite the pronouncement that the epidemic was at an end, cholera had not been eradicated from the Philippines. Although it apparently no longer inspired panic, in the twelve months ending 31 August 1904 it killed 423 residents of Manila alone.[60]

In waging such a vigorous campaign to save lives from cholera, Army surgeons were indirectly waging a campaign to prevent disaster to the local economy. So many farmers died or neglected their fields and animals because of the need to minister to their sick families that crops were neither cared for nor harvested at the proper time. This neglect came just at the time when two epizootic diseases of much interest to medical officers—rinderpest, which affected cattle; and surra, nearly always fatal to horses and spread by the bites of flies—were sweeping through the Philippines, in some areas killing as many as 90 percent of the cattle and water buffalo and 60–75 percent of the horses and ponies. The very quarantine laws that were aimed at preventing the spread of cholera brought internal trade to a standstill, thereby further depressing the Philippine economy. While the Tropical Disease Board began experiments to develop a serum against surra, the Philippine Board of Health, responsible for the health of animals as well as humans, launched a campaign to immunize cattle against rinderpest. Both time and money were required to reach any substantial proportion of the islands' livestock, but by the fall of 1903 the death rate from that disease had fallen from 90 percent to 3 percent.[61]

Other Health Problems

Particularly distressing to U.S. physicians in the Philippines was the mortality among infants, who suffered not only from epidemic diseases but from infections and an inadequate diet. Those under a year of age died at a rate twice that found in the United States, although the rate in the islands might be less than that found among the infants of black Americans, who were almost uniformly very poor and whose overall mortality could be double that of whites. The infant death rate was particularly appalling in Manila, where in the cholera year of 1902 three-fifths died before they were twelve months old. Throughout the islands the annual death rate that year among children under five years old was 141 per 1,000, at a time when the comparable rate in the United States was 52 per 1,000 and 131 per 1,000 among blacks.[62]

Filipino children died of all the other ills afflicting the population, but Army surgeons soon realized that superimposed over these causes were problems stemming from poor nutrition and lack of cleanliness. All too often, neither midwife nor physician attended the mother in childbirth, and tetanus resulting from a lack of proper care in handling the newborn's umbilical cord caused many deaths, perhaps as many as 30 percent of the total. Meningitis also contributed to the mortality. The infant who was breast-fed exclusively by a mother suffering from poor nutrition might also develop beriberi. No safe alternatives existed for a mother who could not produce enough milk herself, especially after rinderpest had killed many of the cows in the islands. Because refrigeration was not available to the poor, infants might be given sour milk, and since the mothers knew nothing of how to modify cow's milk to make it more closely resemble that of humans, their babies often did not do well even if it was otherwise safe. Diluting cow's milk with water from polluted sources spread disease to the hapless offspring. In the attempt to keep them from starving to death, mothers might also feed their infants solid foods in a form they could not possibly digest. Statistics were difficult to obtain. Only physicians could record deaths, but few Filipinos called for medical assistance. Required to cite a cause of death for infants for whom they had not cared, doctors tended to list "infantile convulsions."[63]

Realizing that a reduction in infant mortality depended on the education of the mother, the Philippine Board of Health prepared a bulletin on infant care and had it translated into all the main dialects of the Philippines and distributed throughout the islands. The board also hired eight midwives to help poor women in the city of Manila with their deliveries, hoping thereby to reduce infection in newborns and to educate mothers in the need for cleanliness. The death rate from convulsions in those under twelve months of age stayed high, however, and infant mortality in general remained a problem for years to come.[64]

Many of the health problems that attracted researchers received little or no attention from officers on the various boards of health. No real campaign was ever made against hookworm or beriberi during the boards' lifetime, although the research of the Tropical Disease Board would prove invaluable to the Public Health and Marine Hospital Service officers when they became responsible for public health. Medical officers were concerned about dysentery and typhoid, but their concern centered about these diseases as threats to the health of troops. Malaria was not as

great a problem for the native population as might have been anticipated, even though screening was not often used, apparently because the predominant species of *Anopheles* mosquito did not breed in the coastal areas where most Filipinos lived. Although tuberculosis caused many deaths among the Filipinos and medical officers blamed its spread at least in part on poor hygiene, no campaign was undertaken against this disease. Mental illness in the civilian population concerned doctors principally because the lack of hospital beds for its victims resulted in their being imprisoned at Bilibid.[65]

When the Army relinquished its leading role in the attempt to improve sanitation and to lower disease rates in the Philippines, the work on sewage and water systems initiated at the urging of the various boards of health was not yet complete. Although infant mortality fell to 20 per 1,000 in 1920, in the earliest years of the twentieth century it remained great, and overall death rates in Manila continued to vary as epidemics waxed and waned. The city was definitely cleaner because of the Army's efforts, but the death rate of the Filipinos continued both high and fluctuating. The role cultural factors played in the spread of disease was demonstrated by the contrast in mortality rates between the Filipinos and the Chinese, who cooperated with the fight against disease and whose customs lowered their exposure to cholera. Chinese disease rates in Manila, like those among Americans and Europeans there, dropped markedly and consistently in the period 1902–1905. In the year ending 31 August 1903, when the Chinese rate was 28.26 per 1,000, that of Manila's Filipinos was 43.42. A year later the Chinese rate was 21.85, the Filipino 53.72. The year ending 31 August 1905 saw a Chinese rate standing at 16.15, the Filipino at 44.54.[66]

Victory over rats and insects proved to be far more easily achieved than victory over the customs, traditions, ignorance, and superstitions of a people accustomed to accepting disease and death without a struggle. The work of the disease boards was important to the understanding of such diseases as beriberi, dysentery, and dengue, and a campaign to reduce drastically the rat population of Manila contributed to the defeat of the plague, but the effort to reduce disease rates by improving standards of sanitation met with almost constant frustration. Discovering that a diet based on polished rice led to beriberi proved easier than inducing the people endangered by beriberi to adopt an unfamiliar diet, and the end of the cholera threat, like the end of the insurrection, was achieved by proclamation rather than by vanquishing the enemy. Nevertheless, sufficient progress had been made by 1913 to lead an American observer to comment that Manila was, "except in the matter of infant mortality, . . . about as healthy a city as any of its size in the warmer part of America."[67]

NOTES

1. First quotation from David J. Doherty, "Medicine and Disease in the Philippines," p. 1526; second quotation from Stanley Karnow, *In Our Image*, pp. 196–97. See also Louis M. Maus, "Military Sanitary Problems in the Philippine Islands," pp. 1–2, 11; Edward L. Munson, "The Civil Sanitary Function of the Army Medical Department in Territory Under Military Control," p. 273.

2. Unless otherwise indicated, data concerning the work of the Tropical Disease Boards is based on Edward B. Vedder, "A Synopsis of the Work of the Army Medical Research Boards in the Philippines," in *Army Medical Bulletin*, and Percy M. Ashburn, *A History of the Medical Department of the United States Army*; idem, "The Board for the Study of Tropical Diseases as They Occur in the Philippine Islands," pp. 298–301; Richard P. Strong, "The Bureau of Government Laboratories for the Philippine Islands," pp. 665–67; War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1900, p. 21, 1908, p. 99, 1912, p. 140, and 1915, p. 131 (hereafter cited as WD, *ARofSG*, date); William J. L. Lyster, "The Army Surgeon in the Philippines," p. 31.

3. Joseph J. Curry, "U.S. Army Pathological Laboratories in the Philippine Islands," p. 176. See also p. 175.

4. Strong joined the Army Medical Department in 1898 and was appointed to the Tropical Disease Board when it was created late in 1899. He fell ill, however, on 25 December and was apparently unable to work until February 1900. At this time, he directed the Army's pathology laboratory in the First Reserve Hospital in Manila and continued in this position when the facility was reconstituted as the Government Biology Laboratory. Strong resigned from the Army in 1902. As a civilian, he remained as head of the Government Biology Laboratory until his resignation in 1913. His reputation as an expert on tropical medicine continued to grow after he left the Philippines to teach tropical medicine at Harvard. See Curry, "U.S. Army," p. 176; *Who's Who in America, 1910–1911*, s.v. "Strong, Richard Pearson"; War Department, *[Annual] Report of the Secretary of War*, 1903, 6(pt.2):39–40 (hereafter cited as WD, *ARofSW*, date); idem, *ARofSG*, 1900, p. 109.

5. Joseph J. Curry, "Dysenteric Diseases in the Philippine Islands . . . ," pp. 177–78. Although both organisms are commonly referred to as *E. coli*, *Entamoeba coli* should not be confused with *Escherichia coli*, which, unlike *Entamoeba coli*, does have pathogenic strains—in other words, strains that cause illness.

6. The First Reserve Hospital is discussed in Chapter 8.

7. WD, *ARofSG*, 1900, pp. 245–46, 251, 273; Curry, "U.S. Army," p. 176; *Who's Who, 1910–1911*, s.v. "Strong, R. P."

8. *Entamoeba histolytica* was then known as *Amoeba dysenteriae* and *Entamoeba coli* as *Amoeba coli*.

9. WD, *ARofSG*, 1900, pp. 246, 261, 267–68, 270–71, 273, 1901, p. 205 (first quotation), and 1909, p. 96; Richard S. Strong, "Tropical Medicine," p. 9 (second quotation); "Pseudo-outbreak of Intestinal Amebiasis," p. 1861; Curry, "U.S. Army," p. 175; Simon Flexner, "On the Etiology of Tropical Dysentery," pp. 415–17, 424; idem, "Bacillary Dysentery," p. 219; Charles F. Mason, "Bacillary Dysentery (Shiga)," pp. 242–43; Simon Flexner and L. F. Barker, "The Prevalent Diseases in the Philippines," pp. 525–26; Esmond R. Long, *A History of American Pathology*, pp. 153, 158–59, 413–14n5.

10. WD, *ARofSG*, 1900, pp. 66 (quotations), 67–71, 246, 250; Charles F. Craig, "Observations Upon the Amoebae Coli and Their Staining Reaction," p. 415; idem, "The Pathology of Chronic Specific Dysentery," pp. 353, 376, 378; idem, *The Parasitic Amoebae of Man*; Martha L. Sternberg, *George Miller Sternberg*, p. 210; Edward B. Vedder, "An Examination of the Stools of 100 Healthy Individuals . . . ," p. 872.

11. WD, *ARofSG*, 1906, p. 130, 1907, pp. 40–41, and 1908, p. 98; James M. Phalen and Henry J. Nichols, "Tropical Diseases in the Philippines," p. 467; Ernest L. Walker, "Experimental Entamoebic Dysentery," pp. 254, 325.

12. WD, *ARofSG*, 1912, pp. 144–45, and 1913, pp. 131–32; Henry J. Nichols and James M. Phalen, "The Work of the Board for the Study of Tropical Diseases in the Philippines," p. 368; James M.

Phalen and E. D. Kilbourne, "The Bacteriology of an Epidemic of Bacillary Dysentery," pp. 433, 435–42.

13. "The Treatment of Acute Dysentery," p. 281; Gilbert E. Seamen, "Some Observations of a Medical Officer in the Philippines," p. 184; Richard P. Strong, *Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases*, 1:72, 453; WD, *ARofSG*, 1900, p. 114, 1901, p. 204, 1904, pp. 87–89, and 1911, pp. 144–45; Alfred Alexander Woodhull, "The Value of Ipecac in Dysentery," p. 223; Henry I. Raymond, "Ipecacuanha in Amebic Dysentery," p. 46.

14. Edward W. Pinkham, "Tropical Abscess of the Liver," p. 309. See also pp. 312, 314, 316. This article was published posthumously.

15. WD, *ARofSG*, 1910, p. 96 (quotations); Percy M. Ashburn and Charles F. Craig, "Experimental Investigations Regarding the Etiology of Dengue . . . ," pp. 97, 102.

16. Percy M. Ashburn and Charles F. Craig, "Study of Tropical Diseases in the Philippine Islands," pp. 692–93; idem, "Experimental Investigations," pp. 102, 105, 123 (quotation), 136; Charles F. Craig, "On the Nature of the Virus of Yellow Fever, Dengue, and Pappataic Fever," pp. 363–65; Joseph F. Siler, M. W. Hall, and A. P. Hitchens, "Results Obtained in the Transmission of Dengue Fever," pp. 1163; WD, *ARofSG*, 1907, p. 41, and 1910, p. 96.

17. WD, *ARofSG*, 1899, pp. 289–90, 1900, pp. 53–60, 235, 1911, p. 145, and 1912, p. 147; Curry, "U.S. Army," p. 176; Frederick F. Russell, "The Results of Two Seasons Anti-malarial Work," p. 161.

18. WD, *ARofSG*, 1900, pp. 210–12; George M. Sternberg, "The History and Etiology of Bubonic Plague," p. 813; "The Mode of Spreading of Bubonic Pest," p. 1372; Arthur H. Moorhead, "Plague in India," p. 167; Charles W. Stiles, "Insects as Disseminators of Disease," p. 7; H. Harold Scott, *A History of Tropical Medicine*, 2:733, 735.

19. Clayton left the Tropical Disease Board soon after his appointment in 1899.

20. Quotations from William J. Calvert, "Plague in the Orient," pp. 60, 63. See also Joseph J. Curry, "Bubonic Plague," p. 278; idem, "U.S. Army," pp. 175–76.

21. WD, *ARofSG*, 1900, pp. 218–20, and 1901, pp. 202, 219–34; Sternberg, "History," pp. 813–14; Richard P. Strong, "Studies in Plague Immunity," pp. 157–59, 302, 324–27, 329; Charles F. Craig, "The Bubonic Plague From a Sanitary Standpoint," pp. 586–87.

22. WD, *ARofSG*, 1901, p. 236, 1903, p. 69, and 1911, p. 129; Richard H. Follis, Jr., "Cellular Pathology and the Development of the Deficiency Disease Concept," p. 295.

23. The term *vitamine* was introduced in 1911 by biochemist Casimir Funk, who in the course of his research into the cause of beriberi concluded that the necessary factors in the diet were all amine derivatives. See Henry A. Skinner, *The Origin of Medical Terms*, p. 365.

24. WD, *ARofSG*, 1901, pp. 237, 239 (first quotation), 1902, pp. 100 (second quotation), 101, 1903, pp. 69–70, 1905, p. 52, 1910, pp. 120–21, 1911, pp. 128, 130, 132, and 1912, pp. 130, 138; Rpt, Harry A. Littlefield, 1 May 1902, Ms 5000, Entry 52, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; Weston P. Chamberlain, Horace D. Bloombergh, and Edward B. Vedder, "Report of the U.S. Army Board for the Study of Tropical Diseases as They Exist in the Philippine Islands," p. 446; Weston P. Chamberlain, "The Disappearance of Beriberi From the Philippine (Native) Scouts," pp. 514–15; Weston P. Chamberlain and Edward B. Vedder, "The Cure of Infantile Beriberi by the Administration to the Infant of an Extract of Rice Polishings . . . ," p. 30.

25. Chamberlain and Vedder, "Infantile Beriberi," pp. 26–27, 29; Scott, *History*, 2:892; Edward B. Vedder, *Beriberi*, pp. 257, 264; Edward B. Vedder and Robert R. Williams, "Concerning the Beriberi-preventing Substances or Vitamines Contained in Rice Polishings," p. 194; Robert R. Williams and N. M. Saleeby, "Experimental Treatment of Human Beriberi With Constituents of Rice Polishings," p. 118.

26. United States, Bureau of the Census, *Census of the Philippine Islands . . .* , 1:323 (hereafter cited as *Philippine Census*); WD, *ARofSG*, 1903, pp. 96–97; idem, *ARofSW*, 1902, 10(pt.1):359, 384, and 1906, 1:80–82; Richard P. Strong, "Vaccination Against Plague," p. 190; idem, "The Investigations Carried on by the Biological Laboratory in Relation to the Suppression of the Recent Cholera Outbreak in Manila," pp. 437–38. See also Kristine A. Campbell, "Knots in the Fabric," pp. 600–38.

27. WD, *ARofSG*, 1902, pp. 81 (quotation), 92; Henry J. Nichols and Vernon L. Andrews, "The Treatment of Asiatic Cholera During the Recent Epidemic," pp. 81, 91.

28. James M. Phalen and Henry J. Nichols, "Blastomycosis of the Skin in the Philippines," pp. 280–81, 285, 288, 292; idem, "The Work of the Board for the Study of Tropical Diseases in the Philippines," p. 467; WD, *ARofSG*, 1907, p. 41, 1908, p. 99, 1911, pp. 122, 141–42, and 1912, p. 140; Weston P. Cham-

berlain, Horace D. Bloombergh, and Edwin D. Kilbourne, "Report of the Board for the Study of Tropical Diseases in the Philippine Islands, Quarter Ending Sept. 30, 1910," p. 195; Nichols and Phalen, "Work of the Board," p. 370; Percy M. Ashburn and Charles F. Craig, "Observations Upon Treponema Pertinuis Castellani of Yaws and the Experimental Production of the Disease in Monkeys," pp. 443, 463; William E. Musgrave and M. T. Clegg, "The Etiology of Mycetoma," p. 499.

29. Ken de Bevoise, "Until God Knows When," p. 160 (quotations); *Philippine Census*, 3:17; John Duffy, *The Sanitarians*, pp. 146–47.

30. Bevoise, "Until," pp. 149 (second quotation), 150–54, 159–60 (first quotation); idem, "The Compromised Hosts," Ph.D. diss., pp. iv–v (third quotation), 280–81, 285; *Philippine Census*, 3:10, 23–24, 38–39; Reynaldo C. Ileto, "Cholera and the Origins of the American Sanitary Order in the Philippines," in *Imperial Medicine and Indigenous Societies*, pp. 128, 130–31, 140; Jose P. Bantug, *A Short History of Medicine in the Philippines During the Spanish Regime, 1565–1898*, pp. 26, 35–37, 70, 76, 109; William T. Sexton, *Soldiers in the Philippines*, p. 33.

31. Maus held the permanent rank of major when he arrived in the Philippines and later received his promotion to lieutenant colonel on 7 April 1902.

32. Frederick Chamberlin, *The Philippine Problem, 1898–1913*, pp. 116–17 (first quotation); WD, *ARofSW*, 1902, 10(pt.1):330 (second quotation), 371 (fourth quotation), 329 (fifth quotation), 1904, 12(pt.2):89, and 1907, 9(pt.3):281–82; G. J. Younghusband, *The Philippines and Round About* (New York: Macmillan Co., 1899), pp. 53–54, cited in Gaines M. Foster, *The Demands of Humanity*, p. 29 (third quotation); William T. Sexton, *The Soldiers in the Sun*, pp. 51–52, 104–05; Maus, "Military Sanitary Problems," p. 5; Duffy, *Sanitarians*, pp. 175, 178, 190, 199; Victor G. Heiser, "Unsolved Health Problems Peculiar to the Philippines," p. 171.

33. Victor G. Heiser, *An American Doctor's Odyssey*, p. 60 (quotations); *Regulations of the Army of the United States*, 1895, p. 11 (hereafter cited as *Army Regulations*, date). Maj. Frank S. Bourns of the U.S. Volunteers was the first president of the Manila Board of Health. He was succeeded on 28 August 1899 by Maj. Guy L. Edie, also of the U.S. Volunteers, who was followed in this office by Maj. Franklin A. Meacham, U.S. Volunteers. See WD, *ARofSG*, 1899, p. 119, 1900, p. 99, and 1901, p. 138.

34. This board will be referred to as the Philippine Board of Health to distinguish it from its predecessor, the Manila Board of Health.

35. Major Maus was detailed to serve as the first commissioner of public health for the Philippines on 26 July 1901. He was succeeded in 1902 by Maj. Edward C. Carter, U.S. Volunteers. The first chief health inspector was Major Meacham. His successor in April 1902 was Major Bourns, who resigned two months later. The position of chief health inspector was apparently vacant until September, when T. R. Marshall, presumably a civilian, became chief health inspector. See WD, *ARofSW*, 1902, 10(pt.1):310, and 1903, 6(pt.2):136, 143.

36. WD, *ARofSG*, 1900, p. 99, 1901, pp. 138, 141, and 1902, p. 46; idem, *ARofSW*, 1900, 1(pt.10):283–84, 1902, 10(pt.1):261–62, 274, 309–10, 1903, 6(pt.2):66 and 8:9, 111, 567, 596, and 1904, 11:75–77 and 12(pt.2):83 (quotations); *Army Regulations*, 1901, p. 12; *Digest of Opinions of the Judge Advocate General of the Army, 1912–1940*, p. 115; Paul C. Freer, "Plague and Late Cholera Epidemic in the Philippine Islands," p. 346; Charles R. Greenleaf, "A Brief Statement of the Sanitary Work So Far Accomplished in the Philippine Islands . . . ," p. 159; Louis H. Fales, "The American Physician in the Philippine Civil Service," p. 515.

37. Wilfrid Turnbull, "Reminiscences of an Army Surgeon in Cuba and the Philippines," p. 48 (first quotation); WD, *ARofSG*, 1902, p. 46 (second quotation); idem, *ARofSW*, 1902, 2(pt.1):290a, 10(pt.1):263, 356, and 11:69–72, 1903, 6(pt.2):116–18, 1904, 12(pt.2):84, 134, and 1907, 9(pt.3):280; Samuel O. L. Potter, "Notes on the Philippines," p. 805; Fales, "American Physician," pp. 513–14, 516–17.

38. WD, *ARofSW*, 1904, 12(pt.2):132 and 14:406, 1905, 11(pt.2):63, 66–67, and 1907, 8(pt.2):96, 110; idem, *ARofSG*, 1911, pp. 104–05; John M. Gates, *Schoolbooks and Krags*, p. 59.

39. WD, *ARofSW*, 1903, 6(pt.2):68–70; idem, *ARofSG*, 1899, pp. 119, 135–36, and 1900, p. 99; Sexton, *Soldiers in the Philippines*, pp. 29–30, 33, 38; *Philippine Census*, 3:74.

40. Foster, *Demands of Humanity*, pp. 29–30; WD, *ARofSG*, 1900, 1(pt.10):285, and 1901, 1(pt.9):381–82; Greenleaf, "Brief Statement," p. 162; Richard H. Shryock, *Medicine in America*, pp. 126–27, 129–32, 138.

41. WD, *ARofSW*, 1902, 10(pt.1):261, 272.

42. Ibid., pp. 262, 272, 274, and 1903, 6(pt.2):79, 81; idem, *ARofSG*, 1899, pp. 135–36, and 1901, p. 139; Sexton, *Soldiers in the Sun*, p. 56; Freer, "Plague," p. 346; Greenleaf, "Brief Statement," p. 161.

43. Sexton, *Soldiers in the Sun*, pp. 56, 59–60; WD, *ARofSW*, 1903, 6(pt.2):86–87 and 8:49, and 1907, 9(pt.3):285.

44. WD, *ARofSG*, 1901, pp. 138–39; idem, *ARofSW*, 1903, 6(pt.2):66–67, 74, 82–83, 93, 104, 137.

45. Maus, "Military Sanitary Problems," p.14; WD, *ARofSW*, 1903, 6(pt.2):75, 77, 91–92; Chamberlin, *Philippine Problem*, pp. 22–23 (quotation), 24–25.

46. WD, *ARofSW*, 1903, 6(pt.2):74, 76–77, 91–92, 1904, 12(pt.2):90, and 1907, 9(pt.3):284–85; idem, *ARofSG*, 1903, p. 44.

47. WD, *ARofSW*, 1900, 1(pt.10):285 (quotation), 1902, 10(pt.1):277–78, 1903, 6(pt.2):96–97, 1904, 12(pt.2):150 and 13(pt.3):733, and 1905, 11(pt.2):94; idem, *ARofSG*, 1900, p. 215; Gates, *Schoolbooks*, pp. 57–58; Sexton, *Soldiers in the Sun*, pp. 55–56; Frank S. Bourns, "Some Notes on the Philippines," pp. 732–33; Freer, "Plague," pp. 346–47; Harry Morell, "A Brief Description of the Hospitals of Manila, With a Few Notes on the Plague," p. 261; Bevoise, "Until," pp. 155, 158.

48. WD, *ARofSW*, 1902, 10(pt.1):264, 343–44.

49. Ibid., pp. 277–78, 1903, 6(pt.2):96–97, 101–02, 1904, 12(pt.2):150 and 13(pt.3):733, and 1905, 11(pt.2):94.

50. Ibid., 1900, 1(pt.10):284, 1902, 10(pt.1):411, 1903, 6(pt.2):111, 1904, 12(pt.2):94, and 1905, 11(pt.2):75; idem, *ARofSG*, 1900, pp. 100–101, 106, and 1901, pp. 140, 240–41; "Medical News," p. 437; Sexton, *Soldiers in the Sun*, pp. 55–56.

51. WD, *ARofSW*, 1900, 1(pt.10):284, and 1903, 6(pt.2):110; idem, *ARofSG*, 1900, pp. 99 (quotation), 123–24, 143; John M. Banister, "Medical and Surgical Observations During a Three-Year Tour of Duty in the Philippines," p. 275; Bourns, "Some Notes," p. 732; Greenleaf, "Brief Statement," pp. 158–59.

52. WD, *ARofSW*, 1902, 10(pt.1):264, 1904, 12(pt.2):95–96, 101, and 1905, 5(pt.1):770, 819; idem, *ARofSG*, 1900, pp. 99, 106, 125, and 1901, p. 140; Greenleaf, "Brief Statement," p. 159; Freer, "Plague," p. 347.

53. WD, *ARofSW*, 1900, 1(pt.10):285, 1902, 10(pt.1):275, and 1903, 6(pt.2):181–82, 186; idem, *ARofSG*, 1900, p. 214, and 1901, pp. 139, 230–31; Sexton, *Soldiers in the Sun*, pp. 56–57; James A. LeRoy, "The Philippines Health Problem," p. 779; Sternberg, *Sternberg*, pp. 210–11; Freer, "Plague," p. 347; Maxmillian Herzog, "Bubonic Plague in the Philippine Islands From Its First Outbreak in 1899 to 1905," pp. 652–54.

54. WD, *ARofSW*, 1903, 6(pt.2):181, 188; idem, *ARofSG*, 1900, p. 211, and 1902, p. 99; Freer, "Plague," p. 347.

55. William E. Musgrave, "Infant Mortality in the Philippine Islands," p. 466 (first quotation); WD, *ARofSW*, 1902, 10(pt.1):271, 1903, 5(pt.1):57 and 6(pt.2):109, and 1904, 12(pt.2):114 (second quotation), 115–16; Banister, "Medical and Surgical Observations," pp. 151, 162; Bantug, *Short History*, p. 35.

56. Henry du R. Phelan, "Sanitary Service in Surigao, a Filipino Town in the Island of Mindanao," pp. 1, 3; Banister, "Medical and Surgical Observations," p. 157; Gates, *Schoolbooks*, p. 136; Lyster, "Army Surgeon," p. 33; WD, *ARofSW*, 1904, 12(pt.2):121; idem, *ARofSG*, 1902, pp. 81, 94.

57. WD, *ARofSG*, 1903, p. 92 (quotations); idem, *ARofSW*, 1903, 6(pt.2):106, 115, and 1904, 12(pt.2):117–18, 123–26; Banister, "Medical and Surgical Observations," p. 151.

58. Phelan, "Sanitary Service," pp. 5 (quotation), 6, 9; Banister, "Medical and Surgical Observations," p. 152; Maus, "Military Sanitary Problems," p. 7; WD, *ARofSW*, 1902, 10(pt.1):413.

59. Phelan, "Sanitary Service," p. 18 (first three quotations); WD, *ARofSW*, 1902, 10(pt.1):413 (next three quotations) and 411 (final quotation), and 1903, 6(pt.2):106; Banister, "Medical and Surgical Observations," p. 157.

60. WD, *ARofSG*, 1902, pp. 82–83, and 1910, p. 95; idem, *ARofSW*, 1903, 6(pt.2):107, and 1904, 12(pt.2):86, 114, 132; John M. Banister, "Army Sanitary Administration in the United States and in the Tropics," pp. 570–71; idem, "Medical and Surgical Observations," pp. 149–51; Elbert E. Persons, "Medical Service With Philippine Scouts," pp. 708–10.

61. WD, *ARofSW*, 1903, 6(pt.2):63–65, 112; Joseph J. Curry, "Report on Parasitic Disease in Horses, Mules and Caribao in the Philippine Islands," p. 512; Edwin D. Kilbourne, "Some Experiments With the Trypanosoma Evansi," p. 250; Paul G. Woolley, "Rinderpest," p. 577. Glenn A. May in *Battle for Batangas* suggests that by killing off so many of the animals upon which mosquitoes preferred to feed, the rinderpest epidemic and military operations led these insects to feed more frequently upon humans and thus indirectly contributed to rising malaria rates (see pp. 26, 266–67, 271).

62. *Philippine Census*, 3:28–29; Duffy, *Sanitarians*, p. 180

63. Louis Shapiro, "Umbilical Tetanus," p. 245; WD, *ARofSG*, 1901, p. 139; idem, *ARofSW*, 1903,

6(pt.2):71, 100, and 1904, 12(pt.2):85, 88; Fales, "American Physician," p. 513 (quotation); William E. Musgrave and George F. Richmond, "Infant Feeding and Its Influence Upon Infant Mortality in the Philippine Islands," pp. 362, 364–65, 385; Vernon L. Andrews, "Infantile Beriberi," pp. 85–86.

64. WD, *ARofSW*, 1903, 6(pt.2):100, 1904, 12(pt.2):85, 87, 1905, 2(pt.2):131 and 5(pt.1):58, and 1908, 8(pt.2):22; Musgrave, "Infant Mortality," pp. 459, 466; George Rosen, *Preventive Medicine in the United States, 1900–1975*, pp. 3, 5, 7, 42.

65. WD, *ARofSG*, 1900, pp. 126, 133–34, 1906, p. 109, 1907, p. 40, 1912, p. 140; idem, *ARofSW*, 1902, 10(pt.1):347, 1903, 6(pt.2):97–98, 110–11, 1904, 12(pt.2):93, and 1908, 8(pt.2):90; Sexton, *Soldiers in the Sun*, pp. 58–59; Gates, *Schoolbooks*, p. 136; "Health of Americans in the Philippines," pp. 700–701; Banister, "Medical and Surgical Observations," pp. 270, 272; Ltrs, H. E. Wetherill to SG, 13 Apr 1900, and W. F. Lewis to SG, 17 May 1900, Ms 4888, Entry 52, RG 112, NARA; Henry J. Nichols, "The Simple and Double Continued Fevers of the Philippines," p. 368; Rosen, *Preventive Medicine*, p. 4; Department of the Army, Office of the Surgeon General, *Communicable Diseases: Malaria*, p. 526; Chamberlain and Vedder, "The Cure of Infantile Beriberi," pp. 30, 32. The unexpectedly low rate of malaria in the Philippines might, however, have been related to a genetic resistance. See Andrew A. Skolnick, "Newfound Genetic Defect Hints at Clues for Developing Novel Antimalarial Agents," p. 1765.

66. WD, *ARofSW*, 1903, 6(pt.2):68–70, 1904, 12(pt.2):86, and 1905, 11(pt.2):124; Gates, *Schoolbooks*, p. 60.

67. LeRoy, "Philippines," p. 778; WD, *ARofSW*, 1903, 6(pt.2):65; Rosen, *Preventive Medicine*, p. 48; Chamberlin, *Philippine Problem*, p. 115 (quotation); Ileto, "Cholera," in *Imperial Medicine*, p. 125.

Chapter 12

THE ORGANIZATIONAL REVOLUTION



The organizational revolution that took place in the Army Medical Department after 1898 was inspired by a growing awareness of the implications of the nation's new status as a world power and a long-held concern of reformers about the lack of preparation of the Army as a whole for modern warfare. The experiences of the Spanish-American War had confirmed their belief that significant changes were needed in the organization and management of both the Army and its various components, in the size of the permanent force, and in the training of officers and men. Thus the pattern characteristic of previous postwar periods, when the Army and its Medical Department had tended to revert to their prewar status, was broken after the Spanish-American conflict.[1]

The initial changes accomplished during the period before the outbreak of World War I came largely because of the efforts of Secretary of War Root, who believed that strong centralized control and close coordination of the work of the various branches of the Army were needed. The most significant of the changes Root inspired was the creation in 1903 of the position of chief of staff, with its supporting General Staff to coordinate the work of the Army's various branches and to be responsible for overall planning. A medical officer was usually detailed to the General Staff, thereby providing the Army's leaders with insight into the Medical Department's concerns. Although not himself a member of the General Staff, the surgeon general could also explain his department's needs and responsibilities to that organization, thus increasing the likelihood that they would be considered when the Army's future course was set. But disagreement about the best way to prepare for modern warfare and opposition from those whose positions were threatened by change made progress tedious and rendered the achievement of still further reform difficult for both the Army and its Medical Department.[2]

After Root's resignation in January 1904, his drive to improve the Army's efficiency and effectiveness languished until April 1910, when Maj. Gen. Leonard Wood became Army chief of staff. Despite having endured two operations to remove a brain tumor only weeks before taking office, General Wood attacked his new responsibilities with characteristic vigor. He soon discovered that the chief obstacle to his plans for an Army more nearly approaching European standards in size and training was another former medical officer, Maj. Gen. Fred C. Ainsworth, the adjutant general, who strongly and actively opposed the more centralized organization Wood sought. In May 1911, when Henry L. Stimson became secretary of war, the

chief of staff gained a valuable ally in support of his reform efforts. With the forced retirement of Ainsworth in 1912, Wood's authority was left unchallenged, enabling him to concentrate on creating an army that could hold its own against any foe.[3]

The means General Wood used to achieve his goal—increasing the size of the Army, making the division rather than the regiment the basic unit of organization, and emphasizing the training of both officers and men—had profound effects on the Army Medical Department. The increased size of the Army dictated an increase in the size of the Medical Department, one that led to additional administrative complexity. The move to make the division the basic unit of organization in the field required collateral changes in the department's approach to medical support. The emphasis on training placed a heavy obligation upon those already in the department, who would be called upon to indoctrinate new members of the department, National Guard physicians, and line officers in the department's increasingly complex responsibilities. Because of the need to accommodate Medical Department organization and procedures to those of the Army as a whole and also because of continuing progress in the world of medicine, the years before the outbreak of World War I were a time of significant change.

The Surgeon Generals

With the focus of attention increasingly upon preparedness, attacks on Surgeon General Sternberg for his role in the Medical Department's failure to make adequate medical care available to the soldiers of 1898 never ceased, in spite of the fact that the Dodge Commission had not placed major blame on the department for the disasters of 1898.[4] At least one critic realistically commented that the department had "accomplished all that could have been accomplished under the circumstances." Few could argue, however, that Sternberg's principal contribution to the Medical Department and to the Army lay in his attempts to give medical officers better weapons with which to fight the diseases that had threatened the health and the lives of the troops in war and in peace. By creating boards specifically to study typhoid fever and yellow fever and by assigning the finest scientists in the department to serve on them, Sternberg gained for himself a large degree of the credit for reducing the threat these diseases posed to soldiers and civilians alike. In appointing a board to study the health problems of the Philippines, he set a precedent that was followed by his successors for many years. A law passed on 2 February 1901 as part of the Root reforms limiting the term of a surgeon general to four years did not apply to Sternberg;[5] because of age and with charges still ringing in his ears that his "vain regime" had been an "ingrained orgy of incapacity" and that "the one great blot of the war [rested] upon the medical and surgical department of the army," he retired in June 1902.[6]

Alone of the men who served as surgeon general between the Spanish-American War and World War I, Sternberg's immediate successor, Surgeon General Forwood, failed to leave his mark upon the Medical Department. In office only three months, until September 1902, Forwood was fated to be remembered chiefly for his management of Camp Wikoff in 1898,[7] which had brought him under heavy attack. Upon Forwood's retirement, the law passed on 30 June 1902 that forbade the appointment of any officer as head of a de-



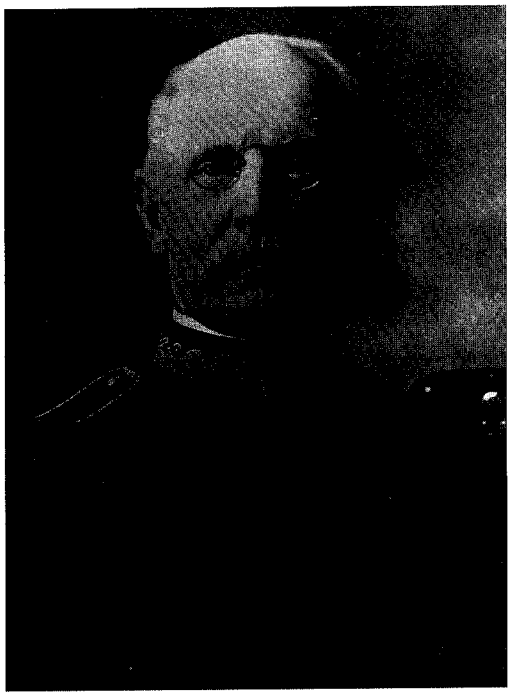
WILLIAM H. FORWOOD



ROBERT M. O'REILLY

partment whose age would require retirement in less than four years came into effect. As a result, Colonel O'Reilly was appointed as Forwood's successor over several other medical officers who had more time in service.[8]

Surgeon General O'Reilly's career in the Army began when he interrupted his medical education during the Civil War to serve as a medical cadet, a wartime position created for medical students. He completed medical school after the war and in 1867 was appointed assistant surgeon. By 1868 he was reported to be suffering from "premonitary [*sic*] symptoms of cerebral disease," including insomnia, nightmares, memory loss, and headaches, requiring him to take several months of leave to head off what was seen as the threat of permanent disability. Although O'Reilly's health thereafter was apparently not robust, he acquired through the years an enviable reputation. Bailey Ashford in his autobiography described him as "an excellent administrator, the very embodiment of a high-ranking military officer, . . . also a great physician," while Walter Reed wrote in 1902 that he was "a distinguished gentleman . . . with sufficient political acumen to make him of material assistance in the Medical Department." Later in his autobiography Brig. Gen. Jefferson R. Kean wrote of the great affection O'Reilly's many friends, and especially those who had served under him, had for him. O'Reilly's image among junior officers as "a father to us all" was undoubtedly furthered by the fact that, breaking with tradition, he chose younger men to serve in the Surgeon General's Office. Having selected these men "wisely and well," as one medical historian put it, he went out of his way to encourage them to use their talents to the fullest.[9]



GEORGE H. TORNEY

Upon O'Reilly's retirement in January 1909, Torney became head of the Medical Department. Torney's success in managing the medical response to the challenges of the San Francisco earthquake and fire of 1906 led to his promotion over several of the department's most distinguished medical officers who were senior to him in rank, among them Colonel Gorgas, whose work in Panama was bringing him increasing fame in the field of public health. As surgeon general, Torney followed the path laid down by his predecessor, retaining O'Reilly's staff and policies. Although Torney had a reputation for impulsiveness, his work in preparing the department to care for an army at war was so highly regarded that he was reappointed to a second term in January 1913. As that year neared its close, however, Torney was desperately ill as a result of a bacterial infection of the heart. After developing pneumonia on 22 December he survived but five days, dying on 27 December. He left the completion of his work to Gorgas, who succeeded him in January 1914.[10]

The Surgeon General's Office

Although the Dodge Commission exonerated the Medical Department for any major responsibility for the horrors of the Spanish-American War, it was critical of the organization and management of the Surgeon General's Office. Neither Surgeon Generals Sternberg nor Forwood attempted the reorganization and streamlining suggested by the Dodge Commission. After nine months of study, Surgeon General O'Reilly concluded that the work of his office was unevenly divided among his assistants and that many minor matters that burdened him could be better handled by his subordinates. The delegation and redistribution of authority he initiated would make it possible, he believed, to expand the department to meet wartime needs without encumbering future surgeon generals with details of the kind that had preoccupied Sternberg.[11]

In attempting to deal with the problems of his growing organization, Surgeon General O'Reilly created a fifth division in his office specifically to manage personnel, a responsibility that had been handled by the chief clerk. He also established a foreign service roster, which made it possible to give medical officers several months' advance warning of impending overseas assignments and also to "equalize foreign service among the officers so far as was practicable. . . ." He was apparently unable to improve the situation of the department's clerks. Since no retirement was available for them, the oldest members of

the staff, 28 percent of whom were over 60, were given lesser responsibilities as their capacity for work dwindled to avoid discharging them. In a report to Secretary of War Root, the curator of the Army Medical Museum suggested another problem, one that resulted from the fact that women, considered to be less efficient workers because they were sick more often and needed more help than the men, formed a quarter of the clerical staff.[12]

When Torney became surgeon general in 1909 the Surgeon General's Office itself was still a simple organization, in spite of the increased size of the Medical Department and of the clerical staff.[13] As under O'Reilly, the superintendent of nurses reported directly to the surgeon general, and all other personnel in the office were grouped into five divisions. Medical officers headed separate divisions of supply, sanitation, and personnel, while yet another ran the museum and library, where seven specialists, two with permanent civil service appointments, were part of the staff. The fifth division consisted of the clerical staff of ninety-eight employees, both male and female, which handled general administrative matters under the supervision of a chief clerk.[14]

Like O'Reilly, Surgeon General Torney was concerned about the female clerks in his office. He wanted to restrict hiring to men until the percentage of women had been reduced because he believed that the "largely scientific and professional" work expected of clerks at the higher levels dictated an increase in the number of men at the lower levels available for promotion. "Vacancies in the higher executive positions [should] be filled from among the men clerks," women being "not as universally as men amenable to the calls of discipline." Furthermore, he noted, women "as a rule do not exhibit that larger zeal and interest in wide official horizons which would fit them for higher usefulness. . . ." Torney also urged that he be allowed to offer higher salaries, and, moved by the plight of some of his elderly, long-time employees whose low salaries forced them to continue to work in spite of physical and even mental infirmities, he suggested that a pension plan be created.[15]

Despite his sensitivity to the needs of his male subordinates, no matter how humble their positions, Surgeon General Torney found himself involved in a controversy over his management of personnel, the seeds of which he inherited from his predecessors. Since the days of the second surgeon general, Brig. Gen. Thomas Lawson, the head of the Medical Department had traditionally retained his most trusted assistants in Washington, where their skills and their advice were constantly available to him. Unlike Lawson, however, whose refusal to grant preferential treatment to world-famous Surgeon William Beaumont led to the latter's resignation from the Army,[16] subsequent surgeon generals occasionally also undertook to spare some of the department's foremost scientists and researchers the routine rotations that were the lot of others. As growing numbers of medical officers became involved in research, the question of whether the assignments of all medical officers should be rotated and whether, beyond that, all medical officers should receive foreign assignments took on an increasing importance.[17]

Surgeon General O'Reilly's exclusion of the medical officers serving in his office from the foreign service roster highlighted the time-honored custom of retaining the surgeon general's assistants in Washington. Surgeon General Torney was not successful in retaining that policy, in spite of his

1912 protest of a move to extend the four-year rotation rule customary in the rest of the Army to the Medical Department. He maintained that unless a delay were granted, such a move would upset the schedule of the Army Medical School. He also claimed that although it was desirable that most medical officers be generalists, the great strides in preventive medicine made by the Army had resulted from the work of specialists, for whom regular rotation from assignment to assignment would have been counterproductive. Rotation overseas seemed to be at the heart of the discussion, and the now particularly obvious fact that certain medical officers, men who were not necessarily eminent specialists, were rarely, if ever, rotated to foreign assignments triggered charges of favoritism against Torney and eventually involved Chief of Staff Wood. In December 1912 General Wood, who had the reputation of going out of his way to avoid the appearance of favoring the Medical Department, ordered that certain medical officers who seemed to have benefited from favoritism, among them future surgeon general Lt. Col. Merritte W. Ireland, be scheduled for foreign service immediately.[18]

Medical Officers

Many demands placed upon the Medical Department after 1898 exacerbated old difficulties even as they created new ones. Perhaps the department's oldest problem, a shortage of trained and experienced physicians, became formidable in the face of the possibility of modern warfare. Experience dating from long before the Spanish-American War had already taught the Army that waiting to deal with this situation until war was imminent and large numbers of civilian physicians had to be called in to meet emergency needs precipitated further complications, for "an untrained, or even a half-trained Medical Officer" was "by the very nature of things an *ally* of the enemy." Furthermore, although one of the Dodge Commission's specific recommendations had been for increases in the number of medical officers in the department, any significant progress that might be made toward achieving this goal would only add to the problem of familiarizing new medical officers with the ever-increasing complexities of their administrative and medical responsibilities. Nevertheless, Congress continued to ignore the question of medical care for the victims of future wars and to be niggardly in increasing the size of the department to meet already existing needs. Thus, for years after the end of the Spanish-American War, Medical Department efforts to prevent a recurrence of the shortage of trained and experienced personnel were, like those of other agencies in a similar predicament, in vain. In 1904 the proportion of medical officers to the total number of men in the Army was less than half that in either the Civil War or the Spanish-American War.[19]

That these problems would continue to plague the Medical Department began to become obvious in the months after the end of the war. The volunteers and regulars who had enlisted specifically for the war were mustered out, and in March 1899 Congress authorized an army of 65,000 regulars, an increase from the previous authorized peacetime strength of 27,000. The legislature also created a 35,000-man volunteer force to replace the wartime volunteers in the Philippines and to serve until 30 June 1901. Each of the volunteer regiments was to have three surgeons. Although most of the physicians who accepted positions as regimental and assis-

tant surgeons with the volunteers at this time were veterans of the Spanish-American War, Surgeon General Sternberg believed that ideally at least one physician with each volunteer regiment should be a regular medical officer. As a result, of the 140 medical officers appointed to the United States Volunteers by June 1899, 45 were regular medical officers.[20]

Surgeon General Sternberg protested the continued shortage of trained medical officers by pointing out that a department with only 15 more physicians than before the beginning of the Spanish-American War could not provide adequate care for an army spread out from the Caribbean to the Pacific, especially when troops were still conducting active military operations in the Philippines. Congress' initial response to Sternberg's plea was restricted, however, to granting his request that the previous limit of 400 contract physicians be raised to 480. To make the best of this bad situation, the surgeon general urged that National Guard physicians be instructed in hygiene and sanitation to create a pool of doctors trained as military surgeons to be available in the event of war.[21]

The situation did not improve when, on 2 February 1901, shortly before the volunteers of 1899 were mustered out, Congress voted to increase regular infantry regiments from twenty-five to thirty and regular cavalry regiments from ten to fifteen, but added only 129 more medical officers to the Medical Department staff. A total of 320 medical officers was thus expected to care for the almost 86,000 officers and men that could now serve in the Regular Army and their families as well. Rather than further increasing the department's staff of regulars to meet the needs of the hundreds of isolated posts still existing in the Philippines and to care for 5,000 scouts, the legislature permitted the president to appoint 200 surgeons and assistant surgeons of the U.S. Volunteers to supplement the regular medical officers in the Philippines for two years. With barely more than 500 physicians, the department was thus required to provide medical attendance to a total of 125 posts, to 567 garrisons in the Philippines, to five general hospitals in the United States and the Philippines, and to troop transports. Moreover, additional physicians were needed at the Army Medical Museum and the Surgeon General's Library. Even the new Hygienic Laboratory of the Public Health and Marine Hospital Service used the services of the Army's medical experts; a medical officer was regularly detailed to its eight-member advisory board. Still faced with a shortage of officers, the department was forced to continue its heavy reliance on contract surgeons.[22]

To obtain the maximum benefit from the new openings for regulars voted in 1901, Surgeon General Sternberg encouraged experienced contract and volunteer surgeons to take the Medical Department's entrance exam, and Congress permitted the time the volunteers had served to be counted toward their rank if they passed. The reopening of the Army Medical School in November 1901 guaranteed that even inexperienced medical officers would soon become familiar with the most basic requirements of military medicine; however, although more than half of the nation's physicians earned as civilians less than what they could earn as first lieutenants, Medical Department salaries were too low to attract the best doctors. Furthermore, the large proportion of medical officers in the lower ranks clogged the pathway to promotion, and thus Sternberg was losing to civilian life some of the most promising young surgeons already in the department. Since the 1901 law did not address the

problem of how to obtain the large numbers of trained physicians that would be needed in the event of war, the Medical Department was still not prepared to meet the demands of a major emergency.[23]

When O'Reilly took office as surgeon general, the Medical Department's problems seemed to be multiplying, but he showed no sign of being intimidated. Initially, he was no more successful in obtaining further increases in the number of commissioned officers in the department than Sternberg had been. The poor opportunity for promotion discouraged potential applicants. Fewer medical school graduates were available to apply to the Army Medical Department because, as a result of the movement to reform medical education then rapidly gaining momentum, inferior civilian medical schools were closing. The number who passed the entrance examination, always a small percentage of the total, was also dwindling. The surgeon general chose this time to make the examinations for promotion more demanding. He also continued the custom of having candidates for promotion serve a year as "attending surgeons in the principal medical centers of the United States." To add to the department without lowering its standards, O'Reilly, like Sternberg before him, took advantage of the experience of former volunteer medical officers, hiring some as contract surgeons so that he could send them back to the Philippines. He allowed those who were under 42 years of age to take the department's entrance exam. The five who passed received the rank of captain, to which they would have been entitled had all their service been as regulars.[24]

In spite of the difficulty in filling vacancies, Surgeon General O'Reilly rejected the idea of appointing even completely qualified black surgeons to serve with black troops. Among the reasons he cited for this decision were his belief that black troops had more respect for white officers, including medical officers, than they had for blacks and that the white officers of black units would find "the attendance of a colored physician . . . repugnant," especially as far as the care of their women was concerned. Furthermore, most hospital corpsmen were white and would object to taking orders from a black.[25]

In 1904 the surgeon general took advantage of the flexibility of the contract hiring system to add a new control over the Medical Department's would-be medical officers. Rather than commission them immediately upon their passage of the entrance examination, he decided to require them to sign contracts when they entered the Army Medical School and to award them commissions only upon the successful completion of their courses. O'Reilly thus gained a period during which he could observe their conduct as students of military medicine; easily eliminate any who, though unsuitable, might have slipped by the entrance examination; and motivate all to greater efforts in their studies.[26]

Although Surgeon General O'Reilly was able to maintain the quality of the Medical Department, the problem of size remained. Troops were still needed in the Philippines, but since the number of posts to be garrisoned had dropped drastically, the 200 volunteer surgeons sent to the islands in 1901 were not replaced when their terms of service were up in 1903. When, also in 1903, Congress took a step forward by finally requiring the Medical Department to familiarize the civilian physicians of the National Guard with the demands of military medicine, it simultaneously took a step backward by failing to increase the size of the Medical Department to reflect these added duties.[27]

O'Reilly argued the department's need for more medical officers before Secretary of War Root, who endorsed the surgeon general's plea in December 1903. The following January, Root emphasized that to have available in wartime men who were "competent to conduct the administration of the great and complicated medical service," the most difficult challenge the Medical Department was likely to face, the appropriate training must be undertaken in peacetime. O'Reilly then drafted a "bill to increase the efficiency and enlarge the Medical Department," which Secretary of War Taft approved shortly after his appointment in February 1904. In January 1905 President Roosevelt, who even published an article on the subject in *Military Surgeon*, called upon Congress to pass the bill, stating that "it is not reasonable to expect successful administration in time of war of a department which lacks a third of the number of officers necessary to perform the medical service in time of peace." [28]

Nevertheless, though Congress was willing to vote increases in the Ordnance Department in 1906, it ignored the needs of the Medical Department. Secretary of War Taft noted in his annual report that because experienced medical officers were taken from their posts to accompany the new army of occupation in Cuba, the care of garrisons at several large posts had to be entrusted to inexperienced contract surgeons. Surgeon General O'Reilly emphasized in his annual report that while the number of line officers in the Army was sufficient for a force of 100,000, the number of medical officers was appropriate for but 42,000. Because war would force the Army to call in large numbers of civilian physicians, the Medical Department would face "a lamentable breakdown" in the event of hostilities, "for the selection and training of medical officers is a gradual process." [29]

When Congress finally addressed the question of the need for more regular medical officers in April 1908, it created 123 new vacancies. It also made official the designation *Medical Corps*, already in informal use as an inclusive term for the department's regular physicians, thereby emphasizing their status as career military officers. But unless Congress made the Medical Department more attractive to promising young physicians, the authority to sign on more doctors would be meaningless in view of the fact that the department could not find physicians willing to fill the vacancies it already had. To deal with the discouragement caused by slow promotions, therefore, the legislature placed more than half the new openings at the level of major or above. More openings at the top resulted from initiating examinations for promotion from major to lieutenant colonel; the major who failed both the promotion examination and a reexamination was retired. Although a requirement for promotion examination up to the rank of brigadier general in all corps and bureaus had been on the books since 1 October 1890, it does not appear to have been applied to the Medical Department. Further inducements included increases in the pay of the Army surgeon so that it compared favorably with incomes available to civilian physicians, as well as retirement on three-quarters pay after forty years of service. The post surgeon would still be allowed to supplement his military income by caring for private patients, but now he could do so only if it neither interfered with his Army duties nor involved opening an off-post office. At this point, the outdated system of giving Medical Department officers labels, such as assistant

surgeon and surgeon, above and beyond their rank was finally abandoned.[30]

In the 1908 law Congress also created the Army's first reserve corps, the Medical Reserve Corps, a step whose importance Medical Department authorities described after World War I as "impossible to overestimate." Surgeon General O'Reilly believed that this step at last met the Dodge Commission's objective in calling for more medical officers in the department. In theory, in providing a pool of physicians from which the Army could draw, the new corps would eliminate the need to rely on contract surgeons. The Medical Department could now screen civilian doctors willing to help the Army in time of need and verify their credentials and skills before their services were required. Any officer joining the Reserve Corps who refused active duty when called up would forfeit his commission. But since the law did not require military training of Reserve Corps officers, it did not create a pool of physicians with an understanding of military medicine.[31]

To be eligible for the Medical Reserve Corps, a doctor had to be between twenty-two and forty-five years old, a graduate of a reputable medical school, and entitled to practice medicine in his home state. With the passage of both physical and professional examinations, he was commissioned as a lieutenant. Except for payment for disability received in line of duty, the reserve officer was entitled to none of the benefits received by his counterpart in the regulars, but Surgeon General O'Reilly believed that the patriotism of the nation's leading physicians would lead many of them to join the new corps.[32]

Although Surgeon Generals O'Reilly and Torney were successful in putting into effect most of the recommendations made by the Dodge Commission, and although O'Reilly suggested that he had met them all, one escaped them despite their best efforts. The early detection of health problems of any type or, better yet, their prevention, made the work of the inspector so important that the commission urged the creation of a corps of sanitary inspectors or of chief surgeons performing that function and blamed some of the troubles of the Spanish-American War on the lack of such an organization. Unable to attain this goal despite his belief in the need for it, Torney was forced to rely on assigning a medical officer to act as sanitary inspector in each geographic department. Thus, even though the trend at the time was toward formalizing common practices and, as a result, other specialized corps were being created, he had to continue the practice of designating individual medical officers to serve in this capacity whenever the gathering of many men at one site posed a particularly great threat to sanitation. In 1912 the War Department ordered that medical officers conduct twice a month "physical inspections" of every enlisted man to ensure that the earliest signs of vermin infestation, venereal disease, and foot problems, among other things, could thus be detected. Even though the function of the inspector was recognized, no specific place for him in the Medical Department was created.[33]

Plans for the Medical Reserve Corps reached full maturity under Surgeon General Torney with little significant opposition. On 30 June 1909, when he had been in office barely more than six months, 364 physicians were on the Medical Reserve Corps roster; of these, 29 were students at the Army Medical School. The number of Reserve Corps members on active duty varied in the early years of the corps' existence from under 100 to a little more than

180, but because of the availability of these officers, no more than 20 contract surgeons were needed at any one time. In 1910, to encourage service in the Medical Reserve Corps, Congress decided to permit any reserve medical officer with a total of forty years of active service in any capacity—whether enlisted, contract, regular, volunteer, or reserve—to retire at age seventy with the pay of a first lieutenant. By June 1913, although the number of reserve officers on active duty was falling, the total number in the combined active and inactive reserve had reached 1,205, giving the department a large pool from which to draw in time of need.[34]

The new Medical Reserve Corps offered many advantages. Most of the first physicians on active duty with the Reserve Corps were former contract surgeons, men with at least a minimum of military experience. Since Congress allowed those vouched for by the surgeon general to enter the corps without taking the entrance examination, Surgeon General O'Reilly could give commissions to 160 of these physicians almost immediately after the passage of the 1908 law while annulling the contracts of all others. For former contract surgeons who did join the corps, their new status as commissioned officers would, according to O'Reilly, bring "great benefit . . . from correcting the former unpleasant and anomalous positions of these gentlemen." [35]

Among the members of the new corps were young doctors passing the examination to enter the Army Medical School, who now routinely became Reserve Corps lieutenants on active duty rather than contract surgeons. If no openings were immediately available in the regulars, they remained in this status for some time after graduation. Surgeon General O'Reilly anticipated having the younger and less eminent doctors on the inactive list devote a short period each year to military training, when through experience and discussion with regular medical officers they could become familiar with Army routines and requirements. Those who had "already proved their qualifications by their good work" would not be asked to take time from their busy civilian lives to train and would be required to take only the most perfunctory of examinations. Although O'Reilly was enthusiastic about the Reserve Corps, he admitted that the occasional hiring of a contract surgeon might be unavoidable.[36]

Active-duty reservists served in several capacities. The largest single block was the contingent at the Army Medical School, but an individual reservist was occasionally called upon to take the place of a surgeon at a nearby post while that officer joined troops in the field. Reserve physicians were also ordered to join regulars in caring for the sick and injured and dealing with sanitation on such occasions as the reunion of the veterans of the Union and Confederate armies at Gettysburg, when 24 Medical Reserve Corps officers joined 25 Medical Corps physicians to care for more than 800 sick among these elderly men. Surgeon General Torney was not happy, however, with the need to use reservists for such duties. He believed that the regular Medical Corps should be large enough to deal with these situations without calling up physicians from the Medical Reserve Corps. The existence of the new organization did not eliminate the old problem of an inadequate number of regular medical officers to meet more or less routine needs.[37]

The effects of the shortage of medical officers were exacerbated by Surgeon General O'Reilly's policy of encouraging "in

every way important scientific work and original investigation" and of helping "other departments of the Government," even when doing so made the men involved unavailable for Army assignments. By the time Torney became surgeon general, the achievements of Medical Department's physicians were well known and requests for assistance from them were many. Medical schools and scientific organizations sought the assistance of the department's bacteriologists and tropical medicine experts. Openings were offered for medical officers in respected civilian laboratories where they could learn "to do more efficient laboratory work at their posts," an offer that Torney could not wholeheartedly accept because he could spare so few officers from their routine assignments. Some of Colonel Gorgas' subordinates in the Canal Zone worked to lure medical officers to Panama. When cases of plague appeared in Puerto Rico, authorities there successfully sought the guidance of Medical Department experts on how to prevent an epidemic. The U.S. Commission to the Republic of Liberia took an Army surgeon with it to study health problems in that country. A medical officer on sick leave in Europe was asked to manage a hospital for sick and wounded soldiers in the Balkans during hostilities until more permanent arrangements could be made. He was then asked to help in caring for the victims of a cholera epidemic in the same region. To all such talented subordinates Torney apparently gave enthusiastic support.[38]

As the Army grew in size and the emphasis on large-scale maneuvers increased, medical officers were called upon to participate in an effort to give medical and line officers a greater understanding of one another's responsibilities. In 1910 the inspector general commented that medical officers needed more training in "campaign work" but that those at maneuver camps were too busy to acquire "tactical knowledge." Until this point, as Maj. Edward L. Munson, an instructor in the care of troops at the Line and Staff College at Fort Leavenworth, noted, "medical officers did not know, were not expected to know, and it was too commonly presumed should not know, anything about the tactical handling of troops," the range of weapons, trajectory, or similar matters. The 1911 creation of the Field Service and Correspondence School for Medical Officers as one of the new schools of the Fort Leavenworth Army Service Schools was a step in the right direction, the suggestion that basics of the Leavenworth course be taught at the Army Medical School was not approved because apparently no room could be found in the curriculum there.[39]

The first class for physicians at Leavenworth began in 1912, offering a six-week nonmedical course designed to familiarize the physician with his staff, field, and administrative duties. The field service course was open to both regular and National Guard officers, with six of each attending the first session—one of the first graduates was future surgeon general Maj. Robert U. Patterson. Among the topics covered were the organization of sanitary work and the equipment used, sanitation in wartime and in occupied territory, and the transport of the sick and wounded. The correspondence course, which was regarded as preparation for the field service course, offered to approximately twenty-five students a broad spectrum of basic courses concerning military planning. Because all classes at the Leavenworth schools were suspended in the spring of 1916, only a few medical officers had had the opportunity of educa-

tion there before the entry of the United States into World War I.[40]

The education of line officers in the responsibilities of the medical officer and the work of medical units was also vital. Medical officers continued in the footsteps of such colleagues as Colonel Woodhull, writing books for the instruction of line officers. Major Munson, himself one of these authors, noted that "the general failure by tacticians to recognize medical units as tactical elements had resulted in the medical service being regarded as something to be utilized after battles were fought, and not concurrently with the combat units except so far as the medical service directly attached to combat units was concerned." By 1911 he had succeeded in having a requirement made at Leavenworth that "no combatant problem . . . should . . . be considered as solved until the student officer had demonstrated a suitable disposition of the medical detachments, organizations and wounded." Another medical officer, Maj. Paul F. Straub, who, like Munson, published on the subject of medical service in the field, was teaching at the Army War College. In teaching military hygiene at Fort Leavenworth and the Army War College, medical officers placed emphasis on the course as "a conservation measure" to maximize its appeal to the line and staff officers who were its students. To teach U.S. line officers about the importance of disease prevention early in their careers and upon the recommendation of the surgeon general, a Department of Military Hygiene was even established at West Point, with the senior medical officer there serving as its head.[41]

The increased respect for the opinion of the medical officer that was a side effect of this sort of course could prove valuable. Even at this late date, the surgeon in the U.S. Army might be informed by his commanding officer that when his advice on sanitation "was wanted he would be sent for and told to offer it; until then he could keep it to himself." This situation was not characteristic of all armies. According to a U.S. medical officer who observed the Russo-Japanese conflict of 1904–1905, the first war in which disease caused fewer fatalities than wounds, Japanese line officers held the opinion of their medical officers in high regard. To their respect, he believed, should be credited the impressive sanitation of the Japanese Army and thus the fact that only 26 percent of the deaths resulted from disease.[42]



PAUL F. STRAUB

The notion of educating line officers about disease prevention was not always greeted with enthusiasm. Because even the best of courses would provide only limited information, the result might serve chiefly to make a complex problem seem simple.

Instructing line officers in such matters, the authors of an article in the *Journal of the Association of Military Surgeons* wrote, was "extremely dangerous, unless it is distinctly understood" that its "sole purpose [was] impressing upon the young officer the importance of the matter, and that he will be acting foolishly if he ignores the sanitary recommendations he receives."[43]

The lack of enthusiasm engendered for the idea of adding further material to the curriculum of the Army Medical School was understandable. Indeed, although skilled instructors, among them physicians who had served with the Tropical Disease Board, taught at the medical school, its facilities and staff were too small even to enable it to enroll many National Guard officers. The growth of the school and of the museum and library that shared its building rendered the facilities increasingly inadequate. In 1901, since Congress had still not voted money for a building on the grounds of the new hospital being built to replace the facility at Washington Barracks, the school was forced to move into rented quarters. This development created difficulties for both students and staff at the school, since they were accustomed to using the museum's specimens and laboratory as well as their own laboratory during their work. As a result, Surgeon General Torney continued to urge that a building for the medical school be erected on the grounds of the new hospital.[44]

Dentists

The concern for the number and qualifications of the physicians serving the Army was traditional, but even the Dodge Commission had not considered the Army's need for dentists. Dentistry was still regarded as "a mechanical trade" whose practitioners were called upon to resolve problems after they occurred rather than to prevent them. In 1890, however, the publication of a book on the role of bacteria in causing dental decay brought the medical revolution to dentistry and offered hope of successful prevention and treatment. The important role that dentists could play in the U.S. Army began to become apparent not long thereafter, when the teeth of U.S. soldiers serving for long periods in the tropics rapidly deteriorated. This state of affairs might have been related to a general deterioration in their health during any long period of service in these areas or even to the flourishing bacteria of a hot climate. In February 1901, when Congress increased the number of officers in the Medical Department, it also authorized contracts with 1 dentist for every 1,000 men, up to a maximum of 30 dental surgeons, who as civilians were given the relative rank of lieutenant. In addition, the legislature permitted hospital corpsmen who had served satisfactorily as dentists to receive contracts without the examination required of all others. By June 1902 a board of 3 dentists had administered qualifying examinations to all applicants required to take them and had hired 30.[45]

Time would prove that 30 dentists were not enough. Since using extraction to deal with rampant decay would leave too many soldiers with too few teeth to eat the Army ration, more and more teeth were filled or crowned rather than removed. Abscesses, gum inflammation, and similar problems also received attention. Far more skill and time were required for treating dental disease than for extraction. Even though each dentist was provided with a Hospital Corps private or acting hospital steward to assist

him, he often found it difficult to stay far enough ahead of decay to preserve teeth.[46]

When Torney became surgeon general in 1909, the limit of 30 dentists was a severe handicap, since the ratio of 1 per 1,000 men would suggest that 85 should be employed. The dentists who were serving in the Medical Department were so seriously overworked that the best among them were not likely to renew their contracts. Torney's efforts to correct the situation were initially doomed to failure, but the prestige of the dental profession was growing. At last, on 3 March 1911, after the American Medical Association joined the 50,000-member American Dental Association to pressure Congress to give dentists rank, the legislature created the Dental Corps, to consist of no more than 60 dental surgeons. They were to be assisted by as many acting, or contract, dental surgeons as needed to provide a ratio of no more than 1 dentist for every 1,000 enlisted men, but the number of dental surgeons in the new corps grew very slowly because the path to be followed in reaching that position was slow and tedious. Each candidate passing the initial examination had to accept contract status. Only after three years of satisfactory work as an acting dental surgeon and the passage of yet another examination could he receive a commission as first lieutenant. On 30 June commissions were awarded to 29 of the Army's dentists, 28 of whom remained in the Army a year later, when 10 more dentists were caring for Army patients under contract. By 1913, 13 additional acting dental surgeons had qualified for commissions, but the increase in the number of commissioned dental surgeons in the corps of necessity remained slow.[47]

Nurses

The Dodge Commission had ignored the need for dentists, but it had called for the creation of a reserve corps of trained female nurses. The use of women to care for the Army's patients was by no means new, and with the development of training schools for female nurses, their value became undeniable, making the formalizing of their position as a permanent institution within the Medical Department a logical step.

This development came only gradually. In June 1899 the War Department added the position of reserve nurse to the Army Nurse Corps, whose members still worked on a contract basis. To be eligible for the reserves, a nurse had to have worked for the Army for at least four months and had to agree to return to an active status whenever her services were requested. The duties of Army nurses remained arduous; by 1 July 1900, 13 had died because of disease contracted while on duty. Until 1901 their organization remained basically an informal one, created by the Executive Branch in response to need rather than by Congress, and medical officers continued to debate the value of the female nurse to the Army.[48]

In the bill of February 1901 that increased the number of regiments in the Regular Army, Congress finally took action that placed the Nurse Corps "on the same footing with the Hospital Corps, as an integral and permanent part of the Army." The Army Nurse Corps now became a matter of law rather than of departmental regulation, its members to be appointed to the Medical Department rather than hired by contract and its head to be formally known as superintendent. The number serving in the new corps was to be determined by need, and each nurse was to serve three years. As a physician, McGee could no

longer direct the Army's nurses, since in appointing a superintendent, the secretary of war was allowed to consider only graduates of two-year or longer courses at nurses training schools. Congress also adopted the concept of the reserve nurse, but the number in this category remained small—only 44 of the 167 nurses in the Medical Department in 1902.[49]

The number of nurses on active duty hovered around 100 in the years after the creation of the corps, with the two largest groups serving at the general hospital at the Presidio in San Francisco and at the First Reserve hospital in Manila. Retaining even this small number of qualified nurses in the Army became very difficult. The Isthmian Canal Commission tempted nurses as well as physicians, offering better salaries and working conditions than the Army. A "large contingent of ex-army nurses" who might otherwise have reenlisted in the Medical Department was soon serving under Colonel Gorgas. Surgeon General O'Reilly's attempts to make Army service more attractive to nurses were in vain. By 1908, when the Canal Commission had been offering nurses a higher salary than the Army for several years and the new Navy Nurse Corps was giving women more fringe benefits than O'Reilly could offer, including more generous leave and travel allowances, he was unable to fill all the vacancies in the Army Nurse Corps.[50]

In 1910, to encourage qualified women to join the Army, Congress finally authorized an increase in pay from $40 to $50 a month. An additional $10 was allowed for overseas service, and an increase of $5 for every additional three years of service up through nine years was also voted. This measure encouraged enlistment to the point where all vacancies had been filled when the appropriation went into effect. The following year another 25 spaces were voted for the Nurse Corps, with yet another 25 in 1913, for a total of 150.[51]

The increase in the size of the Nurse Corps made necessary greater attention to the facilities available for housing female members of the Medical Department. The additional nurses recruited in 1911 were assigned to the Army-Navy Hospital in Hot Springs, Arkansas; to the base hospital at Fort Sam Houston in Texas; to the new Walter Reed General Hospital in Washington, D.C.; and to the office of the Army surgeon responsible for the care of government officials in the District of Columbia. Although initially the facilities at Walter Reed, like those at many other hospitals, were not adequate, by June a new building for the nurses was in place. Thereafter whenever possible, nurses unfamiliar with the Army were sent to Washington, D.C., for training in the military aspects of their duties and for observation about their fitness for this type of work, much as prospective medical officers were sent to the Army Medical School.[52]

The Army Nurse Corps owed its growth to its second superintendent, Jane A. Delano, who was also chairman of the Red Cross Nursing Service.[53] Since the Medical Department had never been successful in building up a sizeable group of reserve nurses, Delano's position with the Red Cross and her determination in increasing the number of nurses in both organizations were of particular significance. Army planning already assumed Red Cross support in wartime, and by 1911 more than 2,000 "carefully selected" Red Cross nurses had pledged to serve in the event that hostilities broke out. When Delano resigned in 1912 after three years as superintendent, the pool of registered Red Cross nurses was the officially recognized source from which the Army would draw its reserve nurses.[54]

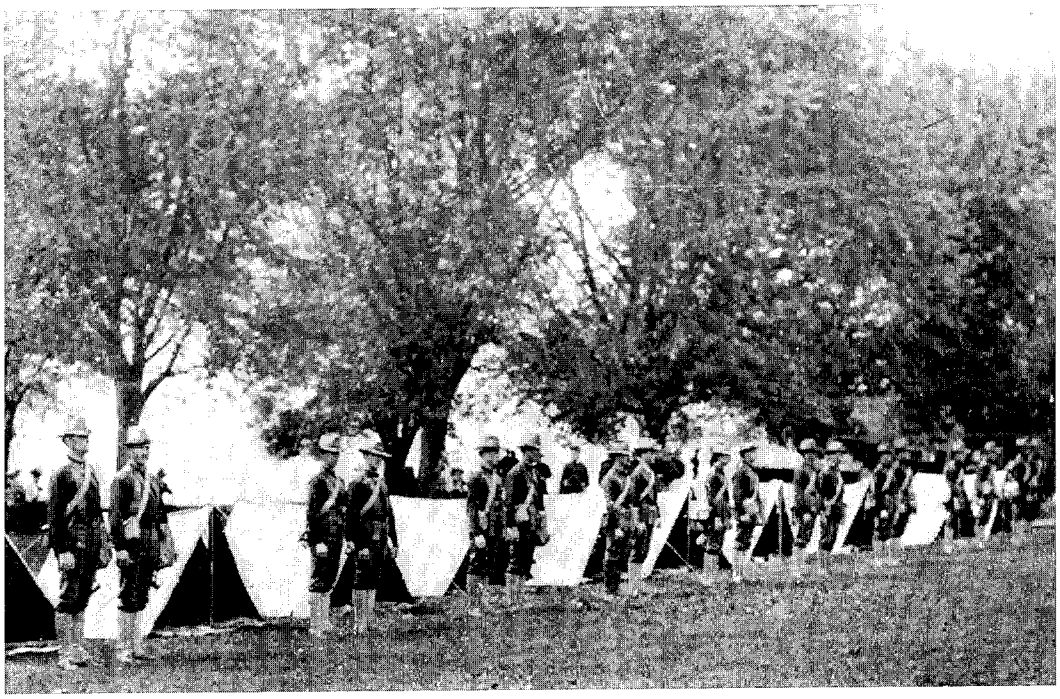


JANE A. DELANO

The Hospital Corps

In the Hospital Corps the Medical Department had already realized before the Spanish-American War the enlisted corps that other bureaus were still seeking, but obtaining and retaining enough hospital corpsmen proved to be difficult. Because hostilities with Spain had ended, the department was required to refrain from signing on more hospital stewards so that the original prewar limit of 100 could be reached by attrition. The shortage that resulted forced the use of acting hospital stewards in positions normally filled by stewards. In May 1900 Congress finally voted to create 100 more openings for hospital stewards. The following February, faced with the loss of experienced stewards mustered out with their volunteer regiments, the legislature voted still another 100 slots, to be reserved specifically for stewards who would otherwise leave the service. As a result of these two measures, the 167 hospital stewards of 30 June 1900 became 246 a year later.[55]

The demand for Hospital Corps privates was also great, particularly in the Philippine Islands, where for several years following the end of the conflict with Spain they served the Filipino scouts as well as U.S. troops. The secretary of war's ability to appoint as many privates as he saw fit did not solve the problem because of a rapid turnover of personnel; the almost simultaneous end of many enlistments in the volunteers saw 1,275 hospital corpsmen leave the Army in one four-month period late in 1901. A year later, after many replacements had been sent to the Pacific and the total number of troops there had begun to dwindle, a surplus developed. Because the proportion of corpsmen to troops was higher than the goal of 5 corpsmen to 100 men with white troops and 3 per 100 with native units, Surgeon General O'Reilly briefly stopped sending privates to the Pacific. In March 1907, however, the Medical Department gained permission to organize a Hospital Corps company in the Philippines. Vacancies in this company were filled as they occurred by transfers from the line, though such men were traditionally not highly regarded because of their "moral and mental inferiority." Hospital Corps noncommissioned officers were retained with the Philippine Souts, but in 1908 a program to train three privates from each scout company to do the work of Hospital Corps privates reduced the number of U.S. corpsmen needed in the Pacific. The exclusive reliance upon native troops in Puerto Rico after 1905 also contributed to a significant reduction in the need for U.S. hospital corpsmen in the tropics.[56]



COMPANY OF INSTRUCTION TRAINING AT WASHINGTON BARRACKS

The declining need for Hospital Corps privates was especially welcome because the requirement for exceptional strength of mind and body made replacements hard to find. The problem was further complicated by the fact that the number of new enlistments tended to fluctuate for reasons Surgeon General O'Reilly could not specifically identify. At times, authority had to be granted to recruiting officers and surgeons to hire locally without obtaining the specific approval usually required from the Surgeon General's Office.[57]

Army regulations issued in 1901 added the grade of lance acting hospital steward to the Hospital Corps so that the Medical Department would have "an opportunity to test the men as to their qualifications for the position of noncommissioned officers"; of the first ninety appointed to the new grade, twelve were later made acting hospital stewards. In the spring of 1903, as part of a reorganization of the corps, the old titles of hospital steward and acting hospital steward were abandoned in favor of reliance upon grade alone. At this time, the grade of corporal was authorized for as many as twenty corpsmen, a promotion regarded as an appropriate reward for those who, though "excellent and experienced soldiers [and] good disciplinarians," could not pass the exams necessary for promotion to sergeant. Army regulations issued in 1904 added the grade of lance corporal to the Hospital Corps.[58] The men so named were to be appointed, apparently without the usual examination, by either the surgeon general or one of the chief surgeons of the military departments. No more men were to be given this grade than would, together with the other noncommissioned officers, constitute a fifth of the detachment with which they served.[59]

To train hundreds of hospital corpsmen in laboratory work, in the care and trans-

portation of patients, in such tasks as vaccination, and in the management of paperwork, the Medical Department had to maintain permanent training companies (companies of instruction). These units generally handled no more than 100 trainees at a time in a course that took four months. One such company was set up at Angel Island, California, and another was routinely assigned to Washington, where it could also be used in training the students of the Army Medical School in their future duties. During those periods when the number of corpsmen was being reduced and few new men were available for instruction, the program for student medical officers was adversely affected. When the demand for hospital corpsmen was great, men who were not fully trained might be sent out into the field.[60]

Other companies of instruction were less permanent. The company of instruction in Manila, for example, was disbanded in 1901, although in 1903 medical officers set up a school for Filipino hospital corpsmen on Mindanao. By 1907 the company on Angel Island had been disbanded, but the Medical Department was maintaining four companies of instruction—two in Cuba, one in the Philippines, and one in Washington. Since many who had joined during or after the Spanish-American War had had no opportunity for careful training, the department also set up "detachments of instruction" at various posts, following the pattern initiated before the war. The chief surgeon of each military department, who was responsible for recruiting, training, and disciplining the corpsmen within that department, was required to see that at least five hours each week were devoted to instructing them in their duties. By 1908 an increase in pay had partially alleviated the problems involved in training hospital corpsmen by making it more likely that those already trained would either remain in the Army or reenlist after a period as civilians.[61]

Like his predecessors, Surgeon General Torney wrestled with problems resulting from the shortage of corpsmen and the difficulties experienced in recruiting and retaining the "better class of men," as he put it. Increasing numbers of experienced corpsmen, 67 in fiscal year 1909 alone, were leaving the Medical Department in favor of the line, where the pay was higher, promotions were more rapid, and duties were more attractive to the average soldier. When Congress created new openings at the top of the Hospital Corps in the spring of 1909, it did so at the expense of openings at the lower levels, leaving the department more in need than ever of Hospital Corps privates, since many were needed by the larger hospitals. Even calling in corpsmen from posts to work with maneuver units could not completely meet the demand in the field, and requests from post surgeons for hospital corpsmen too often had to be denied. When the number of corpsmen dictated by the size of the Army should have been 4,000, the number allotted remained 3,500, with an additional 12 appointed to serve militia units.[62]

Surgeon General Torney emphasized that the shortage of corpsmen would be disastrous in the event of war. He argued in vain that a proper interpretation of the applicable law would permit the secretary of war to appoint as many privates as were needed without regard to personnel ceilings for the Army as a whole. The easiest way to fill openings—that is, transferring unassigned recruits—"has not resulted," Torney emphasized, "in obtaining the most desirable class of men for service with the sick" and was not likely to produce a

supply of the highly skilled men he especially sought. He also urged that the rank of sergeant major be added to the Hospital Corps to attract "pharmacists of exceptional ability, X-ray experts, anesthetists," and similar specialists from civilian life, where they were paid more than they would be in the Army. Organizing the Hospital Corps into four permanent field hospitals and ambulance companies in 1911 was a step forward, since it eliminated the need to form these units from the existing companies of instruction each time medical personnel were required for maneuvers, but it did not resolve the problem of the corps' inadequate size.[63]

Preparing Medical Personnel for War

Obtaining adequate numbers of good men and women for the Medical Department could not alone prevent a repeat of the chaos and confusion of the Spanish-American War. To prepare adequately for the demands of war, doctrine had to be developed to guide the use of medical personnel, who had to be trained in the roles they were expected to play. In the immediate wake of that conflict, plans for using medical personnel effectively were sketchy and based on the approach used in 1898. The responsibility for devising new and detailed plans for meeting the challenges of modern warfare and for training medical personnel fell upon the shoulders of Surgeon General Sternberg's successors.

Perhaps the most crucial and exacting responsibility medical personnel would have to handle in time of war was evacuating the wounded. As many men as possible, including physicians, had to be kept at the front, but the fighting forces must not be encumbered by those no longer able to fight. Medical officers had to be prepared to divide the sick and wounded according to their condition so that those who would not be able to return to the front within a short period could be swiftly evacuated far from the battlefield. In briefly outlining how these goals should be achieved, early versions of the Army's *Field Service Regulations* and Medical Department manuals followed an approach based on that used in the spring of 1864 in the Civil War. The manual issued in 1906, drawn up, like succeeding manuals, by a board of medical officers who utilized suggestions solicited from members of the department, offered a detailed refinement of earlier plans for the organization of medical service in the field. It was designed, according to Surgeon General O'Reilly, "not only to meet the needs of to-day, but also the exigencies of war and the requirements of field service, making all the details of administration plain to the untrained volunteer surgeon." The medical units—field hospitals and ambulance companies—that took part in the maneuvers of 1908, however, were still "wholly provisional, since permanent units did not exist."[64]

Although even more detailed instructions were available by 1909 to guide every step of Medical Department activity in the field, the first attempt to gather a force as large as a division together at one time would not be made for another two years, and the Hospital Corps was yet to be permanently organized into field hospitals and ambulance companies. The 1909 regulations stated that in the event of war the chief surgeon of an army, who was the equivalent of the modern theater surgeon,[65] would give general instructions to the chief surgeons of component field armies who, together with the division surgeons, would be responsible for devising specific and

comprehensive plans to be followed at the front. Of the facilities to care for the wounded, dressing stations, each established by an ambulance company, would be nearest the front, but their number was to be as small as possible to avoid breaking up division medical personnel. Dressing stations and field hospitals were to be in the collecting zone, evacuation and base hospitals in the evacuation zone, and general hospitals in the distributing zone. In addition to four field hospitals and four ambulance companies and any dressing stations that were set up, the divisional medical organization in the field was to include a transport column, two evacuation hospitals, a base hospital, and a supply depot.[66]

When in 1910 the division replaced the regiment as "the basis for army organization," thereby becoming the Army's "great administrative and tactical unit," the Medical Department tailored its approach to caring for the sick and wounded in the field to suit the new 20,000-man division, which was composed of three brigades, each of which had three regiments. Plans that covered the entire line of evacuation from battalion aid station to base hospital were formalized. The manual issued in 1911 offered still greater detail than previous versions and represented a further refinement and formalization of earlier approaches rather than a significant alteration in them.[67]

As called for by the 1911 manual, a director of ambulance companies and a director of field hospitals would serve under the chief surgeon of each division. A reserve medical supply would also accompany each division. According to this plan, wounded who could walk were expected to follow one of the roads to the rear to the division's clearing station, a new concept for the U.S. Army designed to prevent the overcrowding of field hospitals by those least in need of aid. For those who were seriously injured, an aid station established by a regimental surgeon would be the first stop. They would then be taken by litter to the ambulance or dressing station. An ambulance would complete the move back to the nearest of the four 108-bed field hospitals that were allowed each division. Except in regiments operating independently, the regimental hospital had already been reduced to a 6-bed infirmary that played no role in the handling of the wounded in battle. Litter-bearers were organized into four ambulance companies per division, all of which worked under instructions from either the division's director of ambulances or its chief surgeon. Patients in need of prolonged care would be moved to one of the division's two 324-bed evacuation hospitals and from there to the division's 500-bed base facility. A 200-bed hospital train or ship—the former with three physicians, the latter with five—could evacuate patients still farther. When the battle was over, all severely wounded who could not be evacuated would be placed in one of the field hospitals. This facility would become a fixed unit, while the three remaining field hospitals would move on with the division.[68]

Surgeon General Torney benefited from the existence of the General Staff and the Army War College. Though established "to train officers for General Staff duties on the principle of learning by doing," in practice the college "instead of becoming exclusively an academic institution . . . became a part of the General Staff." The surgeon general was thus able to discuss his reservations about how well the Medical Department could carry out its role as outlined in the most recent regulations directly with those responsible for creating war plans. In 1911 Torney, Chief of Staff

Wood, and the planners of the Army War College became involved in a heated discussion when the surgeon general realized that they did not appreciate the implications of the shortage of hospital corpsmen. When the possibility of creating a second division to join the maneuver division already in the field along the Mexican border was discussed, Torney pointed out in very positive terms that he would not be able to provide it with adequate medical coverage without a much larger complement of hospital corpsmen. He could draw on the Medical Reserve Corps for as many more physicians as he needed, but "by no kind of legerdemain can an efficient medical service be provided for another division of regular troops without the enlistment of additional Hospital Corps men." [69]

Surgeon General Torney's efforts to obtain an adequate number of worthwhile men for the Hospital Corps so that the Medical Department could play the role outlined for it in the event of a major war were never successful. The Army's *Field Service Regulations* called for every division to be assigned four field hospitals and four ambulance companies. Even as late as 1913, when the Army was organized into four divisions, the surgeon general did not have the manpower to staff the requisite sixteen field hospitals and sixteen ambulance companies.[70]

The increasingly complex doctrine being developed to guide the medical service in the field emphasized the critical need to familiarize the civilian physicians upon whom the Army would have to rely in wartime with their duties before hostilities began. The task that would face the Medical Department in the event of hostilities would be enormous. The largest group of physicians and corpsmen that the department would have to train was found in the National Guard. For each division of the Guard, whose members were presumably totally unfamiliar with the most recent plans, as many as 100 or more civilian physicians, 132 noncommissioned officers, and 745 privates and privates first class would have to be trained. Of these, 5 doctors and 33–57 enlisted men would be needed in each field hospital and 4 medical officers and 24 enlisted would be required to accompany each infantry regiment.[71]

Eager to increase the size of the nation's pool of physicians with military training and wishing to foster a close relationship between National Guard medical officers and their counterparts in the regulars, Surgeon General O'Reilly urged Guard personnel to look to the Medical Department for advice, assistance, and supplies. Guard and regular units began training together when permanent camps of instruction were authorized in 1901, and in 1903 Congress increased the Regular Army's role in training and equipping the Guard. Regular medical officers noted a lack of discipline on the part of Guard medical officers, who reported to camp only when it suited their fancy. National Guard physicians were eligible to take many courses open to members of the Medical Department, but few took advantage of the opportunity.[72]

General Wood believed that brief periods of intensive military training in summer camps were the only realistic way to prepare both support and line troops for any future wartime expansion of the nation's armed forces, yet the time available for training militia physicians in this way proved to be inadequate. Surgeon General Torney urged making additional training available through summer camps run specifically for medical officers. In the summer of 1909 such camps were established on both coasts and a third was

opened in the Midwest. At each, a field hospital and an ambulance company were called in to demonstrate the work of the Medical Department in the field. During the month these institutions were in operation, National Guard doctors rotated through them for two-week training periods. The reaction to these camps was mixed, and the enrollment was sometimes poor, but Guard officers who attended them were generally enthusiastic.[73]

Although the medical camp concept was apparently abandoned after one summer because of lack of funding, in 1910 a regular medical officer, Capt. Henry D. Thomason, was assigned to the Army's Division of Militia Affairs to guide the medical and sanitary service of the National Guard and to prepare its medical personnel to work in the field with their regular counterparts. During joint maneuvers involving both Guard and regular units that year, regular medical officers were "liberally supplied as inspector-instructors to the National Guard and the sanitary units of the Army were sent out as object lessons." The effect of this training by example as well as by discussion was "a general awakening and improvement in the sanitary service" of Guard units. With the National Guard growing rapidly in size, Captain Thomason succeeded in having the institution of the instructor-inspector made permanent with regular medical officers assigned to function in this capacity. He was also successful in his attempt to have a few of the top noncommissioned officers of the Hospital Corps sent to help train the corpsmen of Guard units. In spite of some improvement, the success of this approach was limited because supplies of both trained personnel and equipment continued to be inadequate; in 1911 Thomason noted that the National Guard had but twenty ambulance companies and twenty field hospitals when it should have sixty-one of each. Since the regulars themselves lacked twenty-seven of their goal in each category at this time, they were in no position to supplement Guard units. As a result, Thomason remained pessimistic about the Guard's ability to handle wartime casualties.[74]

Concluding that many National Guard problems went beyond inadequate numbers, Surgeon General Torney blamed some difficulties experienced in training Guard medical personnel on the lack of federal control over state Guard units. Commanding officers of National Guard regiments in some states could appoint their medical officers without benefit of an examination to test their competence as physicians. Other difficulties stemmed from the fact that few outside the Army appreciated that there was more to being a medical officer than patient care. Local officials were often not aware that even the most competent physicians required training in such areas of military medicine as map reading, weapons, tactics, and the art of predicting approximately how many men might be wounded in a particular battle. The problem of the malingerer was also difficult for civilian doctors to appreciate since they almost instinctively placed the good of the individual above the good of the military unit. Because so many of the Army physician's duties were administrative, Torney agreed with Captain Thomason that inspector-instructors should serve with Guard units. He also urged that more medical officers in the Guard take advantage of the Leavenworth courses.[75]

By the time of Surgeon General Torney's death in 1913, conditions in the National Guard were improving. Some states had organized their medical services following the Medical Department example. But the need

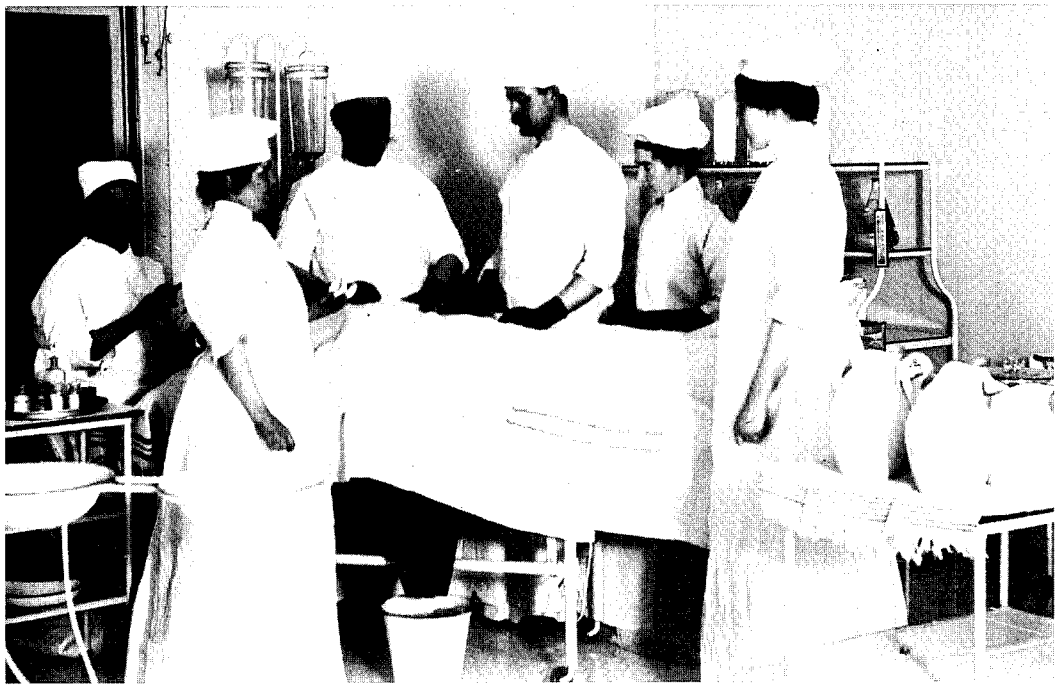


HARRY L. GILCHRIST *in his office*

for doctors to be familiar with "tactical principles, the methods for the employment of sanitary troops, the transportation of their materiel and supplies, the organization of the different units of different arms, and many other things too numerous to mention" was still too often unrecognized. Although more states were requiring physical examinations and immunizations for their recruits, the requirement placed a greater and unwelcome burden on Guard physicians. Captain Thomason's successor, Maj. Harry L. Gilchrist, pointed out that "the majority of men" in the National Guard joined "not only from a patriotic standpoint but also for the purpose of diversion," one of the diversions apparently being practice with weapons. The assignment to spend evenings examining and immunizing soldiers, work similar to that which occupied their days as civilians, left Guard physicians less than enthusiastic about their patriotic duty. This trend, many believed, undermined the enthusiasm of doctors already in the Guard, led to an increase in resignations, and discouraged prospective new members.[76]

General Hospitals

Many of those so seriously wounded in a major war that their recovery period might be prolonged would have to be cared for in facilities in the United States, for the most part in general hospitals. Although plans were developed for the use of these facilities, few adjustments were being made in the network of permanent general facilities in the United States and its territories to prepare them to care for any large number of the patients that a major conflict might produce. Those changes that did take place in these hospitals came, with one partial exception, in response either to

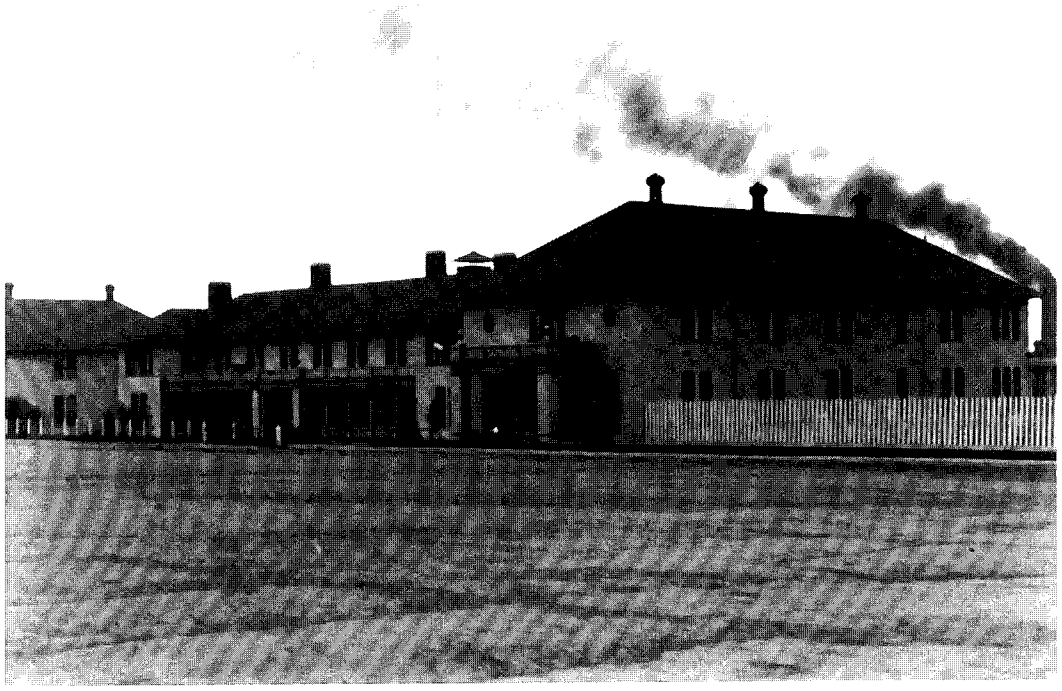


CHIEF SURGEON GIRARD *(center left) operating*

peacetime requirements or to the continuing need to care for the sick and wounded from the Philippines.[77]

By 1900 some general hospitals established to meet the needs of the Spanish-American War had been closed, among them the modern 1,020-bed hospital at Fort Monroe, Virginia. Others remained in operation after the end of hostilities and were even expanded, funding apparently being more easily obtained for them than for post facilities. To these institutions, which were under the direct control of the surgeon general rather than that of the local commander, came the sick and injured brought back from foreign lands and soldiers and members of military families with more serious illnesses or injuries.[78]

A large general hospital was maintained on each coast. In the West, where the sick from units going to and from the Pacific were left for care, the need for general hospital space increased for several years after the end of hostilities with Spain. X-ray specialists were in such great demand that during the period of the Philippine Insurrection the services of at least one civilian technician were required. The work of Elizabeth Fleischmann-Aschheim was apparently very highly valued by civilian and military physicians alike in San Francisco, but her own extensive exposure to the new device led to her early death in 1905 while still in her thirties. By 1902, according to the chief surgeon, Lt. Col. Alfred C. Girard,[79] the general hospital in San Francisco (named Letterman General in 1911), which received patients evacuated from the Philippines, had recovered from the fire that had destroyed "the entire culinary department" in 1901. Of its average monthly case load of 480 patients, more than half came from the Philippines. It housed the post facility for the Presidio and



LETTERMAN GENERAL HOSPITAL, PRESIDIO, SAN FRANCISCO

other posts in the San Francisco area and served as the general hospital for the western half of the United States. It was also the base hospital for the Philippines and Hawaii. The largest general hospital in the United States, Letterman handled more than 3,000 cases in 1913 and continued to grow in the years before World War I.[80]

In the East, in the nation's capital, both the needs of the Army Medical School and an increasing number of patients led to the construction of a new general hospital to replace the makeshift wartime facility at the Washington Barracks. Since in the East the demand for large hospitals slowly diminished after the end of hostilities with the Spanish, Congress was initially reluctant to fund a new general hospital. As time went by, more patients were admitted than the buildings at the Washington Barracks could hold, making it necessary to erect tents and then, as the weather turned cold, temporary structures. When the Army Medical School reopened in November 1901, its clinics in surgery were housed in the hospital, where students were also trained to use X-ray equipment. Enlarging the old hospital at the Washington Barracks would not suffice. Surgeon General Sternberg maintained that a twenty-five- to thirty-acre site was needed for a general hospital not only to house facilities where hospital corpsmen and medical students could be trained but also to serve as a base hospital in wartime.[81]

As the months went by without congressional action, the old buildings of the Washington Barracks hospital continued to deteriorate. Finally, in 1904, after a vigorous campaign waged by Major Reed's friend and colleague, Maj. William C. Borden, the legislature voted $100,000 for the land and another $200,000 for the plant to house a new hospital, to be named after

Reed, and such lesser structures as barracks for hospital corpsmen and a new building for the Army Medical Museum and the Surgeon General's Library. At the time the Walter Reed General Hospital opened in 1909, its capacity was eighty beds, a few of which were made available to the women of Army families. For several years thereafter, work to make it comfortable and safe for its patients and to create facilities to house the hospital staff continued.[82]

The other general hospitals operated by the Medical Department included facilities that differed widely in location and function. The First Reserve Hospital in Manila, while regarded as a general hospital, was a division hospital because it was the responsibility of the area commander. If the Army should be involved in a war in the Pacific, this facility could become very important. Sustained guerrilla activity during the Philippine Insurrection placed considerable demands on it, and the Army's sick and wounded continued to be so numerous that additional facilities had to be established to house contagious cases. Unhappy about the condition of the old Spanish building that housed this fixed hospital, which cared for as many as 2,000 or more patients every year, the division's commanding officer recommended the construction of a new and more modern facility, preferably one with "an intercommunicating telephone system . . . and an automobile ambulance."[83]

The Army's two remaining general hospitals were specialized-care institutions for those suffering from specific illnesses. The patients of the Army-Navy facility in Hot Springs, the Army's oldest permanent general hospital, for the most part treated those for whom the waters of the springs were deemed useful, although some of its occupants were the victims of venereal disease or other problems. It was opened to veterans in 1901. Several years passed before any significant number of them took advantage of the privilege, but its patient load increased in the years immediately preceding World War I. Modernized through the efforts of Torney when he was its commander immediately after the Spanish-American War, this 130-bed facility was described by Surgeon General O'Reilly in 1903 "as complete in every respect as the most elaborate institutions of like nature anywhere."[84]

The hospital at Fort Bayard in New Mexico was opened in the summer of 1899 for the victims of tuberculosis. For many years soldiers with newly diagnosed cases of tuberculosis had been assigned to posts in the Southwest, an area often recommended to victims of this disease. The new facility, not far from the Marine Hospital Service's tuberculosis hospital at Fort Stanton, provided a place where all soldiers, dependents of the Soldiers' Home and, until 1908, Navy patients with the disease could be isolated and cared for according to their needs. Given the condition of many patients when they arrived, often from the Philippines, the high death rate at Fort Bayard was predictable.[85]

Supply

Although reformers had demonstrated little concern about the Army's permanent hospital system, the Dodge Commission's report directed considerable attention to the need to prepare to meet wartime's suddenly increased demands for medical supplies, equipment, and transportation. The Medical Department's 1902 manual eliminated possible confusion concerning precisely what equipment was needed for each field hospital and ambulance unit and who would supply each item, but in the early

years of the new century efforts to accumulate the four-year reserve of nonperishable items suggested by the commission met with frustration. Congress expected the Medical Department to supply other government organizations, among them the National Guard, the Department of Commerce and Labor, and the Isthmian Canal Commission. The discovery that obsolete surgical instruments at many posts would have to be replaced added to the department's burdens. Congress was relatively generous for fiscal years 1901 and 1902, but obtaining the funds necessary to replenish supplies was thereafter difficult at best. A fire that badly damaged the medical depot in New York City in 1909 increased the difficulties experienced during the drive to accumulate and maintain the recommended reserve. Thus, although the department was not ready to meet the demands of a possible future war, a great deal of the energy of those responsible for managing its supplies was consumed by current needs.[86]

Since prices were generally lowest in New York, a considerable amount of buying was still done there. As a result, the medical depot's capacity had to be increased to provide space for the new reserves. Because much of the current demand resulted from continuing hostilities in the Philippines, Surgeon General Sternberg also initiated the enlargement of the facility in San Francisco. Plans called for each of these two depots to hold supplies sufficient for 100,000 men for six months. To leave the major storage points on the coasts free to supply units outside the continental United States, warehouses to store supplies for 20,000 men for six months were built at the St. Louis depot, which assumed responsibility for fifty-two posts within the United States. Depots were also now maintained at Manila, Havana, and San Juan. Shipping medicines to and from these sites was simplified by a system developed by Munson, a physician of considerable practical genius, who devised a packing system based on the liter. Containers for fractions of a liter were designed so that two, four, eight, or thirty-two of them would fit into the space occupied by a liter container and could be stored with no packing material beyond the carton itself.[87]

Surgeon General Sternberg wished to accumulate sufficient supplies and equipment to provide each of the fifteen military departments (nine within the United States and six abroad) with two regimental field hospitals, a challenge made somewhat simpler by the reduction in the number of hospitals and concentration of supplies in the Philippines.[88] By 1903 Medical Department goals called for having two base hospitals, thirty-eight field hospitals, ten stationary hospitals, seventy-eight regimental hospitals, and seven supply depots, stored in Washington, D.C., San Francisco, St. Louis, and Manila and ready for shipment within twenty-four hours. The Medical Department's reserve of the type of field equipment needed in wartime was large enough to supply five Army corps, except for the items provided by the Quartermaster's Department. When Army units reoccupied Cuba in 1906,[89] their medical supplies and equipment were ready for immediate shipment. By January 1909, when Surgeon General O'Reilly retired, all the hospitals and depots originally called for in 1903 had either been accumulated or were in the process of being acquired.[90]

The Dodge Commission had recommended that the Medical Department manage the transportation of its needs to the extent necessary to guarantee prompt delivery. Although convinced that the principal cause of the supply problems of

the Spanish-American War was inadequate transportation, Surgeon General O'Reilly concluded that the movement of goods from depots was an administrative problem that "would probably be no nearer solution if the medical department should be given its own transportation department." A separate quartermaster service for each branch of the Army being totally impractical, he dealt with the problem by appointing acting quartermasters from within the Medical Department and assigning men from the department, including Hospital Corps detachments, to accompany supply shipments.[91]

Although Surgeon General O'Reilly was on the whole determined to carry out the recommendations of the Dodge Commission, he was also not convinced of the necessity for building up significant reserves of all items, since some items could be readily bought in great quantity in the open market. Believing that confusion was in part to blame for the difficulties of 1898, he undertook to have routine needs stored separately from items required only in wartime. He also initiated a system to assemble all supplies needed for a field hospital—regardless of whether they were obtained by the Medical Department, the Quartermaster's Department, or the Ordnance Department—ready for shipment within twenty-four hours. This unit supply system was extended to include equipment for an emergency recruiting setup to handle the first round of physical examinations, for a camp hospital to provide emergency treatment, for a base hospital, for handling regimental needs in combat, for a camp infirmary and reserves for the camp infirmary, for an ambulance company, and for an evacuation hospital. Surgeon General Torney continued the work begun by his predecessors, assembling needed items in Washington, D.C., and shipping them out where needed for use or for storage at a field medical depot created specifically for the purpose. Supplies for one division were sent to San Francisco and for a second division to Honolulu, while some field equipment was stored in Manila.[92]

The changes that had been made in the organization of the Medical Department by December 1913, when Surgeon General Torney died, would make possible a more efficient administration of the department than could have been achieved under its monolithic structure in the nineteenth century. Detailed plans for the operation of the department in the field had also been developed as part of Army-wide preparations for the possibility of large-scale modern warfare. Greater attention had been devoted to the problems involved in acquiring and distributing supplies, and thought had been given to the use of general hospitals in time of major conflict. Still to be solved was the fundamental and perennial problem of how to prepare the hordes of civilians who would have to supplement the work of regular medical personnel in the event of such a conflict to perform their roles effectively. By 1913, except for the problem of training adequate numbers of civilian physicians, the Medical Department may well have been prepared to meet the demands of a conflict like the one in which it had most recently been involved. It was not ready for a conflict on a scale never before encountered in the course of human history.

NOTES

1. James L. Abrahamson, *America Arms for a New Century*, pp. 29–44, 67, 96–97, 100, 153.

2. Paul F. Straub, *Medical Service in the Campaign*, p. 3; Rpt 1036 (Request of the Surgeon General for an Increase in the Enlisted Personnel of the Hospital Corps) and Rpt 1752 (Proposed Amendments of Paragraphs 514, 613, 618, and 636, Army Regulations), Entry 5, Record Group (RG) 165, National Archives and Records Administration (NARA), Washington, D.C.;; Otto L. Nelson, Jr., *National Security and the General Staff*, pp. 56–57; United States, Congress, Senate, *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*, 1:115–16, 188–89 (hereafter cited as *Dodge Commission Report*); Jerry M. Cooper, *Civil Disorder*, p. 34; War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1903, p. 18, and 1908, pp. 121–28 (hereafter cited as WD, *ARofSG*, date); John N. Goltra, "The Executive Element in the Training and Skill of the Army Surgeon," p. 206; Walter Millis, *Arms and Men*, pp. 173–76; War Department, Surgeon General's Office, *The Surgeon General's Office*, pp. 56–57 (hereafter cited as WD, SGO, *SGO*). Unless otherwise indicated, material on the General Staff and the chief of staff is based on James E. Hewes, *From Root to McNamara*.

3. Hermann Hagedorn, *Leonard Wood*, 2:89.

4. See Chapter 7 for the Dodge Commission's findings.

5. The law limited the terms of the heads of all the Army's bureaus to four years.

6. "The Surgeon General of the Army and His Critics," p. 822 (first quotation); Charles J. Post, *The Little War of Private Post*, p. 317 (second and third quotations); "The One Great Blot of the War," p. 279 (fourth quotation); Jefferson R. Kean, "Influence of the Association of Military Surgeons on the Status of Medical Officers," p. 599; Graham A. Cosmas, *An Army for Empire*, pp. 282–83, 295; *Dodge Commission Report*, 1:107, 113, 116, 188–89; James M. Phalen, *Chiefs of the Medical Department, United States Army, 1775–1940*, p. 70; *The Military Laws of the United States*, 1915, 5th ed. (Washington, D.C.: Government Printing Office, 1917), p. 154, para. 373.

7. See Chapter 7 for the details of Forwood's management of Camp Wikoff.

8. Phalen, *Chiefs*, pp. 75, 81; *Military Laws*, 1915, p. 155, para. 380.

9. Ltr, P. Middleton to SG, 8 Dec 1868 (first quotation), vol. 12, Entry 10, RG 112, NARA; Bailey K. Ashford, *A Soldier in Science*, pp. 105–06 (second and fourth quotations); Ltr (copy), Walter Reed to William C. Gorgas, 21 Jul 1902 (third quotation), Ms C48, Walter Reed and William C. Gorgas Papers, National Library of Medicine (NLM), Bethesda, Md.; Percy M. Ashburn, *A History of the Medical Department of the United States Army*, p. 283 (hereafter cited as *History of MD*); Phalen, *Chiefs*, pp. 75, 79–81; Autobiography, Jefferson R. Kean, p. 157, Ms C14, Jefferson R. Kean Papers, NLM. Kean was promoted to brigadier general in the National Army on 26 June 1918.

10. Phalen, *Chiefs*, p. 86; Ltr, Albert G. Love to Jefferson R. Kean, 29 Dec 1913, folder Correspondence, 1913–1915, and Kean Autobiography, pp. 139, 165, Ms C14, NLM.

11. *Dodge Commission Report*, 1:189; WD, *ARofSG*, 1908, pp. 125–26.

12. Memo, SG to SW, 3 Sep 1909 (quotation), Entry 231, and Rpt, Curator, Army Med Museum, to SW, 9 Oct 1909, Entry 245, RG 112, NARA; Kean Autobiography, pp. 78–79, Ms C14, NLM.

13. By the time of Torney's death in December 1913, the Surgeon General's Office was managing the work of about 4,300 men and women.

14. Jefferson R. Kean, "Medical Department of the Army," March 1913, Entry 231, RG 112, NARA; WD, SGO, *SGO*, p. 126.

15. WD, *ARofSG*, 1910, pp. 161–62 (quotations), 163; Kean, "Medical Department," Entry 231, RG 112, NARA.

16. Beaumont's studies of human digestion, made possible when a wound through the stomach wall of one of his patients failed to heal over, brought him wide acclaim.

17. See Mary C. Gillett, *The Army Medical Department, 1818–1865*, for details on Lawson's policies and his relationship with William Beaumont.

18. Memos, J. F. Bell to SW, 20 Apr 1910, Leonard Wood to AG, 27 Dec 1910, and SG to SW, 3 Sep 1909 and 15 Jan 1912, Entry 231, RG 112, NARA; Louis M. Maus, "The Ethics, Scope and Prerogative of the

Army Medical Officer," p. 304; Kean Autobiography, pp. 126, 148, Ms C14, NLM.

19. Goltra, "Executive Element," p. 210 (quotations); *Dodge Commission Report*, 1:188–89; Memo, Acting SG to President, 19 Oct 1904, folder Memoranda, 1904, 1911, Ms C14, NLM.

20. R. G. Ebert, "The Medical Department of the U.S. Army," pp. 93, 96; "Army Contract Surgeons," p. 417; WD, *ARofSG*, 1899, p. 19, and 1900, pp. 19–20; Azel Ames, "A Medical Reserve Corps for the Army of the United States," pp. 70, 89; C. B. G. de Nancrede, "Personal Experience During the Spanish-American War . . . ," p. 611; Joseph M. Heller, "Experiences of the Spanish-American War From a Different Viewpoint Than Major Nancrede," p. 71; Cosmas, *Army*, pp. 296–97; Memoranda on Med Corps, 31 Dec 1899, Entry 245, RG 112, NARA; C. Joseph Bernardo and Eugene H. Bacon, *American Military Policy*, p. 288.

21. WD, *ARofSG*, 1899, pp. 328–29, and 1900, pp. 17, 20, 96; Martha L. Sternberg, *George Miller Sternberg*, p. 201.

22. Erna Risch, *Quartermaster Support of the Army*, pp. 563–64; James A. Huston, *The Sinews of War*, p. 302; AGO GO 36, 4 Mar 1899, and GO 14, 12 Feb 1901; Edgar Erskine Hume, *Victories of Army Medicine*, p. 30; Ebert, "Medical Department," p. 92; WD, *ARofSG*, 1901, p. 35, 1902, p. 16, 1903, pp. 42, 44–45, and 1907, p. 119; William O. Owen, "The Ideal Relation for the Medical Department of an Army," p.365; War Department, Surgeon General's Office, *Manual for the Medical Department, 1906*, pp. 9–10; Victoria A. Harden, *Inventing the NIH*, p. 18; Robert S. Henry, *The Armed Forces Institute of Pathology*, pp. 93, 139 (hereafter cited as *AFIP*); Frederick C. Huidekoper, *The Military Unpreparedness of the United States*, p. 324.

23. WD, SGO, *SGO*, pp. 58–59; Huidekoper, *Military Unpreparedness*, p. 324; Ebert, "Medical Department," pp. 92–93, 97–99; WD, *ARofSG*, 1903, p. 15, and 1904, p. 11; Edward L. Munson, "An Outline of the Organization and Work of the Medical Department of the United States Army," pp. 254–55; James G. Burrow, *Organized Medicine in the Progressive Era*, p. 15.

24. Munson, "Outline," p. 256 (quotation); WD, *ARofSG*, 1902, p. 14, 1903, pp. 18–19, 42, 1904, pp. 10–11, 14, and 1907, pp. 119, 122; George Rosen, *The Structure of American Medical Practice, 1875–1941*, pp. 61, 67; John S. Haller, Jr., *American Medicine in Transition, 1840–1910*, pp. 221–33; W. Bruce Fye, "The Origin of the Full-time Faculty System," p. 1555.

25. Memo, SG to President, 24 Dec 1904, Entry 242, RG 112, NARA.

26. Ltr, Jefferson R. Kean to William C. Gorgas, 23 Aug 1905, 2:93, Ms C5, SGO Correspondence, 1903–1907, NLM; "The Discussion in the Senate on the Army Medical Reorganization Bill," pp. 305–06; WD, *ARofSG*, 1903, p. 18, 1904, pp. 13–14, 1905, pp. 131, 134, and 1908, p. 127; "Change in the Examination for the Army Medical Service," p. 61; Robert Smart, "Military Hygiene," p. 38; R. M. Culler, "Some Facts About the Army Medical Corps," pp. 1092–93.

27. War Department, *Five Years of the War Department Following the War With Spain . . .*, p. 361; idem, *ARofSG*, 1903, p. 18.

28. First quotation from Hearings Before Committees on Military Affairs of United States Senate and House of Representatives, 64th Cong., 1st Sess., p. 629, RG 287, NARA; remaining quotations from WD, *ARofSG*, 1906, p. 112. See also Theodore Roosevelt, "President Roosevelt on Army Medical Reorganization," pp. 133–34.

29. Walter D. McCaw, "The Medical Service of an Army in Modern War," p. 348; War Department, *[Annual] Report of the Secretary of War*, 1906, p. 33; idem, *ARofSG*, 1903, pp. 18–19, 1905, p. 131, 1906, p. 112 (quotations), and 1908, p. 123; Huidekoper, *Military Unpreparedness*, p. 324.

30. WD, *ARofSG*, 1899, p. 329, 1908, pp. 101, 123, 126, and 1909, p. 126; WD, SGO, *Manual, 1906*, pp. 11, 123; Culler, "Some Facts," p. 1092; Charles F. Craig, "The Army Medical Service," pp. 417, 419–20; Percy M. Ashburn, "Service in the Army Medical Corps," p. 667; Huidekoper, *Military Unpreparedness*, p. 344; Louis L. Seaman, "Some of the Triumphs of Scientific Medicine in Peace and War . . . ," p. 340; Rosen, *Structure*, pp. 19, 35–36; Edward L. Munson, "The Army Medical Service," pp. 677–78; idem, "Outline," pp. 254–55; Burrow, *Organized Medicine*, p. 15; Paul Starr, *The Social Transformation of American Medicine*, pp. 84–85; "The Army Medical Corps," p. 58; James A. Tobey, *The Medical Department of the Army*, p. 31.

31. WD, SGO, *SGO*, p. 60 (quotation); Huidekoper, *Military Unpreparedness*, p. 345; WD, *ARofSG*, 1908, p. 123.

32. Huidekoper, *Military Unpreparedness*, pp. 344–46; "Medical Reserve Corps," p. 68; WD, *ARofSG*, 1899, p. 329, 1908, pp. 123, 126, and 1909, p. 127; Richard B. Crossland and James T. Currie, *Twice the Citizen* (Washington, D.C.: Office of the Chief, Army Reserve, 1984), p. 14; Seaman, "Some of the Triumphs," p. 341; *Dodge Commission Report*, 1:188–89.

33. WD, *ARofSG*, 1912, pp. 90 (quotation), 91, 1913, pp. 86–91, 93, and 1914, pp. 82, 85; *Dodge Commission Report*, 1:188–89; WD, SGO, *SGO*, p. 120.

34. WD, *ARofSG*, 1909, p. 127, 1910, p. 126, 1911, pp. 170, 1912, p. 177, 1913, p. 163, and 1914,

pp. 154–55; Huidekoper, *Military Unpreparedness*, pp. 371, 388.

35. WD, *ARofSG*, 1908, pp. 103 (quotation), 104.

36. Ltr, SG to Jesse Overstreet, 19 Feb 1909 (quotation), Entry 27, RG 112, NARA; WD, *ARofSG*, 1908, pp. 103, 127; Huidekoper, *Military Unpreparedness*, pp. 344–45.

37. WD, *ARofSG*, 1913, pp. 162–63, and 1914, pp. 13, 155; Richard Slee, "The Veterans' Reunion at Gettysburg," pp. 723, 725–26.

38. WD, *ARofSG*, 1908, p. 127 (first two quotations), 1910, pp. 157–59, and 1913, pp. 177–79; in RG 112, NARA: Ltrs, SG to Arthur F. Chase, 20 Jan 1909, to Simon Flexner, 18 and 26 Jan 1909, and to William C. Gorgas, 6 and 30 Mar 1909 (final quotation), Entry 27, and Jefferson R. Kean to SW, 16 Jul 1912, Entry 231; Percy M. Ashburn, "Report on Medical Conditions in Liberia," pp. 402–09; Clyde S. Ford, "Some Medicomilitary Observations in the Late Balkan Wars," pp. 53–56, 58; Craig, "Army Medical Service," pp. 421–22; Ira L. Reeves, *Military Education in the United States*, p. 289.

39. First quotation from Paul F. Straub, "The Training of Sanitary Troops," p. 359 (see also p. 360); second quotation from "Better Instruction for Army Medical Officers," p. 1737; third quotation cited in Ashburn, *History of MD*, p. 253.

40. Phalen, *Chiefs*, p. 102; Marvin A. Kriedberg and Merton G. Henry, *History of Military Mobilization in the United States Army, 1775–1945*, pp. 204–05; WD, *ARofSG*, 1912, p. 187; Reeves, *Military Education*, pp. 229–30; W. G. Schauffler, "Report of Medical Service School, New Jersey," p. 531; *A Military History of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1881–1963*, p. 20; Straub, *Medical Service*, pp. 7–8, 35–37.

41. Quotations cited in Ashburn, *History of MD*, pp. 253–54. See also WD, *ARofSG*, 1905, p. 157, and 1906, p. 130; Winslow Anderson, "The U.S. Army Camp of Instruction for the Officers of the Medical Corps of the Organized Militia," p. 527; Ltr, Jefferson R. Kean to Charles Woodbury, 26 Jan 1910, Entry 231, RG 112, NARA; Henry I. Raymond, "What Is the Most Effective Organization of the American National Red Cross for War . . . ," p. 156; Sternberg, *Sternberg*, pp. 203–04; Timothy K. Nenninger, *The Leavenworth Schools and the Old Army*, p. 102; John F. Morrison and Edward L. Munson, *A Study in Troop Leading and Management of the Sanitary Service in War*; Edward L. Munson, *The Principles of Sanitary Tactics*; Francis A. Winter, "Preparedness of the Medical Department of the Army in the Matter of Field Medical Supplies," (Paper delivered at the Army War College, Washington, D.C., [Fall 1912]), Military History Research Collection, U.S. Army Military History Institute, Carlisle Barracks, Pa.

42. Owen, "The Ideal Relation," pp. 362–63 (quotation), 364; John M. Banister, "Army Sanitary Administration in the United States and in the Tropics," p. 562; Louis L. Seaman, "Lessons for America in the Japanese Army Medical Service," pp. 585–86; WD, *ARofSG*, 1905, p. 160; War Department, *Reports of Military Observers Attached to the Armies in Manchuria During the Russo-Japanese War*, pt. 4, p. 13. Even in the Russian Army during the Russo-Japanese War, wounds killed more than disease.

43. Charles E. Woodruff and Frank T. Woodbury, "The Prevention of Disease in the Army and the Best Method of Accomplishing That Result," pp. 22–24 (quotations); WD, *ARofSG*, 1908, pp. 39–40, and 1909, pp. 10, 76.

44. Wyndham D. Miles, *A History of the National Library of Medicine*, pp. 206–07; Henry, *AFIP*, pp. 147–49; WD, *ARofSG*, 1909, p. 140, 1910, p. 133, 1911, pp. 176, 183, and 1912, p. 185.

45. WD, *ARofSG*, 1902, pp. 17, 25, and 1903, pp. 19, 23; Ashburn, *History of MD*, p. 211; WD, SGO, *Manual, 1906*, p. 10; V. O. Hurme, "Notes on the Physical and Dental Condition of U.S. Army Men in 1901–1903," pp. 255, 258–64; John D. Millikin, "The Original U.S. Army Dental Corps," p. 387; Gardner P. H. Foley, "The Peaks of Dental History," p. 14.

46. WD, *ARofSG*, 1902, pp. 18–19, 1903, pp. 21–23, 26, 1905, p. 135, 1906, p. 114, and 1907, p. 120.

47. Ibid., 1909, p. 128, 1910, pp. 126–27, 1911, p. 171, 1912, p. 178, and 1913, p. 164; Huidekoper, *Military Unpreparedness*, p. 386; Memo, Jefferson R. Kean to SG, 23 Mar 1909, Entry 231, RG 112, NARA; Millikin, "Original," p. 387.

48. *Dodge Commission Report*, 1:188–89; WD, *ARofSG*, 1899, pp. 25, 29–30, 52, 54, 74, and 1900, p. 24; Hoff's comment on Anita Newcomb McGee paper, f. idem, "Nurse Corps of the Army," p. 273; Dallas Bache, "The Place of the Female Nurse in the Army," pp. 309, 328; Thomas C. Clark, "Some Observations Upon the Medical Service of the Late War With Spain From the Standpoint of a Volunteer Surgeon," p. 365; in RG 112, NARA: SGO Cir 14, 7 Nov 1898, and Cir, 20 Jun 1899, Entry 66, and Ltr, William C. Gorgas to Anita N. McGee, 27 Feb 1900, Entry 147.

49. McGee, "Nurse Corps," pp. 267–68 (quotation); WD, *ARofSG*, 1901, p. 61, 1903, p. 39, 1908, p. 124, and 1909, p. 133; Hume, *Victories*, p. 205.

50. WD, *ARofSG*, 1904, p. 24, 1906, p. 119 (quotation), 1907, p. 126, and 1908, pp. 109–10.

51. Ibid., 1910, p. 130, 1913, p. 164, and 1914, p. 159.

52. Ibid., 1911, p. 172.

53. Jane Delano's name implies some relationship to Franklin Delano Roosevelt's mother; however, when Delano died in France during World War I and plans were being made to exhume her body, initially buried in France, and to reinter it in the United States, it became apparent that she had no near kin and thus that her success was presumably not based on family influence. See Ltr, Clara D. Noyes to Julia C. Stimson, 11 Feb 1920, Entry 103, RG 112, NARA.

54. Kean, "Medical Department" (quotation), Entry 231, RG 112, NARA; Gustavus Blech, "Organization of Red Cross Personnel for War," pp. 228–36; Raymond, "National Red Cross," pp. 177, 180; WD, *ARofSG*, 1910, p. 130; AGO GO 16, 23 May 1912; War Department, Surgeon General's Office, *Manual for the Medical Department, United States Army, 1911*, change to Sec. 96; idem, *SGO*, p. 60.

55. WD, *ARofSG*, 1898, p. 14, 1899, pp. 20–21, 183, 232–35, 1900, pp. 22–23, 1901, p. 36, 1902, p. 25, and 1908, pp. 123–24; Hume, *Victories*, p. 28; Risch, *Quartermaster Support*, pp. 561–62.

56. WD, *ARofSG*, 1902, p. 27, 1903, p. 32, 1904, p. 20, 1905, pp. 87, 96, and 1906, p. 118; E. L. Ruffner, "The Private Sanitary Filipino Scout," p. 410; WD, SGO, *Manual, 1906*, p. 65; Rpt 1036, Entry 5, RG 165, NARA.

57. Goltra, "Executive Element," p. 211; Elbert E. Persons, "Medical Service With Philippine Scouts," pp. 708–09; WD, *ARofSG*, 1901, pp. 37, 39, 1902, p. 28, 1903, p. 32, 1904, p. 20, 1906, pp. 116, 118, 1907, pp. 124–25, and 1908, p. 108; WD, SGO, *Manual, 1906*, p. 66.

58. The lance corporal was a private serving temporarily as a corporal.

59. WD, *ARofSG*, 1902, p. 27 (first quotation), 1903, pp. 31–32, 1904, p. 19, and 1908, p. 108 (second quotation); WD, SGO, *Manual, 1906*, p. 63.

60. WD, SGO, *Manual, 1906*, pp. 69, 72; WD, *ARofSG*, 1900, p. 23, 1901, p. 48, 1902, p. 39, 1903, pp. 32, 35, 38, 1904, p. 36, and 1905, p. 138.

61. WD, *ARofSG*, 1899, p. 182, 1901, pp. 39 (quotation), 40, 1902, p. 39, 1906, p. 116, 1907, p. 124, and 1908, p. 108.

62. Ibid., 1909, p. 131, 1911, p. 174, 1912, pp. 180–81, and 1913, p. 168 (quotation).

63. Ibid., 1911, p. 175, 1913, pp. 14–15, 166 (first quotation), 167–68 (second quotation), and 1914, pp. 12–13.

64. Ibid., 1908, p. 127 (first quotation); WD, SGO, *SGO*, pp. 63, 70 (second quotation); Frank R. Keefer, "The Functions of the Medical Department of the Army, Especially in the Field," p. 358; *Field Service Regulations*, 1905, pp. 184–87, and 1910, pp. 12, 183–92; War Department, Surgeon General's Office, *Manual for the Medical Department, 1900*, pp. 13–17, 23–26; ibid., *1906*, pp. 178–244; ibid., *1911*, pp. 169–310; Tobey, *Medical Department*, p. 32; Straub, *Medical Service*, p. 4; Papers of Med Dept Manual Board, 1906 (see also 1914), Entry 245, RG 112, NARA. Using maneuvers to train all elements of the Army under conditions resembling as closely as possible those encountered in war was one of Secretary of War Elihu Root's goals (see discussion in Charles D. McKenna, "The Forgotten Reform," *Army History*, Winter 1991/92, pp. 17–23).

65. When a number of field armies conduct operations in the same theater, they might be organized into an army. The field army was a group of divisions, the equivalent of the corps of the Spanish-American War.

66. Straub, *Medical Service*, pp. 68–69, 75, 77, 89, 156.

67. *Field Service Regulations*, 1910, p. 12; WD, SGO, *SGO*, p. 65.

68. *Field Service Regulations*, 1905, pp. 11–12; WD, SGO, *Manual, 1911*, pp. 184–206; Manus McCloskey, "The Importance of the Service of the Evacuation of the Sick and Wounded by the Medical Department in Time of War," p. 414; Paul F. Straub, "Medical Service in the Campaign," pp. 691–92, 695, 698–700, 702–03; idem, *Medical Service*, pp. 95, 129, 139, 149; Henry D. Thomason, "Sanitary Troops in the Organized Militia of the United States," pp. 518–19; Herbert A. Arnold, "Report on Maneuver Camps at San Antonio and Leon Springs, and on Juarez, Mexico," p. 21; William B. Banister, "The Medical Reserve Corps," pp. 27–29, 31–32, 36, 38–41; Elbert E. Persons, "Special Article," p. 403; Reeves, *Military Education*, p. 293.

69. Hewes, *From Root to McNamara*, p. 12 (first two quotations) and 12n; in Entry 245, RG 112, NARA: Memos for CofS, 16 Mar, 24 Apr (final quotation), and 8 May 1911, plus Memo by Sec, GS Corps, 27 Apr 1911, Memo for Sec, GS, 18 Jan 1911, and Ltr, AG to SG, 31 Mar 1911.

70. Mahlon Ashford, "The Mission of the Ambulance Company," p. 165; WD, *ARofSG*, 1911, pp. 175–76, 1912, p. 182, and 1913, pp. 168–69; WD, SGO, *SGO*, pp. 66–67. Field hospitals had also been informally organized on a division basis in the Civil War (see Gillett, *Medical Department, 1818–1865*, p. 289).

71. Joseph H. Ford, "Notes on Organization and Equipment for Evacuation of Wounded," p. 669;

Thomason, "Sanitary Troops," pp. 511, 518–19; Persons, "Special Article," p. 403; *Field Service Regulations*, 1910, p. 181; WD, SGO, *Manual, 1911*, pp. 176–233; Straub, *Medical Service*, pp. 6–7.

72. WD, *ARofSG*, 1903, p. 39, 1904, p. 25, and 1908, p. 128; John K. Mahon, *History of the Militia and the National Guard*, p. 143.

73. WD, *ARofSG*, 1910, pp. 80–83, and 1911, p. 91; Robert H. Pierson, "Conditions of Military Surgery," p. 71; "Better Instruction," p. 1737; George S. Crampton, "Camps of Instruction for Militia Medical Officers in 1909," p. 362; Henry H. Doan, "A Plea for More Camps of Instruction Under Government Supervision, for Officers of the Organized Militia," pp. 75, 77; Edward L. Munson, "The Conduction of Field Maneuvers of Military Sanitary Troops," p. 17; J. F. Edwards, "The Adaptation of the Medical Service of the National Guard to That of the Army," pp. 48–49.

74. WD, *ARofSG*, 1910, p. 125, 1912, pp. 185–86 (quotations), 187, and 1913, pp. 184–85; Charles D. Center, "Lessons Learned at a Maneuver Camp," p. 34; Thomason, "Sanitary Troops," pp. 515, 517; WD, SGO, *SGO*, pp. 66, 68–69.

75. WD, *ARofSG*, 1913, p. 185, and 1914, p. 172; Straub, "Training," pp. 363–69; Ashford, "Mission," pp. 163, 168; Edward L. Munson, "Military Absenteeism in War . . . ," pp. 489–90, 624, 626–28, and p. 25.

76. WD, *ARofSG*, 1913, p. 89, and 1914, pp. 170–71 (quotations).

77. War Department, Surgeon General's Office, *Regulations for the Government of United States Army General Hospitals, 1914* (Washington, D.C.: Government Printing Office, 1914); idem, *Manual, 1911*, pp. 173–75.

78. WD, *ARofSG*, 1898, p. 130, and 1899, pp. 61–62.

79. Girard received his permanent rank of lieutenant colonel on 8 October 1900.

80. WD, *ARofSG*, 1899, pp. 240–41, 1900, pp. 28–29, 33, 1901, pp. 79, 84 (quotation), 1902, p. 138, and 1912, p. 152; WD, SGO, *Manual, 1906*, p. 57; Peter E. Palmquist, comp., "Elizabeth Fleischmann-Aschheim, Pioneer X-ray Photographer," pp. 35–45.

81. WD, *ARofSG*, 1902, pp. 136–38, 1903, p. 125, 1904, p. 127, and 1912, p. 156; William C. Borden, "The Walter Reed General Hospital of the United States Army," pp. 20, 22–25.

82. WD, *ARofSG*, 1905, p. 146, 1908, p. 113, and 1909, p. 140; Borden, "Walter Reed," p. 32. See also Mary W. Standlee, "Borden's Dream," 1:75–78, in Manuscript and Correspondence on History of Walter Reed Army Medical Center ("Borden's Dream) Series, RG 112, NARA.

83. WD, *ARofSG*, 1911, p. 157, 1912, p. 165, 1913, pp. 148–49 (quotation), 152, 188, and 1914, pp. 142, 145.

84. Ibid., 1903, pp. 123 (quotation), 129, 132, 1909, pp. 141–42, 1912, p. 159, 1913, p. 143, and 1914, pp. 137, 140; WD, SGO, *Manual, 1906*, pp. 58–59.

85. SGO Cir 1, 6 Apr 1903, Entry 66, RG 112, NARA; Daniel M. Appel, "The General Hospital and Sanatorium for Treatment of Pulmonary Tuberculosis at Fort Bayard, New Mexico," p. 203; Paul M. Carrington, "Further Observations on the Treatment of Tuberculosis at Fort Stanton, New Mexico," p. 207; WD, *ARofSG*, 1902, pp. 68–69, 1903, pp. 19, 65, 124, 1904, pp. 122, 125–26, and 1908, p. 112; Sternberg, *Sternberg*, p. 139; "An Army Sanitarium for Tuberculosis," p. 248.

86. WD, *ARofSG*, 1899, p. 205, 1901, pp. 59–60, 1903, p. 126, 1908, pp. 124, 126–27, and 1909, pp. 78, 148–50; Fielding H. Garrison, *Notes on the History of Military Medicine*, p. 186; *Dodge Commission Report*, 1:188–89; WD, SGO, *SGO*, 1:70; Memo, Acting SG to President, 19 Oct 1904, folder Memoranda, 1904, 1911, Ms C14, NLM.

87. WD, *ARofSG*, 1900, p. 25, 1903, p. 39, and 1904, p. 29.

88. For the situation in the Philippines, see Chapter 8.

89. For information on the second occupation of Cuba, see Chapter 9.

90. WD, *ARofSG*, 1901, pp. 59–60, 1903, p. 39, 1904, pp. 28–29, 1907, pp. 130–31, and 1908, pp. 124–25; Woodruff and Woodbury, "Prevention of Disease," p. 12; Persons, "Special Article," p. 402; *Field Service Regulations*, 1905, pp. 21–24; WD, *Five Years*, p. 177; WD, SGO, *SGO*, pp. 61, 70.

91. WD, *ARofSG*, 1908, p. 125 (quotation); *Dodge Commission Report*, 1:189.

92. WD, *ARofSG*, 1908, pp. 122, 124, 126, 1911, p. 184, and 1912, p. 193; Abrahamson, *America Arms*, pp. 83, 92–110; WD, SGO, *SGO*, pp. 61–62, 220; Clark, "Some Observations," p. 361.

Chapter 13

THE MEDICAL SERVICE IN ACTION



Although nothing could adequately prepare the Medical Department for the struggle to come, the challenges medical officers faced in peacetime gave them experience that would prove valuable after the United States entered the war in the spring of 1917. Large-scale training maneuvers offered medical officers a greater understanding of their ability to handle military problems similar on a small scale to those they would face in France. A city temporarily paralyzed by a natural disaster provided insights that would help deal with the helpless, homeless, and terrified populations of Europe once the war was over. Finally, troops stationed within the United States and at posts scattered about the new empire continued to benefit from the ever-growing insights and revelations that characterized the new era in medicine.

Fighting Disease and Disability

Before the medical revolution, the Army's physicians had worked in the dark in their unending struggle to limit the inroads of disease and infection. Although they relied heavily on sanitation in their attempts to prevent epidemics, they had lacked a clear understanding of why it was effective. Since the discovery that vaccination prevented smallpox had been accidental, scientists had been unable to develop a similar approach to other diseases. Complex surgery had rarely been undertaken because fatal infection so often resulted. By the turn of the century the efforts of medical officers to maintain high standards of sanitation were increasingly effective because they now understood what they were fighting. Their ability to develop vaccines with which to immunize troops against the most prevalent diseases was growing. Because they knew how wound infection developed, they could attempt forms of surgery they had never dared before, invading even the abdomen, which until the medical revolution had been largely a forbidden territory.

The most obvious approach to preventing a recurrence of the epidemics of 1898 was improved sanitation. In December 1898 Sternberg named Colonel Greenleaf medical inspector for the Army, making sanitation in the field, at posts, and in hospitals one of the major responsibilities of the new office. In the camps established for volunteers in the summer of 1899, tents were placed a tent's width apart, and all tents were floored, with the flooring raised well above the ground. The contents of camp latrines were either flushed into a sewerage system or regularly removed. Water supplies were carefully monitored, and kitchens closely supervised. Bathhouses



FREDERICK F. RUSSELL

with hot and cold running water were available to encourage personal cleanliness.[1]

The triumph over typhoid fever, traditionally a great danger to any military force, represented one of the Medical Department's most significant victories. A major factor in this achievement was the recognition of the fact that the key to maintaining sanitation at a consistently high level was discipline. Discipline was not always easily maintained among new recruits, especially when line officers tended to treat medical officers' warnings about poor sanitation with contempt. Recognition of this situation led the members of Major Reed's Typhoid Board to conclude that immunization might be a more effective approach to preventing typhoid in the Army than sanitation alone. Because the department's attempts to develop an oral vaccine had failed, in 1908 Surgeon General O'Reilly appointed a new board to study the problems involved in immunizing an army against typhoid. The board was composed of both military and Medical Reserve Corps members, among them reservist Dr. Victor Vaughan, the lone survivor of the first Typhoid Board, and medical officer Capt. Frederick F. Russell, who was promoted to major shortly after he assumed his new responsibilities.[2]

Under Major Russell's guidance, U.S. soldiers were injected with a vaccine of a type developed by the British that had been prepared by the Army Medical Museum as part of an effort to develop standardized dosages. Experience gained through a voluntary immunization program started in 1909 proved that though the protection given was relative rather than absolute, the results justified wider use, especially since only 1.2 percent of those given the vaccine had severe reactions, while 92.1 percent had mild reactions or none at all. In 1911 immunization was made compulsory first for a division serving in Texas near the Mexican border, then for the entire Army, and in 1912 for all recruits. The process of immunizing the entire Army was completed early in 1913, when the last men in the Philippines received their third and final shots. As a result, the 1907 typhoid admission rate of 379 per 100,000 men dropped to 243 in 1910 and to 4.41 in 1913. But only time would answer the question of how long immunity lasted.[3]

The Medical Department set aside a room in the Army Medical Museum specifically for the manufacture of vaccine in large amounts. "Entirely new apparatus" was used in a way that would assure the purity of the vaccine, and no exchange of equipment with other laboratories was allowed. Another laboratory to make typhoid vaccine was established in Manila so that soldiers serving in the Far East could

be promptly immunized. The Army was soon supplying thousands of units of vaccine to the U.S. Navy, where immunization had been made mandatory, as well as to National Guard units and various departments of the federal government and state and city boards of health. Surgeon General Torney proudly noted that "among the sanitary achievements of the Medical Department in preventive medicine since the time of the Spanish-American War this sanitary measure for the prevention of typhoid fever should . . . rank second in importance only to the discovery of the method of transmission of yellow fever." [4]

The phenomenon of the typhoid fever carrier, however, was yet to be completely understood. Major Russell, the medical officer most closely associated with the development of the typhoid vaccine, noted in 1909 that he had encountered few carriers up to that point in the United States, a fact that he believed might be related to the relative youth of the American soldier and to a possibly greater prevalence of the carrier state among women than men. In the course of their effort to identify carriers, Army doctors concluded that the Widal test was not as reliable as the examination of blood, urine, and fecal samples. As a result, three consecutive negative reports based on laboratory examinations of fecal and urine samples collected at six-day intervals were required before an Army hospital could release a typhoid patient. When a carrier was identified, he was immediately isolated, and every effort was made to eliminate the typhoid bacillus from his body. In two chronic carrier cases reported by Surgeon General Torney in his 1913 annual report, when all else failed, gallbladder removal proved successful in ending the carrier state.[5]

Even while significant progress was being made in the battle against typhoid, venereal diseases—specifically syphilis, gonorrhea, and chancroid, a localized nonsyphilitic infection that produced genital ulcers—were causing increasing concern. The identification of the gonococcus in 1879 and of *Treponema pallidum*, which causes syphilis in man, in 1905 and the development of the Wassermann test for syphilis in 1906 made the diagnosis of venereal disease easier. Recognition of the extent to which both diseases were responsible for deteriorating health and damage to organs outside the genitourinary system led Surgeon General O'Reilly to comment in his 1907 annual report that they caused a loss in service "equal to the loss for the entire year of the service of about 11 full companies of infantry." Civilian physicians could avoid dealing with venereal disease because of their personal distaste for conditions associated with moral degradation or could conceal its presence to protect their patients from disgrace. By 1913 only five states required doctors to report cases of venereal disease. Medical officers had no such options. The need to prevent the spread of the disease was more important than either the physician's qualms or the patient's privacy.[6]

The ability to identify the causative organisms led to an awareness both of the prevalence of these diseases in the Army and of the embarrassing fact that they were more common in the U.S. Army than in any other major military force in the Western world. The number of cases diagnosed was increasing rapidly, from an annual average of fewer than 75 per 1,000 from 1889 to 1898 to 128 per 1,000 in 1900. By 1905 the figure stood near 180. Venereal disease was the primary cause of rejection of recruits in both 1911 and 1912, although by 1913 it was only the third. In the Philippines the rate of cases reported among U.S.

soldiers—275.64 per 1,000 in 1910—was much higher than the 62.05 per 1,000 characteristic of the Philippine Scouts, who generally lived with their families. The 1909 figure of 11.44 per 1,000 soldiers in the continental United States rendered actually noneffective by venereal disease was a record high and obviously posed a serious concern for an army being prepared for possible wartime service. As late as 1913 the gonorrhea rate remained higher than that of any other nation's army on record, while only the British Army, with its large numbers of men serving far from home, suffered more from syphilis.[7]

The realization of how prevalent these diseases were made discovering a successful treatment for them all the more urgent. At the turn of the century the only treatment for syphilis with hope of success—mercury—was a grim one that could result in loosened teeth, kidney damage, anemia, tremors, and various mental problems, side effects that physicians may have considered only fitting for the victims of a disease they associated with depravity. At least one Army surgeon treated syphilis with two injections a week of "gray oil made of metallic mercury, carefully rubbed up with lanolin," which added occasional local abscesses to the patient's miseries. Injections were given once a week for another twelve to fifteen weeks after all symptoms had disappeared. Injury could also follow the injection into the urethra of a solution of bichloride of mercury given in what was usually a vain attempt to cure gonorrhea.[8]

For a time high hopes were held for a newly discovered treatment for syphilis, Salvarsan, known in the United States as arsphenamine. The Medical Department was apparently aware of the new drug from its inception, since when Paul Ehrlich developed it in 1909, Army assistant surgeon Capt. Henry J. Nichols was working in the German bacteriologist's laboratory. Nichols began his own experiments in 1910 and for several years worked in the Army Medical School laboratory with Capt. Charles F. Craig, who was studying syphilis there. For their tests of the new approach, they used subjects in the Washington, D.C., area, including soldiers and patients in the Government Hospital for the Insane who were the victims of advanced syphilis. Time proved that Salvarsan produced significant side effects, some of which, as both civilian and military physicians soon realized, were related to the method of administration. Given by intramuscular injection, it caused swelling and pain that could last as long as four days and was severe enough to require the use of narcotics for relief. In some cases the tissue around the site of injection died. Even intravenous administration was accompanied by nausea, diarrhea, headache, a low fever, and a minor amount of vomiting.[9]

The greatest question about Salvarsan concerned its effectiveness. Although treatment with mercury was far from ideal and doctors were eager to find something better, they were not initially sure about the dosage and timing of the new drug and thus could not accurately estimate its worth. To evaluate their experiments, they decided that if a patient's Wassermann was still negative after a year without symptoms, they would consider him cured. Judged on this basis, cure with a single dose, as recommended by Ehrlich, rarely proved possible. Surgeon General Torney blamed failures on insufficiently vigorous treatment and in 1912 recommended using Salvarsan and mercury together. Captain Nichols preferred to treat primary syphilis with an intravenous injection of Salvarsan and a month of mercury "by in-

unction [rubbing in a mercury ointment] or injection," followed by a second injection of Salvarsan and possibly another month of mercury. Patients with secondary or tertiary, or advanced, syphilis received even more energetic treatment. Those with secondary syphilis suffered from fever, a rash, hair loss, headache, and pain in the joints that appeared six weeks after exposure and lasted roughly three months. The symptoms of those with tertiary syphilis often occurred after a period without symptoms and affected skin, bone, and internal organs. Nichols found that his approach produced a negative Wassermann in 72 percent of his cases within two months. Hope for a new drug, Neo-Salvarsan, a supply of which Ehrlich sent the Medical Department in 1912, was high for a time, since it was reported to have fewer unfortunate side effects than Salvarsan. After establishing a register of patients so that the results of treatment could be evaluated even when the men involved had been transferred, the department determined that Neo-Salvarsan was less effective than Salvarsan. Experience had suggested that those being treated with either drug could remain on duty without unfortunate consequences and thus that the loss to the Army through ineffectiveness could be held to a minimum. Torney was sufficiently impressed with the findings of the various studies to urge that prompt treatment of syphilis be made mandatory.[10]

Since the Medical Department relied heavily on the Wassermann reaction both to detect unsuspected cases of syphilis and to show the progress of treatment with the various drugs, extensive studies were conducted to ascertain the accuracy of this test. By the end of 1911 it had been used more than 6,000 times, but often no conclusions could be drawn from test results. In others they proved misleading; in one group of 1,661 men believed to have syphilis, for example, only 1,315 tested positive. Medical officers eventually concluded that negative test results could not be relied upon, since such factors as recent heavy alcohol intake could interfere with the Wasserman's accuracy. They learned that false positives were also possible in patients suffering from such diseases as malaria, scarlet fever, and leprosy, and on occasion even cancer or tuberculosis. Although experiments with different cultures and with varying methods of preparing antigens led to improvements in accuracy, misinterpretations by technicians who did not understand the test also caused difficulties. As a result, Captain Craig emphasized that the test should be done only in well-equipped laboratories and by a well-trained staff.[11]

With venereal disease rates alarmingly high and treatment likely to do more harm than good, the Medical Department urged that greater emphasis be placed upon prevention. Because rates in the newly occupied areas were particularly high, troops serving overseas should be warned that local "hovels are sources of infection," whose occupants might carry both venereal disease and tuberculosis. Punishment only led to concealment and very possibly the infection of others. After returning from Belgium, where he was a U.S. delegate to the Second International Conference for the Prevention of Venereal Disease, held in 1902, Lt. Col. Valery Havard suggested that consideration be given to strictly controlled prostitution. This approach was popular in Europe and, in modified form, had been tried in at least one area in the Philippines. Some posts where venereal disease rates were low credited their success in part to the cooperation of nearby

communities in controlling prostitution, often by using medical examinations to identify infected women. Although the concept of dealing with venereal disease by such unofficial licensing of prostitutes was distasteful to all, its proponents believed that this trade, "vicious and shameful" though it might be, should be subject to legal control, just as less distasteful businesses were. Recognizing that those who had no source of recreation on post would be "tempted to drink distilled liquors" in locations where they would be "exposed to the solicitations of the worst class of prostitutes," some post commanders and also some surgeons urged that post canteens again be allowed to sell beer.[12]

Although he supported the "reglementation" of prostitutes, Colonel Havard noted that "it is in the conscience of the young man that prophylaxis should begin." Many favored a campaign of education designed to encourage the recruit to report at once for treatment if a disease were contracted and to convince him that "not only are chastity and continence not prejudicial to health, but, on the contrary, [they are] most commendable from the medical point of view." Since "popular opposition to taking preventive measures" continued to complicate the Army's attempts to combat syphilis and gonorrhea and since in theory abstinence was the simplest and surest way to avoid venereal disease, Surgeon General Torney, too, supported education, urging his surgeons to teach the men about the dangers of unmarried sex and "the advantages of sexual continence."[13]

In no position to entertain illusions about the effectiveness of this approach, Surgeon General Torney pointed out that while it was "a grievous fault that a young man should fail to control his passions, it is a far worse thing for him and for the country if . . . he acquire an infectious disease which unfits him for the performance of his duty as a soldier." The War Department should, therefore, adopt "a philosophical indifference to criticism on the part of self-constituted censors of the public morals whose susceptibilities are offended by a public discussion of these questions" and seek more realistic approaches to the problem.[14]

The use of prophylaxis should be encouraged "for those who have not the moral stamina and self-control to observe continence." Post surgeons should experiment with the exact methods to be used. One possibility was setting up a room at either the barracks or the post hospital to which a man newly returned from a night of uncontained passion could retreat to take advantage of a supply of prophylactic medications. These often included calomel ointment for external use and an Argyrol, silver nitrate, or potassium permanganate solution for irrigating the urethra, stored with the syringes needed to inject the fluid. The Medical Department also made available individual packages of disinfectants, known as K packets, for men apprehensive about being seen entering a room known to have been set aside for those lacking moral stamina. These packets contained, as Edgar Erskine Hume put it, "a tube of mercurous ointment with added colloidal silver." The medications appeared to be effective if the men using them were neither befuddled by alcohol nor repelled by stains left on clothing. Precautions proved to be most effective when handled in a hospital under the supervision of a corpsman.[15]

The condom was apparently never given serious consideration, although its effectiveness against venereal disease was generally recognized. The reasons for the

failure to incorporate the condom in the campaign, a failure shared with the Canadian Army at the time, are not clear. Jay Cassel in *The Secret Plague: Venereal Disease in Canada, 1838–1939*, speculates that perhaps in the period of World War I the condom was regarded as less effective in preventing disease than ointment, or that, since it was a very effective means of birth control, encouraging its use might appear to be advocating illicit sexual activity as well. Apparently the condom did, however, play an important role in the anti-VD effort in the New Zealand Army.[16]

The ultimate success of any campaign against venereal disease depended upon line officers as well as physicians. The commanders of some geographical departments gave their subordinates specific orders to cooperate with post surgeons in their efforts, and Surgeon General Torney urged that both post surgeons and post commanders report on their work to reduce venereal disease rates and on the results they attained. The cooperation he received varied considerably from post to post. At least one officer refused to permit the distribution of K packets at his post, while others allowed them to be doled out to any soldier requesting them. In the Philippines post commanders sponsored lectures on the need for continence; encouraged inspections to detect signs of infection; and punished those who, despite the availability of preventive measures, contracted a venereal disease. Punishment added another difficulty to efforts to keep track of disease rates, however, since it might lead soldiers who had contracted syphilis or gonorrhea to conceal their condition.[17]

After an encouraging drop in 1910, venereal disease admission rates rose again in 1911. The rate for syphilis, at times higher in whites than in blacks, continued to climb, but the increase may have been only apparent because the Wassermann test now revealed cases, particularly secondary cases, that might otherwise not have been diagnosed. The average soldier, unmoved by the grim details of the effects of venereal diseases upon his health, all too often ignored the prophylactics made available to him. Thus the appeal of docking the enlisted man's pay for time lost from his duties because of venereal disease grew. The judge advocate general pointed out that only enlisted men could be dealt with in this manner, since the Army could not legally reduce the pay of officers because of sickness.[18]

The anti–venereal disease campaign also needed to be made more systematic and less dependent on the whim of the officers at the individual posts. In 1912, therefore, the War Department issued an order that made both venereal prophylaxis administered in the hospital and unannounced medical examinations for venereal disease mandatory; the soldier who contracted a sexually transmitted illness after failing to avail himself of the hospital-administered program would have his pay docked for time lost from duty, as would all others losing duty time because of a disease contracted through misconduct. No serious opposition to this campaign ever developed. Many inquiries came in about it from those concerned with public health, but to Surgeon General Torney's distress, a circular he issued detailing anti-VD measures was "furnished confidentially to medical officers" rather than being made freely available to all who were interested.[19]

Care must be used in evaluating the statistics of this period, since some include each time a soldier reported for treatment, regardless of when he contracted the disease, while others represent only new cases. Nevertheless, the use of a threat to

the soldier's wallet appeared to have a positive effect. Beginning in 1912, the rates of venereal disease began to drop more rapidly, from 163.49 first-time admissions per 1,000 in 1911 to 136.70 in 1912 and 97.22 in 1913. The total Army-wide noneffective rate from this cause fell to 10.14 per 1,000 in 1911 and to 4.51 by 1913. Even in the Philippines the VD rate was "markedly reduced." These figures reflected a decline in the individual rates of each of the three prevalent venereal diseases, but the surgeon general was not entirely happy; at some posts, rates remained high, leading him to suspect that the regulations were not uniformly enforced. Moreover, the possibility that men were, under the threat of punishment, failing to report to sick call cannot be ruled out. When men were allowed to delay reporting for prophylaxis more than six hours after sexual intercourse, they ran higher risks of contracting an infection. Prophylactic packets, which could be used immediately after exposure and were sold at a nominal price, were not popular. Torney concluded that either the packets must be given out without any charge or passes must be limited so as to require soldiers to return to base for treatment within the allotted time after exposure.[20]

Associated with the venereal disease rate was the old problem of the alcoholism rate, which was also greater in the U.S. Army than in the other forces whose statistics were available to the surgeon general. Alcoholism was a problem chiefly among white troops. After years of rising rates, the incidence finally began falling in 1908. In 1912 the rate dropped from the 28.26 per 1,000 of the previous year to 16.67, lower than it had been since 1873. This achievement, too, was credited in part to the stoppage of pay for those whose ineffectiveness was deemed to be the result of their willful behavior. The improvement dampened enthusiasm for restoring the institution of the canteen.[21]

Unlike alcohol addiction, drug addiction had received little attention from Army authorities. Beginning in the twentieth century, attitudes toward this problem began to change, and habitual use came to be regarded as a sign of moral weakness. Occasional instances of heroin addiction were uncovered, this drug being easily obtained, but cocaine was not widely recognized as a threat to either health or moral strength; former surgeon general William Hammond was reported to take "a wineglass of cocaine with each meal." Cocaine was named "the official remedy of the Hay Fever Association" and was also used to treat addiction to opium, morphine, and alcohol.[22]

Nevertheless, at least one Army surgeon recognized the dangers of cocaine. At Texas City, Texas, young Lt. William B. Meister was alarmed by the addicted soldiers he discovered in the spring of 1913. He concluded that because few cases were normally encountered, the surgeon general had never attempted to discover the extent of the problem in the Army. After positively identifying eleven cases in which the men had been found to be in actual possession of cocaine, Lieutenant Meister became convinced that this drug was a "new Ogre" that was "gathering adherents unto itself." He noted that the men involved usually first tried it because of curiosity reinforced by the persuasion of a friend or a prostitute who raked in a considerable profit from its sale. Users eventually found that cocaine, often taken by inhaling from a quill or a knife blade, was "more necessary than food itself." "Whosoever worships at the Shrine of

Coca," Meister noted, "remains faithful unto the End." He believed that the problem was "alarmingly on the increase in our army" and that the habit was impossible to break, but his warning to medical officers to be on the alert for it apparently made no impression.[23]

The U.S. Army tended to have a higher rate of mental illness as well as higher rates of venereal disease and alcoholism than other armies. In the continental United States in 1910, for example, 1.58 men in 1,000 were hospitalized because of mental illness, while in 1909 the comparable figure in the British Army was 0.8, in the Bavarian Army 1.4, in the Austro-Hungarian Army, 1.3, and in the Japanese Army 0.32 in 1,000. In the continental United States in 1912, 2.78 soldiers per 1,000 were diagnosed as suffering from mental problems, while in the Philippines, although the troops still had to contend with guerrillas, the rate was only 2.19 per 1,000. The surgeon general's annual report recorded 2.57 per 1,000 discharged from the Army in 1913 because of mental alienation, but statistics for mental illness are of little value, since much depends on how a given Army defines it and how ill a patient has to be before he is included in the records. The high rate of alcoholism among soldiers was believed to contribute to the situation. The surgeon general's annual report for 1910 shows that the rate of acute alcoholism in the U.S. Army in 1909 was 22.19 per 1,000, while the rate for the British Army was 0.9 per 1,000; in 1907 in the French Army the rate was 0.35, while in the Prussian Army it was 0.11. Other cases of mental illness were blamed on sunstroke and such diseases as malaria, typhoid fever, and dysentery. Since the diagnosis of mental alienation included homesickness, then called nostalgia, and hypochondriasis, as well as a "constitutional psychopathologic state" and retardation, comparisons to rates in other armies were not necessarily valid. The problem was of such magnitude that a building was set aside at the Presidio in San Francisco where those believed to be insane could be held for observation before being sent east to the Government Hospital for the Insane in Washington, D.C.[24]

With tuberculosis, as with venereal disease, the increased ability to diagnose that followed in the wake of the medical revolution exacerbated anxiety about the prevalence of the illness. Recognizing the organism that caused tuberculosis, the second greatest cause of noneffectiveness in the U.S. Army, led to the chilling discovery that the bacillus might live in dust for long periods of time if it was not exposed to sunlight. This fact further complicated control of the disease.[25]

The rate of tuberculosis, too, was higher among U.S. soldiers than among those of many European armies, in part, presumably, because so many Americans were stationed in the tropics. Even Filipino troops easily contracted the disease because of what Sternberg called "the enervating effects of the tropical climate." Tuberculosis was especially devastating to black troops in the Philippines and, because they were so often exposed, to hospital corpsmen. By 1903 more than 4 of every 1,000 soldiers in the United States had been discovered to have TB. With so many new cases originating in the tropics, rates did not fall appreciably in the first years of the new century in spite of the Medical Department's efforts.[26]

As late as 1912 tuberculosis was still a major health problem for the Army, causing 17.48 percent of all disability discharges among troops in the Philippines at a time when disease in general was responsible for more than 86 percent of dis-

charges there. Since the Medical Department found it impossible to screen out all recruits with tuberculosis, which was common in the civilian population, a third of the Army's cases were found in men who had not yet completed a year of service. X-ray pictures were not routinely used in the diagnosis of TB until 1917, and the tuberculin test did not distinguish between those who had been exposed to the disease and those who actually had it. Thus, rejecting all those who tested positive was not feasible because it would drastically reduce the number of recruits. Finally the Army adopted a policy common in Europe, dismissing from the military service rather than hospitalizing those who were diagnosed as having TB during their first enlistment, thereby lowering the Army's admission and death rates.[27]

To further reduce the incidence of tuberculosis in the Army, the Medical Department suggested that no one under the minimum weight for his height be taken into the Army, since 74 percent of those treated for TB in 1911 were underweight. Surgeon General Torney also continued to urge that proper attention be paid to ventilation and other sanitary measures, including removing TB victims from their barracks. Some urged that this step should be taken as soon as the disease was suspected, but those who favored delaying it until the diagnosis was definite eventually prevailed. Torney concluded that greater care in the selection of recruits and improved sanitation had contributed to the fall in the tuberculosis rate, which, by the end of 1913 was at an all-time low of 3.07 per 1,000 for soldiers stationed in the United States. Because of a minor increase in the incidence abroad, the overall rate was slightly higher than it had been in 1911 and 1912.[28]

Soldiers sent to the tuberculosis hospital at Fort Bayard, New Mexico, received treatment that was, as Surgeon General O'Reilly put it, "simply hygienic and climatic, with the treatment of intercurrent complications as they arise." Sleeping out of doors was recommended, and tents and porches were provided for the purpose. In the attempt to keep abreast of their physical condition, the sputum of all patients was regularly examined, after which each sufferer was classified as "arrested," "improved," or "unimproved." Longer hospital stays had been shown to result in a higher survival rate, but most patients at Fort Bayard were discharged from the Army after a two-month stay. Although they could then immediately be taken onto the rolls of the Soldiers' Home and remain at the tuberculosis hospital as veterans, they could not be forced to stay at the sanitarium once they were no longer in the Army. Those whose condition permitted their release were regarded as "missionaries in the education of the general public in the all-important knowledge of the hygienic mode of life and protective measures so practically learned."[29]

Enforcing regulations designed to enhance the chances for recovery of patients who remained at Fort Bayard was difficult, in part because many victims of the disease were alcoholics with considerable skill in sneaking in supplies of their favorite beverage. Among other patients who apparently bent or broke some regulations was contract surgeon Joseph Curry, formerly a member of the Tropical Disease Board in the Philippines, who obviously did not take the thorough rest insisted upon for other patients at the sanitarium. Curry continued to examine possibly infective material gathered from the hospital's effluent until a short time before his

death from tuberculosis in January 1903, presumably jeopardizing his chances for recovery; like so many other patients, he may have already been too ill when he arrived to be saved.[30]

Malaria was yet another disease whose rates were falling in the period immediately preceding World War I, in this case because of campaigns to kill mosquito larvae and to keep man and the adult insect separate. In the Philippines malaria rates were invariably higher among Filipino troops than among Americans, presumably because mosquitoes could not be entirely excluded from the houses where they slept with their families in malaria-infested villages. Surgeon General Torney insisted that all occupied buildings in those islands should be screened. Although the malaria rate for U.S. troops unexpectedly increased in 1912, a fact for which Torney could not find an entirely satisfactory explanation, by 1913 it was lower than it had been in any year previously recorded by the Surgeon General's Office.[31]

Strangely, in the United States the greatest difficulties in dealing with malaria were experienced not at a post in the Deep South but at Fort Washington, Maryland. Here dense undergrowth and a nearby marsh favored the breeding of mosquitoes, and the rate resembled that in the Philippines. When cases increased from 144.3 per 1,000 in 1908 to 333.33 per 1,000 by 1911, a board of doctors and representatives of the Quartermaster's Department called together to study the problem recommended draining wet areas, oiling standing water, and eliminating all growth more than an inch high. A Medical Reserve Corps officer was assigned to serve as sanitary inspector at the fort. When the herd of goats bought to deal with the brush proved unequal to the task, prison labor had to be used. The time-consuming work was not completed until the spring of 1913, by which time the malaria rate had fallen below 175 per 1,000. Continual vigilance remained necessary, for malaria was a common affliction among the civilians of the area, who served as a reservoir to infect new generations of mosquitoes.[32]

Encouraged by successive surgeon generals, medical officers also became bolder in their attack on health problems that could be relieved by surgery. Their success in exploring the new world that antisepsis had opened to them rendered previously dangerous surgery safe and effective. A study of operations to repair hernias, a common but disabling affliction, revealed only three recurrences of the condition out of 591 operations in the period 1898–1903. Because this operation was now regarded as safe, men with hernias could be required to undergo the procedure—only "in case of a capital operation involving the risk of life" could a soldier refuse surgery without risking court-martial. Experience also proved that appendectomies did not have to be followed by disaster. When the operation was performed promptly, most patients recovered without major difficulty. But Medical Department surgeons could not save one of their own; Major Reed died in 1902 when peritonitis followed long-delayed surgery to remove his appendix.[33]

Much surgery now involved the abdomen and would thirty years earlier have almost inevitably led to the patient's demise, but deaths were few. Although Army surgeons apparently had not yet begun to use rubber gloves in the operating room, in one series of 904 operations only twenty-four patients died, among them four after amputations following leg wounds, two as a result of gunshot wounds of the abdomen, and two following surgery



CARL R. DARNALL

to relieve empyema (the accumulation of pus, most often in the pleural cavity). Since anesthesia also made a vital contribution to successful surgery, physicians attempted to learn more about using it; studies of the use of spinal anesthesia aroused enthusiasm about its advantages for both the patient and the surgeon. Nothing medical officers encountered in peacetime could entirely prepare them for the wounded they would encounter in war, but, no longer restricted to dealing with injuries by fear of infection, Army surgeons could undertake surgery of a complexity rarely attempted before the Spanish-American War.[34]

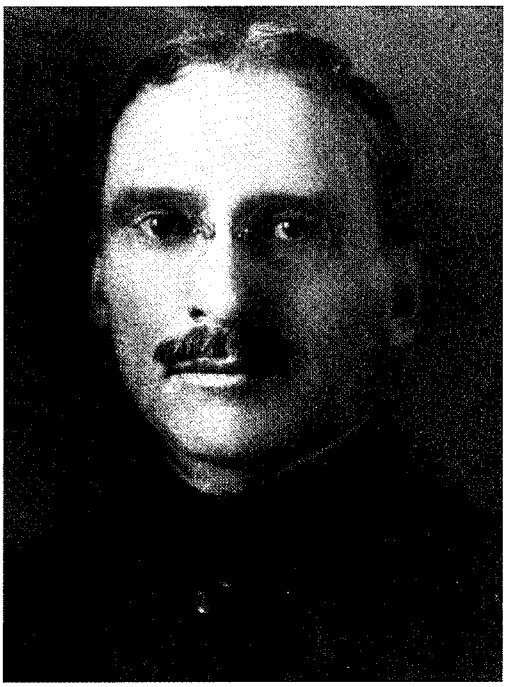
Sanitation and hygiene remained strong weapons in the arsenal of those fighting disease and disability. The need to find a simple and effective device to purify water without adding a disagreeable flavor encouraged Maj. Carl R. Darnall of the Medical Corps to apply his ingenuity to yet another problem that concerned the Medical Department. Seeking an uncomplicated, movable device that would process large quantities of water in a short time without giving it an unpleasant taste, he first experimented with a siphon filter and the use of an agent to precipitate solid particles. To kill bacteria, he eventually turned to chlorine in gaseous form rather than the hypochlorous salts and ozone generally used. Major Darnall's approach had never before been tried, but it required only simple and inexpensive equipment, and he could easily obtain chlorine gas since it was a by-product of the manufacture of sodium hydroxide (caustic soda). Chlorine used in this form proved more effective than filtration alone, although coarse filters might still be needed in some instances to remove particles. The addition of the gas to the water was also easier to regulate than that of the salts tried earlier. In 1910 Darnall's device was put into use with great success. Only three years later, another Army physician, Maj. William J. L. Lyster, developed a simple apparatus to be used to purify water quickly in the field, using calcium hypochlorite added to water stored in what became known as a Lyster bag.[35]

Water purification was of particular interest to the Army because efforts to keep sewage out of the water supply were not always successful. Badly designed systems to handle sewage could still leak polluted material into water supplies, and sewage could still be dumped directly into a post's water source by a nearby civilian community. Should local conditions lead to a temporary contamination of wells, an easily moved apparatus like that devised by Major Darnall would be especially valuable. In October 1909 the War Department appointed a board to study water and sewage disposal problems at Army posts. Captain

Russell and Colonel Kean joined a representative of the Quartermaster's Department to find that although "notable progress" had been made in the management of sewage, difficulties remained at a few posts, sometimes because a disposal system was defective or too small for the effluent it was required to handle. In at least one instance the system recommended by the board was highly elaborate, yet it, too, relied on guaranteeing the elimination of bacteria by using calcium hypochlorite.[36]

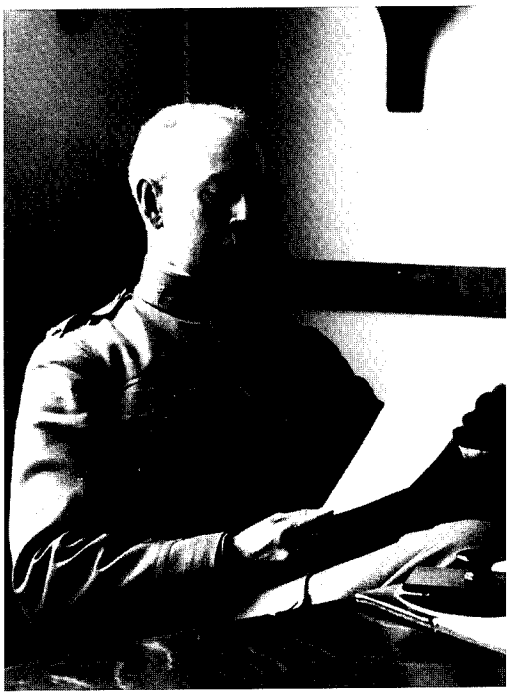
Eternal vigilance was also necessary to prevent overcrowding and poor ventilation in barracks and guardhouses. Surgeon General Torney recommended posting on the doors of dormitories and squad rooms the maximum number of people to be allowed in each and was shocked to learn that at some posts "overhead or double-deck bunks, a sanitary abomination which was believed to be obsolete in the United States Army, had reappeared." He also advocated using electric rather than gas lights in barracks with poor ventilation and resisting the temptation to use the more economical soft coal in preference to hard. "It certainly does not seem desirable to this office," he reported to Secretary of War Stimson, "that for the purpose of a little supposed economy that the beauty of a post should be destroyed, the buildings rendered unsightly, and the health of the inhabitants endangered by clouds of smoke." [37]

Disease was not the only problem that could undermine an army's effectiveness. The problem of ill-fitting shoes had concerned Major Munson for several years. After spending four years examining soldiers' feet by the thousands as one of the officers appointed to the Army Shoe Board to study the problem, he published a book in 1912 on the subject of Army shoes and



WILLIAM J. L. LYSTER

their fit that Surgeon General Torney recommended to "all officers and noncommissioned officers who are concerned in the fitting of shoes." While the board was at work, medical officers checking the fit of the shoes of the enlisted men at their posts discovered the discouraging fact that more than half of the Army's soldiers might be wearing shoes too small for them. One study of almost 600 men revealed that only 43 pairs of shoes were perfectly fitted, while 451 were too short, 33 too long, 111 too wide, and 266 too narrow, with some obviously misfits in both dimensions. Corns, bunions, ingrown toenails, and other ills were the inevitable result. At least some examinations of the fit of shoes involved the use of X-ray pictures, although Munson, who examined various approaches to fitting shoes, did not recommend this step as a general procedure.[38]



EDWARD L. MUNSON

As a result of his study of shoes and soldiers' feet, Major Munson designed a special last, wider and thicker in proportion to its length than the model usually used. Unfortunately, although the new last was adopted, soldiers received the new shoes only after the supply of the old model had been completely exhausted. Surgeon General Torney urged that an officer supervise all fittings, since a shoe that did not fit would cause problems regardless of its design. The Army Shoe Board also made recommendations about the fitting of shoes and pointed out that adequate supplies of the various sizes must always be available. As a result of Torney's concern about the fact that enlisted men were issued only one pair upon joining the Army, leaving them nothing to change into when their shoes became wet, orders were issued that in the future each soldier be issued two pairs. The shoe that was developed as a result of the work of Munson and the board was regarded as the best ever used in the Army.[39]

Although medical officers were experiencing success along many fronts, the Army's improved effectiveness resulted largely from their victories over the principal diseases that had afflicted military forces for centuries. Their achievements in the battle against tropical diseases and typhoid led to a drop in overall disease rates from their 1899 peak, with death and noneffective rates at last falling below those of the pre-1898 period shortly after Torney became surgeon general. The number unable to perform their duties at any one time fell from 41.48 per 1,000 in 1909 to less than 25 per 1,000 in 1913, a year when roughly a fifth of hospital admissions resulted from injury, which caused only one-tenth of the total number of deaths. Only 20.02 per 1,000 were unable to perform their duties in 1913 specifically because of illness rather than injury, as opposed to 42.83 in 1904 and 35.62 per 1,000 in 1909. Tuberculosis continued to be the greatest killer, followed in an order that varied from year to year by heart disease, nephritis, alcoholism, and pneumonia. The disease rates for troops in the Philippines continued to be higher than for those in the continental United States; overall disease rates in the Philippines in 1910, for example, were 544.68 per 1,000, while in the United States the comparable figure was 347.79 per 1,000. Torney noted in his last annual report that overall admission rates in the U.S. Army were now lower than those in the French and British armies and, indeed, than those in all major armies in Western Europe and Asia except those of Prussia, Bavaria, and Russia. Moreover, the death rate among U.S. soldiers, which at one point had been twice that of civilians, was now much less, thanks in part to the Army's attention to sanitation as well as to careful selection of men allowed to enter the Army.[40]

Hospitals and Laboratories

As small posts were slowly consolidated into large ones after the end of the Indian wars, the Medical Department, always hard-pressed for funds, began to discover that the new and large post hospitals it had to build were both more cost effective and more efficient than small ones. Since every post facility now had to have a room set aside specifically for surgery, a reduction in the number of hospitals minimized the expense imposed by this new requirement. Another new concept, one first put to use in 1906 at Fort Myer, Virginia, the isolation pavilion with its own steam sterilizing plant, diet kitchens, and bathrooms, promised to wreak further havoc upon the department's hospital construction budget. Its drive to replace many of the deteriorating small post hospitals with larger buildings was handicapped by a lack of funds. Although willing to vote the funds necessary to increase the personnel of the Medical Department, Congress had never repealed a law dating from the 1850s that limited the money to be spent on such construction to $20,000 unless special legislation were passed waiving the requirement. Costs had more than doubled in the fifty years since the law was passed, and post surgeons were still occasionally forced to rely upon antiquated and dilapidated hospitals and even to take over old barracks. In the Philippines, where post facilities were often particularly makeshift, were made of local materials, and were subject to rapid decay, patients with more than passing illnesses or minor wounds had to be transferred promptly from inferior accommodations to newer and better facilities, which became known as "base hospitals."[41]

Before the medical revolution arrived in the United States, the laboratory at the Army Medical Museum was adequate to handle the Medical Department's laboratory work. Since U.S. physicians tended to be concerned considerably more with the practical than the theoretical, when the value of the laboratory for diagnosis became apparent, the demand for its services grew rapidly. But if diseases were to be diagnosed promptly enough to allow effective measures to prevent epidemics to be taken, specimens could not be sent great distances, especially since any microbes involved might not survive a long journey. Surgeon General Sternberg was not slow in dealing with this problem; by 1902 he could boast that the department had established "a thoroughly equipped laboratory" at the Army Medical School, in each of the general hospitals in the United States and the Philippines, and "at every military post of any importance" in the United States. With the opening of the Southern Department laboratory at the post hospital at Fort Sam Houston in 1912, each military department had its own laboratory. The facility at the Medical School, where much Medical Department research took place, became the main laboratory for the Eastern Department. The general hospital in San Francisco, which served as the post facility for the Presidio and other posts in the San Francisco area, housed the major laboratory for the Western Department. The Central Department laboratory was at the Fort Leavenworth post hospital. The division hospital in Hawaii housed another major laboratory, while the main laboratory for the Philippines shared the facilities of the Tropical Disease Board. A medical officer was specifically assigned to direct each of these large laboratories.[42]

Evacuation

Providing beds and care for men who became sick while en route by train or ship to a new assignment and removing to a hospital those who fell ill or were injured in the field were both continuing concerns for the Medical Department. Evacuation by sea or rail, significant while so many U.S. troops were still stationed overseas, required chiefly the further refinement of an approach initiated during the Civil War. To stay abreast of the most recent developments in evacuation by ambulance, the department had to enter a new era, that of the motor vehicle.

Since isolating troops for an adequate period before they embarked on long journeys to guarantee that none of them would come down with a contagious disease proved impossible, the Medical Department ordered that each troop train have a sleeping car where the sick could be sequestered. A hospital car was to be used when troops were en route for longer than two days. Physicians were to inspect all passengers twice each day to determine whether any were coming down with measles or a similar disease. A contract surgeon chosen by the department was responsible for each ship's sanitation, and if no medical officer accompanied the troops, he was responsible for the health of the men on board as well. Facilities where the sick could be isolated were required on every transport, and at least two hospital corpsmen were assigned to each vessel to care for them.[43]

Although evacuation by ship involved no radical innovations, evacuation on land was being affected by a revolution that would soon end the era of the horse- or mule-drawn ambulance. One of Surgeon General O'Reilly's more unusual quandaries involved the question of what a newfangled machine, the motor ambulance, had to offer. The Medical Department provided its own ambulances, although the Quartermaster's Department remained responsible for "the accessory motor vehicles which experience shows are necessary." When the Medical Department's first motor ambulance, a steam-powered model, proved its superiority to the horse-drawn version at the Washington Barracks, a second was acquired for West Point. A certain distrust for this unfamiliar machine led a board of officers from both departments to go on with plans to adopt a new design for horse-drawn ambulances. To find the best vehicles for moving the wounded, the department even resorted to considering several types of travois.[44]

Obtaining the vehicles needed to move patients and medical supplies was a longstanding problem, especially since the Medical Department was dependent on the Quartermaster's Department for animal-powered ambulances, mule teams, and harness. Although reactions to the new type of vehicle were mixed, with the cooperation of the Quartermaster's Department, the Medical Department continued experimenting with the motor ambulance after Torney became surgeon general. Initial purchases involved several different types of "motor trucks and machines adaptable to ambulance construction" to determine which model best suited the need. At least some purchases apparently involved the frame, engine, and wheels only, with the Army supplying the body. When heavy commercial truck chassis proved to be too heavy, twelve of medium weight were ordered from the Keeton Motor Company, which agreed to supply a six-cylinder vehicle with special wheels and tires for just under $3,000. The Medical Department

sent ambulance bodies to Keeton for that firm to mount on the chassis, but confusion developed concerning the type of body to be sent. When Torney died, the problems between Keeton and the Medical Department were still increasing, but the advantages offered by the motor ambulance, including a diminished need to rely on railroads, had been recognized.[45]

Practice for War

The Medical Department's plans both for disease prevention and for the care and evacuation of the sick and injured were repeatedly tested at camps established for National Guard summer training and during joint maneuvers staged by the Guard and regular units. The combination of large numbers of inexperienced soldiers with inexperienced doctors, all camped at sites without sewers or safe water supplies, produced problems similar to those that had proved so devastating during the Spanish-American War. The situation was further exacerbated by the fact that some National Guard line officers had concluded that sanitation required no greater attention in camp than in the field, where the men would not remain long in one location. Although typhoid did appear at some maneuver camps, constant vigilance kept the disease under control. Septic systems, where bacteria destroyed sewage, were tried at more permanent campsites, and the department began experimenting with the use both of Major Darnall's water filter and of an especially designed incinerator to dispose of excreta where permanent arrangements were lacking.[46]

Summer training and maneuvers where militia and regular troops trained together afforded an opportunity to indoctrinate corpsmen in field duties, especially those involved in maintaining high levels of sanitation. The need to organize and train each ambulance company and to have it capable of rapid wartime expansion was obvious, especially since the militia corpsmen were often "poorly developed boys, without experience or training." In 1906, in response to Surgeon General O'Reilly's urging, sanitary squads consisting of both hospital corpsmen and hired civilian employees were appointed at maneuver camps and were set to work purifying water, killing mosquitoes, and disposing of waste material. O'Reilly considered the use of "the medical department for more extended executive sanitary functions" a significant development.[47]

The reservations of many military officers about the Army's readiness for war were not dispelled by the experiences of the maneuver camps. Such doubts were to a large degree justified in 1911, when political turmoil in Mexico led to an attempt to gather U.S. troops at the border in what proved to be another giant training exercise. Three months were required to bring 13,000 officers and men together in a maneuver division near San Antonio, Texas, and in two separate brigades, one at Galveston, Texas, and the other at San Diego, California. Although these units proved woefully unprepared for combat, the performance of Medical Department personnel, including the men of the Guard, formed a bright spot in the gloomy picture. The department organized the first complete sanitary train, consisting of four field hospitals and four ambulance companies, since the days of the Civil War. When the maneuver division was broken up in July, the department was the undisputed victor over disease. The division's chief surgeon maintained that the health of the men had been "uniformly good," with a noneffective

rate that remained below 2.5 percent, and as the Medical Department's representative in the Army's Division of Militia Affairs, Captain Thomason noted a "very marked advancement in sanitary service . . . in the recent maneuver division in Texas." [48]

The low disease rate at the camps near the border with Mexico was largely the result of immunization against typhoid, coupled with strict attention to sanitation. The close working relationship that developed between Medical Department and Quartermaster's Department (after 1912, the Quartermaster Corps) personnel also "proved to be of mutual advantage and to the best interests of the service." Presumably not only the lessons of the Spanish-American War but the guidelines laid down in the *Field Service Regulations* encouraged and facilitated cooperation. Because adequate quantities of equipment and supplies were promptly delivered to Medical Department representatives, both the division's chief surgeon and sanitary inspector had the means as well as the authority necessary to devise and execute a sound plan for sanitation. Sanitary experts studied each camp to determine the most suitable methods for managing human and kitchen wastes. All recruits were segregated and inoculated. If after two weeks no signs of disease had appeared, they were sent to join their units.[49]

At San Antonio, when efforts to form sanitary squads of medical officers and corpsmen at the regimental level encountered difficulty because only a little more than three-quarters of the required number of hospital corpsmen reported for duty, those available instructed enlisted men in such matters as the operation of incinerators. A medical officer, two noncommissioned Hospital Corps officers, five Hospital Corps privates, and four to ten civilian laborers were appointed to a "general sanitary squad" that kept drains clear, spread oil over standing water, and performed similar tasks, among them removing and burning horse manure so that disease-spreading flies could not live and breed in it. Because of the efforts of medical personnel and the use of vaccination, even though "all rules governing continued or repeated use of camp sites [were] violated," typhoid never appeared in the brigade at Galveston. At San Diego only two cases developed, with two more being diagnosed at San Antonio.[50]

Militia physicians spent two weeks with units along the Mexican border in 1911, with one week usually devoted to camp sanitation and management of a regimental infirmary and the second to the administration of an ambulance company and field hospital. These tours helped demonstrate that "to be a good sanitarian," the medical officer "must develop his executive ability." Experienced physicians closely supervised the inexperienced, most of whom were soon performing satisfactorily, but some militia medical officers who, familiar with the old ways, could not easily accept the new encountered considerable difficulty. Nevertheless, some former contract and volunteer surgeons were inspired to attempt to rejoin the Medical Department, leading Surgeon General Torney to decide that those under forty-five years of age with good records could be taken into the Medical Reserve Corps.[51]

Reviewing the maneuvers, Surgeon General Torney concluded that the Medical Department had done well in its first division-level test. In his annual report for 1913 he pointed out that "for the first time a division appeared with a complete modern sanitary organization and with its full quota of field hospitals and ambulance companies in addition to the regimental medical service." The contrast to the situ-

ation in the camps of 1898 was obvious, not only because of the vastly improved health record but because of the relative lack of administrative confusion.[52]

When the turmoil in Mexico became threatening once more in 1913 and a division was again dispatched to the border, the Medical Department welcomed the opportunity to further refine its approach to managing the health of a division in the field. A sanitary inspector was assigned to each camp, and each regiment had its own sanitary squad under the direction of the regimental surgeon. Outside the area for which the individual regiments were responsible, a civilian sanitary squad worked directly under the authority of the division's sanitary inspector. In Texas City, when the diseases of the civilian population seemed to threaten the health of the soldiers camped nearby, a sergeant first class of the Hospital Corps was sent to inspect each restaurant. Any establishment that did not heed his recommendations was declared off limits. Since soldiers brought substantial income to local businesses, compliance was usually not difficult to obtain. All men were required to sleep under mosquito netting because of the danger of malaria. Even though some camps were poorly sited, no typhoid cases appeared and health again remained good, fewer than 2 percent being sick at any one time. An Army surgeon who served at Texas City and Galveston believed that this success in 1913 served to enhance the respect of line officers for medical officers and thus to increase their cooperation.[53]

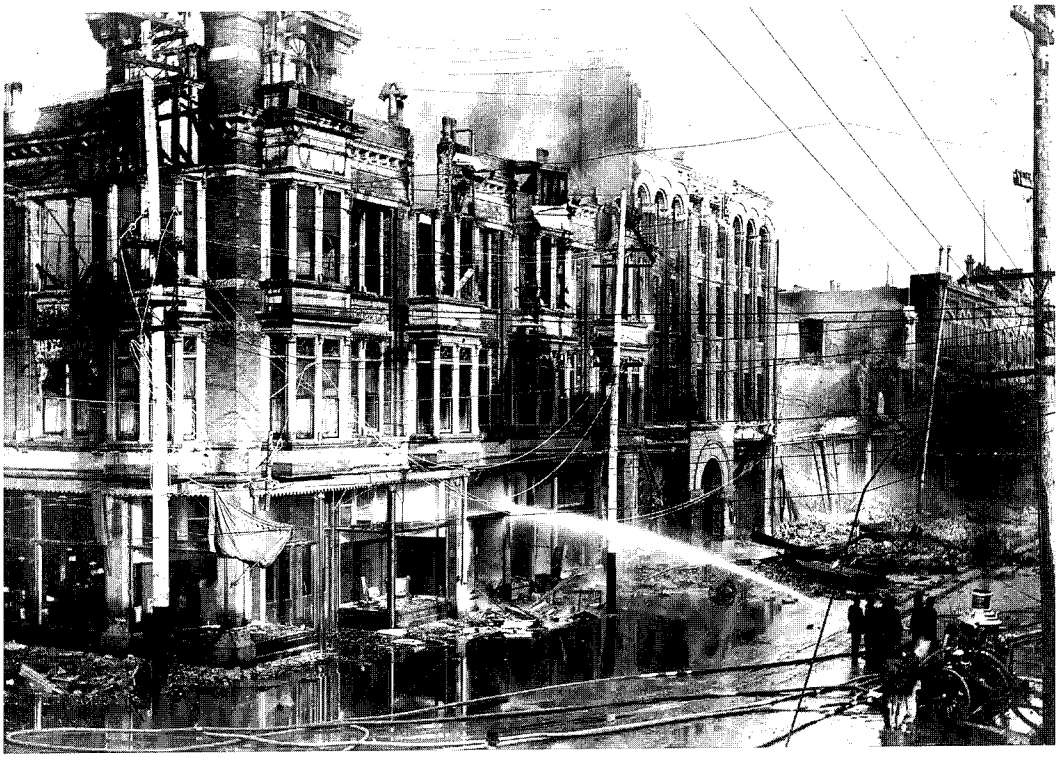
Disaster Relief

As more effective organization and training programs were developed to deal with the Army's increasingly complex needs, the Medical Department could offer those outside the Army more effective aid when called upon to do so. Although the department helped the civilian population on many occasions, perhaps never in the early twentieth century was its aid more evident than in the aftermath of the earthquake of 18 April 1906 at San Francisco, when two shocks, ten seconds apart, collapsed buildings, sent chimneys crashing upon their occupants, and filled streets with rubble. Within minutes, fires began to break out all over the downtown sections of the city. For a brief time, while flames fed by gas from ruptured lines slowly but inexorably consumed block after block, broken water mains crippled firefighting efforts, and cracked sewer lines spewed their contents into the streets, the Army, "the only undisturbed and thoroughly equipped organization in California," ran the stricken city of San Francisco. More than 220,000 people were rendered homeless, but how many hundreds died because of earthquake, fire, disease, and shock may never be known.[54]

Brig. Gen. Frederick Funston, acting commander of the Pacific Division, estimated at the time that the death toll was 1,000. Maj. Gen. Adolphus W. Greely, commander of the Pacific Division, later reported that in the city of 500,000 only 498 lost their lives. Contemporary reports suggested that in the outlying communities fewer than 200 were dead and less than 500 of the 5,000 injured were seriously hurt. Authorities, who were determined not to discourage investment in the rebuilding of the city, dismissed out of hand claims that the loss of life resulting from the earthquake was actually much greater. Thus the low figures were accepted for more than fifty years, until brought into question by



SAN FRANCISCO, APRIL 1906, *following the earthquake*



the work of the San Francisco Earthquake Research Project, operating from the San Francisco Public Library's archives. This research suggested that more than 2,500 may have eventually died as a direct or indirect result of the disaster.[55]

Among the first to offer aid to the stricken populace was Capt. Henry H. Rutherford, an Army medical officer at the general hospital at the Presidio. He was watching the smoke that began to rise from the city when the second shock struck, "a great many seconds long, like the first one." His patients and their attendants did not panic, even though "the shadow of an unearthly stillness seemed to have fallen amongst us. We all spoke softly, in whispers some of us." When the tremors ceased, the hospital power plant and telephone and telegraph lines were no longer operative, the hospital water pipes were dry, and brick and plaster were everywhere. All buildings were to some extent damaged. In spite of the situation at the Presidio, Captain Rutherford and eleven other members of the hospital staff, without waiting for official orders and "all laden down with medical supplies," hiked three miles to San Francisco's Convention Hall in forty-five minutes. A civilian doctor turned down their offer of help as not needed, "an interesting and amusing commentary on the characteristic of self-sufficiency and independence of the native Californian of the time." He soon had a change of heart, however, and began personally helping to load patients for transport to the Presidio hospital. By day's end, with the fire threatening city hospitals, 127 injured civilians had taken refuge at the Army facility, where 145 patients from San Francisco's seven hospitals would join them the next day.[56]

Only 40 of the 2,000 men stationed at the Presidio itself were injured, but by evening, as the flames began to consume the city, Captain Rutherford could see "multitudes seeking refuge, as the livid menace in the skies grew ever more appalling." Hospital Corps and engineer barracks at the hospital and at Fort Mason nearby were emptied so that refugees could be taken in. Mattresses were laid out on the general hospital porch, and tents began to go up on the grounds. From 18 April to 23 May, 756 new patients were cared for at the general hospital, of whom no more than 56 died. Since the general hospital, which held 700 patients when the earthquake struck, was in danger of being overwhelmed, Rutherford was ordered to set up an emergency receiving facility through which all incoming patients could be cleared before being assigned either to a hospital or to outpatient care. From 150 to 200 outpatients a day were treated at this station, while three dispensaries established on the Presidio grounds handled 300–400 dressings a day. A total of more than 4,000 refugees, half sick, half injured, were eventually treated as outpatients. At nearby Fort Mason three of the 365 admitted to the temporary hospital died. The hospital at another nearby post also took in civilian patients. Doctors and nurses among the refugees fleeing the city joined Army personnel to provide first aid and to distribute patients in need of further care among available facilities.[57]

On the evening of the nineteenth, when the peak of the demand placed on the general hospital was reached, "the fire could be seen gathering his mighty forces," Captain Rutherford remembered, "consolidating them into one awful tremendous roar, driving the homeless in before him. . . . They were everywhere and still they came; old and young, sober ones and the hilarious, hysterical men, women, and children;



TORNEY AS A YOUNG OFFICER

horses and mules and dogs and cats." Under the strain, those of less than robust health broke down; "apoplectics had their strokes, worn old hearts gave out, neurotics went to pieces and drunkards had D.T.s. Most embarrassing of all were the numerous cases of childbirth. Women were having babies all over the woods. . . . The illumination from the skies, brighter by the moment, was a godsend. It helped mightily in our ministerings." [58]

The initial reactions of the medical officers in the San Francisco area to the disaster were instinctive and improvised. Torney, at the time a lieutenant colonel and the chief surgeon at the general hospital, together with the post surgeon at nearby Fort Mason and presumably others as well, unhesitatingly made financial commitments without the authority to do so, correctly assuming that the formalities would be taken care of later. Now at the request of city officials, General Funston, in the absence of General Greely, who was on leave, moved to restore system and order in the wake of the disaster. One of the first steps he took was to relieve Colonel Torney, who was also acting chief surgeon of the Department of California at the time of the earthquake, of his command of the general hospital so that he could take "charge of the sanitary arrangements for the city of San Francisco," coordinating all medical efforts, both civilian and military, in the area and advising the city's health commission about sanitation. In this capacity, Torney became head of a committee of civilians responsible for ensuring the cooperation of Army and civil authorities in sanitary matters.[59]

When General Greely returned from leave on 22 April, water had been restored to the general hospital and repairs to the electrical system were almost complete. Although he continued the effort to design a plan to maximize the effectiveness of the Army's contribution to the relief of the city, Greely was concerned that the Army's activities might undermine the city's ability to take care of itself. On 7 May, therefore, when he announced that he was making each of the six military districts into which General Funston had divided the city a sanitary district, he had civil authorities assign each a civilian rather than a military doctor to be responsible for "all sanitary matters other than hospitals in the military district in which he is stationed." While these civilians would still report to Colonel Torney, Greely retained direct Army responsibility for sanitation and health only at the camps under military control.[60]

In the confusion that followed the earthquake, a week passed before shelter was found for all in need. Sanitation in these hastily erected camps, except those under military control, was often poor. General

Greely soon concluded that the homeless would be better off in the twenty-one camps that were eventually established by the Army. Although the first of these communities were set up on an emergency basis, the remainder were created only after Colonel Torney had worked with civilian authorities to choose healthy sites. The operation of all Army camps, which at one point held 20,000 refugees, was supervised by a chief camp surgeon, who inspected both military and nonmilitary camps. Reporting to him in each camp was a medical officer named to work with the camp's commanding officer to maintain the sanitation of the community and the health of the refugees. Hospital corpsmen were also assigned to each camp, as was a civilian physician. Sick call was held every day, and all those more than slightly ill were hospitalized. Patients with contagious diseases were isolated in hospitals established for the purpose.[61]



ROBERT U. PATTERSON

The initial Medical Department response to the disaster had involved only the department personnel who were in the area at the time, but the needs of hundreds of thousands of people sheltered in hundreds of camps required a much larger medical team than could be found in northern California. The first shock was scarcely over, therefore, before Medical Department resources, both human and materiel, together with much from civilian agencies, began coming in from far as well as near. A special train, bearing a medical officer, three noncommissioned officers, and a hundred men of a Hospital Corps company, was soon speeding west from Washington, D.C., picking up Red Cross nurses and doctors and extra carloads of supplies as it went. The attempts of the Red Cross team to provide aid aroused resentment; a member of the Oregon National Guard stated that too many Red Cross officials were "riding about in automobiles making much noise and fuss, promising all sorts of relief for everybody and so far as my observation went failing to execute these promises." Efforts of the Hospital Corps unit were apparently more successful. It spent almost two months in the San Francisco area, on 25 April setting up a field hospital in the Golden Gate Park, "a model institution" with one ward specifically for maternity cases, where future surgeon general Lt. Robert U. Patterson assisted the chief sanitary officer. A second ward and a 200-bed hospital that had been established four days earlier served patients with contagious diseases.[62]

Before the end of the month two Hospital Corps detachments came in from St. Louis, one of which brought another field hospital. Fifteen surgeons from western posts, six recently returned from the Philippines, and two on leave in the area were also assigned to work in San Fran-

cisco. By 22 April forty-two doctors were serving the Presidio sanitary division alone, and on the twenty-fourth Colonel Torney notified Surgeon General O'Reilly that no more medical officers were needed. The Medical Department supplied the twenty-six dispensaries opened at Torney's suggestion by the city's health commission, although twenty-five of them were closed shortly thereafter when the city's health remained good and local pharmacists and physicians began to complain about the harm done their sources of livelihood by government competition. Units of the Oregon National Guard also joined those helping the refugees, opening an emergency hospital in a school.[63]

Supply was not a serious problem, though the fire that followed the earthquake had destroyed the San Francisco medical depot. A new depot was quickly set up, first in the basement of the general hospital and later, because of the danger of fire and the crowded conditions there, in tents near the hospital. All items except those needed by the general hospital were pooled at this site, to be drawn upon as needed. Medical officers filled the new depot with supplies brought in from neighboring cities or shipped in from St. Louis. On 28 April it was closed in favor of a larger depot. Even a fire that destroyed the general hospital's laundry was taken in stride.[64]

The authority of the Army to provide assistance at San Francisco had never been clear, and its resources in supplies and manpower were limited, but the Medical Department played a vital role in the prevention of epidemics among refugees as well as in the care of the sick and injured. Three times in April 1906 Congress voted money to aid earthquake victims, and on the twenty-fourth and the twenty-eighth Secretary of War Taft allotted the Medical Department a total of $400,000 to meet its share of the expenses. In June Congress appropriated another $100,000 to replace medical and hospital supplies destroyed at San Francisco. The sanitary inspectors assigned to refugee camps worked to ensure that water supplies were safe, latrines properly located and maintained, and food properly prepared and protected from flies. By the end of April the Army was also issuing smallpox vaccine at the rate of 3,500 doses a day. Although no compulsion was used, all who were willing were immunized. In the two months following the quake, military and civilian authorities and hospitals also cooperated to create a comprehensive daily report on typhoid cases so that their origin could be traced. When several cases appeared in the same area, the Pacific Division's sanitary inspector checked into conditions and, working through the mayor's office, had those camping in the area removed. In spite of the strain under which the dispossessed inhabitants of San Francisco lived, a brief increase in typhoid and smallpox cases in the six weeks immediately after the earthquake did not lead to epidemics. Moreover, of the 123 cases of smallpox with 11 deaths that were reported in the two months after the earthquake, only 1 was found in a camp under military control. Only 5 of the 95 cases of typhoid fever diagnosed among refugees after 18 April originated in a military camp. The average number of typhoid fever cases in San Francisco before the earthquake had been 12 a month, but 30 were diagnosed in April and 55 in May, with the rate falling back to 10 in June.[65]

In mid-May 50,000 people were still sheltered in a hundred or more camps when General Greely announced that he was turning over to city officials complete responsibility for sanitation in San Fran-

cisco. The Army began returning the civilian patients remaining in military facilities to civilian hospitals. As part of the Army's gradual withdrawal from the relief effort, on 13 May Colonel Torney's almost unlimited authority ended. From this time until he was relieved on 23 May, his responsibility for civilians was confined to that of the chief surgeon to the newly appointed commander of permanent camps. Torney's successor, the new chief surgeon of the Department of California, also served as chief sanitary officer of the Army-controlled camps. As medical officers returned to their normal stations, the number serving in the city dwindled. By July only those camps located on the Presidio grounds remained under the Army's control, and by the end of that month the Army's role in the relief of San Francisco in the aftermath of the earthquake had been played out.[66]

Dealing successfully with the often terrified victims of fire, flood, storm, and earthquake at the turn of the century emphasized the importance of capabilities civilian agencies did not have. Among the advantages the Army had were a tightly controlled organization and a dedicated force of men and women too well disciplined and too well trained to panic, who were prepared to obey orders promptly and without argument, and who were familiar with maintaining standards of sanitation in primitive circumstances. Furthermore, to meet the sudden and overwhelming needs arising from unpredictable natural disasters, large amounts of medicines, vaccine, and hospital supplies unlikely to be immediately available from civilian sources and the transportation to move them and additional manpower swiftly to the disaster site were necessary. Equipped with reserves from the Army's warehouses, the Army Medical Department's professionally trained men and women could be moved promptly to the site of the disaster, where, regardless of the conditions surrounding them, they were capable of functioning effectively both to care for the sick and injured and to prevent further disaster in the form of an epidemic.

In the field, Medical Department personnel handled the challenges that they encountered in the period of peace between the Spanish-American War and the outbreak of World War I in Europe efficiently and effectively. One of the Army's most dangerous foes, typhoid fever, had been defeated. Disease rates were low. Surgeons were experiencing ever greater success in surgical operations that had been never before successfully undertaken. The population of a disaster-stricken city owed its health to the Army and, in particular, to Army medical personnel. But the scale of the challenges was small. Success in preventing a recurrence of the disaster of the Spanish-American War camps, even under circumstances resembling those that spawned 1898's epidemics, may well have encouraged medical officers to believe that they were far more ready for any future war than they were. As 1913 drew to a close, department leaders still had only their Spanish-American War experience to guide them.

NOTES

1. War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1900, pp. 83–86 (hereafter cited as WD, *ARofSG*, date); idem, *[Annual] Report of the Secretary of War*, 1899, 1(pt.2):556, 560 (hereafter cited as WD, *ARofSW*, date).

2. "Antityphoid Vaccination in the Army," p. 728; Edgar Erskine Hume, *Victories of Army Medicine*, p. 102; Thomas J. Kirkpatrick, "Camp Sanitation," p. 426; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, pp. 139–43; Frederick F. Russell, "The Prevention of Typhoid Fever," pp. 482, 485; Percy M. Ashburn, *A History of the Medical Department of the United States Army*, pp. 272–73; WD, *ARofSW*, 1899, 1(pt.2):560; W. D. Tigertt, "The Initial Effort To Immunize American Soldier Volunteers With Typhoid Vaccine," pp. 342–49; Memo, Harry L. Gilchrist to SG, 30 Jan 1934, Ms C322, Harry L. Gilchrist Papers, National Library of Medicine (NLM), Bethesda, Md. Russell became a major on 1 January 1909.

3. Ashburn, *History of MD*, pp. 272–75; Hume, *Victories*, p. 103; Ltr, Frederick F. Russell to Valery Havard, 11 Nov 1908, Entry 231, Record Group (RG) 112, National Archives and Records Administration (NARA), Washington, D.C.; WD, *ARofSG*, 1909, pp. 46, 48, 1911, p. 50, and 1912, pp. 52–54; Frederick F. Russell, "Antityphoid Vaccination," pp. 816, 821–22; idem, "Anti-typhoid Vaccination in the American Army," p. 479; idem, "Progress in Antityphoid Vaccination During 1912," p. 667; idem, "Prevention," pp. 481–82, 518; William J. L. Lyster, "Vaccination Against Typhoid in the United States Army," pp. 511–12; F. J. Conzelmann, "Typhoid Inoculation," p. 316; Henry E. Meleny, "Tropical Medicine in United States Military History," p. 332; Frank W. Foxworthy, "Anti-typhoid Vaccination," pp. 333–34; Frank R. Keefer, "The Prevention of Typhoid Fever," pp. 290–91; United States, Army Medical School, *Immunization to Typhoid Fever*, pp. 7–8, 10–11, 13; Bayne-Jones, *Preventive Medicine*, pp. 141–43; Robert S. Henry, *The Armed Forces Institute of Pathology*, pp. 143–44, 146.

4. WD, *ARofSG*, 1909, p. 46 (first quotation), 1910, p. 148, 1911, p. 53, and 1912, pp. 56–57 (second quotation).

5. Ashburn, *History of MD*, p. 273; Charles F. Craig, "The Army Medical Service," p. 419; WD, *ARofSG*, 1913, pp. 54, 142, 212–13, and 1914, pp. 11–12; Kirkpatrick, "Camp Sanitation," pp. 423, 425; Russell, "Prevention," p. 500.

6. WD, *ARofSG*, 1902, pp. 94–95, 1903, p. 98, 1905, pp. 14–15, 55, 1906, pp. 19, 81, 1907, p. 13 (quotation), 81, and 1909, pp. 14, 93; George Rosen, *Preventive Medicine in the United States*, p. 37; Harry F. Dowling, *Fighting Infection*, pp. 91, 104; Valery Havard, "The Value of Statistics in Connection With Venereal Diseases in the Army and Navy," pp. 114–15; Anita Newcomb McGee, "Facts About the Army Canteen," pp. 262–63; Allan M. Brandt, *No Magic Bullet*, pp. 9–11, 14–15, 22, 40, 42; Prince A. Morrow, "Publicity as a Factor in Venereal Prophylaxis," p. 1245.

7. WD, *ARofSG*, 1902, p. 94, 1906, p. 49, 1910, pp. 16, 23, 28–29, 58–60, 86–87, 1911, pp. 126–27, 1912, pp. 104, 107, 1913, pp. 22, 38, 60, 124, 128–29, 1914, pp. 12, 57, 117, 120, 123, and 1915, p. 187; Dowling, *Fighting Infection*, p. 100; Brandt, *No Magic Bullet*, pp. 12–13.

8. WD, *ARofSG*, 1904, p. 90 (quotation); Dowling, *Fighting Infection*, pp. 83, 89, 92–93; Brandt, *No Magic Bullet*, pp. 11–12; William G. Miller, "The Treatment of Gonorrhea by Irrigation," p. 231.

9. Champe C. McCullough, "The Scientific and Administrative Achievement of the Medical Corps of the United States Army," p. 425; Henry J. Nichols, "The Present Status of Salvarsan Therapy in Syphilis," pp. 603–05; Brandt, *No Magic Bullet*, p. 40; WD, *ARofSG*, 1911, p. 160, and 1913, p. 155; Matthew A. Reasoner and Ray W. Matson, "The Treatment of Syphilis," pp. 741–42; "Salvarsan," p. 179; James S. Fox, "Prophylaxis of Syphilis and Practical Points on Its Treatment by Salvarsan," pp. 95–96.

10. Nichols, "The Present Status," pp. 604–05, 608 (quotation); Brandt, *No Magic Bullet*, p. 41; WD, *ARofSG*, 1909, p. 143, and 1912, pp. 70–71, 169–70; Dowling, *Fighting Infection*, p. 94; Reasoner and Matson, "Treatment," pp. 735, 739, 742; McCullough, "Achievement of Medical Corps," p. 425; Henry J. Nichols, "The Immediate Clinical Results of the Use of Salvarsan in the Army," pp. 212–13; Claude Quetel, *History of Syphilis*, p. 142.

11. WD, *ARofSG*, 1911, pp. 161–62, 165, 1912, pp. 169–73, and 1913, pp. 155–58; Charles F. Craig, "The Interpretation of the Results of the Wassermann Test," p. 565.

12. J. Hamilton Stone, "Our Troops in the Tropics," p. 365 (first quotation); Jefferson R. Kean, "A Plea for Applying the Usual Methods of Preventive Medicine to Venereal Diseases," p. 199 (second quotation); WD, *ARofSG*, 1903, p. 99, 1905, p. 88, and 1911, pp. 60–61 (remaining quotations), 104–05; Ltr to Ed., W. A. Wiseman and W. W. Keen, *Journal of the American Medical Association* 58 (1912): 575; A. S. Condon, "The Army Canteen," p. 721; Brandt, *No Magic Bullet*, p. 35; Charles H. Alden, "Porto Rico," p. 21; Jerome H. Greenberg, "Venereal Disease in the Armed Forces," p. 172.

13. WD, *ARofSG*, 1902, p. 95, 1903, pp. 99–100 (first three quotations), 1909, p. 19 (fourth quotation), 1910, p. 62, and 1911, p. 57 (fifth quotation); "Syphilis of the Innocent," p. 526; Greenberg, "Venereal Disease," p. 172.

14. WD, *ARofSG*, 1910, p. 59 (second quotation), and 1911, p. 59 (first quotation).

15. Ibid., 1911, pp. 57 (first quotation), 59–60, 104, and 1912, pp. 64, 67; Hume, *Victories*, p. 123 (second quotation); Greenberg, "Venereal Disease," p. 177; Quetel, *Syphilis*, pp. 122–23, 141.

16. Jay Cassel, *The Secret Plague*, pp. 129–30; Brandt, *No Magic Bullet*, p. 99.

17. WD, *ARofSG*, 1910, pp. 60–61, 1911, pp. 57–61, 104–05, 1912, pp. 64–67, and 1914, p. 55; Greenberg, "Venereal Disease," p. 172.

18. WD, *ARofSG*, 1911, pp. 23, 54, 59–61, 63, 66, 69, 1912, p. 26, and 1914, p. 56.

19. Ibid., 1908, p. 28, 1909, p. 26, 1911, p. 55, 1912, pp. 40, 57–58, 60, 1913, pp. 19, 35, 58 (quotation), and 1914, p. 58; Jefferson R. Kean, "The Venereal Problem in the Army and Navy," p. 285.

20. WD, *ARofSG*, 1913, pp. 14, 59–60, and 1914, pp. 55–58, 62, 93 (quotation); Mahlon Ashford, "Statistical Report of Venereal Prophylaxis . . . ," pp. 9–10.

21. WD, *ARofSG*, 1908, p. 53, 1911, pp. 25, 71, 107, 1912, pp. 28, 78, 1913, pp. 14, 76, and 1914, pp. 12, 69.

22. Virginia Cowart, "Control, Treatment of Drug Abuse, Have Challenged Nation and Its Physicians for Much of History," pp. 2465 (quotations), 2469; R. M. Blanchard, "Heroin and Soldiers," pp. 141–42.

23. Quotations from William B. Meister, "Cocainism in the Army," pp. 344–45, 348. See also ibid., pp. 346, 350; Edgar King, "The Use of Habit-forming Drugs (Cocaine, Opium and Its Derivatives) by Enlisted Men," pp. 380–81.

24. R. L. Richards, "The Importance of Alcohol, Heat, and Acute Infectious Diseases Occurring in the United States Army in the Past Ten Years," pp. 616, 626; WD, *ARofSG*, 1910, p. 58, 1911, pp. 25, 107, 237–38, 1913, p. 98, and 1914, pp. 22, 69 (quotation). The latter source, 1911, reports on alcoholism in European armies; however, the figures cited are not based on the same years for all armies (see Tables 65 and 66, pp. 237–38).

25. WD, *ARofSG*, 1902, pp. 75–76, and 1905, p. 144; Rosen, *Preventive Medicine*, p. 28.

26. WD, *ARofSG*, 1902, pp. 70 (quotation), 71–72, 1903, pp. 65, 132, 1904, p. 57, 1905, pp. 115, 144, 1906, p. 122, and 1908, pp. 21, 51, 89; Fielding H. Garrison, *An Introduction to the History of Medicine*, p. 579; Rosen, *Preventive Medicine*, pp. 10–11, 28; Daniel M. Appel, "The General Hospital and Sanatorium for the Treatment of Pulmonary Tuberculosis at Fort Bayard, New Mexico," p. 215; Spink, *Infectious Diseases*, p. 225.

27. WD, *ARofSG*, 1909, pp. 55–56, 1910, pp. 54, 137–38, 1911, p. 67, 1912, p. 40, and 1913, p. 99; George E. Bushnell, "The Diagnostic Use of Tuberculin in Pulmonary Tuberculosis," Entry 231, RG 112, NARA; Rosen, *Preventive Medicine*, p. 28.

28. WD, *ARofSG*, 1910, p. 80, 1912, pp. 75–76, 1913, p. 70, and 1914, pp. 65–66; Ltr, Jefferson R. Kean to Surg, Vancouver Barracks, 22 Sep 1912, Entry 231, RG 112, NARA.

29. Quotations from WD, *ARofSG*, 1904, pp. 122–23, 126. See also ibid., 1903, p. 124, 1905, pp. 54, 142–43, 1908, p. 21, and 1909, p. 138.

30. Appel, "The General Hospital," p. 211; Richard Johnson, "My Life in the U.S. Army, 1899 to 1922," p. 82, Spanish-American War, Philippine Insurrection, and Boxer Rebellion Veterans Research Project, Military History Research Collection, U.S. Army Military History Institute, Carlisle Barracks, Pa.

31. WD, *ARofSG*, 1909, p. 19, 1910, p. 51, 1911, pp. 64, 127, 1912, p. 71, 1913, pp. 62–63, 67, 101, 1913, p. 112, and 1914, pp. 12, 65, 93, 115.

32. Ibid., 1911, pp. 64, 66, 1912, pp. 73–74, 1913, pp. 64, 68, and 1914, pp. 64–65.

33. War Department, Surgeon General's Office, *Manual for the Medical Department, 1906*, p. 123 (quotation); WD, *ARofSG*, 1905, pp. 38–39, and 1908, pp. 28–29; William B. Bean, *Walter Reed*, pp. 181–82; William H. Crosby, "The Death of Walter Reed," p. 1342; William C. Borden, "History of Doctor Walter Reed's Illness From Appendicitis," pp. 425–26.

34. WD, *ARofSG*, 1904, pp. 115–16, 1905, p. 145, 1906, pp. 29–30, 1910, p. 28, 1911, p. 150, 1912, p. 30, and 1914, p. 36; Josiah C. Trent, "Sur-

gical Anesthesia, 1846–1946," in *Theory and Practice in American Medicine*, pp. 209–11; Henry D. Thomason, "Personal Experience With Spinal Anesthesia, and Its Application to Military Surgery," p. 297; Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery From Empiric Craft to Scientific Discipline*, pp. 58–59; Bruce D. Ragsdale, "Gunshot Wounds," p. 310.

35. Bayne-Jones, *Preventive Medicine*, pp. 143–44; Carl R. Darnall, "The Purification of Drinking Water for Troops in the Field," pp. 268, 272–76; idem, "Water Purification by Anhydrous Chlorine," pp. 787, 783, 796–97; WD, *ARofSG*, 1911, pp. 82–83, and 1912, p. 99; William J. L. Lyster, "Sterilization of Drinking Water by Calcium Hypochlorite in the Field," pp. 223, 225–28.

36. WD, *ARofSG*, 1910, pp. 74 (quotation), 75–76, 78, 148, 1912, pp. 94–95, and 1914, p. 88.

37. Ibid., 1910, pp. 56, 79 (first quotation), 80, 1911, p. 82, and 1912, p. 96 (remaining quotations).

38. Ibid., 1911, p. 82, 1912, p. 91, and 1913, p. 88 (quotation); Hume, *Victories*, p. 178; Bayne-Jones, *Preventive Medicine*, pp. 145–46; Edward L. Munson, *The Soldier's Foot and the Military Shoe*, pp. 60–63.

39. WD, *ARofSG*, 1908, p. 63, 1912, pp. 96–97, and 1914, p. 85.

40. Ibid., 1897, pp. 48–49, 1902, pp. 136, 150, 1908, pp. 13, 17, 59, 1909, pp. 13, 17, 37–38, 1911, pp. 12, 16, 39, 99, 224–31, 1912, pp. 12, 41, 1913, pp. 24, 36, and 1914, pp. 11, 20–22, 24–27, 32, 36; John van R. Hoff, "Experience of the Army With Vaccination as a Prophylactic Against Smallpox," p. 497.

41. WD, *ARofSG*, 1902, p. 13, 1904, p. 111 (quotation), 1905, pp. 39, 147–48, 1906, pp. 123–24, 1907, pp. 70–71, and 1909, pp. 145, 148; WD, SGO, *Manual, 1906*, p. 62.

42. Martha L. Sternberg, *George Miller Sternberg*, p. 244 (quotations); WD, *ARofSG*, 1911, pp. 151, 165–67, 1912, pp. 152, 167–76, 1913, pp. 152, 187–92, and 1914, p. 131; James M. Phalen, *Chiefs of the Medical Department, United States Army, 1775–1940*, p. 86; Percy M. Ashburn, "The Board for the Study of Tropical Diseases as They Occur in the Philippine Islands," p. 300; Rosen, *Preventive Medicine*, p. 23.

43. WD, *ARofSG*, 1899, pp. 193–95, 1902, p. 51, 1906, p. 110, 1907, p. 117, and 1908, pp. 97–98; WD, SGO, *Manual, 1906*, p. 32.

44. WD, *ARofSG*, 1905, p. 140, 1909, p. 149, and 1917, p. 158 (quotation); Norman M. Cary, Jr., "The Mechanization of the United States Army, 1900–1916," M.A. thesis, pp. 26, 28.

45. Quotation from Ltr, SG to SW, 26 Aug 1913, Entry 28, RG 112, NARA. In loc. cit., see the following: Ambulance Specs, Keeton Motor Co., 13 Nov 1913, and Ltrs, H. D. Snyder to Keeton Motor Co., 28 Aug, 9 Sep, 6 Dec 1913 and 16 Jan 1914; Keeton Motor Co. to SG, 4 Sep 1913; Charles M. Gandy to Ch, QM Corps, 17 Feb 1914; H. H. Newson to QM, Fort Wayne, 18 Feb 1914. See also Louis C. Duncan, "The Use of Motor Vehicles in Transporting Wounded," pp. 241–43; George M. Ekwurzel, "Observations of a Regimental Surgeon With the Maneuver Division," pp. 52–53; WD, *ARofSG*, 1912, p. 194; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 65 (hereafter cited as WD, SGO, *SGO*).

46. WD, *ARofSG*, 1899, p. 329, 1902, p. 59, 1903, pp. 42–43, 1904, pp. 31–32, 74–76, 112, 1905, pp. 39–40, 126–27, 1906, pp. 65, 130, 1907, pp. 69, 71, 113, 1908, pp. 63–64, and 1909, pp. 72–74, 77, 118; Darnall, "Purification," pp. 253–85.

47. WD, *ARofSG*, 1904, pp. 30, 36, 39 (first quotation), 40, 42, and 1908, pp. 126–27 (second quotation).

48. WD, *ARofSG*, 1911, pp. 92, 94 (first quotation), 95, and 1912, p. 51; Henry D. Thomason, "Sanitary Troops in the Organized Militia of the United States," p. 521 (second quotation); Joseph H. Ford, "Galveston Maneuver Camp," pp. 282–83; Paul F. Straub, "Sanitation of the Maneuver Camp at San Antonio, Texas," pp. 607–08; WD, SGO, *SGO*, p. 70; Hermann Hagedorn, *Leonard Wood*, 2:111.

49. Straub, "Sanitation," p. 622 (quotation); *Field Service Regulations*, 1910, pp. 126, 131–32, 181–82; WD, *ARofSG*, 1911, pp. 92, 94–95, 184.

50. WD, *ARofSG*, 1911, pp. 93 (first quotation), 94–96, and 1912, pp. 51–52; Herbert A. Arnold, "Report on Maneuver Camps at San Antonio and Leon Springs, and on Juarez, Mexico," p. 22 (second quotation); Straub, "Sanitation," pp. 620, 622, 626, 629–30; C. W. Decker, "San Diego Maneuver Camp," pp. 271–72; Ekwurzel, "Observations," pp. 57–58.

51. Charles S. Young, "The Advantages Accruing to the National Guard From Tours of Duty With the Regular Establishment . . . ," p. 62 (quotation); WD, *ARofSG*, 1911, pp. 95, 170, 172; Straub, "Sanitation," pp. 627–28; Arnold, "Report," p. 24.

52. WD, *ARofSG*, 1913, pp. 91–93, 214 (quotation).

53. Ibid., *ARofSG*, 1914, p. 82; Reuben B. Miller, "The Sanitation of the Second Division, U.S. Army, at Texas City and Galveston, Texas . . . ," pp. 515–16.

54. Adolphus W. Greely, *Earthquake in California, April 18, 1906*, p. 15 (quotation); WD, *ARofSW*, 1906, p. 101; Charles Keeler, *San Francisco Through Earthquake and Fire*, pp. 4, 9, 26, 48; Gordon Thomas

and Max M. Witts, *The San Francisco Earthquake*, pp. 71, 78, 149. An excellent study of the Medical Department's role in aiding the victims of disaster, including those of the San Francisco earthquake, can be found in Gaines M. Foster, *The Demands of Humanity*, on which this account of the San Francisco disaster is based, except where otherwise indicated.

55. Gladys Hansen and Frank Quinn, "The San Francisco Numbers Game," Paper of the San Francisco Earthquake Research Project, San Francisco, Calif.; Terry Link, "The Great Earthquake Cover-up"; Greely, *Earthquake*, pp. 7–8, 14–15, 30, 32, 44; WD, *ARofSW*, 1906, p. 200.

56. Quotations from Henry H. Rutherford, "Experiences of an Army Medical Officer During the San Francisco Earthquake," pp. 208–09. See also ibid., p. 210; WD, *ARofSG*, 1907, p. 126; Greely, *Earthquake*, pp. 31, 129; Keeler, *San Francisco*, pp. 9–10; John C. Kennedy, *The Great Earthquake and Fire*, p. 132; Rpts, George H. Torney to Adolphus W. Greely, 14 May 1906, vol. 3, and J. M. Kennedy, vol. 4, Ms B286, "Report on Sanitation in San Francisco After the Earthquake," NLM; Thomas and Witts, *San Francisco Earthquake*, p. 71.

57. Rutherford, "Experiences," p. 210 (quotation); Greely, *Earthquake*, pp. 31, 129–30; Rpts, Henry H. Rutherford, J. M. Kennedy, and William Stephenson, vol. 4, Ms B286, NLM; WD, *ARofSG*, 1907, p. 126.

58. Rutherford, "Experiences," pp. 210–11.

59. Quotation from Pacific Div GO 11, 20 Apr 1906, vol. 3, Ms B286, NLM. See also Greely, *Earthquake*, pp. 5, 11, 18, 24–25, 31–32, 60, 72, 130; Kennedy, *Earthquake*, p. 169; WD, *ARofSG*, 1906, pp. 131–32.

60. Greely, *Earthquake*, pp. 10, 58–59, 66 (quotation); Rpts, Albert Truby and J. M. Kennedy, vol. 4, Ms B286, NLM; WD, *ARofSG*, 1906, p. 132.

61. Greely, *Earthquake*, pp. 33, 35, 66, 73, 130–31; Kennedy, *Earthquake*, pp. 109–10; Rpts, Kenneth A. J. Mackenzie, vol. 1, A. Truby, vol. 4, and H. H. Rutherford, vols. 1 and 4, Ms B286, NLM.

62. William E. Carll, "The Oregon National Guard at the San Francisco Earthquake Disaster," p. 462 (first quotation); Greely, *Earthquake*, pp. 20–21, 31–32, 131 (second quotation); WD, *ARofSG*, 1906, pp. 116, 132–33; Rpts, H. H. Rutherford, vol. 1, and Robert U. Patterson, 5 Jun 1906, vol. 4, Ms B286, NLM; George H. Kress, "United States Army Field Hospital in San Francisco in 1906 . . . ," p. 215.

63. Carll, "Oregon National Guard," p. 462; Kennedy, *Earthquake*, pp. 109–10; Greely, *Earthquake*, p. 44; Roster, Sanitary Div, Presidio, 22 Apr 1906, vol. 1, and Rpts, George H. Torney to SG, 24 Apr 1906, and to Greely, 14 May 1906, vol. 3, Ms B286, NLM.

64. WD, *ARofSG*, 1906, pp. 126, 132–33; Kennedy, *Earthquake*, p. 45; Greely, *Earthquake*, pp. 32, 131–32; Rpt, J.M. Kennedy, vol. 4, Ms B286, NLM.

65. Greely, *Earthquake*, pp. 32–34, 58–59, 131, 133–34; Rpt, A. Truby, vol. 4, Ms B286, NLM; WD, *ARofSG*, 1906, p. 12, and 1907, p. 9.

66. Greely, *Earthquake*, pp. 32–33, 72, 131; Pacific Div SO 66, 23 May 1906, vol. 3, and Rpts, H. H. Rutherford, J. M. Kennedy, and W. Stephenson, vol. 4, Ms B286, NLM. According to WD, *ARofSG*, 1906, p. 12, the secretary of war allotted the Army Medical Department $400,000 of money voted for the "relief of sufferers from earthquake and conflagration on the Pacific coast (joint resolutions of April 19, 21, and 24, 1906)."

Chapter 14

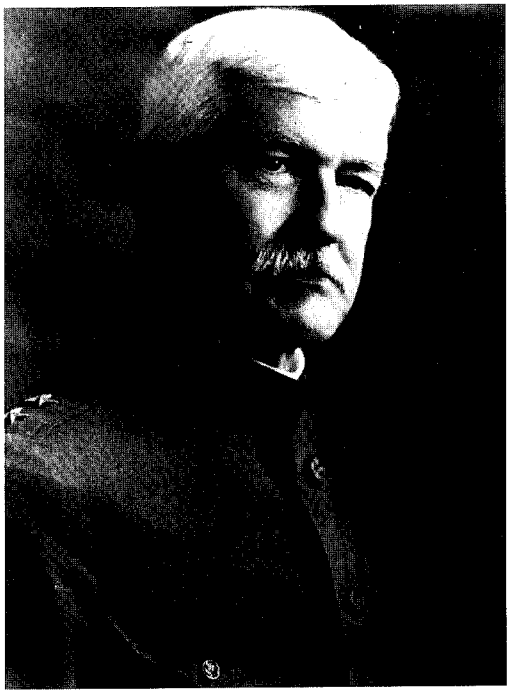
IN THE SHADOW OF WAR



Even as late as 1914, few in the United States expected to be drawn into an overseas conflict unless the territories acquired in the Spanish-American War were threatened. Furthermore, almost until the moment when the nation entered the struggle in April 1917, President Wilson believed that energetic preparations for war would make U.S. involvement in European hostilities more likely. Congress, uncertain first about whether to prepare for war and then about how to do so, refrained from voting a major increase in the size of the Army until raids by Pancho Villa into the United States led to the mobilization of all available regular and National Guard troops along the Mexican border in 1916 and a campaign within Mexico itself.[1]

Military officers realized that the United States might eventually become involved in a major war. But they were preoccupied with thoughts of a conflict that might take place after the war in Europe, especially if Germany failed to achieve a decisive victory and tried to recover stature by aggressive moves in the Americas, possibly taking advantage of the problems with Mexico, or if Japan attempted to take advantage of any weakening of the Western powers. Thus, although the Army was by no means idle in the years before the United States entered World War I, not even the nation's military leaders envisioned a need for great haste in preparing for war.[2]

The hostilities already under way in Europe did emphasize the concerns of those who had for decades wished to see the nation better prepared to meet the challenges of modern warfare. Their efforts moved into high gear early in 1916. The surgeon general, Maj. Gen. William C. Gorgas,[3] was among those who testified before congressional committees as they worked to prepare the legislation that would become known as the National Defense Act of 1916 and to appropriate the money necessary for implementing it. Beginning his testimony in January 1916, he noted that the size of the Medical Department had not changed since 1908, even though the size of the Army had increased by 50 percent. The resultant ratio of less than 5 physicians to 1,000 men was, in his opinion, woefully inadequate. Only by calling up Medical Reserve Corps officers and hiring a few contract physicians could he provide peacetime medical attendance for the posts, hospitals, and depots within the United States and in the Caribbean and the Pacific and for the units serving along the border with Mexico. Gorgas believed that 7 physicians for 1,000 men was a bare minimum for peacetime and that 10 per 1,000 would be necessary to meet wartime needs. Should the Congress decide upon a peacetime Army of 140,000



SURGEON GENERAL GORGAS

men, the Medical Department would have to be more than doubled in size, signing on 537 new medical officers to reach the required total of 980.[4]

Surgeon General Gorgas pointed out that abruptly doubling the size of the Medical Corps would bring into the service large numbers of untrained civilian doctors who were not prepared to do all that was required of a military surgeon. Managing a military hospital was so complex that it had "attained the rank of a distinct speciality." Many duties routinely assigned to the medical officer called for experience and training not available to civilians, and a considerable length of time would be necessary before physicians without military experience who were called up in wartime could function successfully as medical officers. Allowing Medical Reserve Corps officers to train with the National Guard and other branches of the government rather than with the Regular Army meant that some of them would initially be unable to function with complete effectiveness if called up in wartime. The demands upon experienced medical officers was great. The services of many of them would be denied to units in the field because they would be needed to train civilians. Gorgas was by this point resigned to the fact that the "real function" of the Medical Department had become "training whatever medical officers are required for whatever Army may be arranged for," but he seemed to find the French approach of using non-physicians to handle many administrative responsibilities appealing.[5]

Surgeon General Gorgas also testified that the larger the number of men called up to meet a major conflict, the greater the difficulties that would be involved in maintaining their health, especially during the first year of service, when volunteers traditionally suffered a higher rate of disease than regulars. If an army as large as 500,000 men should be called up to meet a critical emergency, he predicted that the Medical Department would have great difficulty in providing adequate care. The situation in early 1916 was only "somewhat better" than it had been at the beginning of the Spanish-American War.[6]

In his testimony Gorgas emphasized that supply would also be a problem if the nation were suddenly plunged into war. In January he had on hand supplies for 300,000 men—or 200,000 more than the existing strength of the Army—for only five to six months. He pointed out that he would have the greatest difficulty promptly supplying the army of two million that might be necessary to defeat a major military power. An inability to purchase abroad would further complicate the supply situation, since some items were

not obtainable in the United States and, in the case of drugs, no effort was being made to develop substitutes. After Congress voted the Medical Department another $37,500 in March, the surgeon general testified that he now had enough in reserve to supply an additional 220,000 men beyond those already serving—in other words, a 320,000-man force.[7]

As passed in June 1916, the National Defense Act demonstrated the attitude prevailing among the nation's leaders. It called for a gradual increase in the Regular Army, not for a rapid mobilization of men and resources, to take place over a five-year period and to peak ultimately at a peacetime strength of 175,000, with an additional increase to 286,000 to be allowed in the event of war. Although passed against the backdrop of the Mexican border situation, this legislation remained basically, as historian John P. Finnegan has put it, "a decision that the United States would *not* arm immediately to meet the menaces of a world at war. [It was] a peacetime measure produced by wartime demands," and an "act . . . far more intelligible when looked upon as an implementation of the Army's peacetime demands than as a response to world war."[8]

The nation's military forces remained unprepared to meet the challenges they would face in the spring of 1917. Even so, the Medical Department was officially delighted with the National Defense Act of 1916. A medical officer who fought in World War I termed it "the most important piece of preparedness legislation ever passed before any of our wars." According to Surgeon General Gorgas' annual report of 1916, it placed the department "for the first time in its history, upon a satisfactory basis." To keep up with the gradual expansion of the Army, the new legislation called for gradually adding 1,107 medical officers to the department. It also created a Veterinary Corps as part of the department, authorized assigning 5 medical officers to work with the Red Cross' military relief department, and established a working relationship between the department and the Red Cross in matters of supply. Lt. Col. Edward L. Munson of the Medical Corps had reservations about the new legislation, however. He pointed out that although the new law established the ratio of 7 medical officers to every 1,000 men that Gorgas favored, the proportion was still less than the 10 to 1,000 the British considered necessary.[9]

The passage of the National Defense Act did not relieve individual Medical Corps officers and civilian physicians of their anxieties about the lack of attention being paid to the "sanitary plans" that must, according to Colonel Munson, be "a part of the general plan of the campaign." Dr. George F. Keenan warned in *Southwestern Medicine* that "we face a serious situation, an ease loving people, self pampered and prosperous. We possess the universal short sightedness of Americans about the possibility of conquest by invading powers. . . ." Dr. Charles H. Mayo of Rochester, Minnesota, agreed, noting in an article in the *St. Paul Medical Journal* that "our nation is becoming soft, dissipated and inefficient" with "from 25 to 50 per cent of our youth from 20 to 30 years of age . . . physically defective from preventable causes." Attacking what he regarded as the traditional neglect of medical preparedness, he maintained that "in recent times, through army officers and war boards, the great nations have prevented their medical officers from doing their full duty because, like that of law, the conduct of war has been estab-

lished by precedent." In the Crimean, Boer, Civil, and Spanish-American Wars, Mayo concluded, "the real cause of failure was lack of medical preparedness." With the zest and optimism typical of his generation, however, he predicted that "two years of war with discipline and sacrifice will make us the greatest nation on earth."[10]

A rider attached to the Defense Appropriations Act of August 1916 increased Surgeon General Gorgas' ability to meet the great challenge that faced him when it created a Council of National Defense, and the six cabinet members and civilian advisors who were to coordinate defense preparations under this measure appointed Gorgas to the Council's committee on medicine. But because few predicted that the United States would enter the vast conflict in Europe, the Medical Department, like the Army itself, remained unprepared to handle the rapid expansion that wartime needs would dictate.[11]

The Surgeon General

When William Gorgas became surgeon general in January 1914 following Torney's unexpected death, less than eight months remained before the outbreak of what would be the most deadly war the world had ever known. He was a 63-year-old physician of illustrious credentials, remarkable accomplishments, and genial disposition, an officer apparently well qualified to meet the challenge facing the Medical Department. His successes in Cuba and the Panama Canal Zone were familiar to many (and possibly most) Americans and to the scientific world abroad as well. His achievements as a scientist were made all the more remarkable by the fact that his medical career had initially been undertaken as an expedient, a means of obtaining an Army commission when he was unable to obtain an appointment to West Point, possibly because he was the son of an officer who had resigned his commission to serve with the Confederate forces in the Civil War. The esteem in which he was held was both demonstrated and enhanced by his becoming the first surgeon general in the history of the Medical Department to be given the rank of major general.[12]

But Gorgas, according to a contemporary in the Medical Department, had little interest in administration. His wife later commented in her biography of her husband that "the new Surgeon-General had little opportunity, at this time, to give to his official labors. The call for his services in the field that he had made his own became insistent." The field that he had made his own was yellow fever, which, should the nation be required to defend its new tropical empire, might well be a matter of concern. In June 1916, after spending many weeks testifying about the department's needs before Congress while it prepared the budget for fiscal year 1917 and designed the National Defense Act, Gorgas accepted an invitation to spend several months visiting countries in South and Central America on behalf of the Rockefeller Foundation, a privately funded organization concerned with world health, to advise it on the formation of comprehensive plans for the struggle against yellow fever. There, while the Germans, French, and British killed one another by the hundreds of thousands at Verdun and along the banks of the Somme, he spent four months that were, according to his wife, "among the most delightful and enjoyable of his life." Everywhere acclaimed and awarded honorary degrees, he joined in the festivities, she noted, "with the zest of a schoolboy." By January 1917, three years

after he became surgeon general, Gorgas was eager to retire to concentrate entirely on yellow fever, but his return to the United States coincided with Germany's resumption of unrestricted submarine warfare, and "the war for a time necessarily postponed" his departure from the Army. He remained at the head of the Medical Department until the end of the struggle.[13]

Medical Department Personnel

Although Gorgas' major interests were clearly scientific, the principal challenges he faced as surgeon general were administrative. The Surgeon General's Office would be responsible for directing the Medical Department during the inevitable turmoil that could follow entry into a major war, but it was still composed only of the surgeon general himself and six other officers, with a civilian staff of 146 working under them. Medical officers headed divisions for personnel, sanitation, supply, and the library and museum, while the Record, Correspondence, and Examining Division worked under the direct authority of the chief clerk.[14]

The shortage of trained, experienced personnel posed an especially formidable problem. Physicians specializing in either scientific or administrative fields were becoming increasingly important to the Army, and training in many of those specialties was scarce outside the military. Yet a total of barely more than 5,000 men and women, including 426 medical officers, were working in the entire Medical Department in 1914. The modest increase in the number of enlisted men and Medical Reserve Corps officers on active duty resulting from the conflict along the Mexican border brought the total serving in the department by 30 June 1916 to 5,792. The theoretical capacity of the field hospital had increased from 108 to 216 beds, and the *Field Service Regulations* of 1914 called for an increase in the size of the evacuation hospital from 324 to 423 beds; but, because of the shortage of personnel, medical support on this scale could be provided for only half the Regular Army. Any expansion of the Army would make it necessary to call up an additional 3,500 physicians, almost all untrained, for every additional 500,000 men. Thus, although plans for the management of medical care in the field continued to be refined, the question remained as to whether the Army would have enough physicians able to carry them out effectively if the United States were drawn into a major war.[15]

The first challenge resulting from the decision to triple the size of the Medical Corps was to make a career in the military service seem attractive to more than 1,100 medical graduates capable of passing the entrance examinations. Although the nation's dwindling number of civilian medical schools had improved in quality, they continued to graduate fewer physicians than before the turn of the century. The *Journal of the American Medical Association* joined *Military Surgeon* in trying to convince more of them of the advantages of an Army career. The increased salaries and benefits voted in 1908 made it possible for *Military Surgeon* to emphasize that the medical officer was paid well enough "to live like a gentleman in a community of gentlemen," with an income that was "adequate [and] assured" and increased with time. Furthermore, "proportionate to the whole number of physicians in the country, the number of medical officers of the Army who have achieved an enviable position in the profession, is greatly in excess of the average

in civil life." The *Journal* noted that the Medical Corps physician was also "encouraged to specialize" and that the Army's laboratories, operating rooms, and post libraries were all equipped to assist the research-minded surgeon with his work. What effect the appeal had is difficult to judge, since the growing possibility of U.S. involvement in war may have also encouraged would-be applicants. In any event, while only 20 young physicians who had passed the initial examination reported for class at the Army Medical School in the fall of 1915, 65 did so a year later.[16]

The increase in the size of the Medical Corps exacerbated the problems of the Army Medical School's already inadequate facilities. Beginning in October 1916, two terms were scheduled for the academic year, with 115 young physicians qualifying for commissions as Medical Reserve Corps officers in order to enroll for one or the other of them. Of the 101 passing the final examinations in that school year, 98 won Regular Army commissions. The school had to prepare to accept a still larger enrollment, but the Medical Department had not yet succeeded in gaining acceptance of the idea of building a new medical school on the grounds of the Walter Reed General Hospital. With no time to waste, Surgeon General Gorgas found a former Department of Commerce building in the city twice as large as the facility then in use and had the school and laboratories moved into it in September 1916. Since even the new grounds were not large enough to permit establishing a camp and initiating field exercises, Gorgas continued to hope for something better in the way of accommodations.[17]

Even if the Medical Department was successful in filling all openings in the Medical Corps, in the event of full-scale war the Army would have to rely heavily on National Guard physicians, who numbered about 800 in 1916, and Medical Reserve Corps officers, roughly twice that number, and possibly on civilians without any exposure to the military. Military training was not required for members of the Medical Reserve Corps, and few reservists were likely to have attended the lectures on military medicine that civilian medical schools and societies were beginning to offer. Few Medical Reserve Corps officers undertook active duty, less than 100 in either 1914 or 1915, though this figure included those at the Army Medical School. In fiscal year 1916, when 1,903 were on the combined active and inactive reserve lists, only 146 requested active duty. The experiences of Medical Reserve Corps officers called up to care for troops during the crisis with Mexico in 1916 showed their lack of enthusiasm for more than the briefest of training, since some resigned rather than be subjected to a similar experience again. The National Defense Act dictated an end to the Medical Reserve Corps as of June 1917 and offered each Medical Reserve Corps officer a commission in the newly created Officers' Reserve Corps, a step that the surgeon general opposed vigorously but in vain.[18]

The untrained medical officer was deemed to be "worse than useless." As an article in *Military Surgeon* pointed out, an Army surgeon had to be able to "visualize the country from a map . . . to handle [medical] units [and] to coordinate their movements with those of other troops." He also had to learn to understand military orders and how to execute them. As a result, the correspondence course given through Fort Leavenworth and designed specifically for reserve officers who could not leave their civilian practices was greeted with enthusiasm. In January 1916 Surgeon

General Gorgas informed the House Committee on Military Affairs that about 700 Medical Reserve Corps officers were taking the correspondence course.[19]

Still another method of training medical personnel was introduced not long after Gorgas became surgeon general, one intended for those who could afford to leave their practices briefly. Joint camps of instruction, apparently similar to Surgeon General Torney's medical camps, offered Medical Reserve Corps officers and their colleagues in the National Guard the opportunity to work with field hospitals and ambulance companies both from the Medical Department and from the Guard. In 1915 five such camps were established, each with its own field hospital and ambulance company. The Army set up the camps at centrally located sites that varied from year to year, to which reserve and Guard medical officers could come with a minimum of transportation expense to spend a week learning about medical problems in the military. At least one prominent member of the Medical Reserve Corps, Maj. Joseph C. Bloodgood of the Johns Hopkins Medical School, believed that his colleagues should be willing to pay for themselves "the small expenses incidental to this experience," which for reservists involved the uniforms they wore, transportation, and mess fees. In spite of Bloodgood's personal enthusiasm, joint camps of instruction for training Medical Reserve Corps officers initially aroused less enthusiasm than the correspondence course.[20]

Since the Medical Department was allowed to hire enough contract dentists to maintain a ratio of 1 to 1,000 men, no new legislation was necessary to increase the size of the Dental Corps. Because dentists were expected under normal circumstances to care for dependents, servants, and civilian employees as well as soldiers, in fiscal year 1915 the ratio of dentists to the total number of eligible patients in the Eastern Department, for example, was 1 to 2,300. Shortly after passage of the National Defense Act in June 1916, 40 dental surgeons and 50 contract dental surgeons were on duty with the Army. Their small number and the fact that their work did not require their presence near the front lines meant that military training for them was not a major problem for the department, even when as many as 43 dentists were serving in the Southern Department during the crisis with Mexico.[21]

Although the new law did not change the ratio of dentists to soldiers, it did modify the organization of the Dental Corps, abolishing the institution of the contract dental surgeon and decreeing that the applicant for a position as a dentist who met the Medical Department's standards be immediately commissioned a lieutenant. Examinations for professional competency were required for eligibility for each promotion thereafter. After eight years the dentist could be promoted to captain, and after twenty-four years he might be chosen as one of the 15 dental surgeons holding the rank of major.[22]

The size of the Army Nurse Corps, like that of the Dental Corps, seemed inevitably to lag behind the need. Three nurses from the Red Cross reserve had to be called in to assist the 9 members of the Army Nurse Corps sent to Vera Cruz when it was occupied by a joint Marine/Army force early in 1914, by which point many base and military department hospitals were urgently requesting more nurses. Transports sent to Europe to bring Americans back after war was declared there in the summer of 1914 needed nurses, and the shortage that this situation created forced the

Medical Department again to hire contract nurses, in this instance for the Walter Reed General Hospital. The 1916 mobilization resulted in a serious shortage until Secretary of War Lindley M. Garrison lifted the ceiling of 150 nurses that he had imposed. Although eventually more than 300 additional nurses were added to the Nurse Corps, the increase did not come in time to avoid the necessity of calling in reserve Red Cross nurses; during the mobilization 184 of the 251 nurses in the Southern Department were from the reserve.[23]

To house nurses, new quarters had been completed at the Army-Navy Hospital in Hot Springs, Arkansas, and were either under way or almost complete at Letterman General Hospital in San Francisco and the hospital in Honolulu, all areas relatively unaffected by the Mexican situation. In June 1915, however, the quarters at the Fort Leavenworth hospital were still inadequate. At the Fort Sam Houston facility, upon which much of the strain fell, space had to be rented in 1916 to house the average of 42 nurses assigned to meet the needs of the newly mobilized forces there. The nurses quarters at the various base and camp hospitals near the border were, of necessity, "temporary structures," the surgeon general reported, but "comfortably furnished, and in the main, very satisfactory." [24]

Although serious complaints about female nurses were no longer heard, some in the Medical Department believed that the Army needed male nurses as well; however, no significant body of trained civilian male nurses existed. Furthermore, of the 900 male nurses in the United States, few were interested in serving in the Army, and not all of those who were interested could qualify for military service. In January 1915, therefore, 10 Hospital Corps privates were chosen to receive four months of training as nurses. A second 10-man class was organized the following November for a six-month program, but the surgeon general's annual report for 1917 does not reveal whether courses of this type were given thereafter.[25]

These 20 student nurses were but a few of the more than 4,000 enlisted men in the Medical Department during this period, most of whom were not of the caliber the surgeon general wanted for the Hospital Corps. Gorgas blamed "inferior inducements" for the poor quality, noting that the War Department had been ignoring his suggestions for improving the situation. Although as early as 1914 the threat of hostilities on the Mexican border rendered the secretary of war more responsive to pleas for an increase in the quantity and the quality of enlistees, except for the sergeants, the enlisted men caring for the sick and wounded continued to be, as one officer put it, "the riffraff of the Army." The quantity was as inadequate as the quality. Gorgas pointed out that while a ratio of 5 corpsmen to 100 soldiers was adequate in peacetime, twice as many would be needed in the event of war and that the department was already having great difficulty in interesting enough men in the corps to keep all authorized positions filled.[26]

In 1916 the National Defense Act ended the official life of the Hospital Corps, the Medical Department's first corps. All the department's enlisted men, including saddlers, farriers, and mechanics as well as former corps members, became part of the enlisted force. Privates first class were given extra pay to serve as dispensary assistants, nurses, or surgical assistants. Surgeon General Gorgas believed that since the extra pay would serve as an incentive, the red tape involved in obtaining the three better-paid specialties for those deemed

worthy of them would have to be endured. Enlisted men new to the department still had to start at the bottom as privates and work their way, if they could, up to the highest position, master hospital sergeant, with its pay of $75 a month. The new law allowed the president to increase the number of the Medical Department's enlisted men by as many as he believed necessary in wartime, but it set the peacetime ratio at 5 percent of the total number of enlisted men in the entire Army.[27]

While causing the Hospital Corps to lose its identity, the National Defense Act gave the veterinarians an organization of their own within the Medical Department. The new law recognized the fact that one of the many new developments following the advent of scientific medicine was the appearance of the professional veterinarian, replacing the self-taught farrier and similar untrained figures who had traditionally cared for sick and injured animals. To be appointed to the new Veterinary Corps, a veterinarian had to be between twenty-one and twenty-seven years old and a graduate of an approved school of veterinary medicine. Veterinarians already in the Army could join the new corps upon passing the required physical and professional examinations, but many proved unable to do so. To receive rank, those accepted into the Veterinary Corps had to serve a two-year probationary period, during which they could be dismissed at any time. By April 1917 sixty-two veterinarians had received commissions as second lieutenants. After five years of service and the passage of the first of the exams they would have to take to progress through the ranks, they would become first lieutenants and after ten years of acceptable service, captains, moving from the category of assistant veterinarian to veterinarian. After another five years, they would become eligible for promotion to major. Two members of the corps were to be assigned to each cavalry regiment, one to every three artillery battalions and one to every mounted engineers battalion, while seventeen would inspect horses and mules. As veterinarians for the Quartermaster Corps, another seven were assigned to inspect meat. Reserve veterinarians, who also had to be graduates of approved institutions of veterinary medicine and pass professional and physical examinations, could also be appointed to care for Quartermaster Corps animals. While on active duty, the reserve veterinarian would be paid as a second lieutenant.[28]

The creation of the new corps and the solidifying of the position of the Army dentists could not mask the fact that, even after the passage of the National Defense Act, the Medical Department continued to face the same basic problem, the shortage of trained personnel. The increases in number, whether voted by Congress or, in the case of nurses and enlisted personnel, allowed by the secretary of war, were inadequate. A system to train the massive numbers of physicians that would be needed in the event of a major war had not been found.

National Guard Medical Personnel

Problems of both quality and quantity plagued the National Guard medical organization as it did the Medical Department. Although some Guard units heeded the congressional requirement that after 21 January 1910 "the organization . . . and discipline of the Organized Militia . . . be the same as that . . . for the Regular Army," this goal was completely realized only after December 1914, when the Division of Military Affairs issued a circular describing the

desired form of organization in detail. As a result, for a time some Guard physicians were still chosen and promoted because of favoritism rather than competence. In addition, the size of the Guard medical establishment grew slowly. While the 869 medical officers serving as of 30 June 1914 represented an increase of 90 from the previous June, the 3,554 enlisted men who handled the duties of the hospital corpsman in 1914 could form only one more Hospital Corps detachment than had existed in 1913. By August 1916, when the number of guardsmen called to the Southern Department to meet the Mexican threat peaked at more than 110,000, the number of enlisted medical personnel was at full strength—19,000 men—and 59 field hospitals, 47 ambulance companies, and 267 sanitary detachments had been federalized. Failures of medical personnel to report with their units for federal service and resignations among those who did continued to cause shortages. Since some state units brought no enlisted medical personnel with them, men had to be transferred from the line to make up for the deficiency. Although the commissioned medical personnel on National Guard rolls at this point included 1,407 medical officers, 307 dentists, and 81 veterinarians, in addition to 53 militia reserve medical officers who had not been called into the federal service, the number of federalized medical officers fell 60 short of those needed.[29]

Until the entire Guard was federalized in 1916, most of the military experience of militia medical officers consisted of determining fitness for duty, but their ability to make objective decisions was compromised by the fact that the men with whom they were dealing were often friends, patients, and friends of patients. Moreover, many civilian and Guard physicians giving physical exams did not bother to familiarize themselves with the standards and might not even require those being examined to undress. One report maintained that a man with a glass eye had been accepted, and a Medical Corps officer reported that "frequently any one who is strong enough to walk can enlist" in the Guard. Those taken into the Guard in spite of their physical condition might have to be discharged shortly thereafter when it became obvious that they could not function successfully as soldiers.[30]

Nevertheless, Major Gilchrist, who was still detailed to the Division of Militia Affairs (shortly thereafter renamed the Militia Bureau), was encouraged by the progress that had been made by early 1915 toward solving the problems of the Guard's medical organization. He gave the credit for the improvement to the adoption of a uniform organization throughout the Guard, greater support from the states, correspondence courses for interested militia physicians, the elimination of officers whose interest in their responsibilities was minimal, the enrollment of younger doctors, and the use of inspector-instructors to spot deficiencies and bring about improvements.[31]

Five Medical Department surgeons had been made available to work as inspector-instructors with the National Guard east of the Mississippi, usually in areas with which they were familiar. They taught a correspondence course, added to it by personal instruction, and inspected camp sanitation. The great size of the areas to which they were assigned was a handicap, for an officer might be responsible for several states whose medical organizations differed. Instructors' problems were further aggravated by a shortage of textbooks and by the fact that they sometimes received little cooperation from state authorities,

which rendered their work "very trying and extremely difficult." [32]

Uniformity in the operations of the various sanitary units of the National Guard became an important goal. Together with eleven Regular Army post surgeons designated to teach correspondence courses for militia surgeons in areas to which instructor-inspectors had not been sent, instructor-inspectors taught an identical and carefully planned course. Since personal instruction proved especially valuable, when the assignment of a post surgeon teaching such a course was changed, the effectiveness of the course was to a degree reduced. Nevertheless, more than 60 percent of the students taking the course completed it successfully in fiscal year 1916. As a result, a sixth medical officer was assigned to work as an inspector-instructor, and Surgeon General Gorgas concluded that still more officers should be assigned to that position. The National Defense Act requirement that all doctors appointed to or promoted within the Guard pass examinations before boards of Regular Army medical officers also contributed to creating uniformity, but when the units of Texas, New Mexico, and Arizona were federalized in May 1916, too few regular medical officers were available to man the examination boards.[33]

Unfit guardsmen might become the responsibility of the Medical Department because the law allowed men from states that had officially adopted federal standards to be mustered into federal service before undergoing federally administered physical exams. Because of inadequate state examinations, a total of 25 percent of the men in newly federalized units had to be discharged in 1916 as physically unable to do all the duties required of them. The new recruits called up to replace them proved to be no healthier, many ending up in hospitals not long after arriving at the recruit depots. The department's suggestion that a Regular Army medical officer examine all men before they were accepted into federal service was overtaken by events. When the Guard was called out and sent south toward the Mexican border, haste was the order of the day, Medical Corps officers were few, and Medical Reserve Corps officers who were called in to help were sometimes slow in arriving. On occasion, federal physical examinations were given first to Guard medical officers so that those who passed could assist in examining the rest.[34]

Both Guard and Regular Army physicians worked as many as sixteen hours a day conducting physicals and administering the required immunizations against typhoid and smallpox in each mobilization camp. In spite of pressure sometimes brought upon physicians at this point to overlook defects, Regular Army surgeons were never given permission to waive problems that would interfere in the performance of duty. Nevertheless, in the haste, men who were not qualified to serve sometimes slipped through.[35]

The quality of the medical enlisted men of the Guard also left something to be desired. Men "of high quality, . . . medical students of good education," might find the duties beneath their dignity, and others would have to improve markedly, Major Gilchrist believed, if they were to meet federal standards. Furthermore, noncommissioned officers, although often able pharmacists, were not necessarily competent to manage the work of others. Guard line officers contributed to the problem by their failure to appreciate the role the Medical Department wanted the corpsmen to play, too often regarding corpsmen as mere laborers available for

digging trenches and latrines. Under such circumstances, the work of Medical Department sergeants as sanitary instructors for the militia proved so valuable that in fiscal year 1916 three more were named to join the twelve already assigned to this duty. Even so, the Medical Department noncommissioned officer and two privates who were sent to each mobilization camp to assist and train their Guard counterparts sometimes ended up doing both their own work and that of the men they were sent to train because so few guardsmen were willing to do the work of a hospital corpsman.[36]

Supply

The supply situation continued to cause the Medical Department less concern than the shortage of trained personnel, although Surgeon General Gorgas had on hand in December 1914 but half the four-year reserve recommended by the Dodge Commission. He blamed the deficiency at least in part upon the fact that much of the department's reserve had accompanied the force sent to Vera Cruz earlier that year. Rebuilding the reserves would not be easy. The rate at which the warring nations in Europe had been buying up medicines and equipment made it difficult for production to keep up with demand, and 80 percent of the surgical instruments used in the United States were of German manufacture. The surgeon general agreed with other members of the nine-member committee that Secretary of War Garrison had named to investigate potential problems in war production that private industry could handle the demand and that a government monopoly over the production of such items was neither needed nor wise.[37]

In April 1916 Surgeon General Gorgas showed no great anxiety over supply. The Medical Department had on hand the equipment for 20 evacuation hospitals, 3 base hospitals, 44 field hospitals, 41 ambulance companies, and 131 regimental infirmaries and a reserve of supplies that, Gorgas estimated, would last 250,000 to 300,000 men five to six months. He admitted early in 1916 that if an army of 2 million men were to be put into the field, providing adequate supplies of medicine would be extremely difficult. The problem would be exacerbated if control of the sea were lost, since he had made no preparations to make in the United States any items usually obtained abroad. By January 1917 he could no longer keep pace with the National Guard's requirements, and in February he noted that eight to twelve months would be required for the department to acquire and pack everything necessary to meet wartime demands.[38]

Although the volume of supplies and equipment held by the Medical Department left much to be desired—the reserve at its maximum was sufficient for a force only three times the size of the Army rather than four—its management was increasingly efficient. The unit system of supply initiated by Surgeon General O'Reilly had been adopted on a widespread basis so that everything needed by a Medical Department unit, be it a field hospital or a recruiting depot, was carefully recorded, stored together, and ready for use regardless of which department of the Army was responsible for procuring each individual item. Plans called for camp infirmaries to hold a reserve of supplies for regiments and to draw on a base medical depot for replenishment. Base depots, similar to those used in the Civil War, each manned by two medical officers and fifteen enlisted

men, would in turn draw on the major depots in New York, St. Louis, and San Francisco. A reserve medical supply, described as "a movable depot," would move with each division, under the control of the division's chief surgeon, and be replenished as needed from base depots along the line of march. To further standardize medical supplies and to find ways in which to speed production and reduce costs, a committee was organized of representatives from the Army and Navy Medical Departments, from the Public Health Service, and from the Red Cross a few weeks before the United States entered the war.[39]

Standardization was but one of the problems involved in supplying motor ambulances, the only vehicles the Medical Department bought for itself. Design improvements were frequent, and no one type filled all needs, making standardization impractical at this early stage of the use of motor transportation. Surgeon General Gorgas did note the need for "a standard commercial chassis made by a reliable firm" so that spare parts would always be available and pointed out that the motorization of all hospital transportation would "increase its efficiency, and . . . economize in the maintaining of this department." A board that met to consider the question of ambulance design recommended buying 500 "standard ambulance bodies," but when the United States declared war in April 1917, motor ambulances were continuing to come from several sources.[40]

Quality was as much of a difficulty as design. A Keeton Motor Company ambulance shipped to Texas City, Texas, for example, in the spring of 1914, a time when the Medical Department had fewer than twenty motor ambulances, arrived with dead batteries. "The entire machine seemed to have been carelessly put together," the department informed the manufacturer. On a march to Houston it broke down the first day, when "the differential came loose and broke up." Incorrect instructions accompanied a Keeton vehicle sent to Fort Riley, Kansas, and the starter could not be located for some time; the discovery that pushing down the light button, which was twisted to control the light, activated the starter was accidental. Nevertheless, the department continued to buy ambulances, although when one old Keeton was condemned in the Philippines, two models from the White automobile company were bought to replace it. So impressed was Surgeon General Gorgas with motorized transport that in the spring of 1916 he even urged Congress to appropriate money for motorcycles, a few of which the department had been trying out in Mexico, to be used to carry Medical Department messages and field supplies.[41]

The true potential of the motor ambulance for meeting Medical Department needs, as well as the difficulties that vehicle might present, first became apparent in 1916 on both sides of the Mexican border. Initially, trucks and mule-drawn ambulances provided transportation for the sick and wounded within Mexico. When motor ambulances arrived, the harsh punishment to which they were subjected in Mexico, where roads were often nonexistent, demonstrated that the models from the General Motors Company were "cheaply constructed." The lack of shock absorbers led to much breakage of springs, and one of the two types provided by this firm had a body so high that it was easily overturned. The problems experienced with these vehicles were exacerbated by the fact that the only trained mechanics available were those sent in to service the expedition's planes.[42]

The difficulties experienced with motor ambulances along the border encouraged debate over the relative merits of this vehicle and the mule-drawn model. The ambulance company with mule-drawn vehicles had, according to one medical officer in 1916, "fully justified its organization and continued existence." Mules could cover terrain too rough for motor vehicles, but this advantage was at least partially negated by questions about the advisability of subjecting the wounded to the jolting caused by a ride over a surface too uneven for motor ambulances. The motor vehicle could go faster than its mule-drawn counterpart, did not have to stop to be fed, could carry a comparatively large number of patients within a given period, and was, European experience suggested, cheaper to operate. Furthermore, some of the ambulances used by the Army apparently had pneumatic tires to provide a less jarring ride for their passengers, and although a truck designed specifically for Army use had yet to be developed, some commercial models had proved to be very durable even under difficult conditions. Despite the fact that by the end of September 135 motor vehicles were in service in the Southern Department and many more were on their way, the motor ambulance company was still regarded as "experimental." [43]

The supply system established by the Medical Department was very effective, but the magnitude of World War I had not been anticipated in designing plans to meet wartime demands. Occasional difficulties with distribution were inevitable. National Guard physicians were generally ignorant about how to buy supplies in an emergency. The sites of mobilization camps were occasionally changed on short notice, delaying delivery and making for even greater difficulties if the requisitions had not been made in a timely fashion in the first place. The movement of supplies rapidly and in adequate amounts remained the major problem, principally because the Quartermaster Corps, hampered by demands for economy and the need to determine when, whether, and how to convert to motor transportation, was, like almost everyone else, uninspired by any sense of urgency.[44]

Hospitals and Laboratories

The fragile relationship with an unstable Mexico and attempts to prepare for the demands of a major war added to the difficulties traditionally experienced in managing the Army's hospitals and laboratories. Permanent hospitals, whether large or small, had rarely received the attention and the financing they needed, and the work of laboratories in the rest of the United States was curtailed in the interests of meeting the demands upon those near the Mexican border. Surgeon General Gorgas' continued efforts to obtain the money to improve and enlarge aging facilities often met with frustration, especially since the limit on money to be spent on construction undertaken without specific congressional authorization still applied. The hospitals at posts near the Mexican border were expanded to meet the needs of troops that gathered there, but in 1914 capacity did not keep up with demand at Forts Bliss and Sam Houston in Texas or at Fort Huachuca in Arizona. Since, in addition, female nurses were not always available for the posts in the Southwest and both medical officers and hospital attendants often lacked appropriate training, a Southern Department surgeon reported to Gorgas that the "care of the sick and the general

management of these hospitals . . . at times suffered severely." [45]

In 1914 the Army-Navy Hospital became an informal general hospital for the Southern Department and the 2d Division, stationed at the Mexican border. A ward for another fifty beds and a new barrack for sixty hospital corpsmen were built there in 1915, but the waiting list was long, and still more space was needed. The hospital at Fort Bayard remained restricted principally to the treatment of patients with tuberculosis, but its population, too, was slowly growing. Because the funds to complete all of the requisite construction there were difficult to obtain, a ward had to be set aside at Letterman General Hospital in San Francisco to accommodate tuberculosis patients. The existing buildings at Letterman, which served as the hospital for posts in the San Francisco area, were all of wood, and the danger of another disastrous fire was real. Surgeon General Gorgas ordered that all new construction there be of reinforced concrete, but because of the size of the hospital grounds, little expansion could be attempted.[46]

The overseas hospitals that might be needed in the event of a colonial war experienced their share of difficulties, many of which could also have been cured by granting more money to improve or enlarge the facilities. What had been a 12-bed post hospital in Honolulu, Hawaii, only a few years before had by 1916 become a 275- to 300-bed facility, serving both as a post hospital for nearby garrisons and as the general hospital for the entire Department of Hawaii and handling well over 2,000 patients a year. In the Philippines, where one quarter of the Army was stationed in 1914, the hospitals were inadequate in size and required repair. In the Canal Zone, now under a U.S. civilian government, the absence of military hospitals made it necessary for Army personnel and their families to use civilian facilities for all problems that could not be handled by a post dispensary. As a result, while an Army medical officer remained responsible for the overall management of Canal Zone hospitals and sometimes another Army physician might manage an individual facility, the care of the individual hospitalized military patient was not otherwise under the Army's control. Military dependents were charged for the entire cost of their hospitalization rather than merely for subsistence and medication.[47]

Although hospitals had always been important to the Army, the role of laboratories, constantly increasing with the growth of medical knowledge, grew still more rapidly under the stimulus of mobilizing large numbers of troops. The experience gained along the Mexican border provided insight into the vital part they would play if the United States were to become involved in a major war. At a time when venereal disease was regarded as a major threat to the Army's effectiveness, both actual and potential, the laboratory was needed to help in the diagnosis and to follow the progress of the treatment of both syphilis and gonorrhea as well as many other health threats. Routine tests, such as urinalyses and blood counts, were done in the small labs that existed in every hospital, while more complicated work, including testing drinking water for signs of bacteria and pollutants, was assigned to major facilities. The importance of the Army Medical School laboratory also grew during the mobilization, initially because it was responsible for making all vaccines. When the demands of the Mexican situation necessitated moving the Central Department's laboratory into the Southern De-



BASE HOSPITAL AT FORT SAM HOUSTON, TEXAS

partment, the Medical School was assigned the routine work normally done by the Central Department's main facility at Fort Leavenworth, Kansas.[48]

The burden of the 1916 mobilization fell most directly upon the Fort Sam Houston laboratory. Although the size of its staff was increased, additional laboratories had to be set up at El Paso, where the Fort Leavenworth unit was moved in August 1916, and at Nogales, Arizona, a month later. After medical officers discovered that the climate in Texas favored raising guinea pigs, many tests that required the use of these animals and were vital to the correct diagnosis of several diseases were run at the Fort Sam Houston laboratory. The facility also sent out guinea pigs to scientists at El Paso and Nogales. An epidemic, probably paratyphoid (a disease similar to but milder than typhoid), first diagnosed in units along the Mexican border in the early summer, struck the guinea pigs in December, threatening vital diagnostic work. The threat was brought under control by vaccinating breeding females, the chief victims of the disease, by isolating sick animals, and by disinfecting cages. Even after the epidemic was brought under control, the load that the Fort Sam Houston laboratory had to carry remained high, dictating the construction of a new building by early 1917.[49]

Training Along the Mexican Border

The involvement of U.S. forces in the turmoil within Mexico increased with time in the first years of Gorgas' service as surgeon general. As a result, Mexico and the Mexican border became, both literally and figuratively, training areas for the medical officers watching over the health of both U.S. soldiers and foreign nationals. When



FIELD HOSPITAL NO. 7 EN ROUTE TO MEXICO

Gorgas first assumed the duties of his office in January 1914, members of the Army Medical Department were already joining representatives of the Red Cross to care for 5,000 Mexican refugees, soldiers, and civilian camp followers who had crossed the border to escape rebel forces. Ten hospital corpsmen and two sergeants were sent to Fort Bliss, Texas, where the refugees were initially interned in a camp commanded by a medical officer, and four more corpsmen joined them there on a temporary basis. Finding the physicians among the refugees of little assistance in either caring for the sick and wounded or taking measures to prevent outbreaks of disease, the six medical officers sent to the fort promptly began immunizing against typhoid and smallpox, thus nipping incipient epidemics in the bud. Because Medical Department personnel insisted upon high standards of sanitation, the 21.8 per 1,000 death rate experienced by the refugees during their six-month internment, first at Fort Bliss and then at Fort Wingate, New Mexico, was blamed on the hardships they had endured, their debilitated condition when they crossed the border, and their poor morale.[50]

Army units were concentrated north of the border with Mexico throughout 1914 and 1915 in a state of watchfulness, the soldiers for hostile activity, the medical officers for signs of disease. Because the refugees continued to bring typhoid, typhus, smallpox, and influenza with them, constant vigilance was necessary to prevent the reappearance of typhoid and smallpox epidemics. Immunization against both was compulsory in the Regular Army and in federalized National Guard units as well, but medical officers were aware that vaccine did not always prevent disease and concluded that the effectiveness of the ty-

phoid vaccine began to weaken after no more than three years. The source of every typhoid case that did develop was routinely traced so that the reasons for any outbreak could be ascertained and steps taken to prevent further spread. Mosquito control kept malaria rates low, and sanitation reduced the threat of dysentery. At times, medical officers also cared for the casualties resulting from minor incursions by Mexicans into Texas and Arizona, including a few members of the factions contending for power within Mexico.[51]

Although medical officers could rely on sanitation and immunization to limit the threat of the old camp diseases, chiefly typhoid and dysentery, to manageable proportions, they could not be equally confident of their ability to devise a truly effective approach to the prevention of venereal disease. While the stoppage of pay for time lost because of self-inflicted health problems caused alcoholism rates to continue the steady decline that had started in 1907, the new regulation had not produced a comparable trend in venereal disease rates. Army studies offered Surgeon General Gorgas the small consolation that the VD rates in the civilian and military populations were similar, a conclusion that the high rejection rate of recruits because of VD seemed to support. One of the Army's most experienced bacteriologists concluded that syphilis alone was "a greater menace to the public health than any other single infectious disease, not even excepting tuberculosis." [52]

The thought of what was likely to happen to the venereal disease rate when soldiers were far from their families, were alone in a strange environment, and were more likely than ever to become the victims of diseased women, was alarming. Surgeon General Gorgas decided that the medical officer's lecture on the dangers of venereal disease at each post should be appropriately illustrated. Because he had received reports that soldiers might use the prophylactic treatment once—just to have their names on the record should they later discover they had contracted a venereal disease—but then fail to report subsequent sexual contacts, he also suspected that the rule calling for prophylaxis within six hours of exposure was being violated. He therefore urged that prophylactic packets, to be used promptly after sexual activity, be given rather than sold to individual soldiers as the men seemed reluctant to buy these items. In spite of the alarm about VD rates, the packet still did not contain condoms, although the recent introduction of vulcanized rubber made their manufacture both easier and cheaper. As late as 1918 an authority on syphilis noted that "the objections to the use of such a mechanical device are practical and moral" (apparently a common belief), since they were expensive and hard to locate when needed and appeared to make immorality safe.[53]

U.S. Army units first ventured across the border into Mexico at the end of April 1914, when they joined the marines who had just taken Vera Cruz. Since military action was by that time at an end, Army medical officers under Col. Henry P. Birmingham, the expedition's chief surgeon, could again add the health of civilians to their routine responsibilities. They took over the direction of local health authorities in all matters except quarantine from the Public Health Service physicians who had borne that burden during the Marine/Navy phase of the occupation. A Medical Reserve Corps lieutenant who lived in Mexico was made temporary superintendent of the civil hospitals, later to be replaced by a retired U.S. Army officer,

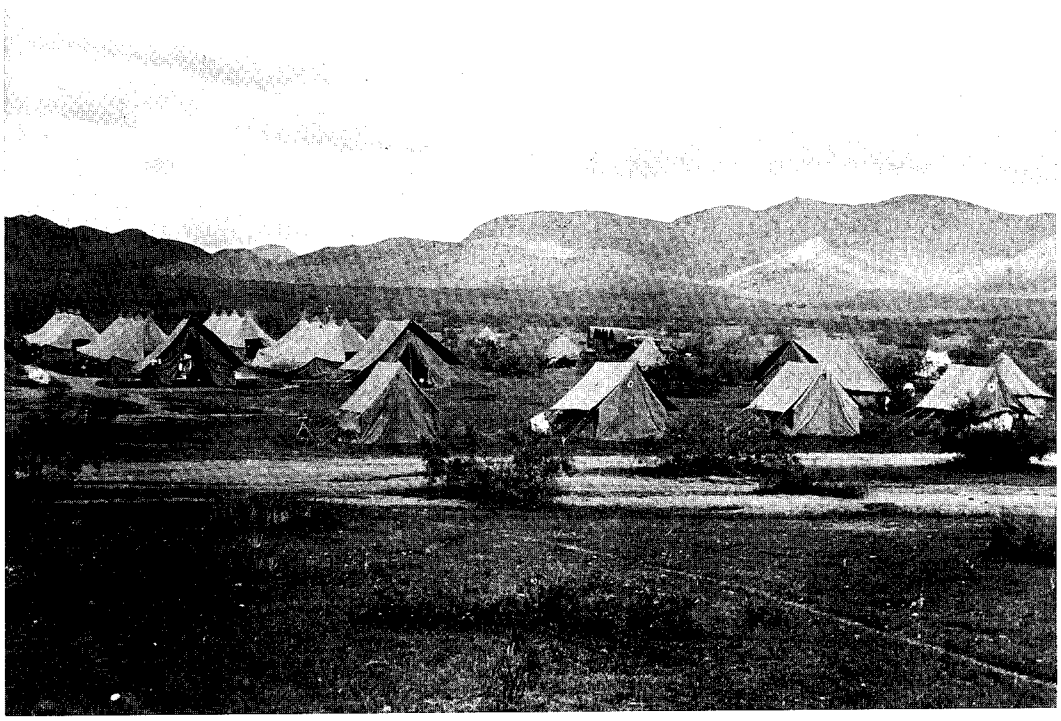
under whom he then served as assistant. To care for their military patients, Army physicians set up a 216-bed field hospital in a preparatory school, "the newest and most modern structure in the city," with modern plumbing and electric lights. The building was large enough to shelter a laboratory and quarters for hospital corpsmen, while the twelve nurses sent in by the Army Nurse Corps were housed in a nearby private building. Two medical officers and twenty-five enlisted men formed an ambulance company. Navy doctors worked under Colonel Birmingham in a separate facility they established for Marine patients, using supplies from the Army.[54]

The burden of the responsibility for civilian and military health was made particularly heavy by the condition of Vera Cruz, "one of the unhealthiest and most disease-ridden cities of the world," where yellow fever, malaria, smallpox, and dysentery were rampant and, according to Colonel Birmingham, the "more or less disorganized state" of the government had resulted in the neglect of sanitation. Army surgeons quickly set to work to immunize the civilian population against smallpox, vaccinating more than 41,000 in the period from 18 May to 30 June. U.S. troops were stationed on the outskirts of the city, where they could use city water and sewers while reducing their exposure to the city's hordes of insects and the diseases they bore. The floors and walls of the buildings occupied by soldiers were disinfected, and a daily dose of three grains of quinine was made mandatory for each man because of the danger of malaria. Experts from the Canal Zone, some of whom had trained under Gorgas, were called in to help improve the city's sanitation, using the techniques he had developed.[55]



HENRY P. BIRMINGHAM

Since city ordinances already in effect allowed authorities to control prostitutes in Vera Cruz, these women were restricted to specific areas, registered, inspected by a medical officer each week and, if diseased, confined in a charity hospital until pronounced cured. Only 25 percent of the registered prostitutes required hospitalization because of venereal disease, but 90 percent of a sampling of the "clandestines" who had escaped regulation were infected. Free prophylactics and educational materials in both Spanish and English were made available at several sites. Colonel Birmingham concluded that "all these measures proved amply effective" and that, as a result, what could have been "an inordinately high rate of venereal infection" was kept at what he regarded as a reasonable level under the circumstances, a noneffective rate for the period from late April through the fall of 1914 of 5.21 per 1,000.[56]



FIELD HOSPITAL AND ITS SURGICAL WARD



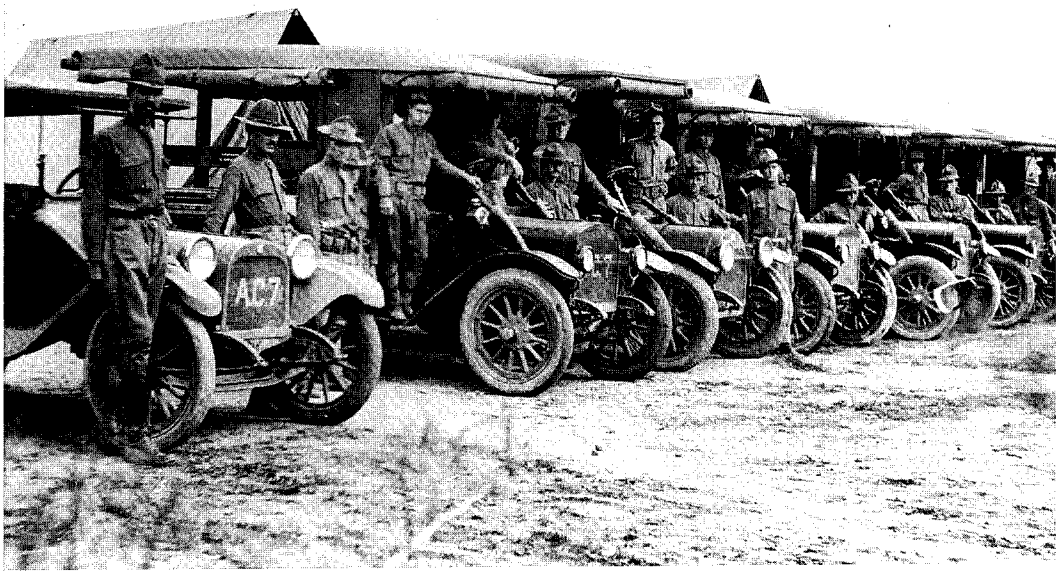
U.S. troops entered Mexico again in 1916, when the situation at the border reached a crisis point after a raid on 9 March by Pancho Villa upon the New Mexican community of Columbus. When Brig. Gen. John J. Pershing led a provisional division across the border, physical and psychological stress was added to the threat of disease. Although National Guard troops were federalized in response to the fear that the situation might get out of hand and many were sent to the border area, only regulars accompanied General Pershing's force in an unsuccessful attempt to run Villa down within Mexico. Medical officers learned at this time, as one of them put it, that "to work with real men and animals and equipment and machines over miles of territory" was "quite different from moving pegs on a map." [57]

General Pershing's punitive expedition was composed of two cavalry brigades and one infantry brigade, all regulars, initially numbering some 5,000 men. Units in the field operated in detachments of varying size stretched out over "an attenuated line of communication." Some of Pershing's officers considered the campaign the most grueling they had ever known. During its active stage, which ended in late June 1916, they chased Villa much as U.S. soldiers had chased the Apaches in the 1880s, when Leonard Wood was first making a name for himself. Like Wood, they discovered that the environment was as difficult an enemy as the Mexicans. The days were very hot, the nights very cold, and violent winds blasted both men and horses with abrasive dust. Pershing's men never went farther than 150 miles south of the border, but the stress they endured was great; horses and men were sometimes inadequately fed as they attempted to live off the land, and some animals died of sheer exhaustion. Physicians left behind with those too exhausted to continue became especially vulnerable to guerrilla attack. Surgeon General Gorgas noted, however, that although service in Mexico involved "a restriction of food, clothing, and shelter quite unparalleled in the history of the United States Army," medical supplies were "plentiful and of good quality" and shipped from the El Paso depot "with remarkable speed, facility, and accommodation. . . ." [58]

Since General Pershing's campaign was conducted by regiment-sized or smaller units, the medical service relied heavily on the regimental organization, backed up by one of the division's two field hospitals set up as a camp hospital and by one of the two ambulance companies from the advance base at Colonia Dublan. Each infantry regiment was usually accompanied by a mule-drawn ambulance, its infirmary, its share of equipment, and two medical officers, but cavalry regiments with Pershing in pursuit of Villa sometimes had to leave most of their supplies and their ambulances behind to move as rapidly as possible. The division surgeon believed that all ambulances should be motorized except those accompanying regiments in the field, which were needed to move patients from areas that motorized vehicles could not reach. Long marches proved so exhausting to Medical Department personnel that the division surgeon urged that transportation be provided for them in the future. Fortunately the health of the men was extremely good in spite of the hardships; the sick rate was under 2 percent. Casualties were light; in 11 encounters from March through May, 31 were wounded and 15 killed, and in the campaign's most disastrous engagement on 21 June, 11 were wounded and 33 killed.



ANIMAL-DRAWN AND MOTOR AMBULANCES



Thus regimental plans for evacuation and hospitalization were never really tested.[59]

When not engaged in the active pursuit of Mexican soldiers, General Pershing's troops fell prey to Mexican prostitutes who swarmed around the camp. The general finally had the prostitutes rounded up and placed in huts behind a formidable barbed wire fence with only one gate, by which he set a guard. For a fee, each soldier was allowed half an hour in the hut of his choice; when he lingered longer, a guard came to fetch him. To leave the compound, the soldier had to visit the prophylaxis station by the gate. The approach of legalizing and controlling prostitution proved to be moderately successful, despite its obvious drawbacks to moralists. The syphilis and gonorrhea rates of the men in Mexico remained low. Nevertheless, venereal disease caused the return of more men to the U.S. than any other health problem, since men with gonorrhea were not up to hard service and those undergoing treatment for syphilis were obviously even less so.[60]

Venereal disease, which afflicted 44 of every 1,000 men on the sick list in General Pershing's force, was but one of several ills encountered by the men in Mexico. "Intestinal disease," including diarrhea, dysentery, typhoid, and paratyphoid, all common diseases in northern Mexico, struck 243 of every 1,000 sick. Paratyphoid was a new threat to health that affected troops along both sides of the Mexican border. Although it had been so rare among U.S. soldiers that in 1914 Medical Department authorities decided not to use a mixed paratyphoid/typhoid vaccine, paratyphoid was identified in 93 cases among Pershing's men and suspected in many more. Malaria was found principally in a regiment that had camped for a lengthy period in a damp area. Disease rates in general were highest where the contact with Mexican civilians was greatest.[61]

Preventing disease among the men of the punitive expedition required eternal vigilance. Although vaccination against paratyphoid prevented its spread, keeping all immunizations current was difficult when soldiers were conducting what was essentially anti-guerrilla warfare. The chief surgeon with the expedition, Lt. Col. James D. Glennan, urged that no civilians be hired until they, too, had been immunized against smallpox, typhoid, and paratyphoid. Washing, boiling, and ironing clothing frequently and thoroughly was necessary to eliminate lice and prevent the spread of infection. An effort was also made at this time to discover how large a role the expedition's veterinarians could play in preventing human disease, but medical officers were not sure how much inspecting cattle and supervising their slaughter contributed to disease prevention in humans. The drive to keep disease rates low was successful in spite of the stress members of General Pershing's expedition endured, since the annual death rate from disease was less than 2 per 1,000 men, as compared with 3 per 1,000 from injury.[62]

The units serving across the border in Mexico formed but a fraction of the entire force called out in 1916 because of the Mexican situation. Although most of the regulars had been moved into the area, the length of the border and the wild country that lay on either side led President Wilson to conclude that the National Guard should also be called out. The Mexicans never attacked in force across the border, and since the entire National Guard was not needed, the Army took advantage of the situation to stage maneuvers, rotating Guard units from state camps to the border so that as many as possible were trained. By the fall

of 1916 a total of 42,000 regulars and 128,000 Guard troops had been involved, 60,000 of whom were totally without previous military experience.[63]

Some difficulties experienced by those guarding the health of these men developed well before the militia troops arrived in the Southern Department, among them supply problems resulting from state government red tape. Because some Guard units brought no ambulances with them, vehicles sometimes had to be hired to take patients from the camp to the hospital. The initial strangeness of Army routines to National Guard medical officers and the relative scarcity of Regular Army medical officers to guide them added to the confusion at mobilization camps. Surgeon General Gorgas sent each camp the equipment and supplies necessary to establish its own camp hospital so that field hospitals could be kept packed and ready to move. Some militia physicians, apparently unable to believe in the adequacy of the camp hospital because their equipment was scanty in comparison to that of civilian facilities, set up field hospitals for their sick and injured, though this move jeopardized the mobility that was the reason for the field hospital's existence.[64]

In the Southern Department, men still unfamiliar with military sanitation were gathered in camps to accommodate from 4,000 to 15,000 that were reminiscent of those seen during the Spanish-American War. To ensure against a repetition of the disaster of 1898, seven "general sanitary inspectors" were appointed to report to the adjutant general on the conditions they found while preparing camps for the arrival of the militia. Another sanitary inspector, who might be the district surgeon, one of the general inspectors, or even a medical officer, functioned exclusively as district inspector in each district. The regulations required that at least one sanitary inspector, who had to be a Regular Army medical officer, be assigned to each camp along the border. He reported problems that he noticed both to the commanding officer, who had the responsibility for seeing that the defects were remedied, and, through one of the general inspectors, to the surgeon general. The camp sanitary inspector was also to instruct "the untrained troops in the care of their camps and personal hygiene." Because of the shortage of Regular Army surgeons, the camp inspector also had to function as camp surgeon. Some older Guard line officers, convinced that age alone gave a superior understanding of sanitation, ignored the advice of younger sanitary inspectors and even assigned their own medical officers the role of camp surgeon. In some instances, this move could be justified by the fact that physical exams and the work of sanitary inspection sometimes overwhelmed the single Medical Corps officer detailed to each camp.[65]

Recognizing the importance of what he called "the human factor" to the maintenance of proper sanitary standards, Surgeon General Gorgas had no doubt that instructing these men about sanitation was crucially important. Each line officer and each enlisted man would have to be convinced of the need "for almost meticulous care in carrying out many rules which appear to them more or less unimportant," since, as one surgeon put it, they were not likely to "appreciate the necessity for sanitary precautions except in an academic way." General orders issued in July 1916 required hand washing after every use of the latrine and bathing at least twice a week. The surgeon general urged daily baths during the summer, a step made all the more advisable by the presence of typhus, a

louse-borne disease, among the Mexicans. Since the Mexican laborers working on the roads used by the U.S. forces were infested with vermin, caring for them was instructive for medical officers, who even devised an "inexpensive plant" that could delouse a man and his clothing every twenty minutes. They were also prepared, should typhus break out among the troops, to provide "a completely equipped bath and disinfecting train" to move its victims. In August a "systematic scheme of training," to be conducted at every camp "as far as circumstances . . . permitted," was started in the Southern Department, with the pupils to be enlisted men and junior officers, especially those in the militia and the Medical Reserve Corps.[66]

Like the camps, the hospitals set up to care for the men serving along the Mexican border formed a training ground, in this instance for medical personnel. They included 200-bed base facilities at El Paso and at San Antonio, Texas, where an early patient was a member of a new and hardy breed, a victim of an airplane crash who reportedly walked for two days from the site of the disaster to reach San Antonio. Patients more fortunate than the aviator arrived at San Antonio on a 160-bed hospital train of ten Pullman cars especially constructed for this purpose, staffed by Medical Department officers and enlisted men and seven members of the Nurse Corps. This train made occasional runs from San Antonio to the Army-Navy Hospital at Hot Springs, Arkansas, or to the West Coast. A temporary facility of 150 beds was built at Columbus, New Mexico, and temporary additions went up at San Antonio, where the total number of beds reached 750, and at El Paso, for a total of 900 beds. New base hospitals of 500 beds each were put up at Brownsville and Eagle Pass, Texas, and at Nogales, Arizona. Six smaller 100–350 bed facilities, presumably classified as camp hospitals, were constructed in Texas and one each in Arizona and New Mexico. By the end of October 1916, 4,600 hospital beds were available to the troops in the Southwest. Each hospital had an operating room with an X-ray machine and a sterilizer and a small laboratory, and all but three of these facilities was staffed by the Nurse Corps and usually by Medical Corps and Medical Reserve Corps officers and Medical Department enlisted, assisted by carefully chosen officers and men from the National Guard.[67]

Six "permanently organized field hospitals" and ambulance companies with motor transport as well as three provisional field hospitals and ambulance companies with mule-drawn vehicles had also served in the Southern Department by the end of fiscal year 1916, and state troops brought thirty-two more field hospitals with them. Field hospitals were "merely meagerly equipped shelters," where in wartime the sick and wounded could be held until sent back to a base hospital. Two field laboratories were also set up, ready to be moved wherever they might be needed to assist in diagnosis.[68]

Among the health problems threatening effectiveness in the Southern Department, venereal disease caused the most concern. In spite of instruction on the price that could be exacted by sexual incontinence, "the human factor" remained a major problem. Two Texas forts, Sam Houston and Bliss, eventually developed the highest VD rates of any Army post in the country. Near the border in the Brownsville area, the prostitutes, few in number, apparently did such a thriving business that all were soon infected with both venereal disease and pubic lice. In the course of a

year, courts-martial convicted seventeen of the soldiers in the Brownsville area for contracting venereal disease when they were not recorded as having used prophylaxis. Along the border at Nogales one surgeon attributed the low infection rate of his infantry regiment, where 5,401 prophylactic treatments were recorded in a year, to the absence of saloons in the area, "venery associated with drunkenness" being "a serious menace." [69]

Maj. Henry J. Nichols, now head of the El Paso laboratory, believed that the huge size of the National Guard camps tended to make access to prostitutes difficult, and the incidence of sexually transmitted ills among the Guard troops in his area was low, 44 per 1,000 men. This rate, roughly one-third of that of the regulars in the area, was attributed to either the "greater moral restraint" of the militia or the "failure of medical officers to detect and report many cases as required by orders." [70]

Apparently many officers assumed that their men inevitably needed the services of prostitutes, and the stories that the public heard about the drunkenness and debauchery of the camps, surrounded and engulfed by saloons and brothels, did not suggest that access to prostitutes was necessarily difficult. Mexican prostitutes were known to boast of serving 40 to 60 soldiers a day, and medical officers encountered one woman with syphilis who had had 120 customers in the two days preceding their discovery of her disease. Although some attempts were made to examine prostitutes regularly, no one in the United States adopted the approach General Pershing used to the problem in Mexico. Some officers reported that their problems with discipline diminished when they closed down the brothels and saloons frequented by their men.[71]

In 1916 another potential threat to health developed when cases of paratyphoid began to appear in significant numbers in National Guard troops, especially those in the area of Mission, Texas, although prompt action prevented any extensive spread. The affected regiments, principally New York State troops, were quarantined, victims sent to civilian hospitals, and carriers isolated, while the use of a triple vaccine was initiated to protect against typhoid and both A and B paratyphoid. In fiscal year 1917 the Army had 410 cases, of which 296 with 4 deaths were among the men of the federalized National Guard and 114 among regulars.[72]

With the new recruits called in during the Mexican crisis, measles also remained a significant problem, and complications, including pneumonia, empyema, and middle ear infections, continued to cause high death rates. The increase in the number of recruits in 1916 brought an increase in the number of cases of measles from 555 in 1915 to 1,247, with 9 deaths. An epidemic of pneumonia that erupted in November 1916 and lasted until April 1917 was blamed in part on measles, from which bronchial pneumonia often resulted, as well as on mumps and influenza. The outbreak, which was limited to Texas, Arizona, and New Mexico, resulted in 611 cases of lobar pneumonia with 103 deaths and 68 cases of bronchial pneumonia with 29 deaths. Surgeon General Gorgas believed that using serum had kept the death rate from climbing even higher.[73]

A study of regiments suffering the highest rates of disease along the Mexican border in 1916 led to testing the men of two southern units for hookworm. More than half the soldiers from Alabama tested positive, as did almost a third of those from Mississippi, but a Texas regiment had a 6-

percent rate. The investigation demonstrated that soldiers with hookworm were much more likely than those not harboring this parasite to contract measles and to have serious complications when they did. The men found to be infected were all treated before their units were demobilized, and Surgeon General Gorgas recommended that in the future all men from hookworm-infected areas be tested before they left the mobilization camp.[74]

Medical Department efforts to prevent nonsexually transmitted diseases among the soldiers along the border brought impressive results, for the sick rate remained below 2 percent. The contrast in the disease rates with that in the camps of the Spanish-American War showed the value of immunization and also suggested that much had already been learned about how to impress neophyte soldiers and their officers with the importance of camp sanitation and to indoctrinate them into its mysteries. Long marches also taught that greater care would have to be exercised in weeding out those who were unfit, many who seemed sound in camp proving not to be up to the "daily stresses of burden carrying" on a march.[75]

Virtual unanimity characterized appraisals of the value of the Mexican border experience. All seemed to agree with the National Guard physician who noted that "the maneuvers were uniformly most interesting and instructive for officers and men." The authors of the Medical Department's mammoth history of World War I noted that the mobilization had done more to inspire improvements in the supply situation than had the outbreak of the war in Europe and that the Army's "sanitary conscience" had been raised to a high point when the United States entered that conflict. One surgeon maintained that the Mexican border experience had shown a clear need for a considerable increase in the size of the medical reserve and that it suggested, as Colonel Munson had also theorized, that even 7 physicians for every 1,000 men would not be a high enough ratio should the United States become involved "in a war of the first magnitude." Because of his experiences in 1916, yet another Army surgeon concluded that an Army-wide policy on dealing with prostitution was necessary. Still others called for a systematization of the Army's approach to field sanitation, which should not be left up to "chance and individual caprice." Surgeon General Gorgas, too, considered the experience of the 1916 mobilization "invaluable." He concluded that it showed that "military medical administration," and specifically "the rendering and keeping of reports and records of sick and wounded and the handling of other essential papers," was still a weak point in the Medical Department's operations.[76]

The training maneuvers along the Mexican border in 1911 had involved the use of planes, whose pilots were assigned to the Signal Corps. A prototype of a plane designed to serve as an ambulance had been tried out in January 1910. Yet little was accomplished to create a medical service specifically for aviators before the United States entered World War I in April 1917. According to the Medical Department's history of World War I, "No division having to do with aviation existed in the Surgeon General's Office, but some thought had been given . . . to what should constitute the physical requirements for admissions to the aviation service." In 1912 the Medical Department had designed a physical examination for would-be pilots that strongly resembled the one given to all Army recruits, with

added emphasis on heart, eyes, and ears, and especially balance, but this effort apparently had not completely satisfied the head of the Aviation Section of the Signal Corps. The department's "partial study" of the physical standards for flyers set by major European nations in an effort to design a better examination proved fruitless, and "preparation for war by way of a Medical Aviation Service had gone no further than this when war came in 1914." The next test to be devised was based on existing requirements modified by information derived from physiology textbooks, but it proved so rigorous that few could pass it until it had been changed.[77]

By June 1916, when the National Defense Act assigned the responsibility for accepting or rejecting all candidates for the Aviation Section of the Signal Corps to a five-member board, two of whose members were to be medical officers, the quest for adequate physical standards for aviators was still under way. Although Lt. Col. Theodore C. Lyster of the Medical Corps and two Signal Corps officers were named in 1916 to a board to develop the physical standards to guide such decisions, their recommendations and the orders that the adjutant general based on them were not issued until May 1918, after the United States had entered the war. At this time, Colonel Lyster was required to add the Medical Department's "aviation work" to his other duties, thus becoming the first Army medical officer to be assigned specifically to examine candidates for the Aviation Section.[78]

Lessons Learned From Europe

The experience of the troops in the Southwest was not the only source of insight into the difficulties U.S. forces might encounter as participants in a major conflict, nor were physical standards set for pilots by the warring nations the only subject of interest to Americans in Europe. The Medical Department's history of World War I recorded that in 1917–1918 "our early arrangements . . . were influenced to a considerable extent by what we had learned before we entered the war, from the experience of our future allies and enemies." U.S. physicians, both civilian and military, Navy as well as Army, had long been interested in what the medical services of European armies were doing. Medical officers who happened to be in Europe at the time the conflict broke out were detailed to serve as observers with the various armies involved, and from time to time the War Department sent others over to join them. Six were sending back reports and observations in the late summer of 1916, when the surgeon general's annual report for the fiscal year was being prepared. The work of these officers, Gorgas noted, was "a matter of great assistance to the War Department and of particular advantage and satisfaction to the Medical Corps." Some American civilians, having worked with small groups from U.S. medical schools that assisted the medical services of one or another of the belligerent nations and having been "imbued with the spirit to serve in their professional capacities," wrote journal articles about what they saw. The Army Medical Department itself also collected pertinent articles from European journals and other publications concerning war surgery on the nervous system and published them for the enlightenment of U.S. physicians.[79]

Among the observations sent back by Medical Department representatives in Europe were those of Lt. Col. Frank R. Keefer, who emphasized the difficulty of

maintaining proper hygiene and sanitation in the trenches, where the men were constantly wet and "tormented by a variety of insects," including lice. Lt. Col. William J. L. Lyster concluded that when American troops joined the war in Europe, they should take medical consultants with them, a member of each specialty "for each group of casualties," physicians who would study both the administrative problems of their specialty as practiced in a military context and the medical problems. An observer who worked with hospital units sent to Germany and Austria in 1916, having resigned his reserve commission to do so with the guarantee that it would be returned to him when he got back from Europe, urged greater attention to preparedness by the U.S. medical profession, both civilian and military. The Army Medical Department also learned that the French preferred light-bodied ambulances to heavier models because they were more maneuverable and easier to free from the mud when they had to leave the road to allow military traffic to get by. Based on reports he had received about the successful use of dogs to search for the wounded on the battlefield, Surgeon General Gorgas was convinced that the department should begin training animals for this purpose. And after months of service in the Balkans, Maj. Clyde S. Ford informed the readers of the *New York Medical Journal* that he was convinced that "no doubt . . . future changes in national frontiers will be effected more permanently by those who eat garlic than by those who do not." [80]

A major conclusion drawn by American observers was that the nation could not wait until it entered the war to take the necessary steps to form a backup system of base hospitals. As a result, the Army began working with the Red Cross' new Military Relief Division to create such a network, using the Army's 500-bed base hospital as a model. The National Defense Act allowed the president to detail up to five Medical Corps officers to work with the Red Cross as it prepared to assist the Army in the event of war. Under the guidance of Colonel Kean of the Medical Corps, the first director general of the Military Relief Division, the Red Cross adopted the approach suggested by Dr. George W. Crile of Cleveland, Ohio, who had operated an American hospital in France, turning to the staffs of large civilian hospitals to form the basis for the new organizations.[81]

By the time the United States entered the war, more than thirty such teams had been formed. In October 1916 Crile's unit from Cleveland's Lakeside Hospital was mobilized in Philadelphia so that the public could see what such a unit entailed and appreciate that it was not a hospital building but a hospital staff. The staffs of institutions too small to create full-sized hospitals could either form the basis upon which a larger unit could be built or serve as a camp hospital. The Red Cross provided the necessary equipment for all facilities, but Army authorities made decisions concerning the nature and quantity of the equipment. With the guidance of future surgeon general Major Patterson, the Red Cross also organized forty-five ambulance companies, but the judge advocate general ruled that they could not be called in to assist the Army unless war had begun or was imminent. As a result, none of the Red Cross units was mobilized for the Mexican crisis.[82]

Principally because of the experiences both of observers in Europe and of medical officers in the conflict with Mexico, the leaders of the U.S. Army Medical Department were aware before 1917 of the general na-

ture of the difficulties their organization might face if the nation were drawn into the European conflict. The National Defense Act of 1916 had created the framework upon which a wartime personnel expansion could be based. A system for the efficient handling of supplies was being devised, but a sufficient reserve had not yet been built up, and in the early months of 1917 the prospects for speedily enlarging it were not good. The men who would have to be called up if the United States entered the European war were not yet trained. Many months would be required for a thousand experienced medical officers to train 29,000 physicians in the intricacies of military medicine, sanitation, and military medical administration and for enlisted men already familiar with their Medical Department duties to assist Regular Army physicians in training an additional 260,000 or more new department recruits. Widespread unwillingness to believe that the United States would in fact be drawn into the war in Europe had caused Medical Department preparations for it, like those of the rest of the nation, to progress slowly. In March 1917, however, a sense of urgency was finally created with the resumption of unrestricted submarine warfare by Germany and the publication of a secret note suggesting that it would form a military alliance with Mexico if the United States joined the war on behalf of the Allies. On 6 April, still unprepared, the United States entered "the most formidable military contest of all time." [83]

NOTES

1. An excellent discussion of the prevalent attitudes toward preparations for war can be found in John P. Finnegan, *Against the Specter of a Dragon.*

2. Mahlon Ashford, "The Most Practicable Plan for the Organization, Training and Utilization of the Medical Officers of the Medical Reserve Corps of the United States Army and Navy and of the Medical Officers of the Officers' Reserve Corps of the United States Army in Peace and War," p. 126; Marvin A. Kriedberg and Merton G. Henry, *History of Military Mobilization in the United States Army, 1775–1945*, p. 189; James L. Abrahamson, *America Arms for a New Century*, pp. 92–100, 151, 162–76; War Department, *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*, 1916, pp. 20, 24, and 1917, pp. 121–22, 124 (hereafter cited as WD, *ARofSG*); James G. Harbord, *The American Expeditionary Forces*, p. 22.

3. Gorgas was appointed surgeon general with the rank of brigadier general on 16 January 1914 and was promoted to major general, the first surgeon general to attain this rank, on 4 March 1915. See James M. Phalen, *Chiefs of the Medical Department, United States Army*, pp. 91–92.

4. Hearings Before Committees on Military Affairs of United States Senate and House of Representatives, 64th Cong., 1st Sess., pp. 572–73, 578–80, 627, 689, 695–97, 719–20 (hereafter cited as Sen/HofReps MilAffs Cmte Hearings), in Record Group (RG) 287, National Archives and Records Administration (NARA), Washington, D.C.

5. Ibid., pp. 578, 627, 688 (remaining quotations), 695–97 (first quotation), 720–21, RG 287, NARA.

6. Ibid., pp. 578 (quotation), 697, RG 287, NARA; WD Bull 16, 22 Jun 1916, p. 40.

7. Sen/HofReps MilAffs Cmte Hearings, pp. 578, 583, 866–67, RG 287, NARA; WD, *ARofSG*, 1916, p. 233.

8. Finnegan, *Against the Specter*, p. 155.

9. Percy M. Ashburn, *A History of the Medical Department of the United States Army*, p. 256 (first quotation); WD, *ARofSG*, 1916, pp. 16 (second quotation), 194, and 1917, pp. 11, 118; Phalen, *Chiefs*, p. 92; Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607–1939*, p. 148; "Medical Preparedness and the Army," p. 575; Louis A. LaGarde, "Relation of the Civilian Physician to National Preparedness," p. 240; War Department, Surgeon General's Office, *The Surgeon General's Office*, p. 75 (hereafter cited as WD, SGO, *SGO*); "Current Comment," p. 1308; George F. Keenan, "Our Medico-military Responsibility," p. 13; Edward L. Munson, "The Training of Medical Reserve Officers," p. 714; WD Bull 16, 22 Jun 1916; William B. Banister, "The Medical Mechanism for War in the U.S.," p. 411; Paul F. Straub, *Medical Service in the Campaign*, p. 129. Munson was promoted to colonel on 15 May 1917.

10. Edward L. Munson, "Military Preparedness From the Medical Standpoint," p. 447 (first two quotations); Keenan, "Medico-military Responsibility," pp. 14 (third quotation), 17; Charles H. Mayo, "Medical Service in the United States Army," pp. 351–52 (remaining quotations); Hermann Hagedorn, *Leonard Wood*, 2:148, 169; Edward M. Coffman, *The War To End All Wars*, pp. 15–16.

11. Bayne-Jones, *Preventive Medicine*, pp. 148–49.

12. Phalen, *Chiefs*, pp. 88, 92; Ltr, William C. Gorgas to Mamie, 27 Aug 1913, Gorgas Family Papers, W. S. Hoole Special Collections Library, University of Alabama (UA), Tuscaloosa, Ala.; Marie D. Gorgas and Burton J. Hendrick, *William Crawford Gorgas*, pp. 302, 305; WD Bull 16, 22 Jun 1916, p. 9; John M. Gibson, *Soldier in White*, pp. 39–40, 212.

13. Quotations from Gorgas and Hendrick, *Gorgas*, pp. 296, 301, 304. See also ibid., pp. 302, 305; Beryl Williams and Samuel Epstein, *William Crawford Gorgas*, pp. 159–60; Hanson W. Baldwin, *World War I*, pp. 77–79; Franklin H. Martin, *Major William Crawford Gorgas, M.C., U.S.A.*, pp. 55–56; Gibson, *Soldier in White*, pp. 231, 296, 299, 301–02, 304–05.

14. WD, SGO, *SGO*, pp. 126, 137, 218, 246; Robert S. Henry, *The Armed Forces Institute of Pathology*, pp. 150, 157; War Department, *[Annual] Report of the Secretary of War*, 1917, 1:138 (hereafter cited as WD, *ARofSW*, date); Preliminary Inventory of RG 112, pp. 30–32, NARA.

15. WD, *ARofSG*, 1914, pp. 13, 154, 1915, p. 157, 1916, p. 194, and 1917, p. 122; WD, SGO, *SGO*, p. 75; Elbert E. Persons, "Special Article," pp. 406–07; Banister, "Medical Mechanism," p. 413; Weston P. Chamberlain, "Care of Troops on the Mexican Bor-

der," pp. 1576–77; Mahlon Ashford, "Most Practicable Plan," p. 125; *Field Service Regulations*, 1914, p. 206; Reuben B. Miller, "The New Manual for the Medical Department," pp. 309–10, 314; Paul F. Straub, "Medical Service in the Campaign," p. 695; Sen/HofReps MilAffs Cmte Hearings, pp. 624, 629, 695–97, RG 287, NARA.

16. Initial quotations from "Is the Medical Corps of the Army Worth While," pp. 660–61; final quotation from "Current Comment," p. 1308. See also Banister, "Medical Mechanism," p. 418; William G. Rothstein, *American Physicians in the Nineteenth Century*, pp. 287, 294; WD, *ARofSG*, 1909, p. 126, 1916, p. 194, and 1917, p. 291; Sen/HofReps MilAffs Cmte Hearings, pp. 612–22, RG 287, NARA.

17. WD, *ARofSG*, 1914, p. 149, 1916, p. 220, and 1917, pp. 298–99, 310; "Current Comment," p. 1308.

18. WD Bull 16, 22 Jun 1916, p. 40; Keenan, "Medico-military Responsibility," p. 13; WD, *ARofSG*, 1914, p. 154, 1915, pp. 157–58, 1916, p. 195, and 1917, p. 292; WD, SGO, *SGO*, pp. 82–83; LaGarde, "Relation," pp. 241–42.

19. Harold Hays, "The Camp of Instruction for Officers of the Medical Reserve Corps, U.S. Army," p. 263 (first quotation); William O. Owen, "Relation of the Army Medical Corps and the Medical Reserve Corps to the Medical Corps of the Organized Militia," p. 555 (second quotation); S. H. Wadhams, "Military Preparedness From the Medical Standpoint," p. 448; M. A. W. Shockley, "The Correspondence Course for Officers of the Medical Reserve Corps," pp. 64, 67; Sen/HofReps MilAffs Cmte Hearings, p. 581, RG 287, NARA.

20. Joseph C. Bloodgood, "The Tobyhanna Camp," pp. 118, 122 (quotation); Hays, "Camp," p. 263; WD, *ARofSG*, 1915, p. 170; S. C. Stanton, "The Sparta Encampment," p. 115; "Camps of Instruction for Medical Officers," p. 722.

21. WD, *ARofSG*, 1915, pp. 81–82, 159, 1916, p. 195, and 1917, p. 122.

22. Ibid., 1915, pp. 81–82, 1916, pp. 16, 195, and 1917, p. 122; Chamberlain, "Care of Troops," pp. 1574, 1577; WD Bull 16, 22 Jun 1916, pp. 12–13.

23. WD, *ARofSG*, 1914, pp. 159–60, 1915, pp. 160–61, 1916, pp. 19, 197, and 1917, pp. 22–23, 123, 226–27; Chamberlain, "Care of Troops," p. 1577.

24. WD, *ARofSG*, 1914, pp. 131, 160, 1915, p. 161, and 1917, p. 153, 296 (quotations).

25. Ibid., 1915, p. 82, 1916, p. 149, and 1917, p. 123; "What About the Sanitary Private?," pp. 326–27.

26. WD, *ARofSG*, 1914, pp. 156–57 (second quotation), 158 (first quotation), 1915, pp. 12, 160, and 1917, p. 119; Sen/HofReps MilAffs Cmte Hearings, pp. 627–28, RG 287, NARA.

27. WD, *ARofSG*, 1916, p. 197; WD Bull 16, 22 Jun 1916, pp. 10–11; WD, SGO, *SGO*, pp. 76–77.

28. WD Bull 16, 22 Jun 1916, pp. 9, 18–20; WD, *ARofSG*, 1916, p. 16; WD, SGO, *SGO*, p. 78; Cassedy, *Medicine in America*, p. 69.

29. Div of Militia Affs Cir 18, 23 Dec 1914, p. 1 (quotation); WD, *ARofSG*, 1914, p. 173, 1915, pp. 168–69, 1916, p. 206, and 1917, pp. 122, 316–17; WD Bull 18, 7 Jun 1913, p. 12 (58–210, JAG, 17 May 1913); Harry L. Gilchrist, "The Necessity for a Uniform Organization for the Medical Corps of the National Guard," p. 22; United States (U.S.), National Guard Bureau (NGB), *Report on Mobilization of the Organized Militia and National Guard of the United States, 1916*, pp. 99–100.

30. William N. Bispham, "Sanitary Service With National Guard Troops," p. 47 (quotation); WD, *ARofSG*, 1916, pp. 207–08, and 1917, pp. 115–16, 123; U.S., NGB, *Report on Mobilization*, pp. 106–07; W. H. Blodgett, "The Doctor on the Border," pp. 432–33.

31. WD, *ARofSG*, 1914, p. 170, and 1915, pp. 168–69; Kriedberg and Henry, *Military Mobilization*, p. 194; William S. Terriberry, "The Medical Service in the Organized Militia," p. 399.

32. WD, *ARofSG*, 1914, p. 172, 1915, p. 170 (quotation), and 1917, p. 123.

33. Ibid., 1915, p. 170, 1916, pp. 206–07, and 1917, p. 317; Chamberlain, "Care of Troops," p. 1573; "Report of the Chief, Bureau of Militia Affairs, 1915," pp. 220–21.

34. WD, *ARofSG*, 1917, pp. 114–16, 121; John K. Mahon, *History of the Militia and the National Guard*, p. 152; Finnegan, *Against the Specter*, pp. 166–67; U.S., NGB, *Report on Mobilization*, pp. 4–5, 53–56, 108.

35. WD, *ARofSG*, 1916, p. 20, and 1917, p. 115; U.S., NGB, *Report on Mobilization*, pp. 54, 70.

36. WD, *ARofSG*, 1915, p. 169, 1916, p. 207, and 1917, pp. 114, 117, 122–23 (quotation); J. Harry Ullrich, "Sanitary Troops—State and Federal," p. 547; Bispham, "Sanitary Service," p. 44.

37. Banister, "Medical Mechanism," p. 415; WD, *ARofSG*, 1914, p. 179, and 1917, p. 323; Kreidberg and Henry, *Mobilization*, p. 234; Frederick C. Huidekoper, *Military Unpreparedness*, pp. 494–95; WD, SGO, *SGO*, p. 61.

38. WD, SGO, *SGO*, p. 61; Sen/HofReps MilAffs Cmte Hearings, pp. 578–80, 583, 866–67, RG 287, NARA; WD, *ARofSG*, 1917, p. 317.

39. Henry I. Raymond and Edwin P. Wolfe, "Duties of Medical Supply Officers and Their Methods," p. 21 (quotation); Banister, "Medical Mechanism," p. 411; H. C. Fisher, "Preparedness of the Medical Department for War," p. 125; WD, SGO, *SGO*, 1:220–21, 559; Mary C. Gillett, *The Army Medical Department, 1818–1865*, p. 183.

40. Memo, P. Halloran to Col Fisher, 12 Nov 1914 (first quotation), and Mtg Mins, H. W. Jones, Recorder, 19 Feb 1917 (third quotation), both Entry 28, RG 112, NARA; WD, *ARofSG*, 1917, pp. 163, 245 (second quotation).

41. Ltrs, H. D. Snyder to Keeton Motor Co., 28 April 1914 (quotations), and Henry Raymond to SG, 8 and 19 May 1914, Entry 28, RG 112, NARA; Kent Nelson, "An Army Motor Ambulance," p. 152; WD, *ARofSG*, 1915, p. 164, and 1916, p. 162; Huidekoper, *Military Unpreparedness*, pp. 494–95; WD, SGO, *SGO*, p. 115; Sen/HofReps MilAffs Cmte Hearings, pp. 855–57, RG 287, NARA.

42. Quotation from Ltr, CO, Ambulance Co 3, to SG, 10 Oct 1916, Entry 28, RG 112, NARA. In loc. cit., see Ltr, Percy L. Jones to SG, 23 Oct 1916; Mtg Mins, H. W. Jones, 19 Feb 1917; and Ltr, Walter McCaw to SG, 12 Mar 1917, esp. "Distribution of Motor Ambulances, Southern Department." See also George C. Clendenen, *Blood on the Border*, p. 226; Haldeen Braddy, *Pershing's Mission in Mexico*, p. 62; WD, SGO, *SGO*, p. 71.

43. Mahlon Ashford, "A Proposed Motor-Ambulance Company," pp. 303 (quotations), 304–06, 394; E. C. Jones, "Transportation of Ambulance Companies," pp. 429, 431–33; WD, *ARofSG*, 1917, p. 149; Chamberlain, "Care of Troops," p. 1576; Norman M. Carey, Jr., "The Mechanization of the United States Army, 1900–1916," M.A. thesis, pp. 40–43, 59–60, 77, 84–85, 100–101; Konrad F. Schreier, Jr., "Army Motor Transport Won Spurs in Mexico," p. 9.

44. WD, *ARofSG*, 1917, pp. 114, 117; Fisher, "Preparedness," p. 127; WD, SGO, *SGO*, 1:61, 221–22; Erna Risch, *Quartermaster Support of the Army*, p. 598.

45. WD, *ARofSG*, 1914, pp. 174–76, 178, 1915, p. 82 (quotation), 1916, p. 211, and 1917, pp. 112–13.

46. Ibid., 1914, pp. 114, 131, 177–78, 1915, pp. 140, 172–73, 175, 1916, pp. 159, 162–63, 168, 171, 210, and 1917, pp. 221, 227, 236, 237, 240; Sen/HofReps MilAffs Cmte Hearings, p. 871, RG 287, NARA.

47. WD, *ARofSG*, 1914, pp. 176–77, 1915, p. 144, 1916, pp. 89, 176, 178–79, and 1917, pp. 109, 244–45, 249–50; "History of Military Records," pp. 3–5, Ms C16, Albert E. Truby Papers, National Library of Medicine (NLM), Bethesda, Md.; Sen/HofReps MilAffs Cmte Hearings, pp. 868, 870, RG 287, NARA.

48. WD, *ARofSG*, 1915, p. 148, 1916, pp. 17, 162, 181, and 1917, pp. 121, 254.

49. Ibid., 1917, pp. 156–57, 256–57, 267.

50. Ibid., 1914, pp. 83, 164; Louis C. Duncan, "The Wounded at Ojinaga," pp. 411–13, 415; Richard Johnson, "My Life in the U.S. Army, 1899 to 1922," p. 174, Spanish-American War, Philippine Insurrection, and Boxer Rebellion Veterans Research Project, Military History Research Collection, U.S. Army Military History Institute, Carlisle Barracks, Pa.; Mahon, *National Guard*, p. 151.

51. Clendenen, *Blood*, p. 180; WD, *ARofSG*, 1915, pp. 51, 64, 81, 121, 169, 1916, pp. 12, 24, 30, 57–58, 72, 91, 96–98, 111, 113, 141, 145, 151, 186, 208, and 1917, pp. 13, 15–16, 27, 33–34, 48, 59, 60, 68, 75, 116, 125, 129, 131, 274; Charles F. Craig, "The Occurrence of Endamoebic Dysentery in Troops Serving in the El Paso District From July 1916 to December 1916," pp. 286, 296, 302, 423, 427–28, 434; Edgar F. Haines, "The Modern Treatment of Amoebic Dysentery," pp. 816, 818; Glenn I. Jones, "The Treatment of Intestinal Amoebiasis," pp. 982–83; G. Foy, "Health in the United States Army," pp. 292–93; Henry J. Nichols, "Possible Reasons for Lack of Protection After Antityphoid Vaccination," pp. 267–68; Eugene R. Whitmore, "Antityphoid Vaccination," pp. 259, 262, 264; William J. L. Lyster, "Present Status of Artificially Treated Drinking Water in the Field," p. 401; Banister, "Medical Mechanism," pp. 409–10.

52. Edward B. Vedder, "Prevalence of Syphilis," pp. 309 (quotation), 310; WD, *ARofSG*, 1914, p. 149, 1915, pp. 11, 68, 151, 1916, pp. 16, 75, 113, and 1917, pp. 17, 79, 131; Edgar King, "The Military Delinquent," p. 577; Richmond C. Holcomb, "Has Our Propaganda for Venereal Prophylaxis Failed?," p. 30.

53. Edward B. Vedder, *Syphilis and Public Health*, p. 167 (quotation); Albert Neisser, "War, Prostitution, and Venereal Diseases," p. 539; Richard C. Cabot, "Are Sanitary and Moral Prophylaxis Natural Allies?," pp. 21, 23; WD, *ARofSG*, 1915, pp. 56–57, 81, 83, and 1917, p. 17; Allan M. Brandt, *No Magic Bullet*, pp. 52–53; Mazyck P. Ravenel, "The Prophylaxis of Venereal Disease," p. 190; Charles W. Clarke, *Taboo*, p. 40; Linda Gordon, *Woman's Body, Woman's*

Right, pp. 64, 205; E. Kilbourne Tullidge, "Venereal Disease in the European Armies," p. 50; Ronald G. Walters, ed., *Primers for Prudery*, p. 135.

54. Henry P. Birmingham, "Sanitary Work of the Army at Vera Cruz," pp. 205, 215 (quotation), 216–17, 219; idem, "Coordination of the Medical Departments of the Army and Navy in Campaign," pp. 377–78; Clendenen, *Blood*, p. 161; WD, *ARofSG*, 1914, p. 160, and 1915, pp. 128–30.

55. Clendenen, *Blood*, p. 166 (first quotation); Birmingham, "Sanitary Work," pp. 205–06 (second quotation), 207, 211–13, 220–21; WD, *ARofSG*, 1915, pp. 129–30; "Correspondence," p. 184; "Mexican Notes," p. 907; "Reprints and Translations," p. 165.

56. Birmingham, "Sanitary Work," pp. 214–15 (quotations); WD, *ARofSG*, 1915, p. 128; Clendenen, *Blood*, p. 171; Brandt, *No Magic Bullet*, p. 54.

57. Raymond C. Turck, "Field Maneuvers of Divisional Sanitary Troops, Leon Springs, Texas, November 1916," p. 156 (quotations); Clendenen, *Blood*, pp. 201–02, 297, 341; WD, *ARofSG*, 1916, p. 20, and 1917, p. 23; Friedrich Katz, "Pancho Villa and the Attack on Columbus, New Mexico," p. 101; Mahon, *National Guard*, p. 151; Chamberlain, "Care of Troops," p. 1573.

58. WD, *ARofSG*, 1917, pp. 23 (first two quotations), 24, 159 (remaining quotations); Braddy, *Pershing's Mission*, pp. 1, 8–9, 16, 43–45, 56, 59, 72n38; Clendenen, *Blood*, pp. 216, 221, 224n14, 237, 244, 248, 262–63, 272, 310; Robert S. Thomas and Inez V. Allen, *The Mexican Punitive Expedition Under Brigadier General John J. Pershing, United States Army, 1916–1917*, ch. 2, p. 11, ch. 4, pp. 24–28, 34.

59. WD, *ARofSG*, 1917, pp. 122, 158, 162–63; idem, *ARofSW*, 1916, 1:291; Turck, "Field Maneuvers," pp. 157, 166; Frank E. Vandiver, *Black Jack*, 2:612; Braddy, *Pershing's Mission*, pp. 43–45, 56; Clendenen, *Blood*, p. 310.

60. Clendenen, *Blood*, pp. 329, 334–38; WD, *ARofSG*, 1917, pp. 160–61; Braddy, *Pershing's Mission*, p. 61; Vandiver, *Black Jack*, 2:612; James A. Sandos, "Prostitution and Drugs," pp. 623, 626–27, 633.

61. WD, *ARofSG*, 1917, p. 160.

62. Ibid., pp. 23, 159–61; Bayne-Jones, *Preventive Medicine*, p. 147; Clendenen, *Blood*, pp. 241–43, 335; Braddy, *Pershing's Mission*, pp. 9, 10; Chamberlain, "Care of Troops," p. 1577; Ashburn, *History of MD*, pp. 236–37.

63. Mahon, *National Guard*, p. 151; Finnegan, *Against the Specter*, p. 168; Kriedberg and Henry, *Military Mobilization*, p. 199; U.S., NGB, *Report on Mobilization*, p. 54; WD, *ARofSW*, 1916, 1:9–13, 193.

64. WD, *ARofSG*, 1917, pp. 114–17; Miller, "New Manual," pp. 307, 315.

65. WD, *ARofSG*, 1916, p. 93, and 1917, pp. 132 (quotations), 133, 137; Chamberlain, "Care of Troops," pp. 1577–78; Bispham, "Sanitary Service," p. 45.

66. Bispham, "Sanitary Service," pp. 47 (third quotation), 55; WD, *ARofSG*, 1916, 20 (fifth quotation), and 1917, pp. 24, 133 (first two quotations), 134, 136–37 (remaining quotations); Chamberlain, "Care of Troops," pp. 1573, 1578. "Disinfecting" here apparently referred to eliminating vermin.

67. Chamberlain, "Care of Troops," pp. 1574–76; Clendenen, *Blood*, p. 297; WD, *ARofSG*, 1916, pp. 20, 209, and 1917, p. 142.

68. WD, *ARofSG*, 1917, p. 122 (first quotation); Chamberlain, "Care of Troops," pp. 1574 (second quotation), 1575–76; Jay D. Whitham, "Paratyphoid Infections," pp. 491–96.

69. WD, *ARofSG*, 1916, pp. 69–70, 91–92 (remaining quotations), 188, and 1917, p. 133 (first quotation); Clendenen, *Blood*, p. 183.

70. WD, *ARofSG*, 1917, p. 131. Nichols was promoted from captain to major on 1 July 1916.

71. Brandt, *No Magic Bullet*, pp. 53–54; Blodgett, "Doctor on the Border," p. 431; M. J. Exner, "Prostitution in Its Relation to the Army on the Mexican Border," pp. 208–12, 214; Sandos, "Prostitution," pp. 629–30.

72. Whitham, "Paratyphoid Infections," p. 496; WD, *ARofSG*, 1915, p. 149, 1916, pp. 64, 66, and 1917, pp. 15, 68, 116–17; WD, SGO, *SGO*, p. 73.

73. WD, *ARofSG*, 1915, p. 84, 1916, pp. 14, 77, and 1917, pp. 16, 19–20, 81, 130, 151; Wesley W. Spink, *Infectious Diseases*, p. 67.

74. WD, *ARofSG*, 1917, p. 131; Joseph F. Siler and C. L. Cole, "The Prevalence of Hookworm Disease in the Fourth Texas Infantry, First Mississippi Infantry and First Alabama Cavalry Regiments," p. 96; George B. Foster and Charles G. Sinclair, "Hookworm Infection as a Medico-military Consideration," pp. 431–33.

75. Edward L. Munson, "The Effect of Marching on the Rates for Non-efficiency of Newly Raised Troops," pp. 171–72, 176 (quotation); Chamberlain, "Care of Troops," pp. 1574, 1580–81; WD, *ARofSG*, 1916, p. 21, and 1917, p. 133.

76. Turck, "Field Maneuvers," p. 156 (first quotation); WD, SGO, *SGO*, pp. 73–74 (second quotation), 83; Chamberlain, "Care of Troops," pp. 1573, 1582 (third quotation); W. F. Lewis and R. B. Miller, "Recent Developments in Camp Sanitation," p. 510 (fourth quotation); WD, *ARofSG*, 1917, p. 123 (re-

maining quotations); Exner, "Prostitution," p. 219; Kreidberg and Henry, *Military Mobilization*, p. 199.

77. Albert E. Truby, "The Airplane Ambulance," Ms C16, NLM; WD, SGO, *SGO*, p. 488 (quotations); Mae M. Link and Hubert A. Coleman, *Medical Support of the Army Air Forces in World War II*, pp. 6–8.

78. WD, SGO, *SGO*, pp. 488 (quotation), 489, 494, 501; WD Bull 16, 22 Jun 1916, p. 16; Link and Coleman, *Medical Support*, p. 8.

79. War Department, Surgeon General's Office, *Administration, American Expeditionary Forces*, p. 13; idem, *SGO*, pp. 75 (first quotation), 83 (third quotation), 92; idem, *War Surgery of the Nervous System*; WD, *ARofSG*, 1915, p. 164, 1916, pp. 11, 18, and 1917, p. 22 (second quotation); Memo for SG, 24 Sep 1908, Entry 245, RG 112, NARA; Sen/HofReps MilAffs Cmte Hearings, pp. 697, 874, RG 287, NARA. The Navy Department also had at least one observer in Europe in the person of Surgeon Archibald M. Fauntleroy, USN, sent to Paris in the spring of 1915 (see Fauntleroy's *Report on the Medico-military Aspects of the European War From Observations Taken Behind the Allied Armies in France*).

80. Frank R. Keefer, "The Sanitary Problems of Trench Warfare," pp. 618, 621 (first quotation); "A Consulting Staff for the Medical Department," p. 484 (second quotation); Clyde S. Ford, "Some Medico-military Observations," p. 58 (third quotation); Memo, E. B. Babbitt to Gen Scott, 1 Mar 1915, Entry 28, RG 112, NARA; WD, SGO, *SGO*, p. 84; Sen/HofReps MilAffs Cmte Hearings, pp. 875–76, RG 287, NARA; John R. McDill, *Lessons From the Enemy*.

81. WD, SGO, *SGO*, pp. 76, 92–93, 95–96; F. B. Lund, "The Surgery of the War and the Part Played Therein by American Surgeons," p. 698; George W. Crile, "The Work of American Units in France," p. 710; idem, "The Unit Plan of Organization of the Medical Reserve Corps of the U.S. for Service in Base Hospitals," p. 68; WD, *ARofSG*, 1916, p. 16; Jefferson R. Kean, "New Role of the American Red Cross," p. 541; Terriberry, "Medical Service," p. 399.

82. WD, SGO, *SGO*, pp. 97–100, 104.

83. WD, *ARofSG*, 1917, p. 12 (quotation), and 1918, pp. 15, 17; Finnegan, *Against the Specter*, p. 189; Coffman, *War To End All Wars*, pp. 7, 18, 20; Munson, "Training," p. 714.

Epilogue

THE YEARS OF CHANGE

The period from 1865 to 1917 was one of great change for the Army Medical Department. The department initially resumed after the Civil War the form and function it had before that conflict; very little changed from the prewar model. With the Army again broken down into small units scattered about among many posts, the individual surgeon was once more responsible for all aspects of the health of a relatively few men. Medical officers had no significantly greater ability to prevent, diagnose, or treat disease than their predecessors, and their surgery was distinguished from that of 1818, when the Medical Department was first organized, principally by their use of anesthesia. But by 1917 two great revolutions—one in medicine, the other in the organization of the U.S. Army—had transformed a small department into a much larger and more complex organization whose officers were among the leaders in a new age of scientific medicine.

The gradual acceptance of the fact that small living organisms caused disease and infection opened a vast, unfamiliar, and exciting world to the physicians of the late-nineteenth century. The nation's outraged reaction to the epidemics of the Spanish-American War suggested that by 1898 the American public felt entitled to expect that the Medical Department would prevent the diseases that had traditionally devastated armies in wartime. In assigning several medical officers to study ways in which this expectation might be met, Surgeon General Sternberg, a Civil War veteran, was following in the footsteps of his illustrious predecessor of that period, Surgeon General Hammond, who had assigned some of the department's most distinguished scientists to study the illnesses that had afflicted the Union Army. By 1898, however, a confident faith in the ultimate triumph of scientific medicine had replaced Hammond's desperate hope that department scientists would discover how such diseases as typhoid were spread.

To battle these old foes, medical officers had to be able to identify the disease and pinpoint the means of its spread. Examinations of specimens of blood, urine, sputum, and feces, as well as of samples of water and food, were now part of preventive medicine and required the creation of many laboratories, both small and large. By 1917 every post hospital was expected to have the means of performing simple tests. Each major geographical area was assigned a large central laboratory, where more elaborate studies could be conducted. New and more equipment was necessary, as well as new facilities to house it, and the men who would use the equip-

ment required training in its use, whether they were physicians or enlisted men.

The acceptance of the germ theory also transformed the practice of surgery. The adoption of antiseptic techniques minimized the chances of infection, and medical officers began to undertake operations they would never have dared during the Civil War. Appendectomies and hernia repairs became common as surgeons ventured ever further into once forbidden territory. The drive to reduce infection after surgery led to a requirement that a room be set aside exclusively for surgical operations, a step that could lead to the expense of new construction.

To the changes brought about by the new developments in the world of medicine were added those resulting from the nation's new image of itself. After 1898 the Army never returned to its pre-Spanish-American-War size, for as the nation gradually accepted its inevitable role as a world power, the responsibilities borne by its armed forces increased. The realization that the United States might have to defend its new empire from encroachment by other great nations and that it was by no means ready to do so led to the transformation of a small, simply organized military force into a larger, more complex Army and, as a result, to a larger, more complex Medical Department. Although Congress slowly acceded to the need for greater expenditures to meet the department's requirements, the new openings it created were never sufficient to meet the growing demand for medical personnel. The department was expected to furnish officers to design and manage public health campaigns in conquered territories, to conduct research into the various diseases that threatened U.S. troops wherever they were, to train civilian doctors who might be called in to assist them in an emergency, and to provide the best available medical care to sick and wounded soldiers. The department was also expected to find solutions to the administrative problems highlighted by the Dodge Commission and to produce an effective plan for hospitalization and evacuation that would be adaptable to large-scale warfare on foreign territory.

Under such circumstances, the creation of several specialized corps within the Medical Department was inevitable, in the interests both of efficiency and of guaranteeing the Army's patients the best possible care. The Dental Corps was created when it became obvious that a handful of hospital corpsmen functioning as dentists could not successfully treat the rapidly decaying teeth of the large numbers of troops being sent to the tropics. The constant need for nurses and the obvious superiority of nursing school graduates over men hastily trained led to the creation of a permanent Army Nurse Corps. The desire to guarantee the Army's animals the benefits of modern medicine resulted in the creation of the Veterinary Corps. In the movement to organize the department according to the specialties of its staff, however, the Hospital Corps, with its enlisted men who, as jacks of many trades, were often masters of none, lost its separate identity.

The trend toward specialization that led to the creation of new corps for the Medical Department affected individual Army physicians as well. The many administrative duties arising from the growing size and complexity of the department could seriously interfere with the scientific work that was also a part of the department's responsibilities to the nation's soldiers. To deal with this problem, some medical officers were allowed to concentrate for ap-

preciable periods of time upon research with the official support of the department, which made available to them its resources in men and equipment. Those serving on the disease boards and those working in the major laboratories could not have given their research the continued effort it necessitated if they had been required at the same time to attend sick call; to function as regimental, brigade, or division surgeons; or to train National Guard doctors.

To deal with the growing size and complexity of the Medical Department and the many and varied demands that were made upon it, the Surgeon General's Office also grew in both size and complexity. The number of civilians serving the department in Washington increased significantly, in large measure to manage the vast collection of records resulting from the Civil War, but for many years the number of medical officers changed remarkably little. Even when overwhelmed by the demands of the Spanish-American War, the surgeon general delegated few of his major responsibilities to others.

Ironically, as World War I came ever nearer, the solutions to some of the Medical Department's problems complicated the solution of others. Sending medical officers to observe the work of their European counterparts enabled the department to prepare more effectively for the time when the United States would become directly involved in the conflict, but it also reduced the number of experienced military physicians available to perform more routine tasks or to train the doctors of the Medical Reserve Corps and the National Guard. The development of hospitalization and evacuation plans designed primarily for use in a major war added to the volume of information that Regular Army doctors would have to impart to their civilian counterparts. Thus the problems created by the constant shortage of regular officers were exacerbated by the effort to establish a large group of trained physicians to assist them in time of emergency.

By the spring of 1917, however, the Army Medical Department was in a position to give military patients the benefit of the most recent developments in medicine. It was also making significant progress toward instituting an organizational structure capable of handling battlefield casualties swiftly and efficiently regardless of the scale of the conflict and toward establishing both a large reserve of supplies and an effective system for delivering them wherever they might be needed. The department had even made some headway against an almost unsolvable problem, that of creating a large pool of civilian physicians who were familiar with the demands of modern military medicine. But despite the magnitude of the changes made since the late 1860s and the years of effort that followed the Spanish-American War, the Medical Department had not actually achieved any of these goals by April 1917, when the United States entered a conflict being conducted on a scale never before encountered by the armed forces of the United States.

BIBLIOGRAPHY



To cover as wide and as eventful a time period as that between the end of the Civil War and the beginning of U.S. participation in World War I, research in a large number of primary sources was necessary. Voluminous Army records are in the custody of the National Archives and Records Administration (NARA) in Washington, D.C. As in the preceding volume, *The Army Medical Department, 1818–1865*, I have relied heavily on various entries of Record Group (RG) 112, the Records of the Office of the Surgeon General (Army), and have listed them below in the Archival Records section. Anyone intending to work extensively with RG 112 would be well advised to obtain a copy of the Preliminary Inventory. . . , which apparently is in very short supply. Some of the entries in RG 112 are easily used. Entry 27, for example, consisting of only eleven months worth of "semiofficial letters," is quickly perused. Entry 2 for the period 1818–1873 is also easy to use, since it consists of sturdy letterbooks, each with its own name and subject index. But research in other entries can be difficult. Outstanding in this category is Entry 12, Letters Received. The collection is arranged by a combined chronological-alphabetical system too complex to describe coherently; a partial name and subject index is marginally useful and a register of letters even less so. Nevertheless, Entry 12 is far too valuable to ignore. Surely the most surprising entry is Entry 245, Miscellaneous Records, Chief Clerk's Office, which contains a fascinating collection of odds and ends. RG 94, Records of the Adjutant General's Office, 1780s–1917, has proved most helpful, particularly when the assistance of an archivist familiar with the collection was available. The researcher planning to rely on any of the collections at the National Archives should be warned, however, that some have been moved out to repositories scattered about the United States and can no longer be seen in the Washington, D.C., area.

Many of the collections in the bibliography that follows are self-explanatory. Those at the National Library of Medicine in Bethesda, Maryland, like those in the Manuscript Room at the Library of Congress, add detail with which the story revealed by the entries of RG 112 can be fleshed out.

I would like to emphasize the value of the apparently often-neglected *National Union Catalog of Manuscripts* in searching out other valuable collections. Many of these have inventories that make it possible to obtain microfilm or photocopies of useful documents without undergoing the expense in time and money of traveling about the country to view material that may prove, upon examination, to be of little use. Unfortunately, at the time this volume was written, the Gorgas Family Papers, held by the University of Alabama in Tuscaloosa, had not been completely cataloged. Thus this collection is of

limited use to those who cannot travel to Tuscaloosa. By contrast, the William R. Shafter Papers, invaluable for the researcher concerned with the Spanish-American War in Cuba, have been microfilmed and can easily be borrowed in that form from Stanford University in California.

Anyone interested in the development of military medicine as a specialty must inevitably consult the articles written by a multitude of medical officers contained in the journal published by the Association of Military Surgeons, the name of which has changed over time from *Transactions of the Association of Military Surgeons of the National Guard of the United States* to *Proceedings of the Association of Military Surgeons of the United States* to *Journal of the Association of Military Surgeons of the United States* to *Military Surgeon* to, finally, *Military Medicine*. Because many medical officers contributed to other professional journals, a search through them for the names of Army surgeons can also be worthwhile.

Obviously the published annual reports both of the Surgeon General and of the War Department were crucial in the writing of this volume. The researcher should not be discouraged by the multiple volumes characteristic of the War Department's reports during and immediately after the Spanish-American War, for they provide copious information on such topics as the government of the Philippines immediately after that conflict.

Although biographies of such Medical Department leaders as Walter Reed and Surgeon Generals Sternberg and Gorgas exist, they are, for the most part, very disappointing, lacking either footnotes and bibliographies and written in a spirit of hero worship.

The bibliography that follows is divided into six sections, each alphabetically arranged. Despite its length, it is not intended to be all inclusive. It includes only manuscripts and publications that were useful in the preparation of this specific volume. Footnotes citing works that are included in the bibliography do not repeat all the details given in the bibliographical entry, being limited to the full name of the author; the complete main title (no subtitle) of the book, or journal article, or dissertation or thesis; and the relevant page number(s). Dissertations or theses are identified as such to avoid any confusion with articles. Works not listed in the bibliography are cited in full at first mention in each chapter. Subsequent references in the same chapter are shortened. All abbreviations used in the footnotes are explained in the list of abbreviations.

Archival Records

Bethesda, Maryland. National Library of Medicine.

Ms B280. "Résumé of the History of the Medical Department" [by John van R. Hoff].

Ms B286. "Report on Sanitation in San Francisco After the Earthquake" [by U.S. Army, Pacific Division]. 4 vols.

Ms C5. Surgeon General's Office. Correspondence, 1903–1907. 3 vols.

Ms C12. "Lectures on Tuberculosis, 1910–1913" [Fort Bayard, N.Mex.].

Ms C14. Jefferson R. Kean Papers.

Ms C16. Albert E. Truby Papers. 1898–1953.

Ms C48. Walter Reed and William C. Gorgas Papers. 1898–1902.
Ms C66. Official Medical Bulletins Relating to the Health of the President.
Ms C91. Charles R. Greenleaf Papers. 1890–1892.
Ms C100. George Miller Sternberg Papers. 1861–1912.
Ms C101. Louis M. Maus Papers.
Ms C102. John van R. Hoff Papers.
Ms C155. Stanhope Bayne-Jones, William C. Gorgas, Hans Zinsser Papers. 1870–1969.
Ms C318. Richard Reynolds Papers.
Ms C322. Harry L. Gilchrist Papers.
Ms C371. Stanhope Bayne-Jones Papers. 1942–1947.
Ms F117. "Case Records of the Cholera Epidemic of 1873." 2 vols.
Ms fB68. "Regulations of Pharmacy, Republic of Cuba, l909" [by Jefferson R. Kean].
Ms fB127. Frank R. Keefer Papers. 1890–1938.
United States. Army. 3d Reserve Hospital. "Manila Report: Supplementary Hospital, Manila, P.I."

Carlisle Barracks, Pa. U.S. Army Military History Institute. Military History Research Collection. Spanish-American War, Philippine Insurrection, and Boxer Rebellion Veterans Research Project.

Haverford, Pa. Haverford College. Quaker Collection. Albert K. Smiley Papers.

Nashville, Tenn. Tennessee State Library and Archives. John W. Ross Papers.

Palo Alto, Calif. Stanford University. William R. Shafter Papers. 1862–1906. Microfilm (7 reels).

Tuscaloosa, Ala. University of Alabama. W. S. Hoole Special Collections. Gorgas Family Papers.

Washington, D.C. Library of Congress. Manuscript Division. William C. Gorgas Papers.
———. ———. ———. William McKinley Papers.
———. ———. ———. John McA. Schofield Papers.

Washington, D.C. National Archives and Records Administration.
Record Group 75, Records of the Bureau of Indian Affairs.
Entry 681. Sanborn Commission. Papers Relating to the Sanborn Commission Investigation of the Fetterman Massacre.
Microfilm 234. Letters Received by the Bureau of Indian Affairs. 1824–1881.
Record Group 92, Records of the Office of the Quartermaster General.
Record Group 94, Records of the Adjutant General's Office, 1780s–1917.
Entry 561. Personal Papers of Medical Officers.
Entry 624. File F. Reports of Surgeons Accompanying Expeditions.
Microfilm 1064. Commission Branch Files.

Record Group 112, Records of the Office of the Surgeon General.

Entry 2. Letters and Endorsements Sent. April 1818–October 1889.

Entry 7. Letters and Endorsements Sent to Medical Officers ("Military Letters"). September 1862–September 1872.

Entry 8. Letters Sent by the Assistant Surgeon General Relating to Personnel. 1869–1883.

Entry 10. Registers of Letters Received. 1822–1889.

Entry 12. Letters Received. 1818–1889.

Entry 13. Correspondence Relating to Army Medical Examining Boards. 1831–1898.

Entry 15. Correspondence Relating to the Promotion, Discharge, and Rating of Personnel ("Confidential File"). 1871–1894.

Entry 16. Correspondence Regarding the Organization of the Hospital Corps. February 1860–March 1888.

Entry 17. Correspondence With Medical Officers Regarding Field Maneuvers. 1888–1890.

Entry 18. Name and Subject Indexes to Parts (1889–1890) of Series 12 and 22.

Entry 22. General Correspondence. 1890–1894.

Entry 23. Name and Subject Index to Series 26. 1894–1917.

Entry 26. General Correspondence. 1894–1917.

Entry 27. Semiofficial Letters Sent by Surg. Gen. George H. Torney. January–November 1909.

Entry 28. Correspondence Regarding the Automobile Ambulance. 1912–1917.

Entry 34. Telegrams Sent and Received. 1868–1889.

Entry 38. Inspection Reports of Medical Facilities at Army Posts. 1890–1894.

Entry 40. Extracts of Inspection Reports Made by the Inspector General's Department Relating to Medical Facilities at Army Posts. 1891–1894.

Entry 41. Sanitary Inspection Reports. 1892–1894.

Entry 51. Reports Relating to Living Conditions at Army Posts in North Carolina, South Carolina, Georgia, Florida, and Alabama. 1868–1869.

Entry 52. Reports of Epidemics, Rare Diseases, and Vaccinations. 1888–1917.

Entry 53. Report of Capt. Louis La Garda [*sic*] Relating to the Medical Department Exhibit at the World's Columbian Exposition, Chicago, Ill. October 31, 1893.

Entry 57. Excerpts of War Department Special Orders Relating to Medical Department Personnel. 1860–1875.

Entry 63. Circulars and Circular Letters of the Surgeon General's Office. 1861–1885.

Entry 66. Circulars of the Surgeon General's Office. July 1889–January 1905.

Entry 77. Reports of Examinations of Candidates for Appointment as Regular Army Surgeons ("Merit Rolls"). 1860–1888.
Entry 89. Military Service Cards of Medical Officers. 1860–1917.
Entry 100. Register of Deaths of Regular Army Medical Officers. 1861–1896.
Entry 103. Historical Files of the Army Nurse Corps. 1900–1947.
Entry 147. Correspondence Relating to Spanish-American War Contract Nurses. 1898–1900.
Entry 150. Correspondence Relating to the Service of Spanish-American War Contract Nurses. 1898–1939.
Entry 223. Abstracts of Correspondence and Orders Relating to the Establishment and Organization of the Army and Navy General Hospital, Hot Springs, Ark. 1882–1888.
Entry 227. Letter Book of Surgeon Thomas F. Azpell. 1862–1876.
Entry 229. Journal of Dr. Anita Newcomb McGee. 1898–1899.
Entry 230. Correspondence of Dr. Anita Newcomb McGee. 1898–1936.
Entry 231. Papers of Col. J. R. Kean and Col. W. J. Lyster. 1905–1916.
Entry 232. Abstracts of U.S. Statutes and Army Regulations Relating to the Medical Department. 1790–1898.
Entry 235. Decisions of Government Officials Relating to the Surgeon General's Office. 1866–1892.
Entry 241. "Memorandum Book" Relating to the Hospital Corps. 1887–1905.
Entry 242. Decisions and Opinions of the Judge Advocate General Relating to the Medical Department. 1904–1909.
Entry 245. Miscellaneous Records of the Chief Clerk's Office. 1880–1917.
Entry 336. Letters Received Relating to the Examination of a New Type of Ambulance. March–July 1891.
Record Group 153, Records of the Office of the Judge Advocate General. Microfilm NNM073–113(465). Proceedings of a Court of Inquiry Into the "Fetterman Massacre." 1866.
Record Group 159, Records of the Office of the Inspector General.
Record Group 165, Records of the War Department General and Special Staffs.
Entry 5. Office of the Chief of Staff, Army, General Correspondence ("Reports"). 1907–1916.
Record Group 185, Records of the Panama Canal [Commission].
Record Group 287, Publications of the United States Government.
Record Group 395, Records of the U.S. Army Overseas Operations and Commands, 1898–1942.
Entry 219. Report of the Chief Surgeon, Second Army Corps, to the Surgeon General, U.S.A.

Washington, D.C. Walter Reed Army Institute of Research. Papers From the Letterpress of Charles Franklin Craig.

Secondary Manuscripts

Bevoise, Ken de. "The Compromised Hosts: The Epidemiological Context of the Philippine-American War." Ph.D. dissertation, University of Oregon, 1986.

Carey, Jr., Norman M. "The Mechanization of the United States Army, 1900–1916." M.A. thesis, University of Georgia, 1972.

Fairfull, Thomas McD. "General Nelson A. Miles and His Charges of Army Brutality in the Philippine Insurrection, 1902." M.A. thesis, Duke University, 1972.

Hansen, Gladys, and Quinn, Frank. "The San Francisco Numbers Game." Paper of the San Francisco Earthquake Research Project, San Francisco, Calif., 1986.

Latshaw, George W. "Military Medical Service During and Immediately After the Spanish-American War (1898–1901)." M.A. thesis, University of Wisconsin, 1958.

Linn, Brian McA. "The War in Luzon: U.S. Army Regional Counterinsurgency in the Philippine War, 1900–1902." Ph.D. dissertation, Ohio State University, 1985.

Pollard, William G. "Structure and Stress: Social Change Among the Fort Sill Apache and Their Ancestors, 1870–1960." M.A. thesis, University of Oklahoma, 1965.

Primary Books

Addresses Delivered Before the Canadian Club of Toronto, Season of 1915–16. Edited by Literary Correspondent. Toronto: Warwick Bros. and Rutter, 1916.

American Medical Association. *Petition of the American Medical Association to the Senate and House of Representatives in Behalf of the Medical Corps of the Army, With a Brief Statement of the Facts in the Case.* Washington, D.C.: N.p., 1874.

Ashford, Bailey K. *A Soldier in Science: The Autobiography of Bailey K. Ashford.* New York: William Morrow and Co., 1934.

Ashford, Bailey K., and Gutierrez Igaravidez, Pedro. *Uncinariasis (Hookworm Disease) in Porto Rico: A Medical and Economic Problem.* Washington, D.C.: Government Printing Office, 1911.

Baldwin, Alice B. *An Army Wife on the Frontier: The Memoirs of Alice Blackwood Baldwin, 1867–1877.* Edited by Robert Carriker and Eleanor R. Carriker. Salt Lake City: Tanner Trust Fund, 1975.

Barker, Lewellys F. *Time and the Physician.* New York: G. P. Putnam's Sons, 1942.

Barrows, David P. *A Decade of American Government in the Philippines*. Yonkers-on-Hudson, N.Y.: World Book Co., 1914.

Bartholow, Roberts. *Medical Electricity: A Practical Treatise on the Applications of Electricity to Medicine and Surgery*. Philadelphia: Henry C. Lea's Son and Co., 1881.

————. *On the Antagonism Between Medicines and Between Remedies and Diseases*. New York: D. Appleton and Co., 1881.

————. *A Practical Treatise on Materia Medica and Therapeutics*. New York: D. Appleton and Co., 1876.

[Baxter, Jedediah H.] *The Medical Part of the Final Report Made to the Secretary of War by the Provost Marshal General*. N.p., [1866].

Bigelow, John J. *Reminiscences of the Santiago Campaign*. New York: Harper and Bros., 1899.

Billings, John Shaw. "Biographical Memoir of Joseph Janvier Woodward." In *Biographical Memoirs*, vol. 2, pp. 297–307. Washington, D.C.: National Academy of Sciences, 1886.

————. "Progress of Medicine in the Nineteenth Century." In *Smithsonian Institution Report for 1900*, pp. 637–44. Washington, D.C.: Government Printing Office, 1901.

————. *A Report on Barracks and Hospitals, With Descriptions of Military Posts*. Circular No. 4, Surgeon General's Office. Washington, D.C.: Government Printing Office, 1870.

————. *A Report on the Hygiene of the United States Army, With Descriptions of Military Posts*. Circular No. 8, Surgeon General's Office. Washington, D.C.: Government Printing Office, 1875.

————. *Selected Papers*. Edited by Frank Brodway Rogers. N.p.: Medical Library Assoc., 1965.

Blount, James H. *The American Occupation of the Philippines, 1898–1912*. 1912. Reprint. Quezon City, P.I.: Malaya Books, 1968.

Borden, William C. *The Use of the Rontgen Ray by the Medical Department of the United States Army in the War With Spain*. Washington, D.C.: Government Printing Office, 1909.

Bourke, John G. *An Apache Campaign in the Sierra Madre*. New York: Charles Scribner's Sons, 1958.

————. *On the Border With Crook*. Lincoln: University of Nebraska Press, 1971.

Bratt, John. *Trails of Yesterday*. 1921. Reprint. Lincoln: University of Nebraska Press, 1980.

Brown, Harvey E. *The Medical Department of the United States Army From 1775 to 1873*. Washington, D.C: Surgeon General's Office, War Department, 1873.

Brown, John C. *Diary of a Soldier in the Philippines*. Portland, Maine: Privately printed, 1901.

Busey, Samuel C. *Personal Reminiscences and Recollections of Forty-six Years' Membership in the Medical Society of the District of Columbia and Residence in This City, With Biographical Sketches of Many of the Deceased Members.* Washington, D.C.: N.p., 1895.

Byrne, Bernard J. *A Frontier Army Surgeon.* New York: Exposition Press, 1962.

Carrington, Frances. *My Army Life and the Fort Phil Kearny Massacre.* Philadelphia: J. B. Lippincott Co., 1911.

Carrington, Margaret I. S. *Ab-sa-ra-ka, Land of Massacre, Being the Experience of an Officer's Wife on the Plains.* 1879. Reprint. Millwood, N.Y.: Kraus, 1975.

Carroll, John M., ed. *General Custer and the Battle of the Little Big Horn: The Federal View.* New Brunswick, N.J.: Garry Owen Press, 1976.

Carter, William G. H. *The Life of Lieutenant General Chaffee.* Chicago: University of Chicago Press, 1917.

Chamberlain, Weston. *Twenty-five Years of American Medical Activity in Panama, 1904–1929: A Triumph of Preventive Medicine.* Mount Hope, C.Z.: Panama Canal Press, 1929.

Chamberlin, Frederick. *The Philippine Problem, 1898–1913.* Boston: Little, Brown and Co., 1913.

Corbusier, William. *Verde to San Carlos: Recollections of a Famous Army Surgeon and His Observant Family on the Western Frontier, 1869–1886.* Tucson, Ariz.: Dale Stuart King, 1968.

Craig, Charles F. *The Parasitic Amoebae of Man.* Philadelphia: J. B. Lippincott Co., 1911.

Creel, Richard H. *Outbreak and Suppression of Plague in Porto Rico.* Washington, D.C.: Government Printing Office, 1913.

Crook, George. *Crook's Résumé of Operations Against Apache Indians, 1882 to 1886.* Notes and Introduction by Barry C. Johnson. Rev. ed. London: Johnson-Taunton Military Press, 1971.

———. *General George Crook: His Autobiography.* Edited by Martin F. Schmitt. Rev. ed. Norman: University of Oklahoma Press, 1960.

Custer, Elizabeth B. *"Boots and Saddles"; or, Life in Dakota With General Custer.* Norman: University of Oklahoma Press, 1961.

Custer, George A. *My Life on the Plains.* Edited by Milo Milton Quaife. Lincoln: University of Nebraska Press, 1966.

Dock, Lavinia; Pickett, Sarah E.; Noyes, Clara D.; Clement, Fannie F.; Fox, Elizabeth G; and Van Meter, Anna R. *History of American Red Cross Nursing.* New York: Macmillan Co., 1922.

Elguera, Alida McP. de. *Footprints in the Sands of Time and Reminiscences.* Lima: Peruvian Times, 1956.

Fauntleroy, Archibald M. *Report on the Medico-military Aspects of the European War From Observations Taken Behind the Allied Armies in France.* Washington, D.C.: Government Printing Office, 1915.

Faust, Karl I. *Campaigning in the Philippines.* San Francisco: Hick-Judd Co., 1899.

Finerty, John F. *War-path and Bivouac*. Chicago: M. A. Donohue and Co., 1890.

Finlay, Carlos J. *Sanitary Conditions in Cuba*. N.p., n.d.

Fitzgerald, Emily. *An Army Doctor's Wife on the Frontier: Letters From Alaska and the Far West, 1874–1878*. Edited by Abe Laufe. Pittsburgh, Pa.: University of Pittsburgh Press, 1962.

Flint, Austin. *Clinical Medicine: A Systematic Treatise on the Diagnosis and Treatment of Disease*. Philadelphia: Henry C. Lea, 1879.

Forster, Edward J. *A Manual for Medical Officers of the Militia of the United States*. New York: Hurd and Houghton, 1877.

Freeman, N. N. *A Soldier in the Philippines*. New York: F. Tennyson Neely Co., 1901.

Funston, Frederick. *Memories of Two Wars: Cuban and Philippine Experiences*. New York: Charles Scribner's Sons, 1914. Microfilm 33391DS, Library of Congress.

Garrison, Fielding H. *John Shaw Billings: A Memoir*. New York: G. P. Putnam's Sons, 1915.

Girard, Alfred C. *The Management of Camp Alger and Camp Meade*. Reprint [from *New York Medical Journal*]. Camp Meade, Pa.: Chief Surgeon's Office, Headquarters, Second Army Corps, 1898.

Gorgas, Marie D., and Hendrick, Burton J. *William Crawford Gorgas: His Life and Work*. Garden City, N.Y.: Doubleday, Page and Co., 1924.

Gorgas, William C. *Sanitation in Panama*. New York: D. Appleton and Co., 1915.

Gradle, Henry. *Bacteria and the Germ Theory of Disease*. Chicago: W. T. Keener, 1883.

Greely, Adolphus W. *Earthquake in California, April 18, 1906: Special Report of Maj. Gen. Adolphus W. Greely, U.S.A., Commanding the Pacific Division, on the Relief Operations, Conducted by the Military Authorities of the United States at San Francisco and Other Points, With Accompanying Documents*. Washington, D.C.: Government Printing Office, 1906.

Hamilton, Frank H. *A Treatise on Military Surgery and Hygiene*. New York: Balliere Bros., 1865.

Harbord, James G. *The American Expeditionary Forces: Its Organization and Accomplishments*. Evanston, Ill.: Evanston Publishing Co., 1929.

Heiser, Victor G. *An American Doctor's Odyssey: Adventures in Forty-five Countries*. New York: W. W. Norton and Co., 1936.

Hoff, John van R. *Military Government of Porto Rico From October 18, 1898, to April 30, 1900*. Washington, D.C.: Government Printing Office, 1901.

Holmes, John A. *The Raw Deal*. N.p., n.d.

Huidekoper, Frederick C. *The Military Unpreparedness of the United States*. New York: Macmillan Co., 1916.

Ingersoll, L. D. *A History of the War Department of the United States, With Biographical Sketches of the Secretaries*. Washington, D.C.: Francis B. Mohun, 1880.

Kagan, Solomon R. *Life and Letters of Fielding H. Garrison.* Boston: Medico-Historical Press, 1938.

Keating, John McL. *A History of Yellow Fever: The Yellow Fever Epidemic 1878 in Memphis, Tenn.* Memphis, Tenn.: Howard Assoc., 1879.

Keeler, Charles. *San Francisco Through Earthquake and Fire.* San Francisco: Paul Elder and Co., 1906.

Keeley, Leslie E. *The Morphine Eater; or, From Bondage to Freedom.* Dwight, Ill.: C. L. Palmer and Co., 1881.

Keen, William W. *The Surgical Operations on President Cleveland in 1893.* Philadelphia: George W. Jacobs and Co., 1917.

Kennan, George. *Campaigning in Cuba.* New York: Century Co., 1899.

Kimball, Maria B. *A Soldier Doctor of Our Army.* Boston: Houghton Mifflin Co., 1917.

King, Charles. *Campaigning With Crook and Stories of Army Life.* Ann Arbor, Mich.: University Microfilms, 1966.

Kober, George M. *Reminiscences of George Martin Kober, M.D., LL.D.* Washington, D.C.: Kober Foundation, Georgetown University, 1930.

Lane, Jack C., ed. *Chasing Geronimo: The Journal of Leonard Wood, May–September, 1886.* Albuquerque: University of New Mexico Press, 1970.

Ledingham, Joseph A., and Arkwright, J. A. *The Carrier Problem in Infectious Diseases.* London: Edward Arnold, 1912.

LePrince, Joseph A.; Orenstein, A. J.; and Howard, L. O. *Mosquito Control in Panama.* New York: G. P. Putnam's Sons, 1916.

Lodge, Henry Cabot, ed. *Selections From the Correspondence of Theodore Roosevelt and Henry Cabot Lodge, 1884–1918.* 2 vols. New York: Charles Scribner's Sons, 1925.

Lopez del Valle, Jose A. *The Development of Sanitation and Charities in Cuba During the Last Sixteen Years.* Havana: La Modern Poesia, 1914.

McDill, John R. *Lessons From the Enemy: How Germany Cares for Her War Disabled.* Philadelphia: Lea and Febiger, 1918.

Magoon, Charles E. *Republic of Cuba: Report of Provisional Administration From December 1st, 1907, to December 1st, 1908.* Havana: Rambla and Bouza, 1909.

Markey, Joseph I. *From Iowa to the Philippines: A History of Company M, Fifty-first Iowa Infantry Volunteers.* Red Oak, Iowa: Thomas D. Murphy Co., 1900.

Marshall, Edward. *The Story of the Rough Riders.* New York: G. W. Dillingham Co., 1899.

Martin, Franklin H. *Major General William Crawford Gorgas, M.C., U.S.A.* Chicago, Ill.: Gorgas Memorial Institute, [1924].

Massachusetts Volunteer Aid Association. *The Work of the Massachusetts Volunteer Aid Association During the War With Spain, 1898.* Compiled by Edward C. Mansfield. [Boston: Mudge, 1899?].

Miles, Nelson A. *Serving the Republic.* New York: Harper and Bros., 1911.

Miley, John D. *In Cuba With Shafter.* New York: Charles Scribner's Sons, 1899.

Miller, Hugh G. *The Isthmian Highway: A Review of the Problems of the Caribbean.* New York: Macmillan Co., 1929.

Morrison, John F., and Munson, Edward L. *A Study in Troop Leading and Management of the Sanitary Service in War.* Fort Leavenworth, Kans., 1910.

Munson, Edward L. *The Prevention of Camp Diseases in Newly Raised Commands, Considered From the Administrative Standpoint.* N.p., n.d.

————. *The Principles of Sanitary Tactics: A Handbook on the Use of Medical Department Detachments and Organizations in Campaign.* Menasha, Wisc.: Banta Co. Press, 1911.

————. *The Soldier's Foot and the Military Shoe: A Handbook for Officers and Noncommissioned Officers of the Line.* Fort Leavenworth, Kans., 1912.

————. *The Theory and Practice of Military Hygiene.* New York: William Wood and Co., 1901.

Otis, George A. *Drawings, Photographs and Lithographs Illustrating the Histories of Seven Survivors of the Operation of Amputation at the Hipjoint During the War of the Rebellion, Together With Abstracts of These Seven Successful Cases.* Washington, D.C.: Surgeon General's Office, War Department, 1867.

————. *Histories of Two Hundred and Ninety-six Surgical Photographs Prepared at the Army Medical Museum.* Washington, D.C.: Surgeon General's Office, War Department, 1866–1871.

————. *A Report of Surgical Cases Treated in the Army of the United States From 1865 to 1871.* Circular No. 3, Surgeon General's Office. Washington, D.C.: Government Printing Office, 1871.

————. *A Report to the Surgeon General on the Transport of the Sick and Wounded by Pack Animals.* Circular No. 9, Surgeon General's Office. Washington, D.C.: Government Printing Office, 1877.

Parkes, Louis C. *The Elements of Health: An Introduction to the Study of Hygiene.* London: J. and A. Churchill, 1895.

Paulding, Holmes O. *Surgeon's Diary With the Custer Relief Column.* Edited by W. Boyes. Washington, D.C.: WJBM Assoc., 1974.

Post, Charles J. *The Little War of Private Post.* Boston: Little, Brown and Co., 1960.

Prinzing, Frederick. *Epidemics Resulting From Wars.* Oxford: At the Clarendon Press, 1916.

Reed, Walter; Vaughan, Victor C.; and Shakespeare, E. O. *Reports on the Origin and Spread of Typhoid Fever in U.S. Military Camps During the Spanish War of 1898.* 2 vols. Washington, D.C.: Government Printing Office, 1904.

Reeves, Ira L. *Military Education in the United States.* N.p., 1914.

Reyburn, Robert. *Fifty Years in the Practice of Medicine and Surgery, 1856 to 1906.* N.p., 1907.

Robinson, George. *The Hospital Ship in the War With Spain.* N.p., 1908.

Root, Elihu. *The Military and Colonial Policy of the United States.* Edited by Robert Bacon. Cambridge, Mass.: Harvard University Press, 1916.

Schofield, John M. *Forty-six Years in the Army.* New York: Century Co., 1897.

Senn, Nicholas. *Medico-surgical Aspects of the Spanish American War*. Chicago: American Medical Assoc. Press, 1900.

———. *War Correspondence (Hispano-American War)*. Chicago: American Medical Assoc. Press, 1899.

Settle, Raymond W., and Settle, Mary Lund, eds. *Overland Days to Montana in 1865: The Diary of Sarah Raymond and Journal of Dr. Ward Howard*. Glendale, Calif.: Arthur H. Clark Co., 1971.

Sheridan, Philip H. *Personal Memoirs of P. H. Sheridan, General United States Army*. 2 vols. New York: Charles L. Webster and Co., 1888.

———. *Record of Engagements With Hostile Indians Within the Military Division of the Missouri From 1868 to 1882*. Washington, D.C.: Government Printing Office, 1882.

Smart, Charles. *Handbook for the Hospital Corps of the U.S. Army and State Military Forces*. Rev. ed. New York: William Wood and Co., 1898.

Sternberg, George M. "Historical Résumé of the Investigations of Yellow Fever Leading up to the Findings of the Reed Board." In *Proceedings of the Second Pan-American Scientific Congress, December 27, 1915 to January 8, 1916*, pp. 645–52. Washington, D.C.: Government Printing Office, 1917.

———. *Immunity: Protection Inoculations in Infectious Diseases and Serum-Therapy*. New York: William Wood and Co., 1895.

———. *A Manual of Bacteriology*. New York: William Wood and Co., 1892.

———. *Report on the Etiology and Prevention of Yellow Fever*. Washington, D.C.: Government Printing Office, 1890.

———. "Transmission of Yellow Fever by Mosquitoes." In *Smithsonian Institution Report for 1900*, pp. 657–73. Washington, D.C.: Government Printing Office, 1901.

Sternberg, Martha L. *George Miller Sternberg: A Biography*. Chicago: American Medical Assoc., 1920.

Straub, Paul F. *Medical Service in the Campaign: A Handbook for Medical Officers in the Field*. Philadelphia: P. Blakiston's Son and Co., 1910.

Strong, Richard P. *Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases*. 7th ed. 2 vols. Philadelphia: Blakiston Co., 1944.

Sutherland, Charles. "Organization of Hospital Corps." In *Pan-American Medical Congress Transactions*, vol. 1, pp. 387–89. Washington, D.C.: Government Printing Office, 1893.

Sutton, R. Stansbury. *A Story of Chickamauga*. Reprint [from *Journal of the American Medical Association*]. Chicago: American Medical Assoc. Press, 1898.

Taft, William H., and Roosevelt, Theodore. *The Philippines*. New York: Outlook Co., 1902.

Thian, Raphael P., comp. *Legislative History of the General Staff of the Army of the United States (Its Organization, Duties, Pay, and Allowances) From 1775 to 1901*. Washington, D.C.: Government Printing Office, 1901.

Thorndike, Rachel S., ed. *The Sherman Letters: Correspondence Between General and Senator Sherman From 1837 to 1891*. New York: Da Capo Press, 1894.

Truby, Albert E. *Memoir of Walter Reed*. New York: Paul D. Harber, 1943.

United States. Army Medical School. *Immunization to Typhoid Fever: Results Obtained in the Prevention of Typhoid Fever in the United States Army, United States Navy, and Civilian Conservation Corps by the Use of Vaccines (Influence of Antigenic Structure and Other Biological Characters of E. Typhosa on the Production of Protective Antibodies in the Blood of Immunized Individuals [and] Increases in Protective Antibodies in the Blood Following the Use of a Single Small Dose of Vaccine for Reimmunization Purposes as Compared With the Use of Three Doses)*. Baltimore: Johns Hopkins Press, 1941.

United States. Bureau of the Census. *Census of the Philippine Islands, Taken Under the Direction of the Philippine Commission in the Year 1903*. 4 vols. Washington, D.C.: Bureau of the Census, 1905.

United States. Congress. Senate. *Charges of Cruelty, Etc., to the Natives of the Philippines*. 57th Congress, 1st Session, 1901. Senate Document 205.

———. ———. ———. *Report of the (Dodge) Commission To Investigate the Conduct of the War Department in the War With Spain*. 8 vols. 56th Congress, 1st Session, 1900. Senate Document 221. Library of Congress Microfilm 82/5365.

———. ———. ———. *Treaty of Peace Between the United States and Spain*. 55th Congress, 3d Session, 1899. Senate Document 62.

———. ———. ———. 61st Congress, 3d Session. *Yellow Fever, a Compilation of Various Publications: Results of the Work of Maj. Walter Reed, Medical Corps, and the Yellow Fever Commission*. Washington, D.C.: Government Printing Office, 1911.

United States. Isthmian Canal Commission. *Population and Deaths From Various Diseases in the City of Panama, by Months and Years, From November 1883 to August 1906*. Washington, D.C.: Government Printing Office, 1906.

United States. National Guard Bureau. *Report on Mobilization of the Organized Militia and National Guard of the United States, 1916*. Washington, D.C.: Government Printing Office, 1916.

United States. Philippine Commission, 1899–1900. *Report of the Philippine Commission to the President*. 4 vols. Washington, D.C.: Government Printing Office, 1900.

Upton, Emory. *The Military Policy of the United States*. Washington, D.C.: Government Printing Office, 1917.

Vaughan, Victor C. *A Doctor's Memories*. Indianapolis: Bobbs-Merrill Co., 1926.

———. *Epidemiology and Public Health*. 3 vols. St. Louis, Mo.: C. V. Mosby Co., 1922.

Vedder, Edward B. *Beriberi*. New York: William Wood and Co., 1913.

———. *The Prevalence of Syphilis in the Army*. Washington, D.C.: Government Printing Office, 1915.

———. *A Synopsis of the Work of the Army Medical Research Boards in the Philippines*. Army Medical Bulletin. Carlisle Barracks, Pa.: Medical Field Service School, 1929.

———. *Syphilis and Public Health*. Philadelphia: Lea and Febiger, 1918.

Walters, Ronald G., ed. *Primers for Prudery: Sexual Advice to Victorian America*. Englewood Cliffs, N.J.: Prentice-Hall, 1974.

War Department. *[Annual] Report of the Secretary of War*. Washington, D.C.: Government Printing Office, 1865–1917.

———. *[Annual] Report of the Surgeon General, U.S. Army, to the Secretary of War*. Washington, D.C.: Government Printing Office, 1865–1918.

———. *Correspondence Relating to the War With Spain and Conditions Growing Out of the Same, Including the Insurrection in the Philippine Islands and the China Relief Expedition, Between the Adjutant-General of the Army and Military Commanders in the United States, Cuba, Porto Rico, China, and the Philippine Islands From April 15, 1898, to July 30, 1902*. 2 vols. Washington, D.C.: Government Printing Office, 1902.

———. *Five Years of the War Department Following the War With Spain, 1899–1903, as Shown in the Annual Reports of the Secretary of War*. N.p., n.d.

———. *Reports of Military Observers Attached to the Armies in Manchuria During the Russo-Japanese War*. Part 4. *Report of Major Charles Lynch, Medical Department, General Staff*. Washington, D.C.: Government Printing Office, 1907.

War Department. Surgeon General's Office. *Administration, American Expeditionary Forces*. Medical Department of the United States Army in the World War. Washington, D.C.: Government Printing Office, 1927.

———. ———. *The Cholera Epidemic of 1873 in the United States*. Washington, D.C.: Government Printing Office, 1875.

———. ———. *Manual for the Medical Department, 1900*. Washington, D.C.: Government Printing Office, 1900.

———. ———. *Manual for the Medical Department, 1906*. Washington, D.C.: Government Printing Office, 1906.

———. ———. *Manual for the Medical Department, United States Army, 1911*. Washington, D.C.: Government Printing Office, 1911.

———. ———. *Manual for the Medical Department, United States Army, 1916, Corrected to April 15, 1917*. Washington, D.C.: Government Printing Office, 1917.

———. ———. *The Surgeon General's Office*. Medical Department of the United States Army in the World War. Washington, D.C.: Government Printing Office, 1923.

———. ———. *Medical and Surgical History of the War of the Rebellion*. 2 vols., 3 pts. ea. Washington, D.C.: Government Printing Office, 1870–1888.

———. ———. *Plan for a Post Hospital of Twenty-four Beds*. Circular No. 4. Washington, D.C.: Government Printing Office, 1867.

———. ———. *Report on Epidemic Cholera in the Army of the United States During the Year 1866*. Washington, D.C.: Government Printing Office, 1867.

———. ———. *Report on Epidemic Cholera and Yellow Fever in the Army of the United States*. Washington, D.C.: Government Printing Office, 1868.

———. ———. *The Venereal Diseases: An Outline of Their Management, Prepared for the Use of Medical Officers of the Army*. Chicago: American Medical Assoc., 1917.

———. ———. *War Surgery of the Nervous System*. Washington, D.C.: Government Printing Office, 1917.

Welsh, Herbert. *The Apache Prisoners at Fort Marion, St. Augustine, Florida*. N.p.: Indian Rights Assoc., 1887. Library of Congress Microfilm 8124E.

Wheeler, Joseph. *The Santiago Campaign, 1898*. 1899. Reprint. Freeport, N.Y.: Books for Libraries Press, 1970.

Wood, Leonard. *The Military Obligation of Citizenship*. Princeton, N.J.: Princeton University Press, 1915.

———. *Our Military History: Its Facts and Fallacies*. Chicago: Reilly and Button Co., 1916.

Woodhull, Alfred Alexander. *A Medical Report Upon the Uniform and Clothing of the Soldiers of the U.S. Army*. Washington, D.C.: Surgeon General's Office, War Department, 1868.

———. *Notes on Military Hygiene for Officers of the Line*. New York: John Wiley and Sons, 1899.

———. ———. 4th ed. New York: John Wiley and Sons, 1909.

———. *Notes on Military Hygiene for Officers of the Line: A Syllabus of Lectures at the U.S. Infantry and Cavalry School*. New York: John Wiley and Sons, 1890.

———. *Studies, Chiefly Clinical, in the Non-emetic Use of Ipecacuanha*. Philadelphia: J. B. Lippincott and Co., 1876.

Woodruff, Charles E. *The Effects of Tropical Light on White Men*. New York: Rebman Co., 1905.

Woodward, Joseph J. *Report to the Surgeon General of the United States Army on Certain Points Connected With the Histology of Minute Bloodvessels*. Washington, D.C.: Surgeon General's Office, War Department, 1870.

———. *On the Structure of Cancerous Tumors and the Modes in Which Adjacent Parts Are Invaded*. Washington, D.C.: Smithsonian Institution, 1873.

Worcester, D. C. *A History of Asiatic Cholera in the Philippines*. Manila: Bureau of Printing, 1908.

Primary Articles

Abbott, A. C. "The Essentials of Successful Public Health Administration." *Journal of the American Medical Association* 46 (1906): 475–78.

"Achievements of the Medical Corps of the United States Army." *Journal of the American Medical Association* 68 (1917): 1324–25.

"Acting Assistant Surgeons in the Philippines." *Boston Medical and Surgical Journal* 142 (1900): 178.

Adair, George W. "Wheeled Vehicles for the Transportation of Wounded." *Proceedings of the Sixth Annual Meeting of the Association of Military Surgeons of the United States*, 1896, pp. 144–51.

Adams, J. F. A. "Substitutes for Opium in Chronic Disease." *Boston Medical and Surgical Journal* 121 (1889): 351–56.

Agramonte, Aristides. "Dr. Carlos J. Finlay." *Transactions of the American Society of Tropical Medicine* 10 (1916): 27–31.

———. "The Inside Story of a Great Medical Discovery." *Scientific Monthly* 1 (1915): 209–39.

Alden, Charles H. "Instruction of the Hospital or Ambulance Corps in the United States." *Medical Age* 14 (1896): 449–56.

———. "Instruction of the Hospital or Ambulance Corps in the United States and State Services." *Proceedings of the Sixth Annual Meeting of the Association of Military Surgeons of the United States*, 1896, pp. 98–106.

———. "Porto Rico: Its Climate and Its Diseases." *New York Medical Journal* 74 (1901): 17–22.

———. ———. *Transactions of the American Climatological and Clinical Association* 17 (1901): 14–28.

———. "Roster of Volunteer Medical Officers Who Served During the Spanish-American War of 1898 in the Military and Naval Services." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 56–92.

———. "The Special Training of the Medical Officer, With Brief Notes on Army Medical Schools Abroad and at Home." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 675–89.

Alger, Russell A. "The Food of the Army During the Spanish War." *North American Review* 172 (1901): 39–58.

"Alleged Yellow Fever Serum a Failure." *Sanitarian* 47 (1901): 371–72.

Allen, Seabury W. "The Conditions at Camp Wikoff." *Boston Medical and Surgical Journal* 139 (1898): 326–27.

Ames, Azel. "A Medical Reserve Corps for the Army of the United States." *Journal of the Association of Military Surgeons of the United States* 16 (1905): 69–94.

———. "The Vaccination of Porto Rico: A Lesson to the World." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 293–313.

Ames, Howard E. "The Hygienic Condition of Enlisted Men as Affected by Moral and Intellectual Influences." *Proceedings of the Fourth Annual Meeting of the Association of the Military Surgeons of the United States*, 1894, pp. 409–25.

Anderson, L. G. "Notes of an Army Surgeon in the Recent War." *American Medicine* 3 (1902): 475–78.

Anderson, Winslow. "The U.S. Army Camp of Instruction for the Officers of the Medical Corps of the Organized Militia." *Pacific Medical Journal* 52 (1909): 521–32.

Andrews, R. W. "Tropical Diseases as Observed in the Philippines." *Albany Medical Annals* 23 (1902): 19–23, 83–89.

Andrews, Vernon L. "Infantile Beriberi." *Philippine Journal of Science* 7B (1912): 67–88.

"Another Transport Scandal." *Medical Record* 54 (1898): 524.

"Antityphoid Vaccination in the Army." *New York State Medical Journal* 70 (1899): 728.

Appel, Daniel M. "The General Hospital and Sanatorium for Treatment of Pulmonary Tuberculosis at Fort Bayard, New Mexico." *Journal of the Association of Military Surgeons of the United States* 11 (1902): 203–21.

"Are Malarial Diseases Air-borne?" *Journal of the American Medical Association* 28 (1897): 943–44.

"Army Contract Surgeons." *Boston Medical and Surgical Journal* 142 (1900): 416–17.

"The Army Investigation." *Medical News* 73 (1898): 399–402.

"The Army Medical Corps." *Military Surgeon* 23 (1908): 57–66.

"Army Medical Department." *Medical Era* 16 (1898): 201–08.

"Army Medical Reorganization: The Proposed Army Medical Corps and Medical Reserve Corps." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 201–06.

"Army Medical School: Closing Exercises of the First Session." *Journal of the American Medical Association* 22 (1894): 352–54.

"The Army Medical Staff Bill." *Medical Record* 9 (1874): 149–51.

"Army Medical Staff Rank." *Medical Record* 9 (1874): 311–12.

"Army Notes." *Boston Medical and Surgical Journal* 142 (1900): 46.

————. *Journal of the American Medical Association* 35 (1900): 1427.

"An Army Sanitarium for Tuberculosis." *Boston Medical and Surgical Journal* 14 (1899): 248–49.

"The Army as a Sanitary Corps." *Military Surgeon* 23 (1908): 425.

"Army Staff Rank." *Medical Record* 9 (1874): 13–14, 136, 373–74.

"Army Staff Rank—Chautauqua County Medical Supply." *Medical Record* 9 (1874): 79.

Arnold, Herbert A. "Report on Maneuver Camps at San Antonio and Leon Springs, and on Juarez, Mexico." *Military Surgeon* 29 (1911): 21–28.

Arthur, William H. "Carrel's Method of Wound Sterilization." *Military Surgeon* 40 (1917): 489–98.

————. "Postgraduate Instruction at the Army Medical School." *Military Surgeon* 38 (1916): 146–50.

Asch, Morris J. "Army Medical Service." *New York Medical Journal* 37 (1883): 203–04.

Ashburn, Percy M. "The Board for the Study of Tropical Diseases as They Occur in the Philippine Islands." *Journal of the Association of Military Surgeons of the United States* 23 (1906): 298–304.

———. "Report on Medical Conditions in Liberia." *Military Surgeon* 27 (1910): 402–09.

———. "Service in the Army Medical Corps." *Boston Medical and Surgical Journal* 159 (1908): 667.

———. "A Trip to China." *Military Surgeon* 34 (1914): 101–24.

Ashburn, Percy M., and Craig, Charles F. "Experimental Investigations Regarding the Etiology of Dengue, With a General Consideration of the Disease." *Philippine Journal of Science* 2B (1907): 93–149.

———. "Observations Made During a Visit to Japan by the United States Army Board for the Study of Tropical Diseases as They Exist in the Philippines." *Military Surgeon* 22 (1908): 116–36.

———. "Observations Upon Filaria Philippinensis and Its Development in the Mosquito." *Philippine Journal of Science* 2B (1907): 1–11.

———. "Observations Upon Treponema Pertinuis Castellani of Yaws and the Experimental Production of the Disease in Monkeys." *Philippine Journal of Science* 2B (1907): 441–67.

———. "Study of Tropical Diseases in the Philippine Islands." *Journal of the American Medical Association* 48 (1907): 691–93.

———. "The Work of the Army Board for the Study of Tropical Diseases in the Philippine Islands." *Military Surgeon* 21 (1907): 38–49.

Ashburn, Percy M.; Vedder, E. B.; and Gentry, E. R. "Concerning Varioloid in Manila." *Military Surgeon* 33 (1913): 59–60.

Ashford, Bailey K. "Ankylostomiasis in Puerto Rico." *New York Medical Journal* 1 (1900): 522–56.

———. "Notes on Medical Progress in Porto Rico." *Military Surgeon* 25 (1909): 725–27.

———. "Notes on Sprue in Porto Rico and the Results of Treatment by Yellow Santonin." *American Journal of Tropical Diseases and Preventive Medicine* 1 (1913–1914): 146–58.

———. "Observations on the Campaign in Western Puerto Rico During the Spanish-American War." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 157–68.

———. "Studies in Moniliasis of the Digestive Tract in Porto Rico." *American Journal of the Medical Sciences* 150 (1915): 680–92.

———. "Where Treatment of All Infected Is the Surest Prophylactic Measure: The Problem of Epidemic Uncinariasis in Porto Rico." *Military Surgeon* 20 (1907): 40–55.

Ashford, Bailey K., and King, Walter W. "A Study of Uncinariasis in Porto Rico." *American Medicine* 6 (1903): 391–96.

Ashford, Mahlon. "The Mission of the Ambulance Company." *Military Surgeon* 30 (1912): 163–69.

———. "The Most Practicable Plan for the Organization, Training and Utilization of the Medical Officers of the Medical Reserve Corps of the United States Army and Navy and of the Medical Officers of the Officers' Reserve

Corps of the United States Army in Peace and War." *Military Surgeon* 40 (1917): 123–55.

————. "A Proposed Motor-Ambulance Company." *Military Surgeon* 39 (1916): 300–06, 392–97.

————. "Statistical Report of Venereal Prophylaxis, From December 1st, 1913, to April 30, 1914, at Fort Washington, Md., for the Purpose of Showing Its Efficacy." *Military Surgeon* 35 (1914): 9–11.

Austin, H. W. "Retrospect of Co-operative Work of the Medical Services of the Government." *Military Surgeon* 23 (1908): 450–61.

Bache, Dallas. "The Location of Sites for, and the Construction of, Military Posts in Relation to Proper Sanitation." *Proceedings of the Fifth Annual Meeting of the Association of Military Surgeons of the United States* 5 (1895): 413–30.

————. "The Place of the Female Nurse in the Army." *Journal of the Military Service Institution of the United States* 25 (1899): 307–28.

"The Bacillus Dysenteriae." *Journal of the American Medical Association* 35 (1900): 501–02.

Baker, Frank. "President Garfield's Case Again." *Medical News* 41 (1882): 115–19.

Baketel, H. Sheridan. "The Army Medical Corps." *Military Surgeon* 34 (1916): 451–57.

Banister, John M. "Army Sanitary Administration in the United States and in the Tropics." *Western Medical Review* 14 (1909): 558–74.

————. "Medical and Surgical Observations During a Three-Year Tour of Duty in the Philippines." *Journal of the Association of Military Surgeons of the United States* 18 (1906): 149–69, 259–77, 318–34.

————. "The Radical Cure of Inguinal Hernia From the Standpoint of the Military Surgeon." *Proceedings of the Seventh Annual Meeting of the Association of Military Surgeons of the United States* 7 (1897): 478–96.

————. "Surgical Observations in the Philippines." *Journal of the American Medical Association* 42 (1904): 1117–21.

Banister, William B. "The Medical Mechanism for War in the U.S." *Illinois Medical Journal* 29 (1916): 407–19.

————. "The Medical Reserve Corps: Its Duties and Relations to the Army in Peace and War." *Chicago Medical Recorder* 34 (1912): 675–85; 35 (1912): 23–42.

Barber, M. S.; Raquel, Alfonso; Guzman, Ariston; and Rosa, Antonio P. "Malaria in the Philippine Islands: The Distribution of the Commoner Anophelines and the Distribution of Malaria." *Philippine Journal of Science* 10B (1915): 177–245.

Bartholow, Roberts. "Alcohol: Its Therapeutic Uses, Internally and Externally." *Philadelphia Medical Times* 11 (1881): 647–52.

————. "Typho-malarial Fever and the Opinions of Dr. Woodward, U.S.A., in 1863 and 1877." *Clinic* 13 (1877): 109–10, 121–23, 133–34.

Bass, C. C. "Treatment of Pellagra." *Southern Medical Journal* 4 (1911–1912): 521–27.

Beck, Harvey G. "Duodenal Medication of Ipecac in the Treatment of Dysentery." *Journal of the American Medical Association* 59 (1912): 2110–14.

Belfield, William T. "Abstract of the Cartwright Lectures." *New York Medical Journal* 37 (1883): 253–55.

Bell, A. N. "Fomites and Yellow Fever." *Public Health Papers and Reports* 27 (1901): 144–51.

———. ———. *Sanitarian* 47 (1901): 302–10.

Berg, H. W. "The Treatment of Diphtheria, Including Serum Therapy." *Medical Record* 47 (1895): 33–43.

"Beri-beri." *Journal of the American Medical Association* 42 (1904): 1148.

"Better Instruction for Army Medical Officers." *Journal of the American Medical Association* 55 (1910): 1736–37.

Biddle, Thomas C. "Typhoid Fever in the Tropics." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 103–06.

Bill, Joseph H. "Notes on Arrow Wounds." *American Journal of the Medical Sciences* 44 (1862): 365–87.

Billings, John Shaw. "American Inventions and Discoveries in Medicine, Surgery and Practical Sanitation." *Boston Medical and Surgical Journal* 124 (1891): 349–51.

———. "Bacteria and Spontaneous Generation." *Bulletin of the Philosophical Society of Washington* 2 (1874–1878): 109–10.

———. "The Causes of Outbreaks of Typhoid Fever." *Medical News* 61 (1892): 601–02.

———. "The Health of the Survivors of the War." *Forum*, January 1892, pp. 652–58.

———. "Ideals of Medical Education." *Boston Medical and Surgical Journal* 124 (1891): 619–23.

———. "International Uniformity in Army Medical Statistics." *Medical News* 57 (1890): 130–34, 153–58.

———. "Notes on Military Medicine in Europe." *Journal of the Military Service Institution of the United States* 3 (1882): 234–47.

———. "On Medical Museums." *Medical News* 53 (1888): 309–16.

———. "Report of Resolutions in Memory of Joseph Janvier Woodward With Abstract of Remarks on Dr. Woodward's Work, etc., November 8, 1884." *Bulletin of the Philosophical Society of Washington* 7 (1884): 75–76.

———. "Who Founded the National Medical Library?" *Medical Record* 17 (1880): 298–99.

Birmingham, Henry P. "Coordination of the Medical Departments of the Army and Navy in Campaign." *Military Surgeon* 38 (1916): 377–80.

———. "Sanitary Work of the Army at Vera Cruz." *Military Surgeon* 36 (1915): 205–21.

———. "Typhoid Fever in the Army of Cuban Pacification." *Military Surgeon* 20 (1907): 427–58.

Bispham, William N. "Sanitary Service With National Guard Troops." *Military Surgeon* 41 (1917): 43–62.

———. "Sanitary Work in the City of Havana." *Philadelphia Medical Journal* 6 (1900): 1094–96.

Blanchard, R. M. "Heroin and Soldiers." *Military Surgeon* 33 (1913): 140–43.

Blech, Gustavus. "Organization of Red Cross Personnel for War." *Military Surgeon* 35 (1914): 228–36.

Bliss, D. Willard. "Report of the Care of President Garfield." *Medical Record* 20 (1881): 393–402.

Blodgett, W. H. "The Doctor on the Border: An Estimate of the Soldier Doctor and Incidents in the Life of the Border Soldier." *Indianapolis Medical Journal* 19 (1916): 429–33.

Bloodgood, Joseph C. "The Tobyhanna Camp." *Military Surgeon* 37 (1915): 117–122.

Blumer, George. "The Influence Which the Acquisition of Tropical Territory by the United States Has Had, and Is Likely To Have, on American Medicine." *Boston Medical and Surgical Journal* 153 (1905): 129–35.

Boak, S. D. "Information Regarding the Army Dental Surgeons Corps." *Dental Cosmos* 57 (1915): 546.

Borden, William C. "Conservatism in Military Surgery." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons in the United States*, 1899, pp. 250–56.

———. "History of Doctor Walter Reed's Illness From Appendicitis." *Washington Medical Annals* 1 (1902): 425–26.

———. "Hospital Corps Instruction at Military Posts." *Proceedings of the Fifth Annual Meeting of the Association of Military Surgeons of the United States*, 1895, pp. 401–12.

———. "Military Surgery." *Proceedings of the Ninth Annual Meeting of the Association of Military Surgeons of the United States*, 1900, pp. 190–231.

———. "The Vital Statistics of an Apache Indian Community." *Boston Medical and Surgical Journal* 129 (1893): 5–10.

———. "The Walter Reed General Hospital of the United States Army." *Military Surgeon* 20 (1907): 20–35.

———. "What Can the Medical Profession Do for the Army." *Journal of the American Medical Association* 42 (1904): 1680–81.

Bourns, Frank S. "Some Notes on the Philippines." *Atlanta Journal-Record of Medicine* 1 (1899–1900): 729–34.

Bradford, E. H. "Metatarso-Tarsal Valgus or Humped Foot and Its Relation to Boots." *Boston Medical and Surgical Journal* 151 (1904): 560–63.

Braver, David R. "Sanitary and Other Problems of the Panama Canal." *Dietetic and Hygienic Gazette* 21 (1905): 257–59.

Brimlow, George F., ed. "Two Cavalrymen's Diaries of the Bannock War, 1878." *Oregon Historical Quarterly* 68 (1967): 221–58, 293–316.

Brinton, John H. "Valedictory Address to the Graduating Class of the Army Medical School, Washington, D.C." *Journal of the American Medical Association* 26 (1896): 599–605.

Brooks, William H. "The Base Hospital in Cuba." *Military Surgeon* 20 (1907): 376–82.

Brown, J. Morris. "Organization and Conduct of a United States Army Medical Supply Depot." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 279–87.

Brown, Paul R. "The Organization of the Surgical Personnel of an Army Division (Twelve Thousand Men) and Its Duties in Time of War." *Medical Record* 54 (1898): 7–9.

Buckingham, E. M. "Tropical and Camp Disease: A Study of Santiago Cases at the Boston City Hospital." *Boston Medical and Surgical Journal* 139 (1898): 433–35.

Buecker, Thomas R., ed. "A Surgeon at the Little Big Horn: The Letters of Dr. Holmes O. Paulding." *Montana: The Magazine of Western History* 32 (Autumn 1982): 34–49.

Burrell, Herbert L. "The Formation, Character, and Work of Schools for Medical Officers in the Volunteer Militia or National Guards." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 336–39.

Burrell, Herbert L., and Tucker, Greenleaf R. "Aseptic Surgery." *Medical Communications of the Massachusetts Medical Society* 14 (1889): 551–70.

Busey, Samuel C. "Address Delivered at the Closing Exercises of the Army Medical School, March 12, 1897." *Journal of the American Medical Association* 28 (1897): 671–76.

Bushnell, George E. "The Expansion of the Hospital Corps in War." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 144–51.

Cabot, A. T. "Science in Medicine." *Boston Medical and Surgical Journal* 137 (1897): 481–84.

Cabot, Richard C. "Are Sanitary and Moral Prophylaxis Natural Allies?" *Journal of the Society for Sanitary and Moral Prophylaxis* 5 (1914): 20–30.

———. "The 'Bay State's' First Trip to Porto Rico." *Boston Medical and Surgical Journal* 139 (1898): 378–79.

Callender, G. R., and Luippold, G. F. "The Effectiveness of Typhoid Vaccine Prepared by the U.S. Army." *Journal of the American Medical Association* 123 (1943): 319–21.

Calvert, William J. "Plague in the Orient." *Bulletin of the Johns Hopkins Hospital* 14 (1903): 60–63.

———. "Plague Serum in Three Cases." *Boston Medical and Surgical Journal* 148 (1903): 35–36.

"Camps of Instruction for Medical Officers." *Military Surgeon* 40 (1917): 722.

"The Care of Our Troops In Hawaii." *Medical Record* 54 (1898): 961–62.

Carll, William E. "The Oregon National Guard at the San Francisco Earthquake Disaster." *Journal of the Association of Military Surgeons of the United States* 19 (1906): 460–63.

Carrington, Paul M. "Further Observations on the Treatment of Tuberculosis at Fort Stanton, New Mexico." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 207–34.

Carter, H. R. "A Note on the Interval Between Infecting and Secondary Cases of Yellow Fever From the Records of the Yellow Fever at Orwood and Taylor, Miss., in 1898." *New Orleans Medical and Surgical Journal* 52 (1900): 617–36.

"A Case for Investigation." *Medical Record* 54 (1898): 127.

"Case of the Late President." *New York Medical Journal and Obstetrical Review* 34 (1881): 489–94.

"The Case of the Late President Garfield." *Lancet* 2 (1881): 553–54.

"The Case of President Garfield." *Medical News* 39 (1881): 631–35.

Cattell, Henry W. "Roentgen's Discovery—Its Application in Medicine." *Medical News* 68 (1896): 169–71.

Caulkins, J. S. "Typho-malarial Fever." *Detroit Lancet* 1 (1878): 403–14.

Center, Charles D. "Lessons Learned at a Maneuver Camp." *Military Surgeon* 28 (1911): 29–34.

Chamberlain, Weston P. "Care of Troops on the Mexican Border." *Journal of the American Medical Association* 67 (1916): 1573–82.

————. "The Disappearance of Beriberi From the Philippine (Native) Scouts." *Military Surgeon* 28 (1911): 509–22.

————. "Hints for Line Officers Regarding the Diseases Liable To Be Met With in Mexico and the General Method of Combating Them." *Journal of Military Service Institution of the United States* 54 (May–June 1914): 341–59.

————. "Is the Poor Physical Development of Southern Recruits due to Uncinariasis?" *Journal of the Association of Military Surgeons of the United States* 25 (1901): 48–56.

————. "Observations on the Influence of the Philippine Climate on White Men of the Blond and of the Brunette Type." *Philippine Journal of Science* 6B (1911): 427–63.

————. "Typhoid Fever in the Philippine Islands." *Military Surgeon* 30 (1912): 53–91.

Chamberlain, Weston P., and Vedder, Edward B. "A Contribution to the Etiology of Beriberi." *Philippine Journal of Science* 6B (1911): 251–58.

————. "The Cure of Infantile Beriberi by the Administration to the Infant of an Extract of Rice Polishings, and the Bearing Thereof on the Etiology of Beriberi." *Bulletin of the Manila Medical Society* 4 (1912): 26–33.

Chamberlain, Weston P.; Bloombergh, Horace D.; and Kilbourne, Edwin D. "Report of the Board for the Study of Tropical Diseases in the Philippine Islands, Quarter Ending Sept. 30, 1910." *Military Surgeon* 28 (1911): 7–16, 180–96.

Chamberlain, Weston P.; Bloombergh, Horace D.; and Vedder, Edward B. "Report of the U.S. Army Board for the Study of Tropical Diseases as They Exist in the Philippine Islands." *Military Surgeon* 28 (1911): 445–52.

"Change in the Examination for the Army Medical Service." *Medical Record* 66 (1904): 61.

Church, James H. "Erlich's Arsenic in the Treatment of Syphilis in the Military Service." *Military Surgeon* 36 (1915): 44–55.

Clark, Thomas C. "The Relation of the National Guard Surgeon to the Medical Profession and to the Community." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 179–84.

————. "Some Observations Upon the Medical Service of the Late War With Spain From the Standpoint of a Volunteer Surgeon." *Northwestern Lancet* 19 (1899): 361–65.

Clarke, Maurice D. "Therapeutic Nihilism." *Medical Communications of the Massachusetts Medical Society* 14 (1888): 221–28.

Cochran, Jerome. "Notes and Reflections: Typho-malarial Fever." *Transactions of the Medical Association of the State of Alabama,* 28th Session, 1875, pp. 337–45.

Coe, A. S. "Therapeutics." *New York Medical Journal* 54 (1891): 239–42.

Coe, Henry C. "Medical Preparedness." *Military Surgeon* 39 (1916): 407–09.

————. "Military Preparedness From the Medical Standpoint." *Medical Record* 89 (1916): 449.

Cole, Clarence L. "Necator American in the Natives of the Philippine Islands." *Philippine Journal of Science* 2B (1907): 333–42.

Condon, A. S. "The Army Canteen." *Journal of the American Medical Association* 58 (1912): 720–21.

Conn, H. W. "Bacteriology in Our Medical Schools." *Science* 11 (1888): 123–26.

Connor, Clarence H. "The Special Physical Examination of Aviators for the United States Army." *Military Surgeon* 40 (1917): 29–32.

"A Consulting Staff for the Medical Department." *Military Surgeon* 41 (1917): 484–86.

"Control of Typhoid Fever in the Army." *Journal of the American Medical Association* 48 (1907): 1443.

Conzelmann, F. J. "Typhoid Inoculation." *Military Surgeon* 22 (1908): 316.

Cornick, Boyd. "The Remedy for Overcrowding in the Medical Profession." *Journal of the American Medical Association* 12 (1889): 613–15.

"Correspondence: Letter From Mexico (Vera Cruz, 24 June, 1914)." *New York Medical Journal* 100 (1914): 184–85.

Councilman, W. T. "Dysentery." *Boston Medical and Surgical Journal* 127 (1892): 1–7.

Cox, George W. "Present Status of Serum Therapy." *Journal of the American Medical Association 31 (1898)*: 829–34.

Craig, Charles F. "The Army Medical Service." *Yale Medical Journal* 16 (1909–1910): 415–27.

———. "The Bubonic Plague From a Sanitary Standpoint." *Pacific Medical Journal* 43 (1900): 577–97.

———. "The Classification of the Malarial Plasmodia." *Boston Medical and Surgical Journal* 160 (1909): 677–79.

———. "Estivo-Autumnal Malarial Fever." *Journal of the American Medical Association* 35 (1900): 1139–48.

———. "The Importance to the Army of Diseases Transmitted by Mosquitoes and Methods for Their Prevention." *Military Surgeon* 26 (1910): 292–308.

———. "Importance of Tropical Diseases to American Practitioners as Illustrated by Their Occurrence in the United States." *American Journal of Tropical Diseases and Preventive Medicine* 3 (1915–1916): 5–16.

———. "The Interpretation of the Results of the Wassermann Test." *Journal of the American Medical Association* 60 (1913): 565–69.

———. "Observations on Malta Fever in the United States Army." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 264–81.

———. "Observations Upon the Amoebae Coli and Their Staining Reaction." *Medical News* 78 (1901): 414–18.

———. "Observations Upon the Morphology, Life Cycle, and Relation to Disease of Entamoeba Histolytica." *American Journal of Tropical Diseases and Preventive Medicine* 2 (1914–1915): 169–84.

———. "The Occurrence of Endamoebic Dysentery in Troops Serving in the El Paso District From July 1916 to December 1916." *Military Surgeon* 40 (1917): 286–302, 423–34.

———. "On the Nature of the Virus of Yellow Fever, Dengue, and Pappataic Fever." *New York Medical Journal* 93 (1911): 360–69.

———. "The Parasites of Estivoautumnal (Remittent) Malarial Fever." *Philadelphia Medical Journal* 5 (1900): 764–68.

———. "The Pathology of Chronic Specific Dysentery." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 353–78.

———. "The Prophylaxis of Malarial Infection." *Southern Medical Journal* 4 (1911): 469–78.

———. "The Results and Interpretations of the Wassermann Test." *American Journal of the Medical Sciences* 149 (1915): 41–56.

Crampton, George S. "Camps of Instruction for Militia Medical Officers in 1901." *Military Surgeon* 27 (1910): 355–63.

Crile, George W. "Standardization of the Practice of Military Surgery: The Clinical Surgeon in Military Service." *Journal of the American Medical Association* 69 (1917): 291–92.

———. "The Unit Plan of Organization of the Medical Reserve Corps of the U.S. for Service in Base Hospitals." *Surgery, Gynecology and Obstetrics* 22 (1916): 68–69.

———. "The Work of American Units in France." *Surgery, Gynecology and Obstetrics* 25 (1917): 709–12.

Crook, J. A. "Malarial and Typhoid Fever." *Memphis Medical Monthly* 12 (1892): 536–40.

Culler, R. M. "Some Facts About the Army Medical Corps." *Journal of the American Medical Association* 52 (1909): 1092–93.

"Current Comment: Membership in the Army Medical Corps as a Career." *Journal of the American Medical Association* 67 (1916): 1308–09.

Curry, Joseph J. "Bubonic Plague: Report on the Plague in Manila, P.I., From January 1, 1900, to June 30, 1900." *Boston Medical and Surgical Journal* 144 (1901): 277–79.

———. "Dysenteric Diseases of the Philippine Islands, With Special Reference to the Ameba Coli as a Causative Agent in Tropical Dysentery." *Boston Medical and Surgical Journal* 144 (1901): 177–78.

———. "The Fevers of the Philippines: A Preliminary Report on the Nature of the Fevers Prevalent in the Philippine Islands, Including Typhoid Fever, Malta Fever, the Malarial Fevers and Undetermined Tropical Fevers." *Boston Medical and Surgical Journal* 144 (1901): 446–51.

———. "Malta Fever: A Report on Four Cases of Malta Fever in the United States Army and Navy General Hospital, Hot Springs, Ark., Among Soldiers and Sailors Returned From Tropical Stations, With Remarks on the Serum Reaction in Malta Fever." *Journal of Medical Research* 6 (1901): 241–48.

———. "On the Value of Blood Examinations in the Diagnosis of Camp Fevers: A Report on the Blood Examinations in Typhoid Fever and in the Malarial Fevers." *Boston Medical and Surgical Journal* 141 (1900): 512–18.

———. "Report on Parasitic Disease in Horses, Mules and Caribao in the Philippine Islands." *American Medicine* 3 (1902): 512–13.

———. " 'Surra' or Nagana." *American Medicine* 4 (1902): 95–99.

———. "U.S. Army Pathological Laboratories in the Philippine Islands." *Boston Medical and Surgical Journal* 144 (1901): 175–77.

Curtin, Roland G. "Medical Conditions of the Isthmus of Panama, With Other Notes." *Medicine* 11 (1905): 343–49.

Dakin, Henry D. "On the Use of Certain Antiseptic Substances in the Treatment of Infected Wounds."' *British Medical Journal* 2 (1915): 318–20.

Daniels, Josephus. "The Physician's Great Problem in the War." *Surgery, Gynecology and Obstetrics* 25 (1917): 701–03.

Darnall, Carl R. "The Purification of Drinking Water for Troops in the Field." *Military Surgeon* 22 (1908): 253–85.

———. "Water Purification by Anhydrous Chlorine." *American Journal of Public Health* n.s. 1 (1911): 783–97.

Day, Richard H. "Review of the Surgical Treatment of President Garfield." *New Orleans Medical and Surgical Journal* 10 (1882): 81–95.

Decker, C. W. "San Diego Maneuver Camp." *Military Surgeon* 29 (1911): 271–81.

De Loffre, Samuel. "The Etiology of Beri-beri." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 101.

Desfosses, P. "Canal de Panama et fievre jaune." *Presse medical* 14 (1906): 729–32.

Devine, William H. "Management of a Field Hospital." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 97–105.

DeVoto, Augustus L. "A Trooper With Custer: Augustus DeVoto's Account of the Little Big Horn." Edited by Dale T. Schoenberger. *Montana: The Magazine of Western History* 40 (Winter 1990): 68–71.

Dickson, Samuel H. "Essay on the Blending and Conversion of Types in Fever." *Transactions of the American Medical Association* 5 (1852): 127–61.

"Discussion." *Medical Communications of the Massachusetts Medical Society* 14 (1889): 570–94.

————. *Transactions of the Association of American Physicians* 14 (1899): 81–88.

"The Discussion in the Senate on the Army Medical Reorganization Bill." *Journal of the Association of Military Surgeons of the United States* 18 (1906): 305–07.

"Disparagement of the Regular Army Surgeons." *Medical Record* 54 (1898): 378.

Doan, Henry H. "A Plea for More Camps of Instruction Under Government Supervision for Officers of the Organized Militia." *Military Surgeon* 32 (1913): 75–77.

Dock, George. "Further Studies in Malarial Disease, the Parasites and the Form of Disease as Found in Texas." *Medical News* 58 (1891): 602–06, 628–34.

————. "Studies in the Etiology of Malarial Infection and of the Haematozoa of Laveran." *Medical News* 57 (1890): 59–65.

Doherty, David J. "Medicine and Disease in the Philippines." *Journal of the American Medical Association* 34 (1900): 1526–31.

Donaldson, Frank. "A Refutation of False Statements Concerning Camp Wikoff." *Medical News* 73 (1898): 334–35.

Donnally, Williams. "An Opportunity for a Great National Museum." *Transactions of the American Dental Association at the Thirty-fifth Annual Session*, 1895, pp. 134–49.

Doty, A. H. "On the Mode of Transmission of the Infectious Agent in Yellow Fever and Its Bearing Upon Quarantine Regulations." *Medical Record* 60 (1901): 649–53.

Draper, William H. "On the Relations of Scientific to Practical Medicine." *Transactions of the Association of American Physicians* 3 (1888): 1–8.

Ducker, Orlando. "The Troops in Santiago." *Journal of the American Medical Association* 31 (1898): 669.

Duncan, Louis C. "The Use of Motor Vehicles in Transporting Wounded." *Journal of the Military Service Institution of the United States* 52 (1913): 235–49.

————. "The Wounded at Ojinaga." *Military Surgeon* 34 (1914): 411–40.

Ebert, R. G. "The Medical Department of the U.S. Army." *Medical Sentinel* 11 (1903): 91–99.

"Echoes and News: Mortality Among the Spanish Soldiers Returning to Spain." *Medical News* 73 (1898): 402.

"Editorial: Demilitarization of the Red Cross." *Military Surgeon* 35 (1914): 365–66.

"Editor's Table." *Sanitarian* 47 (1901): 267–82.

Edwards, J. F. "The Adaptation of the Medical Service of the National Guard to That of the Army." *Military Surgeon* 30 (1912): 43–52.

"The Efficiency of the Army Medical Staff." *Medical Record* 9 (1874): 125–26.

Egan, P. R. "The Best Diet for the Tropics: The Army Ration." *Boston Medical and Surgical Journal* 142 (1900): 47.

———. "Meat Ration in the Tropics." *Boston Medical and Surgical Journal* 144 (1901): 176–77.

Ekwurzel, George M. "Observations of a Regimental Surgeon With the Maneuver Division." *Military Surgeon* 31 (1912): 52–60.

"The Emergency Ration of the Army." *Journal of the American Medical Association* 28 (1897): 37–38.

"The End at Last." *Medical Record* 22 (1881): 350–51.

Erichsen, John Eric. "Impressions of American Surgery." *Lancet* 2 (1874): 717–20.

Esmarch, Friedrich. "Concerning the Treatment of the Wound of President Garfield." Translated by R. Stansbury Sutton. *Boston Medical and Surgical Journal* 107 (1882): 234–37.

"The Etiology of Yellow Fever." *Journal of the American Medical Association* 36 (1901): 446–47, 461.

Ewing, Charles B. "The Treatment of Wounds From the Aspect of Germ Infection." *Transactions of the Second Annual Meeting of the Association of Military Surgeons of the National Guard of the United States*, 1892, pp. 146–51.

———. "The Wounded of the Wounded Knee Battle Field, With Remarks on Wounds Produced by Large and Small Caliber Bullets." *Transactions of the Second Annual Meeting of the Association of Military Surgeons of the National Guard of the United States*, 1892, pp. 36–56.

"Examination of Army Medical Officers for Promotion." *Journal of the American Medical Association* 24 (1895): 694.

Exner, M. J. "Prostitution in Its Relation to the Army on the Mexican Border." *Social Hygiene* 3 (1917): 205–20.

"Experimental Investigation Regarding the Pathology of Malaria." *Medical Record* 20 (1881): 744.

Fabricius, F. W. "Some Observations on Malarial Disease in the Province of Santiago de Cuba." *National Medical Review* 8 (1899): 569–74.

Fales, Louis H. "The American Physician in the Philippine Civil Service." *American Medicine* 9 (1905): 513–17.

Farrell, P. J. H. "Our Sick and Wounded in the Philippines." *Transactions of the Medical Society of the State of California* 29 (1899): 334–37.

Field, P. C. "The Recruit Depot Point of View." *Military Surgeon* 28 (1911): 639–48.

"The Fifty-third Congress, the Army and Navy Medical Services and the Marine-Hospital Service." *Journal of the American Medical Association* 24 (1895): 413–15.

Finlay, Carlos J. "Inoculations for Yellow Fever by Means of Contaminated Mosquitoes." *American Journal of the Medical Sciences* 102 (1891): 264–68.

————. ————. *Medical Classics* 2 (1938): 634–39.

————. "Mosquitoes Considered as Transmitters of Yellow Fever and Malaria." *Medical Record* 55 (1899): 737–39.

————. "The Mosquito Hypothetically Considered as the Agent of Transmission of Yellow Fever." *Medical Classics* 2 (1938): 590–612.

————. "Yellow Fever: Its Transmission by Means of the Culex Mosquito." *American Journal of the Medical Sciences* 92 (1886): 395–409.

"The First Battle Against Yellow Fever." *Medical Record* 54 (1898): 126.

Fisher, H. C. "Preparedness of the Medical Department for War." *Military Surgeon* 38 (1916): 123–30.

Fitz, Reginald H. "Perforating Inflammation of the Vermiform Appendix, With Special Reference to Its Early Diagnosis and Treatment." *Transactions of the Association of American Physicians* 1 (1886): 107–44.

Flexner, Simon. "Bacillary Dysentery." *Therapeutic Gazette* 26 (1902): 218–20.

————. "On the Etiology of Tropical Dysentery." *Philadelphia Medical Journal* 6 (1900): 414–24.

Flexner, Simon, and Barker, L. F. "The Prevalent Diseases in the Philippines." *Science* 11 (1900): 521–28.

Flint, Austin. "Remarks on the Use of the Thermometer in Diagnosis and Prognosis." *New York Medical Journal* 4 (1866–1867): 81–93.

Ford, Clyde S. "Red Cross Problems in Time of War." *New York Medical Journal* 101 (1915): 1099–1107.

————. "Some Medicomilitary Observations in the Late Balkan Wars." *New York Medical Journal* 101 (1915): 52–58.

Ford, Joseph H. "The Antitoxin Treatment of Tertian Malarial Infections." *Medical Record* 66 (1904): 1001–07.

————. "The Conditions Influencing Service of Militia Medical Officers." *Military Surgeon* 26 (1910): 516–28.

————. "Galveston Maneuver Camp." *Military Surgeon* 29 (1911): 282–91.

————. "Notes on Organization and Equipment for Evacuation of Wounded." *Military Surgeon* 31 (1912): 669–93.

————. "The Sanitary Service of Maneuver Camps." *Military Surgeon* 35 (1914): 101–25.

Forwood, William H. "Remarks Upon the Proper Form and the Advantages of a Diagnosis Tag for Use Among the Sick and Wounded on the Battle-

field." *Proceedings of the Fifth Annual Meeting of the Association of Military Surgeons of the United States*, 1895, pp. 456–60.

Foster, George B. "Endemic Typhus Fever in the Philippine Islands." *Archives of Internal Medicine* 16 (1915): 363–81.

Foster, George B., and Sinclair, Charles G. "Hookworm Infection as a Medico-military Consideration." *Journal of the American Medical Association* 69 (1917): 431–34.

Fox, James S. "Prophylaxis of Syphilis and Practical Points on Its Treatment by Salvarsan." *Military Surgeon* 32 (1913): 91–97.

Foxworthy, Frank W. "Anti-typhoid Vaccination." *Military Surgeon* 34 (1914): 332–43.

Foy, G. "Health in the United States Army." *Medical Press and Circular* 103 (1917): 292–93.

Freer, Paul C. "Plague and Late Cholera Epidemic in the Philippine Islands." *Illinois Medical Journal* 7 (1905): 346–47.

Frick, E. B. "Medical Department of the U.S. Army." *St. Paul Medical Journal* 6 (1904): 763–69.

"The Future of Medical Education in the United States." *Detroit Clinic* 1 (1882): 31.

Gallagher, Thomas J. "On the Hypodermic Injection." *New York Medical Journal* 13 (1871): 532–50.

Gandy, Charles. "Typho-malarial Fever." *New York Medical Journal* 70 (1899): 482–86.

Gardner, Leon L. "The Days Gone By": The Hospital Real de Espanoles de Manila—Now Sternberg General Hospital." *Military Surgeon* 64 (1929): 744–53, 917–27.

Garnett, A. Y. P. "The Mission of the American Medical Association." *Journal of the American Medical Association* 10 (1888): 573–79.

Gerster, Arpad G. "How Should the General Practitioner Deal With Strangulated Hernia?" *Boston Medical and Surgical Journal* 129 (1893): 61–62, 66–67.

Gilchrist, Harry L. "The Necessity for a Uniform Organization for the Medical Corps of the National Guard." *Military Surgeon* 34 (1914): 22–26.

Girard, Alfred C. "Letter From Europe." *Journal of the American Medical Association* 22 (1894): 319–20, 361–62, 397–98, 435–37, 636–37.

———. "Lister's Antiseptic Treatment of Wounds: The Material Used and Their Mode of Action." *Medical Record* 12 (1877): 721–26.

———. "The Sanitary Duties and Rights of Medical Officers as Affecting Their Relations With the Commanders of the Line." *Transactions of the Second Annual Meeting of the Association of Military Surgeons of the National Guard of the United States*, 1892, pp. 64–76.

Glennan, James D. "The U.S. Army Ambulance: Its Advantages and Defects as Shown by Actual Service." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 69–72.

Goethals, George W. "The Building of the Panama Canal." *Scribner's Magazine* 57 (1915): 265–82, 395–418, 531–48, 720–34.

Goldthwaite, H. "Matters of Sanitary Interest on the Isthmus." *Mobile Medical and Surgical Journal* 6 (1905): 55–61.

Goltman, M. "The History of X-rays and Their Application in Medicine and Surgery." *Memphis Medical Monthly* 17 (1897): 289–93.

Goltra, John N. "The Executive Element in the Training and Skill of the Army Surgeon." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 206–19.

Gorgas, William C. "Health Problems of the Army." *American Journal of Public Health* 7 (1917): 937–39.

———. "Mosquito Work in Relation to Yellow Fever on the Isthmus of Panama." *Journal of the American Medical Association* 46 (1906): 322–24.

———. "Recommendation as to Sanitation Concerning Employees of the Mines on the Rand Made to the Transvaal Chamber of Mines." *Military Surgeon* 35 (1914): 24–50.

———. "The Results of Yellow Fever Sanitation in Havana, Cuba, for the Year 1901 up to September 1st, Carried on Upon the Basis That the Stegomyia Mosquito Is the Sole Means of Its Transmission." *Public Health Papers and Reports* 27 (1901): 130–33.

———. "Sanitary Conditions as Encountered in Cuba and Panama and What Is Being Done To Render the Canal Zone Healthy." *Medical Record* 67 (1905): 161–63.

———. "The Sanitary Organization of the Isthmian Canal as It Bears Upon Anti-malarial Work." *Military Surgeon* 24 (1909): 261–67.

———. "Sanitation on the Isthmus of Panama." *Detroit Medical Journal* 5 (1905–1906): 37–39.

———. "Sanitation of the Tropics With Special Reference to Malaria and Yellow Fever." *Journal of the American Medical Association* 52 (1909): 1075–77.

———. "A Short Account of the Yellow Fever Epidemic of 1897, and More Particularly Its Relations to the Garrisons of the Regular Army, Stationed in the Regions Affected." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 282–89.

Greenleaf, Charles R. "Ambulance Construction." *Proceedings of the Fifth Annual Meeting of the Association of Military Surgeons of the United States*, 1895, pp. 264–74.

———. "A Brief Statement of the Sanitary Work So Far Accomplished in the Philippine Islands, and of the Present Shape of the Sanitary Administration." *Public Health Papers and Reports* 27 (1901): 157–65.

———. "The Medical Officer of the Summer Encampment." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 145–53.

———. "The Necessity of a Properly Organized Hospital Corps in the National Guard." *Boston Medical and Surgical Journal* 127 (1892): 493–96.

———. "An Object Lesson in Military Sanitation." *Boston Medical and Surgical Journal* 141 (1899): 485–87.

———. "The Organization of the Medical Department of the Army in the Field." *National Medical Review* 8 (1898): 199–202.

Greenleaf, H. S. "Army Medical Service of Nicholas Senn." *Philadelphia Medical Journal* 2 (1898): 694–95.

Griffith, Jefferson D. "Hospital Experience in the War With Spain." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 161–67.

Hagler, Frederick. "Relapsing Fever." *Military Surgeon* 39 (1916): 36–43.

Haines, Edgar F. "The Modern Treatment of Amoebic Dysentery." *Boston Medical and Surgical Journal* 171 (1914): 816–18.

Hall, Horace C. "Typhus Fever." *Military Surgeon* 39 (1916): 474–90.

Hammond, William A.; Sims, J. Marion; Hodges, John T.; and Ashurst, Jr., John. "The Surgical Treatment of President Garfield." *North American Review* 133 (1881): 578–610.

Hartsock, Frederick M. "Military Medical Conditions Relating to the American Legation Guard in Pekin, China." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 239–63.

Harvey, Philip F. "The Medical Department of the Army and the Advantages It Offers the Young Practitioner." *Journal of the American Medical Association* 46 (1906): 578–80.

Haubold, H. A. "The Medical Aspects of Camp Management at Chickamauga." *Medical Record* 54 (1898): 584–86.

Havard, Valery. "The Krag-Jorgensen Bullet-Wound." *Journal of the American Medical Association* 31 (1898): 1412–13.

———. "The Prophylaxis of Venereal Diseases." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 1–17.

———. "Sanitation and Yellow Fever in Havana." *Sanitarian* 47 (1901): 13–21, 121–28.

———. "The Value of Statistics in Connection With Venereal Diseases in the Army and Navy." *Military Surgeon* 14 (1904): 114–17.

Hays, Harold. "The Camp of Instruction for Officers of the Medical Reserve Corps, U.S. Army." *Medical Times* 43 (1915): 263–66.

"Health of Americans in the Philippines." *Medical Record* 66 (1904): 700–701.

"The Health of the Army." *Boston Medical and Surgical Journal* 139 (1898): 200–201.

"The Health of the Army at Honolulu." *Medical News* 73 (1898): 695.

Heiser, Victor G. "A Note on Smallpox and Vaccination in the Philippines." *Public Health Reports* 26 (1911): 495.

———. "Some Considerations With Regard to the Cause of the Frequent Reappearance of Cholera in the Philippine Islands, With Statistics Begin-

ning With the Outbreak in 1902 to January 1, 1908." *Philippine Journal of Science* 3B (1908): 89–104.

———. "Unsolved Health Problems Peculiar to the Philippines." *Philippine Journal of Science* 5B (1910): 171–78.

Heller, Joseph M. "Experiences of the Spanish-American War From a Different Viewpoint Than Major Nancrede." *Military Surgeon* 27 (1910): 70–76.

"The Heroes at the Rear." *Medical Record* 54 (1898): 234–35.

Herrick, James B. "The Relation of the Clinical Laboratory to the Practitioner of Medicine." *Boston Medical and Surgical Journal* 156 (1907): 763–68.

Herzog, Maxmillian. "Bubonic Plague in the Philippine Islands From Its First Outbreak in 1899 to 1905." *Medicine* 11 (1905): 649–54.

Hoff, John van R. "Experience of the Army With Vaccination as a Prophylactic Against Smallpox." *Military Surgeon* 28 (1911): 490–503.

———. "Military Medical Education." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 195–203.

———. "Outlines of the Sanitary Organization of Some of the Great Armies of the World." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 426–514.

———. "Scheme of Military Sanitary Organization." *Proceedings of the Seventh Annual Meeting of the Association of Military Surgeons of the United States*, 1897, pp. 437–47.

———. "The Share of the 'White Man's Burden' That Has Fallen to the Medical Department of the Public Services of Porto Rico." *Philadelphia Medical Journal* 5 (1900): 796–99.

———. "Some Notes on Military Sanitary Organization." *Transactions of the Second Annual Meeting of the Association of Military Surgeons of the National Guard of the United States*, 1892, pp. 76–90.

———. "Some Steps in the Organization and Instruction of the Medical Department of the Third Corps, U.S.V." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 106–38.

———. "The Travois: A New Sanitary Appliance in the First Line of Battlefield Assistance." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 73–84.

———. "Typhomalarial Fever: The So-called Mountain Fever of the Rocky Mountain Region." *American Journal of the Medical Sciences* 79 (1880): 38–60.

———. "What is a Hospital Corps?" *Medical News* 52 (1888): 315–17.

———. "What Is the Most Practical Plan of Sanitary Organization for Active Service in the United States Army?" *Proceedings of the Sixth Annual Meeting of the Association of Military Surgeons of the United States*, 1896, pp. 207–30.

Holcomb, Richmond C. "Has Our Propaganda for Venereal Prophylaxis Failed?" *Military Surgeon* 38 (1916): 30–41.

"Homeopaths for the Army and Navy of the United States." *Journal of the American Medical Association* 30 (1898): 1430.

"The Hospital Ship 'Relief'." *Medical Record* 54 (1898): 310.

"Hospital Ship in Service at Taku." *Philadelphia Medical Journal* 6 (1900): 276.

Howard, George S. "Diary." *Winners of the West* 14 (1937): 3.

Hull, Myra E., ed. "Soldiering on the High Plains: The Diary of Lewis Byrum Hull, 1864–1866." *Kansas Historical Quarterly* 7 (1938): 3–53.

Hume, Edgar Erskine. "Admission to the Medical Department of the Army Half a Century Ago: The Experience of Brigadier General William Hemple Arthur." *Military Surgeon* 79 (1936): 197–202.

Hunt, E. M. "Brief Remarks on the First Part of Medical and Surgical History of the War." *Medical Record* 9 (1874): 177–79.

Huntington, P. W. "Transmissible Diseases in War." *New York Medical Journal* 104 (1916): 62–64.

"Inoculation by Mosquitoes Against Yellow Fever." *Boston Medical and Surgical Journal* 124 (1891): 273.

"Insanity in the Army." *Medical News* 76 (1900): 586.

"Instruction in Hygiene at West Point." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 148.

Ireland, Merritte W. "The Conquest of Yellow Fever." *Military Surgeon* 64 (1929): 244–51.

"Is the Medical Corps of the Army Worth While?" *Military Surgeon* 39 (1916): 660–61.

Janeway, Theodore C. "Some Sources of Error in Laboratory Clinical Diagnosis." *Medical News* 78 (1901): 700–706.

Jarvis, N. S. "Mumps at Fort Apache, Arizona." *New York Medical Journal* 57 (1893): 582–83.

Johnson, Susan Bard. "Some Reasons Why Nurses Do Not Enlist." *American Journal of Nursing* 6 (1905): 79–81.

Johnston, W. W. "Errors in Death Returns From Malarial and Typho-malarial Fevers; Typhoid Fever the Prevailing Continued Fever of Washington." *National Medical Review* 7 (1898): 403–08.

————. "On the Geographical Distribution of Typhoid Fever in the United States: Its Relation to Fevers of Malarial Origin and to Obscure and Unclassified Forms of Continued Fever." *Transactions of the Association of American Physicians* 3 (1888): 9–46.

Jones, E. C. "Transportation of Ambulance Companies." *Military Surgeon* 37 (1915): 429–37.

Jones, Glenn I. "The Treatment of Intestinal Amoebiasis." *Journal of the American Medical Association* 64 (1915): 982–83.

Jones, Percy L. "General Rules Governing Dressing Stations, With Suggestions for Changes in Equipment." *Military Surgeon* 35 (1914): 522–30.

Jones, Philip M. "X-rays and X-ray Diagnosis." *Journal of the American Medical Association* 29 (1897): 945–49.

"Joseph Janvier Woodward." *Medical News* 45 (1884): 249–50.

Kean, Jefferson R. "Editorial: William Crawford Gorgas." *Military Surgeon* 56 (1925): 366–70.

———. "Hospitals and Charities in Cuba." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 140–49.

———. "Influence of the Association of Military Surgeons on the Status of Medical Officers." *Military Surgeon* 89 (1941): 599.

———. "New Role of the American Red Cross." *Military Surgeon* 38 (1916): 539–44.

———. "A Plea for Applying the Usual Methods of Preventive Medicine to Venereal Diseases." *Journal of the American Public Health Association,* n.s. 1 (1911): 198–208.

———. "The Venereal Problem in the Army and Navy." *Military Surgeon* 30 (1912): 251–90.

Keefer, Frank R. "The Functions of the Medical Department of the Army, Especially in the Field." *Journal of the Military Service Institution of the United States* 49 (1911): 347–59.

———. "The Prevention of Typhoid Fever." *Military Surgeon* 28 (1911): 288–94.

———. "The Sanitary Problems of Trench Warfare." *Military Surgeon* 38 (1916): 616–22.

Keen, William W. "Presentation to the College of the Retractor Used in Operation Upon President Cleveland, the Specimen Removed and the Dental Casts Made." *Transactions of the College of Physicians of Philadelphia,* 3d ser., 39 (1917): lxiii–lxiv.

Keenan, George F. "Our Medico-military Responsibility." *Southwestern Medicine* 1 (1917): 12–18.

Kemp, Franklin M. "Field Work in the Philippines." *Proceedings of the Ninth Annual Meeting of the Association of Military Surgeons of the United States* 9 (1900): 73–85.

Kent, A. A. "The Abuse of Alcoholic Stimulants in Practice." *Medical and Surgical Reporter* 74 (1896): 72–76.

Kilbourne, Edwin D. "Some Experiments With the Trypanosoma Evansi." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 248–50.

Kilbourne, Henry S. "The Medical Department of the United States Army Transport Service." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 1–11.

King, Edgar. "The Military Delinquent." *Military Surgeon* 37 (1915): 574–78.

———. "The Use of Habit-forming Drugs (Cocaine, Opium and Its Derivatives) by Enlisted Men: A Report Based on the Work Done at the United States Disciplinary Barracks." *Military Surgeon* 39 (1916): 380–84.

King, Walter W. "Report on the High Mortality on the Island of Porto Rico." *Public Health Reports* 15 (1900): 2722–26.

Kirkpatrick, Thomas J. "Camp Sanitation." *Military Surgeon* 24 (1909): 412–29.

Kober, George M. "The Progress and Tendency of Hygiene and Sanitary Science in the Nineteenth Century." *Medical Record* 59 (1901): 898–906.

Kolipinski, Louis. "The Santiago Campaign: Medical Experience With the Returned Soldiers of the District of Columbia, U.S.V." *Journal of the American Medical Association* 31 (1898): 1355–56.

Kress, George H. "United States Army Field Hospital in San Francisco in 1906, With Some Excerpts From the May 1906 Issue of the California State Journal of Medicine." *California and Western Medicine* 53 (1940): 215–17.

Kulp, John S. "A Manila Military Hospital." *Journal of the Association of Military Surgeons of the United States* 10 (1901): 225–36.

———. "What To Avoid in Army Athletics." *Proceedings of the Seventh Annual Meeting of the Association of Military Surgeons of the United States*, 1897, pp. 311–20.

LaGarde, Louis A. "Comment on Epidemic Typhoid, With Especial Reference to Contact Infection." *Military Surgeon* 22 (1908): 373–74.

———. "The Medical Department in Time of War." *Boston Medical and Surgical Journal* 135 (1896): 585–88.

———. "Notes on an Emergency Ration." *Proceedings of the Sixth Annual Meeting of the Association of Military Surgeons of the United States*, 1896, pp. 345–51.

———. "Relation of the Civilian Physician to National Preparedness." *Military Surgeon* 39 (1916): 237–43.

Lamb, Daniel S. "The Army Medical Museum." *Military Surgeon* 53 (1923): 89–140.

———. "Record of the Postmortem Examination of the Body of President J. A. Garfield, Made September 20, 1881, Commencing at 4:30 PM, Eighteen Hours After Death, at Francklyn Cottage, Elberon, New Jersey." *American Journal of the Medical Sciences* 82 (1881): 583–90.

———. "Report of the Post-mortem Examination of the Body of Charles J. Guiteau." *Medical News* 41 (1882): 43–45.

Leigh, John G. "Sanitation and the Panama Canal: The Solution of Certain Climatic and Hygienic Problems." *Lancet* 1 (1905): 1530–33, 1597–1601, 1726–30.

LeRoy, James A. "The Philippines Health Problem." *Outlook* 71 (1902): 777–82.

Levison, Charles G. "The Present Status of Blood Extract Coagulants and Blood Transfusion." *Military Surgeon* 39 (1916): 625–33.

Lewis, W. F., and Miller, R. B. "Recent Developments in Camp Sanitation." *Military Surgeon* 40 (1917): 499–510.

Lewisohn, Richard. "A New and Greatly Simplified Method of Blood Transfusion." *Medical Record* 87 (1915): 141–42.

Liceaga, Edouardo. "How War Has Been Waged in Mexico Against the Mosquito." *American Journal of Tropical Diseases and Preventive Medicine* 2 (1914–1915): 118–23.

Lippincott, Henry. "Reminiscences of the Expedition to the Philippine Islands." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 168–74.

Long, S. S. "A Few Short Notes on the Administration of the United States Army in the Philippines." *Journal of the Military Service Institution of the United States* 25 (1899): 125–35.

"Low Typhoid Sick Rate in the Army." *Military Surgeon* 23 (1908): 78.

Luce, Edward S., ed. "The Diary and Letters of Dr. James M. DeWolf." *North Dakota History* 25 (April–July 1958): 33–81.

Lyster, William J. L. "The Army Surgeon in the Philippines." *Journal of the American Medical Association* 36 (1901): 30–34.

———. "Present Status of Artificially Treated Drinking Water in the Field." *Military Surgeon* 40 (1917): 401–09.

———. "Sterilization of Drinking Water by Calcium Hypochlorite in the Field." *Military Surgeon* 36 (1915): 222–28.

———. "Vaccination Against Typhoid in the United States Army." *Journal of the American Medical Association* 65 (1910): 510–12.

McBurney, C. "Experience With Early Operative Interference in Cases of Disease of Vermiform Appendix." *New York Medical Journal* 50 (1889): 676–84.

McCaw, Walter D. "The Medical Service of an Army in Modern War." *Journal of the Association of Military Surgeons of the United States* 16 (1905): 334–49.

McClintock, Charles T. "Corrosive Sublimate as a Germicide." *Medical News* 61 (1892): 397–400.

McCloskey, Manus. "The Importance of the Service of the Evacuation of the Sick and Wounded by the Medical Department in Time of War." *Military Surgeon* 27 (1910): 414–27.

McCoy, George W. "A Brief History of Leprosy in Hawaii." *Military Surgeon* 33 (1913): 522–27.

McCullough, Champe C. "The Qualifications, Responsibilities, and Duties of the Regular Army Surgeon: A Reply to Dr. Senn." *Medical Record* 54 (1898): 498–99.

———. "The Scientific and Administrative Achievement of the Medical Corps of the United States Army." *Scientific Monthly* 4 (1917): 410–27.

McGee, Anita Newcomb. "Facts About the Army Canteen." *Military Surgeon* 23 (1908): 260–71.

———. "Nurse Corps of the Army." *Journal of the Association of Military Surgeons of the United States* 11 (1902): 267–73.

———. "Women Nurses in the American Army." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 242–48.

McGlannan, Alexius. "The Prophylaxis and Treatment of Tetanus." *Military Surgeon* 40 (1917): 52–57.

McIntire, Charles. "Medical Education in the United States: From Chaos Towards Cosmos." *Bulletin of the American Academy of Medicine* 1 (1893): 460–69.

McLaughlin, Allan. "The Suppression of a Cholera Epidemic in Manila." *Philippine Journal of Science* 4B (1909): 43–56.

Maddux, H. C. "Hospital Treatment of Acute Gonorrhea." *Military Surgeon* 37 (1915): 584–86.

Mason, Charles F. "Bacillary Dysentery (Shiga)." *Journal of the American Medical Association* 41 (1903): 242–46.

Mattison, Ray H., ed. "The Diary of Surgeon Washington Matthews, Fort Rice, D.T." *North Dakota History* 2 (1954): 5–74.

Maus, Louis M. "The Ethics, Scope and Prerogative of the Army Medical Officer." *Military Surgeon* 28 (1911): 295–309.

———. "Military Sanitary Problems in the Philippine Islands." *Military Surgeon* 24 (1909): 1–31.

———. "Venereal Diseases in the United States Army: Their Prevention and Treatment." *Military Surgeon* 27 (1910): 130–48, 248–67.

Mayo, Charles H. "Medical Service in the United States Army." *St. Paul Medical Journal* 19 (December 1917): 351–53.

"Medical and Sanitary History of Troops in the Philippines." *Philadelphia Medical Journal* 5 (1900): 826–31.

"The Medical Department of the Army Again." *Boston Medical and Surgical Journal* 139 (1898): 178.

"The Medical Department Praised." *Boston Medical and Surgical Journal* 14 (1899): 26.

"Medical Ethics Among the Military Brethren." *New York Medical Journal* 7 (1893): 110–11.

"Medical News." *Journal of the American Medical Association* 35 (1900): 437.

"Medical Preparedness and the Army." *Journal of the American Medical Association* 66 (1916): 575–76.

"Medical Reserve Corps." *Military Surgeon* 23 (1908): 66–69.

"The Medical Staff of the Army." *Medical Record* 14 (1878): 174–75.

Meister, William B. "Cocainism in the Army." *Military Surgeon* 34 (1914): 344–51.

"Memorial of the American Medical Association." *Medical Record* 9 (1874): 72.

"Mexican Notes." *Boston Medical and Surgical Journal* 170 (1914): 907.

Michie, Henry. "Mexican Typhus Fever." *Medical Record* 87 (1915): 214–18.

Miller, Reuben B. "The New Manual for the Medical Department." *Military Surgeon* 38 (1916): 300–19.

———. "The Sanitation of the Second Division, U.S. Army, at Texas City and Galveston, Texas, March 1 to July 31, 1913." *Military Surgeon* 33 (1913): 503–16.

Miller, William G. "The Treatment of Gonorrhea by Irrigation." *Journal of the Association of Military Surgeons of the United States* 19 (1906): 229–32.

Minges, George. "The Present State of Bacteriology." *Journal of the American Medical Association* 12 (1889): 298–300.

"Miscellany—Emergency Rations for the Army: Summary of Proceedings, Conclusions, and Recommendations of the Emergency Ration Board." *Journal of the American Medical Association* 28 (1897): 41–44.

"Miscellany—The Danger of Chloroform and the Safety of Ether as an Anaesthetic." *New York Medical Journal* 54 (1891): 222–23.

"The Mode of Spreading of Bubonic Pest." *Journal of the American Medical Association* 31 (1898): 1372.

Moorhead, Arthur H. "Plague in India." *Military Surgeon* 22 (1908): 165–81.

Morell, Harry. "A Brief Description of the Hospitals of Manila, With a Few Notes on the Plague." *St. Paul Medical Journal* 4 (1902): 261–65.

Morrow, Prince A. "Publicity as a Factor in Venereal Prophylaxis." *Journal of the American Medical Association* 47 (1906): 1244–46.

"Mosquitoes and Malaria." *Medical Record* 54 (1898): 163.

Munson, Edward L. "The Army Medical Service." *Medical Record* 75 (1909): 676–79.

———. "Cholera Carriers in Relation to Cholera Control." *Philippine Journal of Science* 10B (1915): 1–9.

———. "The Civil Sanitary Function of the Army Medical Department in Territory Under Military Control." *Military Surgeon* 25 (1909): 273–304.

———. "The Conduction of Field Maneuvers of Military Sanitary Troops." *Military Surgeon* 30 (1912): 1–17.

———. "Contract Surgeons in the United States Army." *Boston Medical and Surgical Journal* 141 (1899): 588–89.

———. "The Effect of Marching on the Rates for Non-efficiency of Newly Raised Troops." *Military Surgeon* 40 (1917): 171–82.

———. "The Ideal Ration for an Army in the Tropics." *Journal of the Military Service Institution of the United States* 26 (1900): 309–46.

———. "Military Absenteeism in War, With Special Reference to the Relation of the Medical Department Thereto." *Military Surgeon* 30 (1912): 489–513, 619–43; 31 (1912): 1–27.

———. "Military Preparedness From the Medical Standpoint." *Medical Record* 89 (1916): 447.

———. "A New Method of Waterproofing Military Clothing." *Proceedings of the Ninth Annual Meeting of the Association of Military Surgeons of the United States*, 1900, pp. 430–36.

———. "An Outline of the Organization and Work of the Medical Department of the United States Army." *International Clinician* 2 (1902): 249–60.

———. "Surgeon General George M. Sternberg, In Memoriam." *Transactions of the American Society of Tropical Medicine* 10 (1916): 19–26.

———. "The Training of Medical Reserve Officers." *Surgery, Gynecology and Obstetrics* 25 (1917): 714–16.

Munson, F. M. "The Ration in the Tropics." *Military Surgeon* 27 (1910): 41–50.

Murphy, John B. "Appendicitis." *Journal of the American Medical Association* 24 (1895): 433–37.

Murray, R. "Necrology, Joseph Janvier Woodward." *Journal of the American Medical Association* 3 (1884): 279–80.

———. "Obituary: Joseph Janvier Woodward, U.S.A." *Boston Medical and Surgical Journal* 111 (1884): 237.

Musgrave, William E. "Infant Mortality in the Philippine Islands." *Philippine Journal of Science* 8B (1913): 459–67.

———. "Intestinal Amoebiasis Without Diarrhea: A Study of Fifty Fatal Cases." *Philippine Journal of Science* 5B (1910): 229–31.

———. "Paragonimiasis in the Philippine Islands." *Philippine Journal of Science* 2B (1907): 15–65.

———. "Symptoms, Diagnosis and Prognosis of Uncomplicated Intestinal Amebiasis in the Tropics." *Journal of the American Medical Association* 45 (1905): 830–37.

———. "The Treatment of Intestinal Amebiasis." *Journal of the American Medical Association* 58 (1912): 13–18.

Musgrave, William E., and Clegg, M. T. "The Etiology of Mycetoma." *Philippine Journal of Science* 2B (1907): 477–511.

Musgrave, William E., and Marshall, Harry T. "Gangosa in the Philippine Islands." *Philippine Journal of Science* 2B (1907): 387–400.

Musgrave, William E., and Richmond, George F. "Infant Feeding and Its Influence Upon Infant Mortality in the Philippine Islands." *Philippine Journal of Science* 2B (1907): 361–85.

Musser, John H., and Sailer, Joseph. "Further Notes on a Case of Malta Fever: A Study in Serum Diagnosis." *Transactions of the Association of American Physicians* 14 (1899): 163–67.

Nancrede, C. B. G. de. "Personal Experience During the Spanish-American War, Showing the Disadvantages of Depending Upon Untrained Civilian Physicians for Military Service in Time of War, With Some Suggestions." *Military Surgeon* 26 (1910): 611–27.

Neisser, Albert. "War, Prostitution, and Venereal Diseases." *Social Hygiene* 3 (1917): 537–41. Originally published in *Deutsche Medizinische Wochenschrift*, 1915.

Nelson, Kent. "An Army Motor Ambulance." *Military Surgeon* 38 (1916): 151–68.

"A New Course of Instruction for the Army Hospital Corps." *Boston Medical and Surgical Journal* 14 (1899): 375.

"News Item: Professor Esmarch on the Case of President Garfield." *Medical News* 4 (1882): 307–08.

"News of the Service: The Medical Department at Panama." *Journal of the Association of Military Surgeons of the United States* 18 (1906): 140–42.

"The New Surgeon General." *Medical News* 58 (1891): 51.

"New York Academy of Medicine: General Meeting, October 6, 1898." *Medical Record* 54 (1898): 566–68.

Nichols, Henry J. "Fact and Fancy About the Hookworm." *Medical Record* 65 (1911): 322–25.

———. "The Immediate Clinical Results of the Use of Salvarsan in the Army." *Military Surgeon* 30 (1912): 212–16.

———. "Possible Reasons for Lack of Protection After Antityphoid Vaccination." *Military Surgeon* 38 (1916): 263–68.

———. "The Present Status of Salvarsan Therapy in Syphilis." *Journal of the American Medical Association* 58 (1912): 603–09.

———. "Report on the Bombay Medical Congress." *Military Surgeon* 25 (1909): 172–79.

———. "The Simple and Double Continued Fevers of the Philippines." *Military Surgeon* 22 (1908): 358–68.

Nichols, Henry J., and Andrews, Vernon L. "The Treatment of Asiatic Cholera During the Recent Epidemic." *Philippine Journal of Science* 4B (1909): 81–98.

Nichols, Henry J., and Phalen, James M. "The Work of the Board for the Study of Tropical Diseases in the Philippines." *Military Surgeon* 23 (1908): 361–70.

"Obituary." *Medical News* 45 (1884): 249–50.

"Official Bulletin of the Autopsy on the Body of President Garfield." *Medical Record* 20 (1881): 364.

"The One Great Blot of the War." *Medical Century* 6 (1898): 278–79.

Osler, William. "An Address on the Haematozoa of Malaria." *British Medical Journal* 1 (1887): 556–62.

———. "The Disguises of Typhoid Fever." *Maryland Medical Journal* 36 (1897): 423–25.

———. "The Problem of Typhoid Fever in the United States." *New York Medical Journal* 70 (1899): 673–76.

———. "A Study of the Fevers of the South." *Journal of the American Medical Association* 26 (1896): 999–1006.

Otis, Elwell S. "The Army in Connection With the Labor Riots of 1877." *Journal of the Military Service Institution of the United States* 5 (1884): 301–23.

Otis, George A. "Notes on the Contributions to the Army Medical Museum by Civil Practitioners." *Boston Medical and Surgical Journal* 98 (1878): 163–69.

Owen, William O. "The Ideal Relation for the Medical Department of an Army." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 361–65.

———. "Relation of the Army Medical Corps and the Medical Reserve Corps to the Medical Corps of the Organized Militia." *Military Surgeon* 37 (1915): 523–39.

———. "Some of the Trials and Tribulations of a Medical Officer of the United States Army." *Proceedings of the Ninth Annual Meeting of the Association of Military Surgeons of the United States*, 1900, pp. 388–93.

Park, William H. "Typhoid Bacilla Carriers." *Journal of the American Medical Association* 51 (1908): 981–82.

Pearson, Leonard. "Tetanus." *American Veterinary Review* 21 (1897): 380–86.

Peed, G. P. "A Guide To Facilitate the Organization and Administration of Independent Sanitary Commands in the Field." *Military Surgeon* 36 (1915): 241–53, 305–32.

Perry, J. C. "A Report on the Sanitary Condition of Colon and Panama, and the Isthmus Between These Points." *Public Health Reports* 19 (1904): 351–58.

Persons, Elbert E. "Medical Service With Philippine Scouts." *Military Surgeon* 25 (1909): 705–10.

———. "Special Article: 'Field Service Regulations, United States Army, 1914,' and 'Organization Tables, United States Army, 1914'." *Military Surgeon* 34 (1914): 401–10.

Peters, John C. "On Filth and Semi-filth Diseases." *Medical Record* 19 (1881): 625.

Pettey, George E. "The Heroin Habit Another Curse." *Alabama Medical Journal* 15 (1902–1903): 174–80.

Phalen, James M. "An Experiment With Orange-Red Underwear." *Philippine Journal of Science* 5B (1910): 525–46.

———. "The Teaching of Tropical Medicine." *Military Surgeon* 23 (1908): 290–97.

———. "Vaccine Inoculation, Prophylactic and Curative of Typhoid Fever." *Journal of the American Medical Association* 58 (1912): 9–11.

Phalen, James M., and Kilbourne, E. D. "The Bacteriology of an Epidemic of Bacillary Dysentery." *Military Surgeon* 26 (1910): 433–43.

Phalen, James M., and Nichols, Henry J. "Blastomycosis of the Skin in the Philippines." *Military Surgeon* 24 (1909): 280–300.

———. "Tropical Diseases in the Philippines." *Military Surgeon* 23 (1908): 462–68.

———. "The Work of the Army Board on Tropical Diseases as They Exist in the Philippine Islands." *Military Surgeon* 24 (1909): 132–38.

———. "The Work of the Board for the Study of Tropical Diseases in the Philippines." *Military Surgeon* 25 (1909): 458–69.

Phelan, Henry du R. "Experiences in the San Francisco Disaster." *Journal of the Association of Military Surgeons of the United States* 19 (1906): 95.

———. "Sanitary Service in Surigao, a Filipino Town in the Island of Mindanao." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 1–18.

Phillips, Carl. "Problems of a National Guard Regimental Surgeon in a Maneuver Campaign." *Military Surgeon* 32 (1913): 65–69.

Pierson, Robert H. "Conditions of Military Surgery." *Medical Sentinel* 20 (1912): 71–84.

———. "Importance of Blood Pressure Readings in Annual Examinations of Field Officers." *Military Surgeon* 34 (1914): 458–60.

Pilcher, James E. "The Building of the Soldier." *United Service* n.s. 7 (1892): 321–37.

———. "The Place of Physical Training in the Military Service." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 170–78.

———. "The Uniform of the West Point Cadet." *Journal of the Military Service Institution of the United States* 10 (1889): 479–87.

Pinkham, Edward W. "Tropical Abscess of the Liver." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 301–16.

———. "The Tropical Diseases of the Philippine Islands, With Especial Reference to Amebic Abscess of the Liver." *New Orleans Medical and Surgical Journal* 60 (1907): 267–73.

"Portable Army Hospitals." *Medical Record* 54 (1898): 523.

Potter, Samuel O. L. "Notes on the Philippines." *Philadelphia Medical Journal* 5 (1900): 803–07.

Powell, Junius L. "Some Observations on the Organization and Efficiency of the Hospital Corps and Work of Medical Corps in Time of War." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 329–36.

Powell, William A. "Report on Camp Wilhelm, Tayabas, P.I." *Military Surgeon* 29 (1911): 408–23.

"President Garfield's Case Again." *Medical News* 41 (1882): 128–30.

"Preparing the Medical Profession of the Country for War." *Military Surgeon* 40 (1917): 74–76.

"The Prevention and Cure of Yellow Fever." *Medical Record* 54 (1898): 125.

"Professor Esmarch on the Case of President Garfield." *Medical News* 41 (1882): 294–95.

"Progress in Military Sanitation." *Boston Medical and Surgical Journal* 14 (1899): 328–29.

"Public Health." *Journal of the American Medical Association* 22 (1894): 98–99.

"Public Health—Diphtheria Antitoxin." *Journal of the American Medical Association* 24 (1895): 67.

"Public Health—Good Sanitary Results at Santiago de Cuba." *Journal of the American Medical Association* 31 (1898): 868–69.

"The Radical Cure of Hernia." *Journal of the American Medical Association* 25 (1895): 506.

"The Rank and Pay of the Hospital Stewards of the Army." *Medical Record* 10 (1875): 670.

Ravenel, Mazyck P. "The Prophylaxis of Venereal Disease." *Social Hygiene* 3 (1917): 185–95.

Raymond, Henry I. "Ipecacuanha in Amebic Dysentery." *Military Surgeon* 22 (1908): 46–54.

———. "What Is the Most Effective Organization of the American National Red Cross for War, and What Should Be Its Relation to the Medical Department of the Army and Navy." *Military Surgeon* 23 (1908): 153–87.

Raymond, Henry I., and Wolfe, Edwin P. "Duties of Medical Supply Officers and Their Methods." *Military Surgeon* 39 (1916): 1–21, 150–55, 288–92, 398–404.

Reasoner, Matthew A. "The Effect of Soap Upon Treponema Pallidum." *Journal of the American Medical Association* 68 (1917): 973–74.

Reasoner, Matthew A., and Matson, Ray W. "The Treatment of Syphilis." *Medical Sentinel* 19 (1911): 734–43.

"The Red Cross and the Army." *Medical Record* 54 (1898): 125–26.

Reed, Charles A. L. "Isthmian Sanitation—The Panama Canal Mismanagement: Report to the Government Showing How the Commission Makes Efficient Sanitation Impossible." *Journal of the American Medical Association* 44 (1905): 812–18.

Reed, Walter. "The Propagation of Yellow Fever: Observations Based on Recent Researches." *Medical Record* 60 (1901): 201–09.

————. "Recent Researches Concerning the Etiology, Propagation, and Prevention of Yellow Fever by the United States Army Commission." *Journal of Hygiene* 2 (1902): 101–19.

————. "Typhoid Fever in the District of Columbia." Part III (A). "Diagnosis: The Value of Widal's Test, the Dried Blood Method." *National Medical Review* 7 (1897): 144–46.

Reed, Walter, and Carroll, James. "A Comparative Study of the Biological Characters and Pathogenesis of Bacillus X (Sternberg), Bacillus Icteroides (Sanarelli), and the Hog-Cholera Bacillus (Salmon and Smith)." *Journal of Experimental Medicine* 5 (1900): 215–70.

————. "The Prevention of Yellow Fever." *Medical Record* 60 (1901): 641–49.

————. ————. *Public Health Papers and Reports* 27 (1901): 113–29.

————. "The Specific Cause of Yellow Fever: A Reply to Dr. G. Sanarelli." *Medical News* 75 (1899): 321–29.

Reed, Walter; Carroll, James; and Agramonte, Aristides. "The Etiology of Yellow Fever: An Additional Note." *Journal of the American Medical Association* 36 (1901): 431–40.

————. "Experimental Yellow Fever." *American Medicine* 2 (1901): 15–23.

Reed, Walter; Carroll, James; Agramonte, Aristides; and Lazear, Jesse. "The Etiology of Yellow Fever: A Preliminary Note." *Philadelphia Medical Journal* 6 (1900): 790–96.

Reno, William W. "The Sanitary Officer." *Military Surgeon* 28 (1911): 153–61.

————. "The Wheel Litter Travois." *Military Surgeon* 38 (1916): 175–92.

"Report of the Chief, Bureau of Militia Affairs, 1915." *Military Surgeon* 38 (1916): 215–38.

"Report of the Surgeon-General of the Army." *Boston Medical and Surgical Journal* 142 (1900): 118.

"Reprints and Translations: Disease Among Our Troops at the Front." *Military Surgeon* 35 (1914): 163–66.

"The Responsibility of the Army Medical Department." *Medical Record* 54 (1898): 450–51.

Reyburn, Robert. "Clinical History of the Case of President Garfield." *Journal of the American Medical Association* 22 (1894): 411–17, 460–64, 498–502, 545–49, 578–82, 621–24, 664–68.

Richard, Charles. "The Army Hospital Train During the Spanish-American War." *Proceedings of the Eighth Annual Meeting of the Association of Military Surgeons of the United States*, 1899, pp. 196–202.

Richards, R. L. "The Importance of Alcohol, Heat, and Acute Infectious Diseases Occurring in the United States Army in the Past Ten Years." *Military Surgeon* 25 (1909): 614–26.

Richardson, G. W. "Intestinal Fever, Causes and Prevention." *Philadelphia Medical Journal* 5 (1900): 815–17.

Richardson, Mark W. "On the Bacteriological Examination of the Stools in Typhoid Fever and Its Value in Diagnosis." *Boston Medical and Surgical Journal* 137 (1897): 433–37.

Roberts, William W. "Report on an African Trip." *Military Surgeon* 28 (1911): 310–30.

Robertson, Oswald H. "Transfusion With Preserved Red Blood Cells." *British Medical Journal* 1 (1918): 691–95.

Roosevelt, Theodore. "General Wood's Early Life." *Journal of the American Medical Association* 32 (1899): 431–32.

———. "President Roosevelt on Army Medical Reorganization." *Journal of the Association of Military Surgeons of the United States* 16 (1905): 133–43.

———. "The Rough Riders." *Scribner's Magazine* 25 (1899): 3–20, 131–51, 259–77, 420–40, 565–85, 677–93.

Ross, John W. "Outline of the Organization of the Department of Health of the Isthmian Canal Commission, Isthmus of Panama." *Journal of the Association of Military Surgeons of the United States* 15 (1904): 418–26.

Rucker, William C. "The Relation of the Military and Naval Forces of the United States to Public Health." *Military Surgeon* 23 (1908): 333–60.

Ruffner, E. L. "The Private Sanitary Filipino Scout." *Military Surgeon* 27 (1910): 410–13.

Russell, Frederick F. "Antityphoid Vaccination." *American Journal of the Medical Sciences* 146 (1913): 803–33.

———. "Anti-typhoid Vaccination in the American Army." *Journal of the American Public Health Association* n.s. 1 (1911): 473–79.

———. "The Experience of the German Colonial Army With Anti-typhoid Vaccination." *Military Surgeon* 24 (1909): 53–56.

———. "Laboratories in the Army." *Surgery, Gynecology and Obstetrics* 25 (1917): 717–18.

———. "The Prevention of Typhoid Fever by Vaccination and by Early Diagnosis and Isolation." *Journal of the Association of Military Surgeons of the United States* 24 (1901): 479–518.

———. "Progress in Antityphoid Vaccination During 1912." *Journal of the American Medical Association* 61 (1913): 666–69.

———. "The Results of Two Seasons Anti-malarial Work." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 157–61.

Russell, Ira. "Opium Inebriety." *Medico-Legal Journal* 5 (1887): 144–52.

Rutherford, Henry H. "Experiences of an Army Medical Officer During the San Francisco Earthquake." *Military Surgeon* 79 (1936): 207–15.

Safford, H. E. "The Present Status of the X-ray in Diagnosis." *Physician and Surgeon* 20 (1898): 538–44.

"Salvarsan." *Southern Medical Journal* 4 (1911–1912): 177–79.

Sanarelli, Guiseppe. "Some Observations and Controversial Remarks on the Specific Cause of Yellow Fever." *Medical News* 75 (1899): 193–99.

"Sanarelli and the Pathogenic Role of the Bacillus Icteroides." *Medical News* 75 (1899): 209–10.

"Sanarelli's Bacillus Not the Cause of Yellow Fever." *Medical News* 75 (1899): 119.

Schauffler, W. G. "Report of Medical Service School, New Jersey." *Military Surgeon* 35 (1914): 531–34.

Schuppert, M. "A Review of the Treatment and Death of James A. Garfield, Late President of the United States." *Gaillard's Medical Journal* 32 (1881): 494–519.

"Science Schools and Museums in America." *Nature* 2 (1870): 289–90.

Seaman, Louis L. "Lessons for America in the Japanese Army Medical Service." *American Monthly Review of Reviews* 32 (1905): 584–86.

———. "Some of the Triumphs of Scientific Medicine in Peace and War in Foreign Lands, With Suggestions Upon the Necessity of Important Changes in the Organization of the Medical Department of the United States Army." *New York Medical Journal* 87 (1908): 335–43.

———. "The U.S. Army Ration, and Its Adaptability for Use in Tropical Climates." *Journal of the Military Service Institution of the United States* 24 (1899): 375–97.

Seamen, Gilbert E. "Some Observations of a Medical Officer in the Philippines." *Milwaukee Medical Journal* 10 (1902): 181–89.

Senn, Nicholas. "Abdominal Surgery on the Battlefield." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States,* 1894, pp. 1–21.

———. "The Invasion of Porto Rico From a Medical Standpoint." *Journal of the American Medical Association* 31 (1898): 594–99.

———. "The Medical Department of the Army." *Medical Record* 54 (1898): 214–15.

———. "Qualifications and Duties of Military Surgeons." *Journal of the American Medical Association* 31 (1898): 503–08.

———. "Recent Experiences in Military Surgery After the Battle of Santiago." *Journal of the American Medical Association* 31 (1898): 1164–71, 1239–42.

———. ———. *Medical Record* 54 (1898): 145–50.

———. "The Returning Army." *Journal of the American Medical Association* 3 (1898): 652–54.

———. "Surgical Diseases of the Spanish-American War." *Journal of the American Medical Association* 31 (1898): 1419–20.

———. "Typhoid Fever in the Porto Rican Campaign." *Journal of the American Medical Association* 31 (1898): 599–604.

———. "The X-ray in Military Surgery." *Philadelphia Medical Journal* 5 (1900): 36–37.

Shafter, William R. "The Capture of Santiago de Cuba." *Century* 57 (1899): 612–30.

Shapiro, Louis. "Umbilical Tetanus." *Bulletin of the Manila Medical Society* 2 (1910): 245–46.

Shattuck, Frederick C. "Some Thoughts on Medical Education." *Boston Medical and Surgical Journal* 142 (1900): 529–34.

———. "Specialism: The Laboratory and Practical Medicine." *Boston Medical and Surgical Journal* 136 (1897): 613–17.

Shockley, M. A. W. "The Correspondence Course for Officers of the Medical Reserve Corps." *Military Surgeon* 38 (1916): 64–67.

Shrady, George F. "The Medical Staff of the Army." *Medical Record* 14 (1878): 174–75.

———. "Surgical and Pathological Reflections on President Garfield's Wound." *Medical Record* 20 (1881): 404–06.

Siler, Joseph F. "Major-General William Crawford Gorgas." *American Journal of Tropical Medicine* 2 (1922): 161–71.

Siler, Joseph F., and Cole, C. L. "The Prevalence of Hookworm Disease in the Fourth Texas Infantry, First Mississippi Infantry and First Alabama Cavalry Regiments." *Military Surgeon* 41 (1917): 77–99.

Siler, Joseph F., and Garrison, Philip E. "An Intensive Study of the Epidemiology of Pellagra: Report of Progress." *American Journal of the Medical Sciences* 146 (1913): 42–66, 238–77.

Siler, Joseph F.; Hall, M. W.; and Hitchens, A. P. "Results Obtained in the Transmission of Dengue Fever." *Journal of the American Medical Association* 84 (1925): 1163–72.

Simmons, James S., and St. John, Joe H. "The Prevalence and Distribution of Malaria on the Island of Corregidor, Philippine Islands." *Military Surgeon* 64 (1929): 710–33.

Slee, Richard. "The Veterans' Reunion at Gettysburg: A Sketch of the Medical Sick Written by One Who Was There." *American Journal of Clinical Medicine* 20 (1913): 723–32.

Smart, Charles. "The Army Medical Museum and the Library of the Surgeon-General's Office." *Journal of the American Medical Association* 24 (1895): 577–80.

———. "Correspondence: The Medical Department of the Army." *Journal of the American Medical Association* 31 (1898): 546–47.

———. "On Mountain Fever and Malarious Waters." *American Journal of the Medical Sciences* n.s. 75 (1878): 17–43.

———. "Transportation of Wounded in War." *Proceedings of the Fourth Annual Meeting of the Association of Military Surgeons of the United States*, 1894, pp. 22–44.

———. "The Vital Statistics of the War." *Journal of the American Medical Association* 31 (1898): 1252–53.

Smart, Robert. "Military Hygiene: Its Theoretical and Practical Study in the Regular Army and Militia Forces." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 35–47.

Smith, Henry H. "The Appendix Vermiformis: Its Function, Pathology and Treatment." *Journal of the American Medical Association* 10 (1888): 707–13.

Smith, Lloyd L. "Syphilis as a Cause of Mental Disease in the Military Service." *Military Surgeon* 37 (1915): 447–58, 561–73.

Smith, Louis P. "Correspondence: The Medical Department of the Army." *Journal of the American Medical Association* 31 (1898): 477–78.

Smith, William F. "Sanitation in Puerto Rico." *Public Health Papers and Reports* 27 (1901): 166–74.

Snow, William F. "The Control of Venereal Diseases." *Surgery, Gynecology and Obstetrics* 25 (1917): 720–22.

"The Soldier and the Medical Department of the Army." *Medical Record* 54 (1898): 233.

"Some of the Medical Lessons of the War." *Medical Record* 54 (1898): 485–86.

Southard, W. F. "Opening of the New Military Hospital at the Presidio, July 9, 1899." *Pacific Medical Journal* 42 (1899): 454–64.

Stanton, S. C. "The Sparta Encampment." *Military Surgeon* 37 (1915): 107–16.

Sternberg, George M. "The Address of the President." *Journal of the American Medical Association* 30 (1898): 1373–80.

———. "The Bacillus Icteroides as the Cause of Yellow Fever: A Reply to Professor Sanarelli." *Medical News* 75 (1899): 225–28, 767–68.

———. "Bacillus Icteroides (Sanarelli) and Bacillus X (Sternberg)." *Journal of the American Medical Association* 30 (1898): 233–34.

———. "The Bacillus of Typhoid Fever." *Medical News* 49 (1886): 197–202.

———. "The Bacillus of Typhoid Fever (Typhus Bacillus of Eberth)." *Transactions of the Association of American Physicians* 1 (1886): 193–205.

———. "Bacteria and the Germ Theory of Disease." *Transactions of the Medical Society of the State of California* 12 (1882): 193–98.

———. "The Biological Characteristics of the Cholera Spirillum—Spirillum Cholerae Asiaticae (Comma Bacillus of Koch)—and Disinfection in Cholera." *Medical Record* 42 (1892): 387–91.

———. "The History and Etiology of Bubonic Plague." *Philadelphia Medical Journal* 5 (1900): 809–15.

———. "How Can We Prevent Cholera?" *Medico-Legal Journal* 11 (1893): 1–8.

———. "An Inquiry Into the Modus Operandi of the Yellow Fever Poison." *New Orleans Medical and Surgical Journal* n.s. 3 (1875): 1–23.

———. "An Inquiry Into the Nature of the Yellow Fever Poison, With an Account of the Disease as It Occurred at Governor's Island, New York Harbor." *American Journal of the Medical Sciences* n.s. 65 (1873): 398–406.

———. "An Instructive Experiment." *Medical Record* 22 (1881): 339–40.

———. "The Malarial Germ of Laveran." *Medical Record* 29 (1886): 498–93, 517–22.

———. "The Medical Department of the Army." *Medical Record* 54 (1898): 213–14.

———. "The Microscopical Investigations of the Havana Yellow Fever Commission." *New Orleans Medical and Surgical Journal* n.s. 7 (1880): 1017–24.

———. "Practical Results of Bacteriological Researches." *Transactions of the Association of American Physicians* 7 (1892): 68–86.

———. "Protective Inoculations in Infectious Diseases." *Boston Medical and Surgical Journal* 128 (1893): 29–34, 56–59.

———. "Recent Researches Relating to the Etiology of Yellow Fever." *Transactions of the Association of American Physicians* 3 (1888): 321–29.

———. "Report on Yellow Fever Cases." *New Orleans Medical and Surgical Journal* 8 (1880): 482–87.

———. "Sanitary Lessons of the War." *Journal of the American Medical Association* 32 (1899): 1287–94.

———. "Sanitary Problems Connected With the Construction of the Isthmian Canal." *North American Review* 175 (1902): 378–87.

———. "Science and Pseudo-science in Medicine." *Science* n.s. 5 (1897): 199–206.

———. "Special Report to National Board of Health: Experimental Investigations Relating to the Etiology of Malarial Fevers." *Bulletin of the United States National Board of Health*, supp. 14, 3 (1881–1882): 1–11.

———. "A Study of the Natural History of Yellow Fever and Some Remarks Upon the Treatment Based Upon the Same, With Cases and Tables of Observations Upon the Temperature and Urine." *New Orleans Medical and Surgical Journal* n.s. 4 (1877): 638–74.

———. "The Thermal Death Point of Pathogenic Organisms." *American Journal of Medical Science* n.s. 94 (1887): 146–60.

———. "The Value of Carbolic Acid as a Germicide, as Established by Experimental Data." *Medical Record* 22 (1882): 314–17.

———. "Yellow Fever Etiology." *Journal of the American Medical Association* 35 (1900): 1039–40.

Stiles, Charles W. "Insects as Disseminators of Disease." *Sanitarian* 47 (1901): 1–13.

Stone, J. Hamilton. "Remarks Suggested by Three Years' Service in Cuba." *Journal of the Association of Military Surgeons of the United States* 12 (1903): 317–31.

———. "Our Troops in the Tropics—From a Surgeon's Standpoint." *Journal of the Military Service Institution of the United States* 26 (1900): 358–69.

Stone, Witmer. "Samuel Washington Woodhouse." *Proceedings of the Delaware Valley Ornithological Club* 8 (1904): 4.

Straub, Paul F. "Medical Service in the Campaign." *Military Surgeon* 25 (1909): 675–704.

———. "Sanitation of the Maneuver Camp at San Antonio, Texas." *Military Surgeon* 29 (1911): 607–30.

———. "The Training of Sanitary Troops." *Military Surgeon* 28 (1911): 359–76.

Strong, Richard P. "The Bureau of Government Laboratories for the Philippine Islands." *American Medicine* 5 (1903): 665–67.

———. "The Investigations Carried on by the Biological Laboratory in Relation to the Suppression of the Recent Cholera Outbreak in Manila." *Philippine Journal of Science* 2B (1907): 413–39.

———. "The Opportunities and Needs of the American Student and Investigator in Tropical Medicine: President's Address." *Transactions of the American Society of Tropical Medicine* 9 (1914): 15–27.

———. "Protective Inoculation Against Plague." *Journal of Medical Research* 18 (1908): 325–46.

———. "Studies in Plague Immunity." *Philippine Journal of Science* 2B (1907): 155–331.

———. "Tropical Medicine." *Bulletin of the Manila Medical Society* 2 (1910): 9–11.

———. "Vaccination Against Plague." *Philippine Journal of Science* 1B (1906): 181–90.

Strong, Richard P., and Musgrave, W. E. "The Bacillus of Philippine Dysentery." *Journal of the American Medical Association* 35 (1900): 498–500.

"Summary." *Pacific Medical and Surgical Journal* 17 (1874–1875): 299–300.

"The Surgeon General of the Army and His Critics." *New York Medical Journal* 68 (1898): 820–22.

"Surgeon General Sternberg." *Journal of the American Medical Association* 38 (1902): 1011–12.

Surgical Section, Suffolk District Medical Society. "The Treatment of Appendicitis." *Boston Medical and Surgical Journal* 127 (1892): 118–21.

Sutton, Richard L. "The Diseases of the Isthmian Canal Zone." *Medical Record* 67 (1905): 41–44.

"Syphilis of the Innocent." *Medicine* 11 (1905): 524–26.

Tenney, Elmer S. "Some Observations on the Prevalence of Intestinal Parasites in the Philippine Islands." *Transactions of the American Society of Tropical Medicine* 8 (1913): 69–73.

Terriberry, William S. "The Medical Service in the Organized Militia." *New York Medical Journal* 103 (1916): 398–99.

Thomas, Benjamin. "Status of Therapy by Antigonococcus Serum, Gonococcus Bacterin and Pyocyaneus Bacteria." *Journal of the American Medical Association* 54 (1910): 258–60.

Thomason, Henry D. "Personal Experience With Spinal Anesthesia, and Its Application to Military Surgery." *Journal of the Association of Military Surgeons of the United States* 19 (1906): 272–97.

————. "Sanitary Troops in the Organized Militia of the United States." *Military Surgeon* 29 (1911): 511–26.

Thompson, W. Gilman. "Notes on the Observation of Malarial Organisms in Connection With Enteric Fever." *Transactions of the Association of American Physicians* 9 (1894): 110–27.

Thornburgh, Robert M. "The Treatment of Amebic Dysentery." *Military Surgeon* 22 (1908): 55–59.

Todd, L. L. "The Therapeutic Properties of Opium." *Transactions of the Indiana State Medical Association* 20 (1877): 79–87.

[Toner, J. M.] "Necrology [Joseph Janvier Woodward]." *Journal of the American Medical Association* 3 (1884): 249–51.

Torney, George H. "The Army and Navy General Hospital at Hot Springs, Arkansas." *Journal of the Association of Military Surgeons of the United States* 14 (1904): 345–52.

"To Select Camps in Cuba for the Army of Occupation." *Medical Record* 54 (1898): 524.

"Tours of Duty in the Army Medical Service." *Journal of the American Medical Association* 24 (1895): 145–46.

"Trained Female Nurses for the Army." *Journal of the American Medical Association* 32 (1899): 329.

"Training School for Nurses in the Johns Hopkins Hospital." *Bulletin of the Johns Hopkins Hospital* 1 (1889): 15.

"Transports Under the Care of the Marine Hospital Service." *Medical Record* 54 (1898): 236–37.

"The Treatment of Acute Dysentery." *Medical Record* 54 (1898): 281.

"Tropical Diseases." *Medical Record* 54 (1898): 377.

Tullidge, E. Kilbourne. "Venereal Disease in the European Armies." *Military Surgeon* 39 (1916): 49–53.

Turck, Raymond C. "Field Maneuvers of Divisional Sanitary Troops, Leon Springs, Texas, November 1916." *Military Surgeon* 40 (1917): 156–70.

Turnbull, Wilfrid. "Reminiscences of an Army Surgeon in Cuba and the Philippines." *American Historical Collection* 2 (1974):31–49.

Turnipseed, E. B. "A Dissenting Voice From the Standpoints Taken by D. W. Bliss." *Medical Record* 20 (1881): 621.

Turrill, H. S. "Instruction of the Hospital Corps of the U.S. Army." *Proceedings of the Fifth Annual Meeting of the Association of Military Surgeons of the United States*, 1895, pp. 394–400.

"Typhoid Fever in the Cities and Towns of New York During the Last Decade, and Disinfection by Chlorination of Public Water Supplies in the State." *Boston Medical and Surgical Journal* 172 (1905): 563–64.

Ullrich, J. Harry. "Sanitary Troops—State and Federal." *Military Surgeon* 37 (1915): 540–48.

"Uncinariasis: An Economic Question for Porto Rico." *American Medicine* 6 (1903): 422.

"Uncinariasis in Grenada and the Other Windward Islands." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 311.

"Value of Blood Examinations in Malarial and Typhoid Fevers." *Medical Record* 54 (1898): 746–47.

Vaughan, Victor C. "The Care of the Wounded at Santiago." *Medical Record* 54 (1898): 323–24.

————. "Some Remarks on Typhoid Fever Among Our Soldiers During the Late War With Spain." *Transactions of the Association of American Physicians* 14 (1899): 63–88.

Vedder, Edward B. "An Examination of the Stools of 100 Healthy Individuals, With Especial Reference to the Presence of Entamoeba Coli." *Journal of the American Medical Association* 46 (1906): 870–72.

————. "The Known and the Unknown With Regard to the Etiology and Prevention of Beriberi." *Military Surgeon* 39 (1916): 368–79.

————. "Prevalence of Syphilis." *Therapeutic Gazette* 40 (1916): 308–12.

————. "What Measures Should Be Adopted for Effective Prevention of Unsanitary Conditions in the Early Stages of Volunteer Camps in Time of War?" *Journal of the Military Service Institution of the United States* 48 (1911): 313–57.

Vedder, Edward B., and Clark, Elbert. "A Study of Polyneuritis Gallinarum: A Fifth Contribution to the Etiology of Beriberi." *Philippine Journal of Science* 7B (1912): 423–58.

Vedder, Edward B., and Hough, William H. "The Prevalence of Syphilis Among the Patients of the Government Hospital for the Insane." *Journal of the American Medical Association* 64 (1915): 972–75.

Vedder, Edward B., and Williams, Robert R. "Concerning the Beriberi-preventing Substances or Vitamines Contained in Rice Polishings." *Philippine Journal of Science* 8B (1913): 175–95.

Villoldo, P. "Smallpox and Vaccination in Cuba." *Public Health Reports* 26 (1911): 495–99.

Wadhams, S. H. "Military Preparedness From the Medical Standpoint." *Medical Record* 89 (1916): 448.

Waldo, Fullerton L. "Panama: A Discussion of Present Conditions and the Prospect." *Science* n.s. 23 (1906): 769–73.

Walker, Ernest L. "Experimental Entamoebic Dysentery." *Philippine Journal of Science* 8B (1913): 253–330.

"War Articles: News of the Week." *Medical News* 73 (1898): 39–40.

Warbasse, James P. "Some Observations on the Treatment of Fractures." *Journal of the Association of Military Surgeons of the United States* 17 (1905): 255–61.

Warfield, Louis M. "Grave Anaemia due to Hook-worm Infection." *Medical Record* 66 (1904): 9–12.

Warner, M. D. "The Cultivation of the Plasmodium Malariae." *New York Medical Journal* 68 (1898): 835–40.

Warren, J. Collins. "The Case of President Garfield." *Boston Medical and Surgical Journal* 105 (1881): 463–66.

Warren, Joseph H. "Radical Cure for Hernia." *Chicago Medical Review* 2 (1880): 182–84.

Wasdin, Eugene. "The Etiology of Yellow Fever." *Philadelphia Medical Journal* 6 (1900): 950–52.

Washburn, Wickes. "Montauk Point and the Government Hospitals." *Medical Record* 54 (1898): 801–05.

Weisse, Faneuil D. "Surgico-anatomical Study of the Gunshot Wound of President Garfield." *Medical Record* 20 (1881): 402–03.

Welch, William H. "The Evolution of Modern Scientific Laboratories." *Bulletin of the Johns Hopkins Hospital* 7 (1896): 19–24.

————. "President Welch, General Sternberg, and the Yellow Fever Commission." *Journal of the American Medical Association* 54 (1910): 1326.

————. "Principles Underlying the Serum Diagnosis of Typhoid Fever and the Methods of Its Application." *Journal of the American Medical Association* 29 (1897): 301–09.

————. "Some of the Conditions Which Have Influenced the Development of American Medicine, Especially During the Last Century." *Bulletin of the Johns Hopkins Hospital* 19 (1908): 33–40.

Wellcome, Henry S. "Observations on the Medical and Sanitary Department of the Panama Canal Commission During My Visits to the Isthmus the First Week in March and at the End of April and the Beginning of May, 1910." *Military Surgeon* 27 (1910): 1–13.

Wellington, William W. "Modern Medicine: Its Need and Its Tendency." *Medical Communications of the Massachusetts Medical Society*, ser. 2, 11, no. 7 (1874): 133–72.

"What About the Sanitary Private?" *Military Surgeon* 38 (1916): 325–29.

White, Charles S. "The Last Illness of Major Walter Reed." *Medical Annals of the District of Columbia* 24 (1955): 396–98.

White, J. William. "A Review of Some of the More Important Surgical Problems of President Garfield's Case." *Medical News* 40 (1882): 677–83.

Whitham, Jay D. "Paratyphoid Infections." *Military Surgeon* 39 (1916): 491–96.

Whitmore, Eugene R. "Antityphoid Vaccination." *Pennsylvania Medical Journal* 18 (1915): 258–66.

Wickline, William A. "The Effects of Tropical Climate on the White Race." *Military Surgeon* 23 (1908): 282–89.

Wilkinson, H. Brookman. "Leprosy in the Philippines, With an Account of Its Treatment With the X-ray." *Journal of the American Medical Association* 46 (1906): 315–21.

Wilkinson, J. G. "Pellagra—Symptoms, Diagnosis and Treatment." *Southern Medical Journal* 4 (1911–1912): 607–10.

Williams, A. W. "Vaccination Against Typhoid in the U.S. Army." *American Journal of the Medical Sciences* n.s. 143 (1912): 352–56.

Williams, Robert R., and Saleeby, N. M. "Experimental Treatment of Human Beriberi With Constituents of Rice Polishings." *Philippine Journal of Science* 10B (1915): 99–118.

Winter, F. A. "Some Comments on the Disappearance of 'Potomac Malaria' at Fort Myer, Virginia." *Military Surgeon* 26 (1910): 309–18.

"A Woman Army Surgeon." *Medical Record* 54 (1898): 344.

Wood, Jr., H. C. "Medical Education in the United States." *Lippincott's Magazine of Popular Literature and Science* 16 (1875): 703–11.

Wood, Leonard. "Santiago Since the Surrender." *Scribner's Magazine* 25 (1899): 515–27.

Woodbury, Frank T. "An Improvised Letter on Horseback." *Military Surgeon* 23 (1908): 25–28.

Woodhull, Alfred Alexander. "The Better Type of Medical Officer." *Proceedings of the Seventh Annual Meeting of the Association of Military Surgeons of the United States*, 1897, pp. 340–46.

———. "Ipecacuanha in Dysentery." *Military Surgeon* 22 (1908): 114–15.

———. "Military Medical Problems." *Proceedings of the Seventh Annual Meeting of the Association of Military Surgeons of the United States*, 1897, pp. 537–76.

———. "The Place of the Medical Department in the Army." *Journal of the Military Service Institution of the United States* 11 (1890): 544–65.

———. "The Value of Ipecac in Dysentery." *Therapeutic Gazette* 26 (1902): 222–24.

Woodruff, Charles E. "Artificially Cooled Hospital Wards for Hot Weather." *Bulletin of the Manila Medical Society* 2 (1910): 17–18.

———. "The Causes of the Explosion Effect of Modern Small Caliber Bullets." *New York Medical Journal* 67 (1898): 593–601.

———. "Correspondence." *Bulletin of the Manila Medical Society* 2 (1911): 250–51.

———. "Emergency Rations." *Proceedings of the Sixth Annual Meeting of the Association of Military Surgeons of the United States*, 1896, pp. 309–44.

———. "Military Medical Problems." *Transactions of the Third Annual Meeting of the Association of Military Surgeons of the National Guard of the United States*, 1893, pp. 220–38.

———. "The Soldier in the Tropics: His Food, Alcohol, and Acclimatization." *Philadelphia Medical Journal* 5 (1900): 768–82.

Woodruff, Charles E., and Woodbury, Frank T. "The Prevention of Disease in the Army and the Best Method of Accomplishing That Result." *Journal of the Association of Military Surgeons of the United States* 19 (1906): 1–37.

Woodson, R. S. "Smallpox in Cuba." *Journal of the American Medical Association* 31 (1898): 1466–68.

Woodward, Joseph J. "The Army Medical Museum of Washington." *Lippincott's Magazine of Popular Literature and Science* 7 (1871): 233–42.

————. "Brief Rejoinder to Some Recent Articles by Dr. Roberts Bartholow." *Cincinnati Medical News* 10 (1877): 743–49.

————. "Obituary: Otis." *American Journal of the Medical Sciences* n.s. 82 (1881): 278–84.

————. "On Photo-micrography With the Highest Powers, as Practiced in the Army Medical Museum." *American Journal of Science and the Arts* 92 (September 1866): 189–95.

————. "Typho-malarial Fever: Is It a Special Type of Fever?" *Transactions of the International Medical Congress of Philadelphia*, 1876, pp. 305–40.

Woolley, Paul G. "Rinderpest." *Philippine Journal of Science* 1B (1906): 577–616.

Wyeth, John M. "The Value of Clinical Microscopy, Bacteriology and Chemistry in Surgical Practice." *Boston Medical and Surgical Journal* 144 (1901): 541–47.

"The Yellow Fever." *Medical Record* 54 (1898): 128.

"Yellow Fever and the Panama Canal." *Medical Record* 63 (1903): 580.

"Yellow Fever Hospital at Santiago Closed." *Medical News* 73 (1898): 628–29.

Young, Charles S. "The Advantages Accruing to the National Guard From Tours of Duty With the Regular Establishment, Like That at Sparta, Wisconsin, in 1912." *Military Surgeon* 32 (1913): 58–64.

Secondary Books

Abrahamson, James L. *America Arms for a New Century: The Making of a Great Military Power*. New York: Free Press, 1981.

Ackerknecht, Erwin H. *A Short History of Medicine*. New York: Ronald Press Co., 1955.

Amos, Preston E. *Above and Beyond in the West: Black Medal of Honor Winners, 1870–1890*. Washington, D.C.: Potomac Corral, the Westerners, 1974.

Ashburn, Percy M. *A History of the Medical Department of the United States Army*. Boston: Houghton Mifflin Co., Riverside Press, 1929.

Bailey, Lynn R. *Bosque Redondo: An American Concentration Camp*. Pasadena, Calif.: Socio-Technical Books, 1970.

Baldry, Peter. *The Battle Against Bacteria: A Fresh Look*. Cambridge: At the University Press, 1976.

Baldwin, Hanson W. *World War I: An Outline History*. New York: Harper and Row, 1962.

Bannister, Robert C. *Social Darwinism: Science and Myth in Anglo-American Social Thought*. Philadelphia: Temple University Press, 1979.

Bantug, Jose P. *A Short History of Medicine in the Philippines During the Spanish Regime, 1565–1898*. Manila: Colegio Medico-Farmaceutico de Filipinas, 1953.

Bayne-Jones, Stanhope. *The Evolution of Preventive Medicine in the United States Army, 1607–1939*. Washington, D.C.: Office of the Surgeon General, Department of the Army, 1968.

Bean, William B. *Walter Reed: A Biography*. Charlottesville: University Press of Virginia, 1982.

Bearss, Edwin C., and Gibson, Arrell. *Fort Smith: Little Gibraltar on the Arkansas*. Norman: University of Oklahoma Press, 1969.

Bentley, George R. *A History of the Freedmen's Bureau*. New York: Octagon Books, 1974.

Bernardo, C. Joseph, and Bacon, Eugene H. *American Military Policy: Its Development Since 1775*. Harrisburg, Pa.: Stackpole, 1955.

Bispham, William N. *Malaria: Its Treatment and Prophylaxis*. Baltimore: Williams and Wilkins Co., 1944.

Blake, John B., ed. *Centenary of Index Medicus, 1879–1979*. Bethesda, Md.: Department of Health and Human Services, 1980.

Bonner, Thomas N. *American Doctors and German Universities: A Chapter in International Intellectual Relations, 1870–1914*. Lincoln: University of Nebraska Press, 1963.

Bowers, John Z., and Purcell, Elizabeth P., eds. *Advances in American Medicine: Essays at the Bicentennial*. 2 vols. New York: Josiah Macy, Jr., Foundation, 1976.

Bradbury, Savile. *The Evolution of the Microscope*. Oxford: Pergamon Press, 1967.

Braddy, Haldeen. *Pershing's Mission in Mexico*. El Paso: Texas Western Press, 1966.

Brandt, Allan M. *No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880*. New York: Oxford University Press, 1985.

Bratt, John. *Trails of Yesterday*. 1921. Reprint. Lincoln: University of Nebraska Press, 1980.

Brieger, Gert H. "The Development of Surgery: Historical Aspects Important in the Origin and Development of Modern Surgical Science." In *Davis-Christopher Textbook of Surgery: The Biological Basis of Modern Surgical Practice*, edited by David C. Sabiston, Jr., pp. 1–22. Philadelphia: W. B. Saunders Co., 1981.

———, ed. *Medical America in the Nineteenth Century: Readings From the Literature*. Baltimore: Johns Hopkins Press, 1972.

———. *Theory and Practice in American Medicine*. New York: Science History Publications, 1976.

Brooks, Stewart M. *Our Murdered Presidents: The Medical Story*. New York: Frederick Fell, 1966.

Brown, Dee. *Fort Phil Kearny*. New York: G. P. Putnam's Sons, 1962.

Brown, Fred R. *History of the Ninth U.S. Infantry, 1799–1909*. Chicago: R. R. Donnelley and Sons, 1909.

Brown, Percy. *American Martyrs to Science Through the Roentgen Rays*. Springfield, Ill.: Charles C. Thomas, 1936.

Bullard, Robert L. *Personalities and Reminiscences of the Great War*. Garden City, N.Y.: Doubleday, Page and Co., 1925.

Bulloch, William. *The History of Bacteriology*. London: Oxford University Press, 1938.

Bunge, Frederica M., ed. *Philippines: A Country Study*. 3d ed. Washington, D.C.: Department of the Army, 1984.

Burrow, James G. *Organized Medicine in the Progressive Era: The Move Toward Monopoly*. Baltimore: Johns Hopkins University Press, 1977.

Busvine, J. R. *Insects: Hygiene and History*. London: Athlone Press, University of London, 1976.

Carroll, John M., ed. *The Medal of Honor*. Bryan, Tex.: Privately published, 1979.

Carter, William G. H. *The Life of Lieutenant General Chaffee*. Chicago: University of Chicago Press, 1917.

Cassedy, James H. *American Medicine and Statistical Thinking, 1800–1860*. Cambridge, Mass.: Harvard University Press, 1984.

———. *Medicine in America: A Short History*. Baltimore: Johns Hopkins University Press, 1991.

Cassel, Jay. *The Secret Plague: Venereal Disease in Canada, 1838–1939*. Toronto: University of Toronto Press, 1987.

Castiglione, Arturo. *A History of Medicine*. Translated by E. B. Krumbhaar. 2d rev. ed. and enl. New York: Knopf, 1947.

Chambers, John S. *The Conquest of Cholera: America's Greatest Scourge*. New York: Macmillan Co., 1938.

Clark, Paul E. *Pioneer Microbiologists of America*. Madison: University of Wisconsin Press, 1961.

Clarke, Charles W. *Taboo: The Story of the Pioneers of Social Hygiene*. Washington, D.C.: Public Affairs Press, 1961.

Clendenen, Clarence C. *Blood on the Border: The United States Army and the Mexican Irregulars*. [New York]: Macmillan Co., 1969.

———. *The United States and Pancho Villa: A Study in Unconventional Diplomacy*. 1961. Reprint. Port Washington, N.Y.: Kennikat Press, 1972.

Cloudsley-Thompson, J. L. *Insects and History*. New York: St. Martin's Press, 1976.

Coakley, Robert W. *The Role of Federal Miltiary Forces in Domestic Disorders 1789–1878*. Washington, D.C.: U.S. Army Center of Military History, 1988.

Coffman, Edward M. *The Old Army: A Portrait of the American Army in Peacetime, 1784–1898*. New York: Oxford University Press, 1986.

————. *The War To End All Wars: The American Military Experience in World War I*. New York: Oxford University Press, 1968.

Conn, Harold J. *Biological Stains*. 6th ed. Geneva, N.Y.: Biotech Publications, 1953.

Conniff, Michael L. *Black Labor on a White Canal: Panama, 1904–1981*. Pittsburgh: University of Pittsburgh Press, 1985.

Cooper, Jerry M. *The Army and Civil Disorder: Federal Military Intervention in Labor Disputes, 1877–1900*. Westport, Conn.: Greenwood Press, 1980.

Corner, George W. *A History of the Rockefeller Institute, 1901–1953: Origins and Growth*. New York: Rockefeller Institute Press, 1964.

Cosmas, Graham A. *An Army for Empire: The United States Army in the Spanish- American War*. Columbia: University of Missouri Press, 1971.

————. "San Juan Hill and El Caney, 1–2 July 1898." In *America's First Battles, 1776–1965*, edited by Charles E. Heller and William A. Stofft, pp. 109–48. Lawrence: University of Kansas Press, 1986.

Courtwright, David T. *Dark Paradise: Opiate Addiction in America Before 1940*. Cambridge, Mass.: Harvard University Press, 1982.

Curtin, Philip D. *Death by Migration: Europe's Encounter With the Tropical World in the Nineteenth Century*. Cambridge: At the University Press, 1989.

Cutright, Paul R., and Brodhead, Michael J. *Elliott Coues: Naturalist and Frontier Historian*. Urbana: University of Illinois Press, 1981.

Daniels, George H., ed. *Nineteenth-Century American Science: A Reappraisal*. Evanston, Ill.: Northwestern University Press, 1972.

Debo, Angie. *Geronimo: The Man, His Time, His Place*. Norman: University of Oklahoma Press, 1976.

Delaporte, Francois. *The History of Yellow Fever: An Essay on the Birth of Tropical Medicine*. Translated by Arthur Goldhammer. Cambridge, Mass.: MIT Press, 1971.

Department of the Army, Office of the Surgeon General. *Communicable Diseases: Malaria*. Edited by Ebbe Curtis Hoff. Preventive Medicine, vol. 6, Medical Department of the United States Army in World War II. Washington, D.C.: Government Printing Office, 1963.

Derthick, Martha. *The National Guard in Politics*. Cambridge, Mass.: Harvard University Press, 1965.

Deutrich, Mabel E. *Struggle for Supremacy: The Career of General Fred C. Ainsworth*. Washington, D.C.: Public Affairs Press, 1962.

Deutsch, Albert. "Military Psychiatry: The Civil War." In *One Hundred Years of American Psychiatry*, edited by J. K. Hall, pp. 367–84. New York: Columbia University Press for American Psychiatric Association, 1944.

Dowling, Harry F. *Fighting Infection: Conquests of the Twentieth Century*. Cambridge, Mass.: Harvard University Press, 1977.

Downey, Fairfax. *Indian Wars of the U.S. Army, 1776–1865*. Garden City, N.Y.: Doubleday and Co., 1963.

Duffy, John. *The Healers: The Rise of the Medical Establishment*. New York: McGraw-Hill, 1976.

———. *The Sanitarians: A History of American Public Health*. Urbana: University of Illinois Press, 1990.

DuVal, Jr., Miles P. *And the Mountains Will Move: The Story of the Building of the Panama Canal*. Stanford, Calif.: Stanford University Press, 1947.

Ekirch, Arthur A. *The Civilian and the Military*. New York: Oxford University Press, 1956.

Etheridge, Elizabeth W. *The Butterfly Caste: A Social History of Pellagra in the South*. Westport, Conn.: Greenwood Publishing Co., 1972.

Ettling, John. *The Germ of Laziness: Rockefeller Philanthropy and Public Health in the New South*. Cambridge, Mass.: Harvard University Press, 1981.

Farley, John. *Bilharzia: A History of Imperial Tropical Medicine*. Cambridge: At the University Press, 1991.

Fellman, Anita C., and Fellman, Michael. *Making Sense of Self: Medical Advice Literature in Late Nineteenth Century America*. Philadelphia: University of Pennsylvania Press, 1981.

Ferrer, M. Irene, ed. *Cold Injury: Transactions of the First Conference, June 4–5, 1951*. New York: Josiah Macy, Jr., Foundation, 1952.

Finnegan, John P. *Against the Specter of a Dragon: The Campaign for American Military Preparedness, 1914–1917*. Westport, Conn.: Greenwood Press, 1974.

Flexner, Simon, and Flexner, James T. *William Welch and the Heroic Age of American Medicine*. New York: Viking Press, 1941.

Foner, Jack D. *The United States Soldier Between Two Wars: Army Life and Reforms, 1865–1898*. New York: Humanities Press, 1970.

Ford, William W. *Bacteriology*. Clio Medica. New York: Harper and Bros., Paul B. Hoeber, [1939].

Foster, Gaines M. *The Demands of Humanity: Army Medical Disaster Relief*. Washington, D.C.: U.S. Army Center of Military History, 1983.

Foster, William D. *A History of Medical Bacteriology and Immunology*. London: William Neinemann, 1970.

———. *A History of Parasitology*. Edinburgh: E. and S. Livingstone, 1965.

Franklin, John H. *Reconstruction*. Chicago: University of Chicago Press, 1961.

Furman, Bess. *A Profile of the United States Public Health Service, 1798–1948*. Washington, D.C.: Department of Health, Education, and Welfare, 1973.

Garrison, Fielding H. *An Introduction to the History of Medicine*. 3d rev. ed. and enl. Philadelphia: W. B. Saunders Co., 1921.

———. *Notes on the History of Military Medicine*. Reprint [from *Military Surgeon*]. Washington, D.C.: Association of Military Surgeons, 1922.

Gates, John M. *Schoolbooks and Krags: The United States Army in the Philippines, 1898–1902*. Westport, Conn.: Greenwood Press, 1973.

Gevitz, Norman. *Other Healers: Unorthodox Medicine in America*. Baltimore: Johns Hopkins University Press, 1988.

Gibson, John M. *Physician to the World*. Durham, N.C.: Duke University Press, 1950.

————. *Soldier in White: The Life of General George Miller Sternberg*. Durham, N.C.: Duke University Press, 1958.

Gillett, Mary C. *The Army Medical Department, 1775–1818*. Washington, D.C.: U.S. Army Center of Military History, 1981.

————. *The Army Medical Department, 1818–1865*. Washington, D.C.: U.S. Army Center of Military History, 1987.

Ginger, Ray. *Age of Excess: The United States From 1877 to 1914*. New York: Macmillan Co., 1965.

Goode, Paul R. *The United States Soldier's Home: A History of the First Hundred Years*. Privately published, 1975.

Gordon, Linda. *Woman's Body, Woman's Right: A Social History of Birth Control in America*. New York: Viking Press, Grossman Publishers, 1976.

Gorham, Frederic P. "The History of Bacteriology and Its Contribution to Public Health Work." In *A Half Century of Public Health*, edited by Mazyck P. Ravenel, pp. 66–93. New York: American Public Health Assoc., 1921.

Gray, John S. *Centennial Campaign: The Sioux War of 1876*. Norman: University of Oklahoma Press, 1988.

Green, Constance McL. *Washington: Village and Capital, 1800–1878*. Princeton: Princeton University Press, 1962.

Hagedorn, Hermann. *Leonard Wood: A Biography*. 2 vols. New York: Harper and Bros., 1931.

Haller, Jr., John S. *American Medicine in Transition, 1840–1910*. Urbana: University of Illinois Press, 1981.

Harden, Victoria A. *Inventing the NIH: Federal Biomedical Research Policy, 1887–1987*. Baltimore: Johns Hopkins University Press, 1986.

Harrison, Gordon. *Mosquitoes, Malaria, and Man: A History of the Hostilities Since 1880*. New York: E. P. Dutton, 1978.

Hart, Herbert M. *Old Forts of the Northwest*. Seattle: Superior Publishing Co., 1963.

Harvey, A. McGehee. *Research and Discovery in Medicine: Contributions From Johns Hopkins*. Baltimore: Johns Hopkins University Press, 1976.

Havens, Jr., W. Paul, ed. *Infectious Diseases and General Medicine*. Medical Department, United States Army in World War II. Washington, D.C.: Office of the Surgeon General, Department of the Army, 1968.

Heard, Isaac V. D. *History of the Sioux War and Massacres of 1862 and 1863*. New York: Harper and Bros., 1864.

Henry, Robert S. *The Armed Forces Institute of Pathology: Its First Century, 1862–1962*. Washington, D.C: Office of the Surgeon General, Department of the Army, 1964.

Hewes, James E. *From Root to McNamara: Army Organization and Administration, 1900–1963*. Washington, D.C.: U.S. Army Center of Military History, 1975.

Hill, Hibbert W. *The New Public Health*. New York: Macmillan Co., 1920.

Hume, Edgar Erskine. *The Golden Jubilee of the Association of Military Surgeons of the United States*. Washington, D.C.: Association of Military Surgeons, 1941.

————. *Ornithologists of the United States Army Medical Corps*. Baltimore: Johns Hopkins Press, 1942.

————. *Victories of Army Medicine: Scientific Accomplishments of the Medical Department of the United States Army*. Philadelphia: J. B. Lippincott Co., 1943.

Hunt, Elvid. *History of Fort Leavenworth, 1827–1927*. Edited by Walter Ernest Florence. Leavenworth, Kans.: General Services Schools Press, 1937.

Huston, James A. *The Sinews of War: Army Logistics, 1775–1953*. Washington, D.C.: Office of the Chief of Military History, United States Army, 1966.

Hutton, Paul A. *Phil Sheridan and His Army*. Lincoln: University of Nebraska Press, 1985.

Ileto, Reynaldo C. "Cholera and the Origins of the American Sanitary Order in the Philippines." In *Imperial Medicine and Indigenous Societies*, edited by David Arnold, pp. 125–48. Manchester, England: Manchester University Press, 1988.

Israel, Jerry, ed. *Building the Organizational Society: Essays on Associational Activities in Modern America*. New York: Free Press, 1972.

Isselbacher, Kurt J.; Adams, Raymond D.; Braunwald, Eugene; Petersdorf, Robert G.; and Wilson, Jean D. *Harrison's Principles of Internal Medicine*. 9th ed. New York: McGraw-Hill Book Co., 1980.

Karnow, Stanley. *In Our Image: America's Empire in the Philippines*. New York: Random House, 1989.

Karsten, Peter. "Armed Progressives: The Military Reorganizes for the American Century." In *The Military in America From the Colonial Era to the Present*, edited by Peter Karsten, pp. 229–71. New York: Free Press, 1980.

Kaufman, Martin. *Homeopathy in America: The Rise and Fall of a Medical Heresy*. Baltimore: Johns Hopkins University Press, 1971.

Kean, B. H.; Mott, Kenneth W.; and Russell, Adair J., eds. *Tropical Medicine and Parasitology: Classic Investigations*. 2 vols. Ithaca, N.Y.: Cornell University Press, 1978.

Kennedy, John C. *The Great Earthquake and Fire: San Francisco, 1906*. New York: William Morrow and Co., 1963.

King, Lester. *The Growth of Medical Thought*. Chicago: University of Chicago Press, 1965.

Kriedberg, Marvin A., and Henry, Merton G. *History of Military Mobilization in the United States Army, 1775–1945*. DA Pamphlet No. 20–212. Washington, D.C.: Department of the Army, 1955.

Lane, Jack C. *Armed Progressive: General Leonard Wood*. San Rafael, Calif.: Presidio Press, 1978.

————, ed. *Chasing Geronimo*. Albuquerque: University of New Mexico Press, 1970.

Laurie, Clayton D., and Cole, Ronald H. *The Role of Federal Military Forces in Domestic Disorders, 1878–1945*. Washington, D.C.: U.S. Army Center of Military History, forthcoming.

Leech, Margaret. *In the Days of McKinley*. New York: Harper and Bros., 1959.

Lewis, George G., and Mewha, John. *History of Prisoner of War Utilization by the United States Army, 1776–1945*. DA Pamphlet No. 20–213. Washington, D.C.: Department of the Army, 1955.

Lim, Genny, ed. *The Chinese American Experience: Papers From the Second National Conference on Chinese American Studies (1980)*. San Francisco: Chinese Historical Society of America and the Chinese Culture Center, n.d.

Linn, Brian McA. *The U.S. Army and Counterinsurgency in the Philippine War, 1899–1902*. Chapel Hill: University of North Carolina Press, 1989.

Link, Mae M., and Coleman, Hubert A. *Medical Support of the Army Air Forces in World War II*. Washington, D.C.: Office of the Surgeon General, U.S. Air Force, 1955.

Lockwood, Frank C. *The Apache Indians*. New York: Macmillan Co., 1938.

Long, Esmond R. *A History of American Pathology*. Springfield, Ill.: Charles C. Thomas, 1962.

Ludmerer, Kenneth M. *Learning To Heal: The Development of the American Medical Educator*. New York: Basic Books, 1985.

McCullough, David. *The Path Between the Seas: The Creation of the Panama Canal, 1870–1914*. New York: Simon and Schuster, 1977.

McGillycuddy, Julia B. *McGillycuddy, Agent*. Stanford, Calif.: Stanford University Press, 1941.

MacLeod, Roy, and Lewis, Milton, eds. *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion*. London: Routledge, 1988.

MacMahon, Edward B., and Curry, Leonard. *Medical Cover-ups in the White House*. Washington, D.C.: Farragut Co., 1987.

Macpherson, Kerrie L. *A Wilderness of Marshes: The Origins of Public Health in Shanghai, 1843–1893*. New York: Oxford University Press, 1987.

MacThomas, Gordon, and Witts, Max M. *The San Francisco Earthquake*. New York: Stein and Day, 1971.

Mahon, John K. *History of the Militia and the National Guard*. Edited by Louis Morton. Macmillan Wars of the United States. New York: Macmillan Co., 1983.

Major, Ralph H. *Fatal Partners: War and Disease*. Garden City, N.Y.: Doubleday, Doran and Co., 1941.

Manson-Bahr, P. E. C., and Bell, D. R. *Manson's Tropical Diseases*. 19th ed. Philadelphia: Balliere Tindall, 1987.

Marshall, S. L. A. *Crimsoned Prairie: The Wars Between the United States and the Plains Indians During the Winning of the West*. New York: Charles Scribner's Sons, 1972.

Matloff, Maurice, ed. *American Military History*. Washington, D.C.: Office of the Chief of Military History, U.S. Army, 1969.

Maxwell, William Q. *Lincoln's Fifth Wheel: The Political History of the United States Sanitary Commission.* New York: Longmans, Green and Co., 1956.

May, Glenn A. *Battle for Batangas: A Philippine Province at War.* New Haven: Yale University Press, 1991.

Miles, Wyndham D. *A History of the National Library of Medicine: The Nation's Treasury of Medical Knowledge.* Washington, D.C.: Government Printing Office, 1982.

A Military History of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1881–1963. N.p., n.d.

Miller, Darlis A. *Soldiers and Settlers: Military Supply in the Southwest, 1861–1885.* Albuquerque: University of New Mexico Press, 1989.

Miller, Stuart C. *'Benevolent Assimilation': The American Conquest of the Philippines, 1899–1903.* New Haven: Yale University Press, 1982.

Millett, Allan R. *The Politics of Intervention: The Military Occupation of Cuba, 1906–1909.* Columbus: Ohio State University Press, 1968.

Millis, Walter. *The Martial Spirit: A Study of Our War With Spain.* Boston: Houghton Mifflin Co., Riverside Press, 1931.

————. *Arms and Men: A Study in American Military History.* New York: G. P. Putnam's Sons, 1956.

Morgan, H. Wayne. *William McKinley and His America.* Syracuse, N.Y.: Syracuse University Press, 1963.

————, ed. *Yesterday's Addicts: American Society and Drug Abuse.* Norman: University of Oklahoma Press, 1974.

Morison, Samuel E., and Commager, Henry S. *The Growth of the American Republic.* 5th rev. ed. and enl. New York: Oxford University Press, 1962.

Mowry, George E. *The Era of Theodore Roosevelt and the Birth of Modern America, 1900–1912.* New York: Harper and Row, Harper Torchbooks, 1958.

Musto, David F. *The American Disease: Origins of Narcotic Control.* New Haven: Yale University Press, 1973.

Nadeau, Remi. *Fort Laramie and the Sioux Indians.* Englewood Cliffs, N.J.: Prentice-Hall, 1967.

Nelson, Jr., Otto L. *National Security and the General Staff.* Washington, D.C.: Infantry Journal Press, 1946.

Nenninger, Timothy K. *The Leavenworth Schools and the Old Army.* Westport, Conn.: Greenwood Press, 1978.

Nevins, Allan. *Grover Cleveland: A Study in Courage.* New York: Dodd, Mead and Co., 1964.

Nyrop, Richard F., ed. *Panama: A Country Study.* 3d ed. Washington, D.C.: Government Printing Office, 1981.

O'Connor, Richard. *Black Jack Pershing.* Garden City, N.Y.: Doubleday and Co., 1961.

Parascandola, John, ed. *The History of Antibiotics: A Symposium.* Madison, Wis.: American Institute of the History of Pharmacy, 1980.

Paul, Rodman W. *The Far West and the Great Plains in Transition, 1859–1900.* New York: Harper and Row, 1988.

Peirce, Paul S. *The Freedmen's Bureau: A Chapter in the History of Reconstruction.* 1904. Reprint. New York: Haskell House, 1971.

Phalen, James M. *Chiefs of the Medical Department, United States Army, 1775–1940.* Washington, D.C.: Office of the Surgeon General, War Department, 1940.

Pilcher, James E. *The Surgeon Generals of the Army of the United States of America.* Carlisle, Pa.: Association of Military Surgeons, 1905.

Prucha, Francis P. *The Great Father: The United States Government and the American Indians.* 2 vols. Lincoln: University of Nebraska Press, 1984.

Quetel, Claude. *History of Syphilis.* Translated by Judith Braddock and Brian Pike. Baltimore: Johns Hopkins University Press, 1990.

Randall, J. G., and Donald, David. *The Civil War and Reconstruction.* 2d ed. Boston: D. C. Heath and Co., 1961.

Reiser, Stanley J. *Medicine and the Reign of Technology.* Cambridge: At the University Press, 1978.

Reverby, Susan M. *Ordered To Care: The Dilemma of American Nursing, 1850–1945.* New York: Cambridge University Press, 1987.

Rickey, Jr., Don. *Forty Miles a Day on Beans and Hay: The Enlisted Soldier Fighting the Indian Wars.* Norman: University of Oklahoma Press, 1963.

Risch, Erna. *Quartermaster Support of the Army: A History of the Corps, 1775–1939.* Washington, D.C.: Office of the Quartermaster General, 1962.

Rorabaugh, W. J. *The Alcoholic Republic: An American Tradition.* New York: Oxford University Press, 1979.

Rosebury, Theodor. *Microbes and Morals: The Strange Story of Venereal Disease.* New York: Viking Press, 1971.

Rosen, George. *Fees and Fee Bills: Some Economic Aspects of Medical Practice in Nineteenth Century America.* Supplement to the *Bulletin of the History of Medicine*, no. 6. Baltimore: Johns Hopkins Press, 1946.

———. *Preventive Medicine in the United States, 1900–1975: Trends and Interpretations.* New York: PRODIST, 1977.

———. *The Structure of American Medical Practice, 1875–1941.* Edited by Charles E. Rosenberg. Philadelphia: University of Pennsylvania Press, 1983.

Rosenberg, Charles E. *The Cholera Years.* Chicago: University of Chicago Press, 1962.

———. *The Cholera Years: The United States in 1832, 1849, and 1866.* Chicago: University of Chicago Press, 1987.

———. *Trial of the Assassin Guiteau: Psychiatry and the Law in the Guilded Age.* Chicago: University of Chicago Press, 1968.

Rosenkrantz, Barbara G. *Public Health and the States: Changing Views in Massachusetts, 1842–1936.* Cambridge, Mass.: Harvard University Press, 1972.

Roth, Russell. *Muddy Glory: America's 'Indian Wars' in the Philippines, 1899–1933.* W. Hanover, Mass.: Christopher House, 1981.

Rothstein, William G. *American Physicians in the Nineteenth Century: From Sects to Science*. Baltimore: Johns Hopkins University Press, 1972.

Russell, Paul F. *Man's Mastery of Malaria*. London: Oxford University Press, 1955.

Scheips, Paul J., ed. *The Panama Canal: Readings on Its History*. Wilmington, Del.: Michael Glazier, 1979.

Scott, Douglas D.; Fox, Jr., Richard A.; Connor, Melissa A.; and Harmon, Dick. *Archaeological Perspectives on the Battle of the Little Bighorn*. Norman: University of Oklahoma Press, 1989.

Scott, H. Harold. *A History of Tropical Medicine*. 2 vols. Baltimore: Williams and Wilkins Co., 1939.

Sefton, James E. *The United States Army and Reconstruction, 1865–1877*. Baton Rouge: Louisiana State University Press, 1967.

Sexton, William T. *Soldiers in the Philippines: A History of the Insurrection*. Washington, D.C.: Infantry Journal Press, n.d.

————. *Soldiers in the Sun: An Adventure in Imperialism*. Harrisburg, Pa: Military Service Co., 1939.

Shryock, Richard H. *The Development of Modern Medicine: An Interpretation of the Social and Scientific Factors Involved*. Philadelphia: University of Pennsylvania Press, 1936.

————. *Medicine in America: Historical Essays*. Baltimore: Johns Hopkins University Press, 1966.

Skinner, Henry A. *The Origin of Medical Terms*. Baltimore: Williams and Wilkins Co., 1949.

Smillie, Wilson G. *Preventive Medicine and Public Health*. 2d ed. New York: Macmillan Co., 1955.

Smillie, Wilson G., and Kilbourne, Edwin D. *Preventive Medicine and Public Health*. 3d ed. New York: Macmillan Co., 1963.

Smythe, Donald. *Guerrilla Warrior: The Early Life of John J. Pershing*. New York: Charles Scribner's Sons, 1973.

————. *Pershing: General of the Armies*. Bloomington: Indiana University Press, 1986.

Spink, Wesley W. *Infectious Diseases: Prevention and Treatment in the Nineteenth and Twentieth Centuries*. Minneapolis: University of Minnesota Press, 1978.

Starr, Paul. *The Social Transformation of American Medicine*. New York: Basic Books, 1982.

Strode, George K., ed. *Yellow Fever*. New York: McGraw-Hill Book Co., 1951.

Thomas, Gordon, and Witts, Max M. *The San Francisco Earthquake*. New York: Stein and Day, 1971.

Thomas, Robert S., and Allen, Inez V. *The Mexican Punitive Expedition Under Brigadier General John H. Pershing, United States Army, 1916–1917*. Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1954.

Tobey, James A. *The Medical Department of the Army: Its History, Activities and Organization*. Baltimore: Johns Hopkins Press, 1927.

Trask, David. *The War With Spain*. New York: Macmillan Co., 1981.

Trent, Josiah C. "Surgical Anesthesia, 1846–1946." In *Theory and Practice in American Medicine*, edited by Gert H. Brieger, pp. 193–226. New York: Science History Publications, 1976.

Utley, Robert M. *Frontier Regulars: The United States Army and the Indian, 1866–1891*. New York: Macmillan Co., 1973.

———. *Frontiersmen in Blue: The United States Army and the Indian, 1848–1865*. New York: Macmillan Co., 1967.

Vandiver, Frank E. *Black Jack: The Life and Times of John J. Pershing*. 2 vols. College Station, Tex.: Texas A & M University Press, 1977.

Vogel, Morris J., and Rosenberg, Charles E., eds. *The Therapeutic Revolution*. Philadelphia: University of Pennsylvania Press, 1979.

Wangensteen, Owen H., and Wangensteen, Sarah D. *The Rise of Surgery From Empiric Craft to Scientific Discipline*. Minneapolis: University of Minnesota Press, 1978.

Weigley, Russell F. *The American Way of War: A History of United States Military Strategy and Policy*. 1973. Reprint. Bloomington: Indiana University Press, 1977.

———. *History of the United States Army*. New York: Macmillan Co., 1967.

———. *History of the United States Army*. Enl. ed. Bloomington: Indiana University Press, 1984.

Whayne, Tom F., and DeBakey, Michael E. *Cold Injury, Ground Type*. Medical Department, United States Army in World War II. Washington, D.C.: Office of the Surgeon General, Department of the Army, 1958.

Whipple, Allen O. *The Evolution of Surgery in the United States*. Springfield, Ill.: Charles C. Thomas, 1963.

Williams, Beryl, and Epstein, Samuel. *William Crawford Gorgas: Tropic Fever Fighter*. New York: Messner, 1953.

Williams, Greer. *The Plague Killers*. New York: Charles Scribner's Sons, 1969.

Williams, Ralph C. *The United States Public Health Service, 1798–1950*. Washington, D.C.: Commissioned Officers Association of the United States Public Health Service, 1951.

Wolf, Leon. *Little Brown Brother: How the United States Purchased and Pacified the Philippine Islands at the Century's Turn*. Garden City, N.Y.: Doubleday and Co., 1961.

Wooster, Robert. *The Military and United States Indian Policy, 1865–1903*. New Haven: Yale University Press, 1988.

Zinsser, Hans. *A Textbook of Bacteriology*. New York: D. Appleton and Co., 1927.

Zinsser, Hans, and Bayne-Jones, Stanhope. *A Textbook of Bacteriology*. 8th rev. ed. New York: D. Appleton-Century Co., 1939.

Secondary Articles

Ackerknecht, Erwin H. "Diathesis: The Word and the Concept in Medical History." *Bulletin of the History of Medicine* 56 (1982): 317–25.

Agnew, James B. "Carromatos and Quinine: Private Longden and the Medical Corps of 1898." *Military Review* 59 (July 1979): 11–21.

Anderson, Lee. "Headlights Upon Sanitary Medicine": Pubic Health and Medical Reform in Late Nineteenth Century Iowa. *Journal of the History of Medicine and Allied Sciences* 46 (1991): 178–200.

Baker, Samuel L. "Physician Licensure Laws in the United States, 1865–1915." *Journal of the History of Medicine and Allied Sciences* 39 (1984): 173–197.

Bartlett, M. K.; Jones, C. M.; and Ryan, A. E. "Vitamin C and Wound Healing: Ascorbic Acid Content and Tensile Strength of Healing Wounds in Human Beings." *New England Journal of Medicine* 226 (1942): 474–81.

Bean, William B. "A Note on the Association of Walter Reed and William Osler." *Johns Hopkins Medical Journal* 129 (1971): 346–50.

————. "Walter Reed and the Ordeal of Human Experiments." *Bulletin of the History of Medicine* 51 (1977): 75–92.

————. "Walter Reed and Yellow Fever." *Journal of the American Medical Association* 250 (1983): 659–62.

Bevoise, Ken de. "Until God Knows When: Smallpox in the Late-Colonial Philippines." *Pacific Historical Review* 59 (1990): 149–85.

Bibel, Debra Jan. "Sternberg, Metchnikoff, and the Phagocytes." *Military Medicine* 147 (1982): 550–63.

Breunle, Phillip C. "William Crawford Gorgas: Military Sanitarian of the Isthmian Canal." *Military Medicine* 141 (1976): 795–97.

Brieger, Gert H. "American Surgery and the Germ Theory of Disease." *Bulletin of the History of Medicine* 40 (1966): 135–45.

Brooks, John J.; Enterline, Horatio T.; and Aponte, Gonzalo E. "The Final Diagnosis of President Cleveland's Lesion." Offprint from *Transactions and Studies of the College of Physicians of Philadelphia* 2 (March 1980): 1–25.

Bryan, Jr., Leon S. "Blood-letting in American Medicine, 1830–1892." *Bulletin of the History of Medicine* 38 (1964): 516–29.

Buerki, Robert A. "Medical Views on Narcotics and Their Effects in the Mid-1890s." *Pharmacy in History* 17 (1975): 3–12.

Burnham, John C. "The Progressive Era Revolution in American Attitudes Toward Sex." *Journal of American History* 59 (1973): 885–908.

Butler, Anne M. "Military Myopia: Prostitution on the Frontier." *Prologue* 13 (1981): 233–50.

Campbell, Kristine A. "Knots in the Fabric: Richard Pearson Strong and the Bilibid Prison Vaccine Trials, 1905–1906." *Bulletin of the History of Medicine* 68 (1994): 600–38.

Cangi, Ellen C. "Abraham Flexner's Philanthropy: The Full-time System in the Department of Surgery at the University of Cincinnati College of Medicine, 1910–1930." *Bulletin of the History of Medicine* 56 (1982): 160–74.

Cassedy, James H. "The 'Germ of Laziness' in the South, 1900–1915: Charles Wardell Stiles and the Progressive Paradox." *Bulletin of the History of Medicine* 45 (1971): 159–69.

————. "Numbering the North's Medical Events: Humanitarianism and Science in Civil War Statistics." *Bulletin of the History of Medicine* 66 (1992): 210–233.

Chaves-Carballo, Enrique. "Samuel T. Darling: Studies on Malaria and the Panama Canal." *Bulletin of the History of Medicine* 54 (1980): 95–100.

Clymer, Kenton J. "Not So Benevolent Assimilation: The Philippine-American War." *Reviews in American History* 11 (1983): 547–52.

Coffman, Edward M. "The Long Shadow of the Soldier and the State." *Journal of Military History* 55 (1991): 69–82.

Cosmas, Graham A. "From Order to Chaos: The War Department, the National Guard, and Military Policy, 1898." *Military Affairs* 29 (1965): 105–21.

————. "Securing the Fruits of Victory: The U.S. Army Occupies Cuba, 1898–1899." *Military Affairs* 38 (1974): 85–91.

Cowart, Virginia. "Control, Treatment of Drug Abuse, Have Challenged Nation and Its Physicians for Much of History." *Journal of the American Medical Association* 256 (1986): 2465–69.

Crosby, William H. "The Death of Walter Reed." *Journal of the American Medical Association* 248 (1982): 1332–42.

Dock, George. "Clinical Pathology in the Eighties and Nineties." *American Journal of Clinical Pathology* 16 (1946): 673–80.

Downs, Wilbur G. "The Story of Yellow Fever Since Walter Reed." *Bulletin of the New York Academy of Medicine* 44 (1968): 721–27.

Duke, Raymond M. "The Army Medical Service School: Its History and Mission." *United States Armed Forces Medical Journal* 11 (1960): 621–40.

Duffy, John. "Medicine in the West: An Historical Overview." *Journal of the West* 21 (1982): 5–14.

Fee, Elizabeth. "Competition for the First School of Hygiene and Public Health." *Bulletin of the History of Medicine* 57 (1983): 339–63.

Field, Jr., James A. "American Imperialism: The Worst Chapter in Almost Any Book. *American Historical Review* 83 (1978): 644–68.

Fish, Stewart A. "The Death of President Garfield." *Bulletin of the History of Medicine* 24 (1950): 378–92.

Fletcher, Marvin. "The Black Volunteers in the Spanish-American War. *Military Affairs* 38 (1974): 48–52.

Foley, Gardner P. H. "The Peaks of Dental History." *Bulletin of the History of Dentistry* 23 (June 1975): 11–16.

Follis, Jr., Richard H. "Cellular Pathology and the Development of the Deficiency Disease Concept." *Bulletin of the History of Medicine* 34 (1960): 291–317.

Fye, W. Bruce. "The Origin of the Full-time Faculty System: Implications for Clinical Research." *Journal of the American Medical Association* 265 (1991): 1555–62.

————. "S. Weir Mitchell: Philadelphia's 'Lost' Physiologist." *Bulletin of the History of Medicine* 57 (1983): 188–202.

Gates, John M. "War-related Deaths in the Philippines, 1898–1902." *Pacific Historical Review* 53 (1954): 367–78.

Gillett, Mary C. "Medical Care and Evacuation During the Philippine Insurrection, 1899–1901." *Journal of the History of Medicine and Allied Sciences* 42 (1987): 169–85.

————. "A Tale of Two Surgeons." *Medical Heritage* 1 (1985): 404–13, 466.

————. "United States Army Surgeons and the Big Horn–Yellowstone Expedition of 1876." *Montana: The Magazine of Western History* 39 (Winter 1989): 16–27.

————. "U.S. Army Medical Officers and Public Health in the Philippines in the Wake of the Spanish-American War, 1898–1905." *Bulletin of the History of Medicine* 64 (1990): 567–87.

Goodyear, James D. "The Sugar Connection: A New Perspective on the History of Yellow Fever." *Bulletin of the History of Medicine* 52 (1978): 5–21.

Gordon, David S. "The Relief of Fort Phil Kearny." *Journal of the Military Service Institution of the United States* 49 (1911): 281–84.

Greenberg, Bernard. "Flies and Disease." *Scientific American* 213 (July 1965): 92–99.

Greenberg, Jerome H. "Venereal Disease in the Armed Forces." *Medical Aspects of Human Sexuality*, March 1972, pp. 165–201.

Guerra, R.; Wheby, M. S.; and Bayless, T. M. "Long-term Antibiotic Therapy in Tropical Sprue." *Annals of Internal Medicine* 63 (1965): 619–34.

Hagan, Barry. "Prelude to a Massacre: Fort Philip Kearny, December 6, 1866." *Order of the Indian Wars Journal* 1 (Fall 1980): 1–17.

Hemmeter, J. C. "Joseph Janvier Woodward, Brevet Lieutenant Colonel, U.S. Army: Pioneer in Photomicrography, Pathologic Histology and Medical Historian of the Civil War." *Military Surgeon* 52 (1923): 635–47.

Heyd, Charles G. "The Evolution of Modern Surgery." *American Journal of Surgery* 5 (1941): 54–65.

Hitchens, A. P., and Leikind, M. C. "The Introduction of Agar-agar into Bacteriology." *Journal of Bacteriology* 37 (1939): 485–93.

Hoffert, Sylvia D. "Childbearing on the Trans-Mississippi Frontier, 1830–1900." *Western Historical Quarterly* 22 (1991): 273–288.

Hurme, V. O. "Notes on the Physical and Dental Condition of U.S. Army Men in 1901–1903: The First Large-scale Experiment in Tropical Dental Medicine." *New York State Dental Journal* 16 (1950): 255–65.

Hyson, John M. "William Saunders: The United States Army's First Dentist—West Point's Forgotten Man." *Military Medicine* 149 (1984): 435–41.

Ireland, M. W. "The Conquest of Yellow Fever." *Military Surgeon* 64 (1929): 244–51.

Katz, Friedrich. "Pancho Villa and the Attack on Columbus, New Mexico." *American Historical Review* 83 (1978): 101–30.

Kaufman, Martin. "The American Anti-vaccinationists and Their Arguments." *Bulletin of the History of Medicine* 41 (1967): 453–78.

Keuchel, Edward F. "Chemicals and Meat: The Embalmed Beef Scandal of the Spanish-American War." *Bulletin of the History of Medicine* 48 (1974): 249–64.

King, Lester S. "The Changing Scene. "*Journal of the American Medical Association* 249 (1983): 1897–1900.

———. "Clinical Science Gets Enthroned." *Journal of the American Medical Association* 250 (1983): 1847–50.

———. "The Flexner Report of 1910." *Journal of the American Medical Association* 251 (1984): 1079–86.

———. "Germ Theory and Its Influence." *Journal of the American Medical Association* 249 (1983): 794–98.

———. "Medical Education: Elitism and Reform." *Journal of the American Medical Association* 250 (1983): 2457–61.

———. "Medical Education: The Decade of Massive Change." *Journal of the American Medical Association* 251 (1984): 219–24.

———. "Medical Education: The Problems Intensify." *Journal of the American Medical Association* 250 (1983): 3100–104.

———. "Medical Journalism, 1847–1883." *Journal of the American Medical Association* 250 (1983): 744–48.

———. "Medicine Seeks To Be Scientific." *Journal of the American Medical Association* 249 (1983): 2475–79.

Klayman, Daniel L. "Weeding Out Malaria: American Scientists Pursue a Cure From a Chinese Plant." *Natural History*, October 1989, pp. 18, 20, 22–24, 26–27.

Kress, George H. "United States Army Field Hospital in San Francisco in 1906: An Interesting Letter, With Some Excerpts From the May, 1906, Issue of the *California State Journal of Medicine*." *California and Western Medicine* 53 (1940): 215–17.

Laurie, Clayton D. "Civil Disorder and the Military in Rock Springs, Wyoming: The Army's Role in the 1885 Chinese Massacre." *Montana: The Magazine of Western History* 40 (Summer 1990): 44–59.

Leikind, Morris C. "Army Medical Museum and Armed Forces Institute of Pathology in Historical Perspective." *Scientific Monthly* 79 (1954): 71–78.

———. "The Evolution of Medical Research in the United States." *International Record of Medicine* 17 (1958): 455–68.

Lesky, Erna. "American Medicine as Viewed by Viennese Physicians, 1893–1912." *Bulletin of the History of Medicine* 56 (1982): 368–76.

Link, Terry. "The Great Earthquake Cover-up." *Oakland Sunday Tribune*, 18 January 1987.

Long, Esmond R. "The Army Medical Museum." *Military Medicine* 128 (1963): 367–77.

Love, Walter D. "Army Dentistry Forty Years Old." *Journal of the American Dental Association* 42 (1951): 313–14.

Ludmerer, Kenneth M. "The Plight of Clinical Teaching in America." *Bulletin of the History of Medicine* 57 (1983): 218–29.

Lull, George F. "Dissemination of Cholera by the 38th Infantry in 1867." *Military Surgeon* 79 (1936): 382–85.

Lund, F. B. "The Surgery of the War and the Part Played Therein by American Surgeons." *Surgery, Gynecology and Obstetrics* 25 (1917): 698–99.

McKenna, Charles D. "The Forgotten Reform: The Institution of a System of Field Maneuvers in the U.S. Army, 1902–1912." *Army History*, Winter 1991/1992, pp. 17–23.

Malison, Michael D., and Waterman, Stephen H. "Dengue Fever in the United States: A Report of a Cluster of Imported Cases and Review of the Clinical, Epidemiologic, and Public Health Aspects of the Disease." *Journal of the American Medical Association* 249 (1983): 496–500.

Matas, Rudolph. "Surgical Operations Fifty Years Ago." *American Journal of Surgery*, n.s. 51 (1941): 40–53.

Meleny, Henry E. "Tropical Medicine in United States Military History." *Bulletin of the New York Academy of Medicine* 18 (1942): 329–37.

Millikin, John D. "The Original U.S. Army Dental Corps: A Brief History." *Journal of the California State Dental Association and the Nevada State Dental Society* 30 (1954): 387.

Mitchell, James F. "The Introduction of Rubber Gloves for Use in Surgical Operations." *Annals of Surgery* 122 (1945): 902–04.

Mitchell, Jr., Robert E. "Notes on Medical History of the Panama Canal." *New Orleans Medical and Surgical Journal* 103 (1950): 87–91.

Morgan, William G. "Contributions of the Medical Department of the United States Army to the Advancement of Knowledge." *Military Surgeon* 66 (1930): 779–90.

Morrison, Hyman. "The Chapter on Appendicitis in a Biography of Reginald Heber Fitz." *Bulletin of the History of Medicine* 20 (1946): 259–69.

Morreels, Jr., Charles L. "New Information on the Cleveland Operations." *Surgery* 65 (1947): 542–51.

Morton, John J. "The Struggle Against Sepsis." *Yale Journal of Biology and Medicine* 31 (1959): 397–422.

Nadeau, Gabriel. "Indian Scalping Techniques in Different Tribes." *Bulletin of the History of Medicine* 10 (1941): 178–94.

Norris, John. "The 'Scurvy Disposition': Heavy Exertion as an Exacerbating Influence on Scurvy in Modern Times." *Bulletin of the History of Medicine* 57 (1983): 325–38.

Olch, Peter D. "Medicine in the Indian Fighting Army, 1866–1890." *Journal of the West* 21 (1982): 32–41.

Omer, Jr., George E. "An Army Hospital: From Dragoons to Rough Riders—Fort Riley, 1853–1903." *Kansas Historical Quarterly* 23 (1957): 336–67.

Palmieri, Anthony, and Hammond, Daniel J. "Drug Therapy at a Frontier Fort Hospital: Fort Laramie, Wyoming Territory, 1870–1889." *Pharmacy in History* 21 (1979): 35–44.

Palmquist, Peter E., comp. "Elizabeth Fleischmann-Aschheim, Pioneer X-ray Photographer." *Western States Jewish History* 23 (1990): 35–45.

Peller, Sigismund. "Walter Reed, C. Finlay, and Their Predecessors Around 1800." *Bulletin of the History of Medicine* 33 (1959): 195–211.

Perez, Jr., Louis A. "Vagrants, Beggars, and Bandits: Social Origins of Cuban Separatism, 1878–1895." *American Historical Review* 90 (1985): 1092–1121.

Petersen, Edward S. "The Military Surgeon in the West." *Westerners Brand Book* 28 (1971): 1–3.

————. "Surgeons of the Little Big Horn." *Westerners Brand Book* 31 (1974): 41–43.

Powers, Ramon S., and Younger, Gene. "Cholera and the Army in the West: Treatment and Control in 1866 and 1867." *Military Affairs* 39 (1975): 49–54.

"Pseudo-outbreak of Intestinal Amebiasis." *Journal of the American Medical Association* 253 (1985): 1861.

Quinones, Mark A. "Drug Abuse During the Civil War (1861–1865)." *International Journal of the Addictions* 10 (1975): 1007–20.

Ragsdale, Bruce D. "Gunshot Wounds: A Historical Perspective." *Military Medicine* 149 (1984): 301–15.

Ransom, J. E. "The Development of Ambulance Service in the Armies of Great Britain, the United States and Other Countries." *Ciba Symposia* 8 (1947): 553–59.

Regato, Juan A. del. "Carlos Finlay and the Nobel Prize in Physiology or Medicine." *Pharos of Alpha Omega Alpha* 50 (Spring 1987): 5–9.

————. Letter: "In Reference to 'The Unsung Hero of Yellow Fever' by Colin Norman, *Science* 223 (1984): 1370–1372." *Science* 224 (1984): 1044.

Richmond, Phyllis. "Some Variant Theories in Opposition to the Germ Theory of Disease." *Journal of the History of Medicine and Allied Sciences* 9 (1954): 290–303.

Riley, Harris D. "Joseph Jones, MD: An Early Clinical Investigator." *Southern Medical Journal* 80 (1987): 623–29.

Robinson, Frank U. "The Battle of Snake Mountain." *Military Affairs* 14 (1950): 92–98.

Rosenberg, Charles. "The Therapeutic Revolution: Medicine, Meaning, and Social Change in Nineteenth Century America." *Perspectives in Biology and Medicine* 20 (1977): 485–506.

Rossiter, P. S. "The Growth of the Association of Military Surgeons." *Military Surgeon* 89 (1941): 602–03.

Sandos, James A. "Prostitution and Drugs: The United States Army on the Mexican-American Border, 1916–1917." *Pacific Historical Review* 49 (1980): 621–45.

Schlack, Carl A. "A Short History of the United States Naval Dental Corps." *United States Naval Medical Bulletin* 40 (1942): 775–79.

Schoenberg, Bruce. "Joseph Janvier Woodward and an Early American View on Cancer." *Surgery, Gynecology and Obstetrics* 136 (1973): 456–62.

Schreier, Jr., Konrad F. "Army Motor Transport Won Spurs in Mexico." *Periodical: Journal of the Council on America's Military Past* 18 (April 1991): 3–13.

Schullian, Dorothy M., and Rogers, Frank B. "The National Library of Medicine." *Library Quarterly* 28 (1958): 1–17, 95–121.

Shryock, Richard H. "American Indifference to Basic Science During the Nineteenth Century." *Archives internationales d'histoire des sciences* 28, no. 5 (1948): 50–65.

Simmons, James S. "Progress of the Army's Fight Against Malaria." *Journal of the American Medical Association* 120 (1942): 30–34.

Skolnick, Andrew A. "Newfound Genetic Defect Hints at Clues for Developing Novel Antimalarial Agents." *Journal of the American Medical Association* 269 (1993): 1765.

Smith, Dale C. "A Historical Overview of the Recognition of Appendicitis." *New York State Journal of Medicine* 86 (1986): 571–83, 639–47.

————. "The Rise and Fall of Typho-malaria." *Journal of the History of Medicine and Allied Sciences* 37 (1982): 182–220, 287–321.

Smith, Dale C., and Sanford, Lorraine B. "Laveran's Germ: The Reception and Use of a Medical Discovery." *American Journal of Tropical Medicine and Hygiene* 34 (1985): 2–20.

Stevenson, Lloyd G. "Putting Disease on the Map: The Early Use of Spot Maps in the Study of Yellow Fever." *Journal of the History of Medicine and Allied Sciences* 20 (1965): 226–61.

————. "Science Down the Drain." *Bulletin of the History of Medicine* 29 (1955): 1–26.

Straight, William M. "Camp Miami, 1898." *Journal of the Florida Medical Association* 74 (1987): 504–13.

————. "The Great Typhoid Epidemic in Florida, 1898." *Journal of the Florida Medical Association* 73 (1986): 289–99.

Tigertt, Helen, and Tigertt, W. D. "Clara Louise Maass: A Nurse Volunteer for Yellow Fever." *Military Medicine* 148 (1983): 252–53.

Tigertt, W. D. "The Initial Effort To Immunmize American Soldier Volunteers With Typhoid Vaccine. *Military Medicine* 124 (1959): 342–49.

Turcheneske, Jr., John A. "Arizonans and the Apache Prisoners of Mount Vernon Barracks, Alabama: They Do Not Die Fast Enough." *Military History of Texas and the Southwest* 11 (1973): 197–226.

"U.S. Army Medical Service Contributions to Civilian Health and Medicine." *Ohio Medical Journal* 5 (1959): 332–34, 492–94.

Wangensteen, Owen H., and Wangensteen, Sarah D. "Lister, His Books and Evolvement of His Antiseptic Wound Practices." *Bulletin of the History of Medicine* 48 (1974): 100–28.

Ward, Patricia S. "The American Reception of Salvarsan." *Journal of the History of Medicine and Allied Sciences* 36 (1981): 59–60.

Ward, R. A. "The Influence of Ronald Ross Upon the Early Development of Malaria Vector Control Procedures in the United States Army." *Journal of Tropical Medicine and Hygiene* 76 (1973): 207–09.

Warner, Margaret. "Hunting the Yellow Fever Germ: The Principle and Practice of Etiological Proof in Late Nineteenth Century America." *Bulletin of the History of Medicine* 59 (1985): 361–82.

Wengert, James W. "The 1878 Ambulance Board." *Military Collector and Historian* 37 (1985): 8–23, 50–66.

Whayne, Tom F., and McNinch, Joseph M. "Fifty Years of Medical Progress; Medicine as a Social Instrument: Military Medicine." *New England Journal of Medicine* 244 (1951): 592–601.

Wier, James A. "The Army Doctor and the Indian." *Denver Westerners' Roundup* 31 (September 1975): 3–14.

———. "19th Century Doctors on the Frontier and in Nebraska." *Nebraska History* 61 (1980): 192–214.

Wilson, Charles. "American Contributions to Neurosurgery." *New Orleans Medical and Surgical Journal* 96 (1943): 140–47.

Wright, Scheffel H. "Historical Issue; Medicine in the Florida Camps During the Spanish-American War: Great Controversies." *Journal of the Florida Medical Association* 62 (1975): 19–26.

LIST OF ABBREVIATIONS



Adj	Adjutant
AG	Adjutant general
AGO	Adjutant General's Office
Am	American
AMA	American Medical Association
Aprops	Appropriations
AR	Annual report
Assoc.	Association
Asst	Assistant
Bull(s)	Bulletin(s)
C-in-C	Commander-in-chief
CG	Commanding general
Ch	Chief
Cir(s)	Circular(s)
Cmte	Committee
Co(.)	Company
CO(s)	Commanding officer(s)
Com	Commission, Commissioner
comp.	compiler
Compt	Comptroller
Conf	Conference
Cong.	Congress
cont	continued
CofS	Chief of staff
Dept(s)	Department(s)
Dir	Director, Directive
diss.	dissertation
Dist(s)	District(s)
Div(s)	Division(s)
ed(s).	editor(s), edition
Encl	Enclosure
End	Endorsement
enl.	enlarged
Ex	Exhibit

f.	following
GO(s)	General Order(s)
Gov	Governor
GS	General Staff
H	House
HC	Haverford College, Haverford, Pa.
Hist	History
Hq	Headquarters
HofReps	House of Representatives
IG	Inspector general
IndAffs	Indian Affairs
Inf	Infantry
Info	Information
Instr(s)	Instruction(s)
Interv(s)	Interview(s)
LC	Library of Congress, Washington, D.C.
loc. cit.	*loco citato*, in the place cited
Ltr(s)	Letter(s)
M.A.	Master of Arts
MD	Medical Department
Med	Medical
Mf	Microfilm
MHS	Marine Hospital Service
Mil	Military
MilAffs	Military Affairs
Mins	Minutes
Ms	Manuscript
Mtg	Meeting
MVAA	Massachusetts Volunteer Aid Association
NARA	National Archives and Records Administration, Washington, D.C.
NGB	National Guard Bureau
NLM	National Library of Medicine, Bethesda, Md.
n.s.	new series
Off(s)	Officer(s)
OIC	Officer-in-charge
Pam	Pamphlet
Ph.D.	Doctor of Philosophy
Pres	President

QM	Quartermaster
QMG	Quartermaster general
rev.	revised
RG	Record Group
Rpt(s)	Report(s)
Sec	Secretary
Sen	Senate
ser.	series
Sess.	Session
SG	Surgeon general
SGO	Surgeon General's Office
SO(s)	Special Order(s)
SU	Stanford University, Palo Alto, Calif.
supp.	supplement
Surg	Surgeon
s.v.	*sub verbo*, under the word
Svc	Service
SW	Secretary of war
Tel	Telephone
Telg(s)	Telegram(s)
Treas	Treasury
TSLA	Tennessee State Library and Archives, Nashville, Tenn.
UA	University of Alabama, Tuscaloosa, Ala.
U.S.	United States
WD	War Department

INDEX

Ackerknecht, Erwin H., 94
Acting assistant surgeons. *See* Contract surgeons.
Adair, Maj. George W., 106–07
Adjutant general, 19, 23–24
Adjutant General's Department, 33*n24*
Agramonte, Aristides, 239, 240–41, 242, 243, 250–51, 277. *See also* Yellow Fever Board.
Aguinaldo, Emilio, 202, 207
Ainsworth, Maj. Gen. Fred C., 24, 313–14
Alabama, 81, 82–84, 126, 185, 402–03
Alcohol, 4, 49, 352
Alcoholism
  discharges due to, 40, 103–04
  among Indian scouts, 102
  among medical officers, 82
  prevention of, 48–49
  among soldiers, 103, 218, 224, 354, 355, 356, 360, 373*n24*, 394
  treatment of, 52, 103–04
Alden, Col. Charles H., 97–98
Alger, Russell, 123, 155, 156, 158, 159, 160, 162, 163, 177, 185, 193, 194, 214
Ambulance attendants, 19, 20, 166
Ambulance companies, 127, 130, 138*n29*, 166, 182, 332, 333, 334–35, 339–40, 341, 363, 364, 383, 386, 388, 390, 395, 397, 401, 405
Ambulance corps, 11, 54
Ambulance stations, 129–30, 145, 167
Ambulance trains, 164
Ambulances
  in China, 222–23
  Civil War, 30
  in Cuba, 145–46, 147, 153–54, 155, 235
  design of, 362–63, 405
  disinfection of, 155
  drivers for, 85, 145–46, 244
  equipment for, 54
  in Mexico, 397
  motor vehicles, 362–63, 389–90, 397, 401
  National Guard, 400
  personnel for, 100
Ambulances—Continued
  in the Philippines, 166, 209, 213, 215, 297, 339
  procurement of, 4–5, 6*n8*, 166, 362–63, 389
  Spanish-American War, 125, 130, 131, 132, 145–46
  used to move supplies, 163
  wagons, 69–70, 73, 74, 76, 77, 85, 86, 145, 155, 204, 209, 213, 222, 390, 397
  for yellow fever patients, 235, 238
Amebiasis, 289
American Dental Association, 327
American Medical Association, 16, 95, 98, 106, 267, 277, 285, 327, 381–82
American Public Health Association, 58*n8*
American Red Cross, 135, 144, 146–47, 154, 158, 162, 174, 178, 180, 182, 187, 189, 190, 369, 379, 389, 393
  Military Relief Division, 405
  Nursing Service, 328
  reserve nurses, 383, 384
American Registries of Pathology, 28
Ames, Maj. (Vol.) Azel, 258, 259, 279*n6*
Amoeba coli. *See Entamoeba coli*.
Amoeba dysenteriae. *See Entamoeba histolytica*.
Amputations, 67, 71, 77, 80, 86, 147, 148, 214, 357–58
Anatomical specimens, 26
Ancon, Panama, 265, 270, 275–76
Anderson, Maj. Gen. (Vol.) Thomas M., 135, 164, 165, 201
Anemia, 257, 260–61, 272
Anesthesia, 49, 108, 332, 357–58. *See also* Chloroform; Ether.
Angel Island, California, 111, 213, 331
Angeles, Philippine Islands, 210
Anniston, Alabama, 186
Anthrax, 98
Antipyretics, 105. *See also* Quinine.
Antiscorbutics, 73
Antisepsis, 50–51, 357
Antiseptics, 29, 31, 95, 96
Antitoxins, 93, 105, 291, 293

Anti-tuberculosis League, 233
Antivaccination movement, 39–40
Apaches, 78–80
  children, 81–84
  Chiricahua, 81
  deaths of, 81–82, 83, 84
  in Florida, 81
  as prisoners, 81–84, 87
Aparri, Philippine Islands, 212
Apomorphine, 104
Aponte, Gonzalo E., 108
Appel, Maj. Aaron H., 130, 132, 144
Appendectomies, 50–51, 106, 165, 357
Arapahos, 80
Arctic exploratory team, 46
Argyrol, 352
Arizona, 387, 394, 401, 402
Arizona, Department of, 79
Arizona Territory, 78, 81
Arkansas, 42
Armed Forces Institute of Pathology, 28
Army Medical Museum, 26, 27–28, 30, 97–98, 317, 319, 326, 338–39
  catalogs of holdings, 28
  exhibits sent abroad, 28
  laboratory, 28, 43, 50, 98–99, 107, 348–49, 361
Army Medical School, 97–99, 100, 102, 119, 191, 318, 319, 320, 322–23, 324, 326, 328, 331, 338, 350, 361, 382, 391
Army-Navy Hospital, 51, 52, 109, 328, 339, 384, 391, 401
Army Nurse Corps, 327, 383–84, 395, 401, 414
Army of Cuban Pacification, 250
Army Service Schools, 324, 335
Army Shoe Board, 359, 360
Army Transport Service, 208
Army War College, 325, 333–34
Arrow wounds, 66–67
Arroyo, Puerto Rico, 162
Arsphenamine, 293, 350–51
Arthur, Brig. Gen. William H., 14, 33*n21*
Asch, Morris J., 81
Ashburn, Capt. Percy M., 28, 288, 290, 293
Ashford, Maj. Bailey K., 113*n11*, 260–63, 277, 279*n15*, 315
Asiatic cholera. *See* Cholera.
Aspirin, 4
Athletic training, 48–49
Atlantic, Division of the, 53
Atropine, 104
Augusta, Georgia, 185–86
Aurists, 179
Austria, 405
Austro-Hungarian Army, 355
Autopsies, 50, 241, 286, 287, 289, 291
Aviation medicine, 401, 403–04

Bache, Col. Dallas, 84–85, 86–87, 90*n67*, 123–24
Bacillus icteroides, 240–41, 245
Bacoor, Philippine Islands, 212, 213
Bacteria
  as cause of disease, 29, 115*n46*
  as cause of infection, 31
  cultures, 25, 28
  filtered from water supply, 103
Bacteriologists, 28, 95, 192, 239, 324, 394
Bacteriology, 30, 41, 94, 95, 97, 98, 191, 240
Balangiga, Samar, 215
Banister, Maj. (Vol.) William B., 220–21, 222–23, 224
Barbados, West Indies, 273
Barker, Lewellys F., 288
Barnes, Brig. Gen. Joseph K., 7–8, 11, 12, 13, 14, 15–17, 19, 22–23, 25, 26, 27, 31, 32*n3*, 32*n13*, 40, 56, 65, 72
Barton, Clara, 146–47
Bathing
  facilities for, 43, 45, 47, 135, 165, 178, 180–81, 204, 206, 347–48
  promotion of, 43, 47, 400–401
Battalion aid stations, 333
Bavarian Army, 355, 360
Baxter, Brig. Gen. Jedediah H., 8–11, 12, 24, 56, 95, 100
Bean, William B., 244
Beaumont, William, 317, 342*n16*
Bell, Alexander Graham, 50
Beriberi, 272, 291–93, 294, 305, 306, 308*n23*
Bevoise, Ken de, 294
Bighorn River, 67, 70–71, 72
Bighorn-Yellowstone Expedition, 67, 69–78, 83
Bilibid prison, Philippine Islands, 291, 293, 306
Bill, Lt. Joseph H., 66
Billings, Maj. John Shaw, 22–23, 25, 26, 27, 28, 30, 35*n48*, 40–41, 42, 46–47, 56–57, 98, 99
Birmingham, Col. Henry P., 394–95
Bismarck, Dakota Territory, 67
Black soldiers, 40, 42, 49, 320
  black surgeons for, 320
  as hospital assistants, 156
  illnesses of, 102
  malaria and, 150
Black workers, Canal Zone, 273
Bleeding (treatment), 4
Blood
  as disease transmitter, 244–45, 290

Blood—Continued
examinations of, 164, 241, 261, 349
white cells, 95, 261
Bloodgood, Maj. Joseph C., 383
Board of Health for the Philippine Islands and the City of Manila, 295, 309*n34*.
Boards of health, 303
Manila, 285–86, 290–91, 295, 296–98, 300, 301, 302, 309*n33*, 309*n34*
Philippine, 295–96, 297–305, 309*n34*
Puerto Rico, 257, 258, 260, 261–62
Spanish, 257
Bohol, Philippine Islands, 213
Borden, Maj. William C., 83–84, 338–39
Bourns, Maj. (Vol.) Frank S., 309*n33*, 309*n35*
Boxer Rebellion, 201, 220, 221–22, 224
Brechemin, Capt. Louis, 55
Brigade surgeons, 215
Brinton, John H. 105–06
Bristow, Virginia, 184
British Army, 16, 40, 350, 355, 360, 379
Bronchitis, 49
Brooke, Maj. Gen. John R., 175, 177, 178, 232–33, 237, 258
Brownsville, Texas, 401–02
Brucellosis, 263
Bryant, Joseph Decatur, 107, 108
Bryant, Maj. William S., 179
Bullet wounds, 99
nature of, 147–48
treatment of, 49–50, 147–48
Burial records, 23

Calamba, Philippine Islands, 212, 213
Caldwell, Maj. Daniel G., 109–10
California, 141
California, Department of, 368, 371
Calvert, Lt. William J., 290–91, 295
Camps
Alger, Virginia, 127, 181–83, 184, 191–92, 197*n24*
Dewey, Philippine Islands, 165–66, 167
Lazear, Cuba, 243–44
Meade, Pennsylvania, 184, 185
Merritt, California, 133–34
Robinson, Nebraska, 73, 74–75, 78, 86
Thomas, Kentucky, 129, 174, 175–78, 185
Wikoff, New York, 160, 186–91, 193, 230, 314
Canadian Army, 352–53
Cardwell, Maj. (Vol.) Herbert W., 166, 167, 209, 217–18
Caribbean, 117, 118, 122–23, 126. *See also* Cuba; Puerto Rico.
Carlisle, Pennsylvania, Indian School, 81–82
Carnegie, Andrew, 95
Carr, Maj. (Vol.) Lawrence C., 235, 236, 238
Carroll, James, 239, 240–41, 242–43, 244, 245, 255*n58*. *See also* Yellow Fever Board.
Carter, Maj. (Vol.) Edward C., 309*n35*
Carter, Henry Rose, 241, 265, 272–73
Cassedy, James H., 30
Cassel, Jay, 353
Cattle plague, 286
Cavalry
1st, 104
7th, 67, 70, 71, 85
9th, 85
Cavalry, 1st, U.S. Volunteers. *See* Rough Riders.
Cavite, Philippine Islands, 164, 165, 166
Cebu, Philippine Islands, 213
Central Department, 391–92
Cesspools, 233, 234, 236, 299
Chaffee, Maj. Gen. (Vol.) Adna R., 220, 222
Chamberlain, Maj. Weston P., 292–93
Chancroid, 349
Chaplains, 11
Charitable organizations, 126, 162, 163, 174–75, 233. *See also* American Red Cross.
Cheyennes, 67
Chicago, Illinois, 109–10, 111
Chickamauga, Georgia, 126, 174–78, 192
China, 201, 220–24
China Relief Expedition, 207, 220–24
Chinese
communities, 297, 298, 300, 302, 306
laborers in the Philippine Islands, 208–09, 290, 304
Chlorine, 358
Chloroform, 49. *See also* Anesthesia; Ether.
Cholera
Asiatic, 25, 42
causes, 25, 28, 41–42, 43, 93, 105, 241, 294, 303
diagnosis, 43
epidemics, 27, 40, 41–43, 58*n10*, 229, 293, 296, 299, 300, 302–04, 305, 306, 324
hog, 241
hospitals, 293
immunity to, 40
isolation of patients with, 303
prevention, 42–43, 293, 302
study of, 27, 43
symptoms, 42
treatment, 293
Cholera Epidemic of 1873 in the United States, The, 27
Chronic respiratory disease, 40
Cienfuegos, Cuba, 250–51
Cisterns, 43–44, 52, 247, 270, 273

Civil War, 9–10, 54, 63, 64, 121, 193, 332, 345*n70*
aftermath, 3, 7
assistance to victims of, 21–25
records, 23
and scientific medicine, 26, 29–30
veterans, 21–25
Clayton, Lt. Jere B., 290–91, 308*n19*
Clearing stations, division, 333
Cleary, Maj. Peter J. A., 82, 83
Clements, Maj. Bennett A., 72, 76, 77–78
Clerks, 23–24
Cleveland, Grover S., 9, 32*n8*, 93, 95, 98, 107–08, 109, 233
Cleveland, Ohio, 229
Clothing
adequacy of, 77–78, 83
health and, 47–48, 149, 219, 220, 291, 293
purchase of, 4–5
Cocaine, 49, 354–55
Coffman, Edward M., 113*n12*
Cold injuries, 67, 70, 74
Colon, Panama, 264, 266, 268, 270, 273, 275
Colonia Dublan, Mexico, 397
Columbia Barracks, Cuba, 238–39, 240–41
Columbia Hospital for Women and Lying in Asylum, 23
Columbus, New Mexico, 397, 401
Commerce and Labor, U.S. Department of, 340
Commissary Department, 16, 33*n24*
Common cold, 49
Construction materials, 163, 187
Contract dentists, 383
Contract physicians. *See* Contract surgeons.
Contract surgeons, 11, 176, 356–57, 364
on Arctic expedition, 46
assignments, 177, 179, 321, 362
in China, 222
in Cuba, 129, 150, 154–55, 234, 239–46, 248
deaths of, 42, 71, 72
for Freedmen's Bureau, 21
hiring of, 12–13, 14, 15, 18, 150, 208, 320, 322, 323, 377
on Indian War expeditions, 64, 69, 71, 72, 73, 74, 75, 76, 78, 80
numbers of, 11, 15–16, 18, 96–97, 119, 319, 323
in Panama, 265–66, 275, 279*n6*
in the Philippines, 214, 221, 287–90, 293, 297, 320
promotions of, 14–15, 320
providing care of Indians, 82, 83
in Puerto Rico, 259
qualifications, 15, 121, 275
research by, 287–88
Contract surgeons—Continued
responsibilities of, 56, 120–21, 162, 184, 275
on ships, 208, 214, 293, 362
in the South, 15, 21
in Spanish-American War, 120–21, 162
training of, 17–18, 121
in the West, 64, 69, 71, 72, 73, 74, 75, 76
Convalescents
in Cuba, 159
hospitals for, 179–80, 189, 190, 204, 206, 235–36
in Puerto Rico, 163–64
returned to troop units, 175, 176
returned to the United States, 156–59, 160, 164
Cooks, 187, 189
hospital corpsmen as, 20, 21
quality of, 47
training of, 19, 47, 54, 100
Corbin, Brig. Gen. Henry C., 157, 159, 174–75
Corps, Army, 118, 138*n34*, 185
I, 162, 175, 177, 178, 185, 186
II, 162, 181–86
III, 122, 175, 185
IV, 162, 184, 185, 186
V, 129–33, 135, 136, 138*n34*, 138*n36*, 141, 143–60, 162, 180, 184, 185, 186, 187, 190, 229, 230, 231, 233, 234, 248, 251
VI, 169*n18*, 185, 197*n40*
VII, 178, 179, 180, 186, 230, 231
VIII, 133–36, 141, 164–67, 172*n70*, 201–04, 208, 294
Corps surgeons, 119, 121, 122, 127, 128, 138*n29*, 181
Corregidor Island, Philippine Islands, 206, 208, 225*n9*
Cosmas, Graham A., 232
Coues, Capt. Elliott, 57
Craig, Capt. Charles F., 176, 288, 290, 293, 350, 351
Crane, Brig. Gen. Charles H., 7–8, 9, 12, 18, 32*n13*, 64–65
Crile, George W., 405
Crook, Brig. Gen. George, 67, 72, 73–74, 75, 76–77, 78
Crosby, Maj. (Vol.) William D., 165, 204
Cuba, 41, 93, 117, 129–33, 136, 139*n41*, 141–60, 168*n2*, 178, 180, 183, 186, 229, 230–51, 260, 263, 264, 281*n26*, 321, 331, 340, 380
anti–yellow fever campaign, 247–51, 266, 269
military government of, 252*n6*, 253*n14*
veterans of, 128, 186, 187–88, 190
Cuba, Department of, 230, 249, 252*n6*
Cuba, Division of, 232–33, 237, 252*n6*
Cuban nationals
laborers, 232
physicians, 234

Culion Island, Philippine Islands, 301
Curry, Joseph J., 287, 290–91, 356–57
Custer, Lt. Col. George A., 67, 70, 71, 72, 78

Dagupan, Philippine Islands, 212
Daiquiri, Cuba, 141, 143, 154
Dakota, Department of, 67, 69
Darnall, Maj. Carl R., 358, 363
Daughters of the American Revolution, 123
Deadwood, Dakota Territory, 76–77
Death rates, 135, 150, 158–59, 173, 178, 191, 193, 231, 339, 356, 360
  in Cuba, 233, 235, 236, 239, 249
  of Indians, 81–84
  in Panama, 272, 273
  in the Philippines, 290–91, 293–94, 296, 304, 306
  in Puerto Rico, 259, 261
  racial differences, 42, 49
  in the United States, 229
Deaths
  from anemia, 261
  from beriberi, 291, 305
  causes of, 40, 46, 49, 234, 360
  from cholera, 42, 304
  from dysentery, 261, 264, 287
  among Indians, 81–84
  infants, 296, 304–06
  from malaria, 264
  among Mexican refugees, 393
  from paratyphoid, 402
  from plague, 302
  from San Francisco earthquake, 365, 367
  from scurvy, 46
  from smallpox, 40, 301
  from tuberculosis, 306, 339, 360
  from typhoid, 216–17, 251
  from yellow fever, 41, 243, 244, 248, 250, 251, 264, 268
Delano, Jane A., 328, 345*n53*
Demobilization, 11–12
Dengue, 151, 192, 213, 251, 289–90, 306
Dental Corps, 327, 383, 414
Dentists, 18–19, 99, 108, 179, 206, 212, 326–27, 383, 385, 386
Department of the South, 13
Depression (mental), 76–77
Deserters, identification of, 24
Detention camps, 154–55, 170*n35*, 189, 190, 230, 234, 300
De Witt, Lt. Col. Calvin, 233, 253*n13*
Dewey, Commodore George, 117, 133, 164–65
DeWolf, James M., 71
Diarrhea, 42, 84, 104–05, 110, 111, 130, 150–51, 216, 217, 219, 222, 251, 258, 261, 263, 288, 399
Diet, 3, 4, 39, 46–47, 76–77, 81, 82, 83–84, 103, 104–05, 110, 111, 132, 135, 147, 149, 151, 167, 174–75, 190, 194, 207, 208, 216, 217, 219, 220, 258, 260–61, 291–93, 294, 304, 305, 306, 308*n23*, 326, 405
Digestive problems, 164, 251, 263
Diphtheria, 28, 93, 98, 105
Disability discharges, 17, 23, 40, 52, 106, 206, 355–56, 387
Disaster relief, 365–71, 375*n66*, 379
Disease. *See also* Disease rates; Death rates; particular diseases.
  causes of, 3, 25, 26, 28, 29, 39, 46, 93, 173. *See also* particular diseases.
  diagnosis of, 93–94, 151, 191–92, 361, 392. *See also* particular diseases.
  prevention of, 4, 28, 39–49, 97, 100, 102, 105, 119, 130, 134, 151, 152–53, 167, 232–34, 325–26, 363, 399
  treatment of, 3, 4, 105–06. *See also* particular diseases.
Disease rates, 40, 128, 148, 164, 193, 399, 402–03
  in Cuba, 149–60, 173–74, 230, 233, 236, 246–47
  in mobilization camps, 173–74, 175, 176, 178, 182, 184–86, 378
  in Panama, 275
  in the Philippines, 166, 206, 216, 287, 293–94, 297–98, 300
  in Puerto Rico, 258
Disinfectants, 25, 43, 95, 235–36, 266, 352
Disinfection
  of buildings, 231–32, 234–35, 236, 237, 246, 247–48, 258, 270, 273, 275, 277, 297–98, 301, 302, 303, 395
  of individuals, 234, 235
  of mail, 159
  methods of, 43, 184, 187, 224, 234–35, 270, 399, 401, 410*n66*
  of patient's effects, 157, 184, 187, 234, 236, 246, 247–48, 302, 399, 401
  of ships, 157, 247–48, 317
  of tents, 184
  of towns, 232–33
Dispensaries, 135, 262, 275, 367, 370, 391
Division surgeons, 119, 121, 129, 138*n29*, 332–33, 364
Doctrine (Medical Department), 332, 334
Dodge, Maj. Gen. (Vol.) Grenville M., 193–94, 199*n71*
Dodge Commission, 188, 193–94, 314, 316, 318, 322, 326, 327, 339–41, 388, 414

Drainage, 185, 204, 206, 221, 233, 271, 297–98, 299, 303
Dressing stations, 51, 53–54, 60*n49*, 86, 100, 127, 145, 210, 222, 223, 333
Drug addiction, 354–55
Duffy, John, 229
Dunn Loring, Virginia, 184
Dysentery, 216, 222, 236, 251, 394, 399
  causes, 3, 28, 29, 93, 113*n2*, 287–88
  chronic, 4, 82, 83, 212, 221
  in Cuba, 149, 150–51, 159, 231
  discharges due to, 40
  and malaria, 217, 288
  in Panama, 275
  in the Philippines, 217, 285–88, 305–06
  in Puerto Rico, 258, 261
  treatment, 4, 217, 288–89

Eagle Pass, Texas, 401
Ear infections, 402
Earthquakes, 365–71, 375*n66*
Edie, Maj. (Vol.) Guy L., 309*n33*
Efficiency rating systems, 23, 24
Ehrlich, Paul, 350, 351
El Caney, Cuba, 141, 145, 146, 147, 153–54, 157
El Paso, Texas, 392, 397, 401, 402
Eliot, Charles W., 4
Empyema, 357–58, 402
Engineers, U.S. Army Corps of, 16, 33*n24*
England, 25, 31
Enlisted men, Medical Department, 19, 20, 100, 123–24, 155, 156, 162, 163, 334, 381, 384–85, 401, 414
Entamoeba coli, 287–88, 307*n5*, 307*n8*
Entamoeba histolytica, 287–88, 307*n8*
Epidemics, 3, 40, 159, 190, 229, 296–97, 306
  cholera, 27, 40, 41–43, 58*n10*, 229, 293, 296, 299, 300, 302–04, 305, 306, 324
  dengue, 289–90
  influenza, 49
  plague, 302, 324
  pneumonia, 402
  prevention of, 347, 361, 370, 393–94, 413
  smallpox, 40, 237–38, 257–59, 301–02
  typhoid, 173–78, 180–81, 183, 186, 191, 229, 251
  yellow fever, 27, 40–41, 43, 150, 152, 155, 159, 186, 234–36, 238–39, 240–41, 246, 247, 251, 266–69, 272
Epilepsy, 40
Epizootic diseases, 259, 286, 296, 304, 305, 310*n61*, 392
Equipment, laboratory, 173
Erysipelas, 74, 93
Ether, 49, 107, 108. *See also* Anesthesia; Chloroform.
Ettling, John, 279*n15*
Evacuation, medical. *See also* Ambulance companies; Ambulances; Hospital ships; Hospital trains; Litter-bearers.
  in China, 222, 223
  from Cuba, 143–44, 145, 156–58, 160
  doctrine, 64–65, 100, 127
  to field hospitals, 74, 145, 167, 208
  to hospital ships, 143–44, 207
  during Indian campaigns, 63–66, 71–72, 84–86
  management of, 127, 362–63
  from the Philippines, 207–08, 212
  in the Philippines, 167, 204, 208–10, 212, 213
  planning for, 128, 173, 399, 414, 415
  from Puerto Rico, 163–64
  by ship, 156–59, 160, 163–64, 222, 223
  training for, 53–55, 84, 85, 98–99, 324, 332
Evacuation hospitals, 333
Ewing, Capt. Charles B., 85–86

Far West (supply steamer), 70–71, 72, 73, 76
Fevers
  in Cuba, 149–51, 153, 154, 234
  dengue, 151, 192, 213, 251, 289–90, 306
  diagnosis of, 105, 153, 164, 173, 179
  isolation of patients with, 132
  in the Philippines, 213
  in Puerto Rico, 164
  treatment of, 4
  typho-malaria, 173
Field Service and Correspondence School for Medical Officers, 324–25
Field Service Regulations, 332, 334, 364, 381
Filipino scouts. *See* Philippine Scouts.
Finlay, Carlos Juan, 41, 241–42, 243, 250–51, 254*n41*. *See also* Yellow Fever Board.
Finnegan, John P., 379
First aid
  packets, 124–25, 138*n22*, 144, 210
  services, 127, 367
  training in, 20, 53, 101
First Reserve Hospital, 204, 206, 225*n9*, 285–86, 287, 290–91, 307*n4*, 328, 339
Fleas, 290, 291
Fleischmann-Aschheim, Elizabeth, 337
Flexner, Simon, 288
Flies, 43, 134, 175–76, 192, 224, 231, 299, 303, 304, 364, 370
Florida, 40, 81, 82, 126, 141, 159, 178–81
Fomites, 245–46, 247, 349, 356

Food. *See also* Diet.
contamination of, 175–76, 192, 224, 231, 260, 285, 299, 302, 303, 304, 370
preservation of, 46–47, 83–84
shortages, 67, 76–77, 167, 183–84, 187, 194, 219, 220, 232, 233, 397
Foot problems, 219, 322, 359–60
Forage, for Army animals, 4–5, 73, 397
Ford, Maj. Clyde S., 405
Ford's Theater, 24–25, 28
Forts
Abraham Lincoln, Dakota Territory, 67, 70, 72, 73
Barrancas, Florida, 40–41
Bayard, New Mexico, 339, 356, 391
Bliss, Texas, 390, 393, 401
Brady, Michigan, 70
Buford, Dakota Territory, 46–47, 67, 69, 70, 71
D. A. Russell, Wyoming Territory/Wyoming, 54, 74, 100
Douglas, Utah Territory, 45
Ellis, Montana Territory, 67, 69
Fetterman, Wyoming Territory, 67, 73–74, 75, 76, 77–78
Hamilton, New York, 45, 51–52
Harker, Kansas, 42
Huachuca, Arizona, 390
Jefferson, Florida, 40–41
Keogh, Montana, 54, 86
Laramie, Wyoming Territory, 74, 75
Leavenworth, Kansas, 17, 54, 103, 109, 110, 324–25, 335, 361, 382, 384, 391–92
McKinley, Philippine Islands, 289–90
McNair, Washington, D.C., 100
McPherson, Georgia, 128–29, 130, 159, 174, 180, 184
Marion, Florida, 81
Mason, California, 367, 368
Monroe, Virginia, 42, 47, 54, 127, 129, 159, 162, 174, 337
Myer, Virginia, 105, 127, 129, 174, 179, 182, 184, 361
Niobrara, Nebraska, 54, 86
Omaha, Nebraska, 87
Pickens, Florida, 81
Reno, Wyoming Territory, 74
Riley, Kansas, 54, 87, 100–101, 389
Ringgold, Texas, 102–03
Robinson, Nebraska, 73, 74–75, 78, 86
Sam Houston, Texas, 328, 361, 384, 390, 392, 401
Shaw, Montana Territory, 69
Sheridan, Illinois, 109, 110
Sill, Oklahoma Territory, 84
Slocum, New York, 262
Stanton, New Mexico, 339
Forts—Continued
Fred Steele, Wyoming Territory, 75
Thomas, Kentucky, 129, 174, 175–78, 185
Washington, Maryland, 357
Wingate, New Mexico, 393
Wood, New York, 51–52
Forwood, Brig. Gen. William H., 98, 107, 123–24, 187, 188–89, 190, 250, 265, 314–15, 316
Foster, Gaines M., 232
France, 25, 220, 222, 264, 265, 268, 272, 345*n53*
Franco-Prussian War, 112
Franklin, John Hope, 39
Freedmen's Bureau. *See* Refugees, Freedmen, and Abandoned Lands, Bureau of.
French Army, 355, 360, 405
Frostbite, 67, 70
Fungi, 28
Funk, Casimir, 308*n23*
Funston, Brig. Gen. Frederick, 365, 368

Galveston, Texas, 363, 364, 365
Gangrene, 67
Garbage
collection of, 94, 234, 266, 275
disposal of, 3, 84, 234, 294–95, 296, 298
Garfield, James A., 8, 49–50, 107, 108
Garrison, Fielding H., 28
Garrison, Lindley M., 384, 388
General Motors Company, 389
General Staff, 313, 333
Georgia, 185
Germ theory, 25–26, 28, 29, 31, 39, 49–50, 414
Germany, 25, 30, 99, 220, 224, 377, 405, 406
Geronimo, 78–79, 80, 81
Giardia lamblia, 288
Gibbon, Col. John, 67, 69, 70–71, 72, 73
Gilchrist, Maj. Harry L., 295, 336, 386, 387
Girard, Lt. Col. Alfred C., 31, 109, 110, 181–83, 184, 337, 346*n79*
Glennan, Lt. Col. James D., 399
Goethals, Col. George W., 276–77
Golden Gate Park, San Francisco, 369
Gonorrhea, 93, 217–18, 349, 350, 352, 353, 391, 399
Goodyear, James D., 246
Goodyear Rubber Company, 60*n39*
Goose Creek, 75, 76
Gorgas, Marie, 267, 277, 281*n30*, 380
Gorgas, Maj. Gen. William C., 150, 154, 236, 237, 239, 247, 248–50, 251, 254*n34*, 264–78, 280*n25*, 281*n30*, 316, 324, 328, 377–78, 379, 380–81, 382–83, 384–85, 387, 388, 389, 390–91, 392–93, 394, 395, 397, 400, 402, 403, 404, 405, 407*n3*

Government Hospital for the Insane, 350, 355
Government Laboratories, Bureau of, 285–86, 295–96
Governor's Island, New York, 42, 43
Graham, Maj. Gen. (Vol.) William M., 181, 182–83, 184, 197*n23*
Grant, Ulysses S., 56
Great Britain, 220, 222, 223, 230–31, 348
Greely, Maj. Gen. Adolphus W., 46, 365, 368–69, 370–71
Greenleaf, Col. Charles R., 118–19, 121, 127, 128, 152, 154, 155–56, 162, 163, 164, 166, 174, 177, 190–91, 193, 210, 214–15, 220, 226*n24*, 301, 347
Grimes, Robert B., 76
Guam, 218
Guanica, Puerto Rico, 160
Guantanamo, Cuba, 160, 162, 230
Guerrilla warfare, 63, 117, 145, 201, 202, 204, 206, 207, 208, 213, 215, 216, 232, 286–87, 301, 339, 397, 399
Guiteau, Charles J., 50
Guiteras, Juan, 41, 129, 130, 133, 134, 138*n36*, 152–53, 154, 248, 250–51
Gutierrez Igaravidez, Pedro, 262

Halsted, William S., 60*n39*
Hammond, Brig. Gen. William A., 26, 28–29, 30, 32*n3*, 97, 111, 354, 413
Harrison, Benjamin, 9
Hartsuff, Lt. Col. Albert, 74, 75, 76, 77, 85, 175, 177, 178
Havana, Cuba, 117, 129, 143, 230, 232, 236, 237, 238, 240–41, 242, 244, 246, 247–48, 249, 250, 251, 264, 265, 266, 269, 270, 276–77, 340
Havana, Department of, 236, 237, 238–39, 252*n6*
Havana Yellow Fever Commission, 41, 129, 239–46, 254*n35*
Havard, Lt. Col. Valery, 129, 146, 150, 154, 233, 253*n13*, 351, 352
Hawaii, 135–36, 337–38, 361
Hawaii, Department of, 391
Hay Fever Association, 354
Heart disease, 40
Heat exhaustion, 111, 216, 217, 223
Hemorrhage, 74
Henry, Capt. Guy V., 76
Hernias, 22, 40, 106–07, 166, 357
Heroin, 354
Hoff, Alexander H., 178, 197*n15*
Hoff, Maj. (Lt. Col., Vol.) John van R., 20, 21, 85, 197*n15*, 258, 259, 260, 265
Homeopaths, 120
Hong Kong, 206, 207, 291
Honolulu, Hawaii, 136, 174, 341, 384, 391
Hookworm, 257, 260–63, 272, 277, 294, 305–06, 402–03
Horner, J. W., 179
Horses
  diseases of, 304
  equipment for, 4, 6*n8*
  purchases of, 4–5
  shortages of, 54
  taken to Cuba, 132, 143, 144–45
  training in the care of, 100
  used as food, 77
  used to produce antitoxin, 105
  used to transport patients, 65, 66, 72, 76
Hospital attendants. *See* Hospital stewards; Nurses.
Hospital construction, 4–5, 185–86, 187, 188, 189, 190, 206, 338–39, 361. *See also* Hospitals, design.
  funds for, 51, 108, 206, 361, 390, 391
  materials for, 163
Hospital Corps, 34*n38*, 84, 100, 113*n13*, 329–32
  companies, 122, 329, 369
  creation of, 18–21
  desertion rates, 21
  entrance examination, 20, 21
  organization, 332, 385, 414
  privates, 329, 330, 331, 384
  size, 122
  wartime responsibilities, 119, 134
Hospital Corps, National Guard. *See* National Guard.
Hospital corpsmen, Regular Army. *See also* National Guard, hospital corpsmen.
  in China, 221, 222
  command of, 183, 320
  in Cuba, 129–30, 155, 234, 242, 244
  as dentists, 18–19, 206, 212, 326–27
  duties of, 18–20, 85, 100, 110, 111, 119, 122, 127, 128, 129–30, 155, 166, 177, 178, 179, 187, 189, 202, 206, 208–09, 212, 214, 326–27, 331, 335, 341, 352, 362, 363, 364
  Filipino, 331
  handbook for, 122
  housing for, 391, 395
  in laboratory work, 330–31
  numbers of, 19, 101, 122–23, 155, 166, 214, 329
  as nurses, 19, 20, 123–24, 384
  organization of, 129–30, 166
  pay, 21, 101, 331, 384–85
  in the Philippines, 133–34, 135, 165, 166, 206, 212, 213, 214, 215, 329, 355
  promotions, 330
  in Puerto Rico, 162, 163, 259, 263

Hospital corpsmen, Regular Army—Continued
quality of, 101, 122, 182, 184, 213–14, 331–32, 384
rank, 330, 332, 345*n58*
at refugee camps, 369, 393
shortages of, 21, 85, 118, 121–22, 155, 166, 182–83, 188, 213, 222, 329, 331, 333–34, 364, 384–85
training of, 21, 53–54, 96, 100–101, 122, 155, 173, 181, 183, 184, 185, 213, 330–31, 334–35, 338, 363, 390
uniforms for, 101
U.S. Volunteers, 122, 133–34, 135, 163, 165, 166, 329
and Yellow Fever Board, 242, 244, 245
Hospital ships, 3, 11, 119, 132, 143, 144, 148, 156–57, 163–64, 206–07, 208, 222, 223, 231, 235–36, 333. *See also* individual ships.
shortages of, 157, 162
staffing of, 174, 206
Hospital stewards, pre-1887, 12–13, 18–20, 21, 23, 34*n38*, 69, 73
Hospital trains, 3, 11, 128–29, 138*n33*, 179–80, 182, 184, 190, 210, 275, 333, 363, 369, 401
Hospitals
administration of, 120–21, 174, 177, 188, 210, 265, 275–76, 378, 390–91
base, 222, 223, 333, 337–38, 340, 341, 361, 384, 388, 401, 405
beds, 124–25, 145, 147, 212
buildings used for, 86, 144–45, 154, 163, 164, 165, 177, 204, 206, 210, 212–13, 221–22, 223, 275, 300, 361, 395
camp, 231, 384, 397, 400, 401, 405
city, 233, 234, 267
civilian, 174, 184, 190, 300, 367, 371, 391, 394–95, 405
construction. *See* Hospital construction.
convalescent, 179–80, 189, 190, 204, 206, 225*n9*, 282*n55*
crowding at, 176, 177, 188, 189, 367
design, 30, 45, 51–52, 97, 108–09
detention, 154–55, 170*n35*, 189, 190, 230, 234, 300
diet kitchens, 182, 361
equipment for, 134, 173, 182, 186, 212, 221, 388, 400
evacuation, 333, 341, 381, 388
Freedmen's Bureau, 21
funds for, 361, 390
for Indians, 83
isolation, 204, 208, 230, 236–38, 248, 273, 293, 300–301, 349, 361, 369
Hospitals—Continued
laboratories, 204, 206, 224, 276, 391–92, 395, 401
laundry facilities, 188, 212
Marine, 222
for National Guard, 96
Navy, 206, 221–22
organization of, 130, 173, 177–79, 208, 210, 212, 275–76, 390
planning for, 195, 208, 275–76, 340–41
plumbing, 204, 275, 361
sanitation at, 180–81, 194, 236, 258, 270, 347–48
ships. *See* Hospital ships; individual ships.
staffing of, 177, 188, 189, 206, 213–14, 275, 405
supplies, 4, 120, 124, 162, 165, 212, 223, 275, 340–41, 388, 400
tents used for, 71, 77–78, 86, 130, 132, 143, 144, 146, 147, 154, 163, 164, 165–66, 167, 176, 177, 181–82, 187, 189, 204, 206, 208, 213, 222, 300, 338
transports. *See* Hospital ships.
wartime organization, 11, 127–29, 130, 155, 163, 333
Hospitals, brigade, 166, 212, 213
Hospitals, division, 121, 122, 128, 130, 174, 177, 178, 179, 182, 183–86, 190, 193, 204, 339
in Cuba, 143, 146, 155, 231
organization of, 181, 333
reserve, 130, 147, 162
on ships, 132, 143, 156–57
staffing of, 127, 134, 156
supplies for, 187
Hospitals, field, 51, 53–54, 60*n49*, 66, 70, 71, 72, 74, 77, 84–85, 86–87, 110, 332, 333–35, 340, 345*n70*, 364, 383, 395, 397, 400, 401
in China, 223
in Cuba, 144–45, 146–48
for disaster relief, 369–70
exhibited, 99
facilities for, 111, 363
National Guard, 386
in the Philippines, 208, 210, 212
planning for, 118–19, 127, 332, 339–40, 341
in Puerto Rico, 260–61
shortages of, 145, 146, 334, 335
and Spanish-American War, 127, 129, 180, 182, 184
staffing of, 100, 127, 138*n29*, 174, 334, 381
supplies for, 339–41, 388
Hospitals, general, 3, 60*n49*, 174, 190, 231, 333, 336–39, 367
Civil War, 11, 30
in Cuba, 155, 234
design of, 30

Hospitals, general—Continued
disaster relief, 367–68
equipment for, 148
facilities for, 177–78, 182, 187, 188, 391
funding for, 337
laboratories, 361
location of, 127, 333, 391
in the Philippines, 204–08, 225*n9*
in Puerto Rico, 163, 164, 257
responsibility for, 119, 128
staffing of, 177
supplies for, 13, 127, 187–89
training at, 122
women nurses in, 18, 123, 156, 188–89, 328
Hospitals, post, 18–19, 51–52, 66, 74, 76, 86, 96, 100, 110, 174, 180, 337–38, 390–91
cooks for, 47
equipment for, 99, 108
exhibited, 99
facilities for surgery, 86, 107, 108–09, 165, 361
laboratories, 361, 413–14
in the Philippines, 165, 207, 208, 212
in Puerto Rico, 257
women nurses in, 162
Hospitals, regimental, 127, 128, 130, 144–45, 146, 153–55, 163, 174, 177, 178, 179, 186, 190, 206, 210, 231, 333, 340, 388
Housing
in Cuba, 149, 233, 234–35, 237, 247–48
fumigation of, 234–35, 237, 247–48, 277
for hospital corpsmen, 391, 395
for Indian prisoners, 83, 84
for lepers, 272–73
for nurses, 212, 223, 328, 384, 393
in Panama, 272–73
in the Philippines, 291, 299
in Puerto Rico, 257–58
for refugees, 367, 368–69
for soldiers, 43, 102, 149, 185, 187, 257–58, 367
Hoyt, Maj. (Vol.) Henry F., 209
Huidekoper, Lt. Col. (Vol.) Rush S., 177
Hume, Edgar Erskine, 352
Huntsville, Alabama, 184, 186
Hypnotics, 176–77

Illinois Militia, 110
Illinois National Guard, 55, 117, 120
Immunization, 336, 403
of animals, 304, 392
paratyphoid, 399, 402
plague, 291
rabies, 25
serums, 285–86, 291, 293, 301, 304
Immunization—Continued
smallpox, 3, 37*n75*, 39–40, 133, 231, 237–38, 248, 258, 259, 273, 301, 347, 370, 387, 393, 395, 399
training for, 330–31
typhoid, 192, 348–49, 364, 387, 393–94, 399, 402
yellow fever, 248
Index Catalogue, 26, 36*n64*
Index Medicus: A Monthly Classified Record of the Current Medical Literature of the World, 27
Indian Affairs, Bureau of, 81
Indians, American. *See also* specific tribes.
as adversaries, 3
artifacts, 27–28
campaigns against, 49, 52, 63–91
death rates, 81–84
illness among Army scouts, 102
medical care for, 81–84, 85, 86, 90*n67*
as prisoners, 81, 86
on reservations, 81–84
schools for, 81–82
Indigents, care for, 23
Infantile convulsions, 296, 304–06
Infantry
9th, 220–21
14th, 220, 222
24th, 156
Infantry, U.S. Volunteers
2d, 156
3d, 156
Infection
causes of, 3, 29, 31, 148, 167, 222
from cold injuries, 67
fear of, 49–50, 358
prevention of, 4, 25, 51, 144, 148, 167, 305, 347
studies of, 27–28
Influenza, 49, 393, 402
Insects, as disease vectors, 134, 241–51, 257, 263–64, 266, 269–72, 285, 289–90, 395
Inspector General's Department, 33*n24*
Institute of Tropical Medicine and Hygiene, 262
Instruction, camps of, 53–54, 334–35, 383
Instruction, companies of (hospital corpsmen), 54, 101, 330–31, 332
International Sanitary Conference (Rome, 1886), 30
Ipecac, 288–89
Ireland, Lt. Col. Merritte W., 130, 318
Isthmian Canal Commission, 257, 264–65, 266, 267–69, 277, 328, 340
Ives, Maj. (Vol.) Francis J., 151, 155, 156, 160, 224, 231

Jacksonville, Florida, 178, 179, 180, 186
Jamaica, 230–31, 272

James, William, 49
Japan, 206, 218, 220, 222, 223, 224, 291, 293, 377
Japanese Army, 325, 355
Jefferson Barracks, Missouri, 45, 102–03, 105
Johns Hopkins Hospital, 35*n48*
Johns Hopkins University, 10, 60*n39*, 191, 239, 266, 288
Johnson, Andrew, 7, 8
Josiah Simpson General Hospital, 128

K packets, 352, 353, 354
Kean, Brig. Gen. (NA) Jefferson R., 32*n8*, 139*n41*, 230, 238–39, 250–51, 254*n34*, 255*n58*, 256*n69*, 263, 315, 358–59, 405
Keefer, Lt. Col. Frank R., 404–05
Keen, William W., 98
Keenan, George F., 379
Keeton Motor Company, 362–63, 389
Kentucky, 126, 185
Key West, Florida, 40, 123, 159, 174
Kilbourne, Maj. Henry S., 129
Kimball, Capt. James P., 70
King, Walter W., 262
Kitchens, 178, 192, 208, 347
Kiyoshi Shiga, 287
Koch, Robert, 25, 30, 95, 240

Labor violence, 53, 55, 109–12
Laboratories
  analyses done in, 43, 260, 324, 349
  equipment for, 176, 266, 285–86, 348–49
  experiments done in, 241–46, 276, 350, 351
  facilities, 285–86, 290–91, 295, 307*n4*, 326, 361, 381, 390, 391–92, 402, 413–14, 415
  field, 263, 401
  set up by Typhoid Board, 192
  training for use of, 324
LaGarde, Maj. Louis A., 99, 130, 132, 138*n36*, 147, 150, 153, 154, 156, 158, 265, 266, 270
Lakeside Hospital, 405
Lamb, Daniel Smith, 50
Lambert, Alexander, 268–69
Lamont, Daniel S., 97
Lampasas (hospital ship), 162, 164
Las Guasimas, Cuba, 141, 144, 157
Latrines, 42–43, 44, 45, 83, 135, 173, 176, 178, 181, 182, 183, 184, 192, 219, 231–32, 267, 275, 294, 297–98, 300, 347, 370
Lawson, Brig. Gen. Thomas, 317
Lawton, Capt. Henry W., 78, 79, 81
Lazear, Jesse W., 239, 241, 242, 243, 244, 248. *See also* Yellow Fever Board.
Le Prince, Joseph, 265, 271
LeCompte, Edward, 76
Lee, Maj. Gen. Fitzhugh, 178
Leiter General Hospital, 177, 178
Leprosy, 28, 272–73, 300–301
Letterman, Jonathan, 54, 127
Letterman General Hospital, 337–38, 384, 391
Lexington, Kentucky, 185
Leyte, Philippine Islands, 213
Liberia, U.S. Commission to the Republic of, 324
Library of Congress, 26
Lice, 322, 399, 400–402, 404–05
Line and Staff College, 324
Ling, John, 179
Lippincott, Lt. Col. Henry, 133–34, 135–36, 165–66, 172*n73*, 208, 216, 219, 226*n24*
Lister, Joseph, 25, 29, 30–31
Litter-bearers, 20, 101, 127, 167, 222, 333
  arming of, 111
  Chinese coolies, 208–09, 222
  Filipino, 208
  in the Philippines, 208–09
  prisoners of war, 208
  training of, 53–54, 85, 100, 101
Litters, 64–66, 71–72, 77, 124–25, 127, 144–45, 209, 224
Little Bighorn River, 72
Liver abscesses, 289
Living conditions, 149, 173, 294, 297–99, 359. *See also* Housing.
Loggerhead Key, Florida, 41
Long Island, New York, 160, 186
Long Island Railroad, 187
Lord, Lt. George E., 71
Los Animas disinfecting plant, 247
Louisiana, 126
Louisville, Kentucky, 229
Lovell, Joseph, 26, 36*n61*
Ludlow, Brig. Gen. William, 237, 254*n27*
Luzon, Philippine Islands, 202, 209, 210, 212, 213, 301
Lyster, Lt. Col. Theodore C., 276, 404
Lyster, Lt. Col. William J. L., 358, 404–05

Maass, Clara L., 248
MacArthur, Maj. Gen. (Vol.) Arthur, 201, 202, 214, 220, 225*n3*
McClellan, Capt. Ely, 27, 43
McCreery, Maj. George, 130, 146, 150
McGee, Anita Newcomb, 123, 327–28
McGee, Thomas, 80
McGillycuddy, Valentine T., 65, 76, 77
McKinley, William, 95, 117, 120, 129, 193–94, 204, 230, 233

McVay, Capt. Harlan E., 165, 204
Madison Barracks, New York, 109
Magoon, Charles E., 250
Maine (hospital ship), 223
Malaria, 3, 67, 81–82, 150, 154, 159, 182, 212, 213, 216, 221
  causes of, 28, 93, 95, 105, 130, 134, 136, 139*n41*, 150, 152, 190, 248, 290
  in China, 224
  chronic, 294
  in Cuba, 230, 236, 251, 276–77
  danger of, 365, 394
  diagnosis, 151, 173, 176, 179, 192, 217, 258, 290, 292
  and dysentery, 217, 288
  falciparum, 150, 151, 160, 190, 270–71, 289
  immunity to, 270–71
  in Mexico, 399
  in Panama, 257, 263–64, 270–72, 276–77
  in the Philippines, 217, 285, 289, 290, 305–06, 310*n61*, 311*n65*
  prevention of, 102–03, 130, 221, 248–49, 276–77, 357, 395
  in Puerto Rico, 258, 260
  symptoms, 112, 164, 175, 217
  transmission of, 150, 229, 230
Malta fever, 263
Manila, Philippine Islands, 133, 135, 164–65, 166–67, 201, 202, 204, 206, 207–08, 209–10, 212, 213, 217, 218, 219, 288, 289, 290–91, 293, 294, 296, 299, 300, 305, 306, 307*n4*, 328, 331, 339, 340, 341, 348–49, 354
  Board of Health, 285–86, 290–91, 295, 296–98, 300, 301, 302, 309*n33*, 309*n34*
  census, 295, 298–99
  fire, 300
Manila Bay, 117, 164
Manuals (Medical Department), 119, 214, 332, 333, 339–40
Mariel, Cuba, 132
Marine Hospital Service, 157, 159, 174, 187, 234, 235, 241, 253*n21*, 257, 260, 261, 297, 339. *See also* Public Health and Marine Hospital Service; Public Health Service.
Marshall, T. R., 309*n35*
Massachusetts Volunteer Aid Association, 187–88, 190
Matanzas, Cuba, 233
Matanzas and Santa Clara, Department of, 231–32, 233, 239, 252*n6*
Matrons (civilian housekeepers), 18
Maus, Lt. Col. (Vol.) Louis M., 178, 179, 180, 294, 302–03, 309*n31*, 309*n35*
May, Glenn A., 310*n61*
Mayaguez, Puerto Rico, 164
Mayo, Charles H., 379–80
Meacham, Maj. (Vol.) Franklin A., 297–98, 309*n33*, 309*n35*
Measles, 130, 132–33, 362, 402, 403
Medical and Surgical History of the War of the Rebellion, 28–30, 31, 37*n73*
Medical Association of the District of Columbia, 56
Medical boards, 173, 190–93, 262, 285–93, 314, 332, 348, 357, 358–59, 362, 387, 415. *See also* Boards of health; Havana Yellow Fever Commission; Philippine Tropical Disease Board; Typhoid Board; Yellow Fever Board.
Medical chests, 117, 124, 134, 143, 222–23
Medical Corps, 321, 379, 381–82, 386, 387, 401, 405
Medical directors
  Civil War, 30
  of military districts, 13, 63–64
  responsibilities of, 12–13, 15, 16, 63–64, 102
Medical education, 4, 10, 15, 17, 25–26, 93, 97, 99–100, 320
Medical inspectors, 12, 127, 135, 299, 300–301, 303, 304, 322, 347–48
Medical laboratories, 28, 43, 50, 94, 107, 108–09, 112, 164
Medical libraries, 26–27. *See also* Surgeon General's Library.
Medical officers, Medical Reserve Corps, 322–23, 334, 348, 377, 381, 382, 386, 401
  benefits, 322, 323
  duties, 323, 357, 386, 387, 394–95
  qualifications, 322, 323, 364
  training of, 322, 323, 378, 382–83, 386, 415
Medical officers, Regular Army
  administrative duties, 52–53, 96, 97, 119, 120, 121, 152, 174, 188, 193, 208, 250, 318, 324, 332, 335, 364–65, 378, 403, 405, 406, 414–15
  assignments, 52, 53, 64, 69–80, 82, 138*n29*, 163, 181, 364–65, 379, 400, 404
  black Americans, 320
  in China, 220–24
  competency of, 81, 188, 193, 391
  in Cuba, 233, 250–51
  deaths of, 42, 165
  demobilization of, 11
  detailed to Freedman's Bureau, 21
  detailed to Red Cross, 405
  disabled, 17, 149–50
  and disaster relief, 368–69
  disease among, 149–50
  education of, 53, 78, 99–100, 188

Medical officers, Regular Army—Continued
engineering responsibilities, 42, 52, 97
entrance examinations for, 12, 13–15, 18, 78, 319, 320, 381, 382
foreign service, 316–18. *See also* subheads for particular countries.
leave, 16, 72, 96–97, 212
morale, 13
as municipal sanitary officers, 233, 250–51
with National Guard units, 55, 112, 334–35, 386–88, 400
numbers of, 12, 15, 96–97, 119, 127–28, 319–20, 321, 381
in Panama, 265, 275
paperwork, 43, 97, 121
pay, 13, 81, 319, 321, 381
in the Philippines, 133–34, 202, 212, 213, 214–16, 285, 295, 301–04
planning by, 69, 78, 84–85
and private practice, 56, 262, 321
promotions, 13–16, 34*n29*, 120, 319–20, 321
in Puerto Rico, 163, 257, 258–63
on punitive expedition, 397
rank, 4, 12, 15, 16, 17, 34*n29*, 319, 320, 321–22, 407*n3*
research by, 239–46, 262, 317–18
responsibilities, 43, 56, 96, 109, 119, 152, 157, 214, 320, 324–25, 369, 378, 394, 406
retirement, 17, 321
shortages of, 16–17, 53, 64, 69, 117, 118, 120–21, 150, 158, 176, 188, 194, 202, 212, 213–16, 318, 320–21, 323–24, 377, 381, 400, 415
specialists, 381
standards for, 13, 320
teaching responsibilities, 17, 53–54, 96, 101, 112, 119, 120, 181, 314, 334–35, 386–87, 388, 394, 406, 415
training of, 14, 17–18, 53, 97–98, 112, 118, 318, 319–21, 324–25, 332, 338, 378, 381–82
on transport ships, 134, 157–58, 206, 208, 319
for U.S. Volunteer units, 318–19
Medical officers, U.S. Navy, 15, 18–19, 52, 111, 147, 214, 220–22, 260, 265, 395
Medical officers, U.S. Volunteers, 11, 12, 21, 121, 128, 129, 173, 177, 318–19, 320, 323, 364
assignments, 120, 129, 177–81, 185, 191
in Cuba, 149–52, 230, 231, 233, 235, 253*n14*
in the Philippines, 165, 166, 209, 220–21, 297, 309*n33*, 309*n35*, 319, 320
in Puerto Rico, 258
training of, 120, 121, 332
Medical purveyors, 8, 10, 12, 13, 15–16, 56, 134, 180
Medical records, Civil War veterans, 24–25
Medical research, 30, 95–96, 99–100, 239–46, 248–49, 250, 262, 265, 266, 271, 276, 277, 285–93, 294, 305–06, 308*n23*, 317–18, 323–24, 350–51, 361, 382, 414–15
Medical Reserve Corps, 322–23, 334, 348, 357, 364, 377, 378, 381, 382, 401, 415
Medical schools, 15, 96, 97, 99–100, 120, 320, 324, 381, 382, 404
Medical statistics, 29–30
Medical Statistics of the Provost Marshal General's Bureau, 9–10
Medical storekeepers, 12, 15–16, 72
Medical supplies
for Cuban expedition, 131–33, 141, 143–44, 146, 157
for disaster relief, 369, 371
distribution of, 12, 124, 125–26, 219, 339–41, 390, 395, 397, 415
and equipment, 84–85, 118, 124, 134, 144–45, 176, 339–41
for the Freedmen's Bureau, 21
for military expeditions, 63, 64, 67, 69, 70–71, 76, 222–24, 364
for the National Guard, 96
for Panama, 266, 267, 268
for the Philippines, 134, 165, 166–67, 219–20
planning for, 69, 117–19, 124, 131–33, 134, 136, 194, 333, 339–41, 390, 406
for posts in the West, 4, 64
for Puerto Rico, 162–63
for punitive expedition, 397
purchase of, 12, 13, 124, 127
reserve, 132, 194, 333, 339–41, 371, 378–79, 388–89, 406, 415
shortages of, 53, 69, 112, 118, 128, 131, 156, 176–77, 182, 194, 219, 266, 267
for Spanish-American War, 124–27, 180, 186, 194
standardization of, 388–89
tables of, 125, 126, 186
testing of, 28
transportation of, 64, 69–70, 74, 76, 124–26, 127, 162, 187, 188, 194, 223, 340–41, 362–63
wartime need, 339–41, 390
Medical supply officers, 131
Medicines. *See also* individual names of specific medicines.
emetics, 288–89
Indian, 83
prophylactic, 352
shortages of, 128, 177, 219
supplies of, 11, 53, 72, 77–78, 120, 124–25, 131, 143–44, 147, 156, 163, 176–77, 181–82, 212, 233, 275, 340, 371, 378–79, 388

Meister, Lt. William B., 354–55
Memphis, Tennessee, 229
Meningitis, 305
Mental illness, 218–19, 272–73, 276, 300, 306, 350
  among medical officers, 82
  among soldiers, 76–77, 355
Mercury, 350–51
Merritt, Maj. Gen. Wesley, 76, 133–34, 135, 164, 165, 201
Metchnikoff, Elie, 95
Meteorological reports, 23
Mexicans, care of, 79, 393, 394–95
Mexico, 406
  border skirmishes with, 78, 334, 363–65, 377, 379, 381, 382, 383–84, 386, 387, 389–90, 391, 392–403, 405
  punitive expedition to, 397, 399
Miami, Florida, 178
Michigan National Guard, 55
Microscopes, 3, 10, 28, 29, 30–31, 95, 98, 186, 191–92, 231
Microscopic photography, 27, 28, 95
Miles, Maj. Gen. Nelson A., 79, 84, 117, 118, 129, 152–53, 154, 156, 159, 160, 162, 163, 239
Military Affairs, House Committee on, 383
Military dependents, medical care for, 56, 96, 337, 339, 391
Military Evacuation Commission (Cuba), 230–31
Military governments
  Cuba, 229–33, 243, 252*n6*, 253*n14*
  Puerto Rico, 257
Military maneuvers, 332–34, 335, 345*n64*, 347, 363–64, 392–404
Military Surgeon, 321, 381–82
Military Surgeons, Association of, 102, 113*n26*, 326
Military Surgeons of the National Guard of the United States, Association of, 55
Militia Affairs, Army Division of, 363–64, 385–86
Militia Bureau, 386
Mindanao, Philippine Islands, 301, 331
Mission, Texas, 402
Mississippi, 402–03
Missouri, 42
Missouri (hospital ship), 157, 206
Missouri, Division of the, 63–64, 67, 76, 84
Missouri River, 70, 103
Mobile, Alabama, 41, 184
Mobilization camps, 193
  disease rates at, 173–76, 178, 182, 184–86, 378
  location of, 183
  sanitation problems at, 173, 175–76, 178, 181, 182, 183, 184
Modoc War, 66
Modocs, 67, 80
Montauk Point, Long Island, 186–91
Moore, Brig. Gen. John, 9, 10, 18, 22, 24, 32*n8*, 52, 54, 55
Morale
  effect on disease incidence, 82
  of medical officers, 13
  of soldiers, 45–46, 47, 150, 159, 164, 218
Morgan, William G., 37*n73*
Mosquitoes, 81–82, 213, 216, 263, 298
  Aedes aegypti, 40, 151, 152, 186, 241, 244–45, 247, 248, 251, 254*n40*, 266, 269–70, 271, 290
  Anopheles, 150, 247, 248–49, 270–72, 290, 306
  connection to malaria, 105, 130, 133, 134, 139*n41*, 229, 230, 263–64, 265, 270–72, 285, 310*n61*
  Culex fatigans, 290
  and dengue, 289–90
  eradication of, 247, 266, 269–72, 273, 276–77, 357, 363, 364, 394
  netting, 110, 130, 139*n41*, 216, 230, 248–49, 270, 290, 299, 365
  and yellow fever, 241–46, 247, 248–49, 251, 254*n41*, 265, 266, 268, 269–70
Motorcycles, 389
Mount Vernon Barracks, Alabama, 81, 82
Mules
  purchase of, 4–5
  taken to Cuba, 132, 145
  used for food, 77
  used as pack animals, 64, 74, 75, 76
  used to transport patients, 65–66, 71–72, 76, 204, 209
Munn, Maj. Curtis E., 73, 74, 78, 83
Munson, Lt. Col. Edward L., 104, 106, 324, 325, 340, 359–60, 379, 403
Murray, Brig. Gen. Robert, 8–9, 10, 19, 22, 23–24, 25, 31, 51
Musgrave, William E., 287–88
Mutter Museum, 108

Nagasaki, Japan, 222, 223
Narcotics, 105, 218, 350. *See also* Cocaine.
National Board of Health, 41, 58*n8*
National Defense, Council of, 380
National Defense Act of 1916, 377, 379, 380, 382, 383, 384, 385, 387, 404, 405, 406
National Guard
  assistance to, 17, 55, 112, 335–36, 340
  dentists, 386
  hospital corpsmen, 55, 122, 334–35, 363, 386, 387–88, 401
  medical officers assigned to, 55, 112, 334–35, 386–88, 400

National Guard—Continued
medical organization, 385–86
medical supplies for, 96, 348–49, 388, 400
on Mexican border, 393, 397, 399, 402
sanitary detachments, 386, 387
state units, 55, 117, 118, 120, 173, 369, 370, 377, 386, 387
surgeons. *See* Surgeons, National Guard.
training, 322, 323, 378, 399–400
used to suppress labor violence, 109
veterinarians, 386
National Library of Medicine, 26
Naturalists, 57
Navy Medical Department, 389
Navy Nurse Corps, 328
New Mexico, 387, 397, 401, 402
New Orleans, Louisiana, 11–12
New York City, 157, 159
death rate in, 229
supply depot, 11–12, 126–27, 180, 231, 340, 388–89
New York State National Guard, 402
New Zealand Army, 353
Newport News, Virginia, 159
Nez Perces, 80
Nichols, Maj. Henry J., 288, 293, 350–51, 410*n70*
Nogales, Arizona, 392, 401, 402
Nurses. *See also* Army Nurse Corps; Hospital corpsmen.
in China, 222, 223
civilian, 206
contract, 123, 174, 177, 189, 212, 214, 266, 283–84, 327
Cuban, 156
female, 11, 18, 123–24, 156, 158, 162, 174, 177, 182, 185, 188–89, 206, 212, 213, 214, 222, 223, 276, 327–28, 384
housing for, 212, 223, 328, 384, 395
naval, 111
numbers of, 383–84
pay, 174, 384–85
qualifications, 18, 123, 174, 327
quality of, 182
Red Cross, 147, 162, 174, 177, 182, 369, 383, 384
reserve, 327–28
shortages of, 123, 162, 174, 188, 194, 383–84, 390
sisters (religious order), 123, 158
training, 19, 100, 174, 327, 328, 384
volunteer, 174, 177, 194
for yellow fever patients, 155–56, 157
Nursing schools, 18, 123, 327–28

Occupation armies, 122–23, 183, 185
in Cuba, 186, 229, 230–51, 321, 351
in Philippines, 201–24, 225*n5*, 293–95, 296, 298, 329, 351, 361
planning for, 231
in Puerto Rico, 164, 186
Oculists, 179
Officers' Reserve Corps, 382
Olivette (hospital ship), 132–33, 143, 144, 147, 156–57, 160
Operating kits, field, 124
Operating rooms, 25, 86, 107–09, 112, 130, 135, 147–48, 165, 189, 204, 221, 361, 401, 414
Opiates, 4, 219
Ordnance Department, 4, 6*n8*, 16, 33*n24*, 99, 321, 341
Oregon National Guard, 369, 370
O'Reilly, Brig. Gen. Robert M., 107–08, 115*n54*, 230–31, 232–33, 238, 253*n12*, 253*n13*, 265, 268, 288, 289, 315–16, 317, 320–21, 322, 323–24, 328, 329, 330, 332, 334, 339, 340–41, 348, 349, 356, 362, 363, 369–70, 388
Organization (Medical Department), 12, 17, 113*n13*, 121, 313–42, 382
Organized Militia. *See* National Guard.
Osler, William, 105
Otis, Maj. Gen. (Vol.) Elwell S., 201, 202
Otis, Maj. George A., 28, 65

Pablo Beach, Florida, 179–80
Pacific, Department of the, 133, 201, 202
Pacific, Division of the, 63–64, 365, 370
Pack animals, 64, 65–66, 70, 74, 75, 76
in Puerto Rico, 259
taken to Cuba, 143
training of, 65–66
used to transport patients, 65–66, 71–72
Panama Canal Commission, 268–69, 272, 276–77
Panama Canal Zone, 263–78, 324, 380, 391, 395
Department of Health, 265–66, 272–73, 275, 281*n30*
government, 277. *See also* Isthmian Canal Commission; Panama Canal Commission.
Panama City, 264, 266, 268, 270, 273, 275
Panay, Philippine Islands, 213
Paperwork, administrative, 23, 43, 121–22, 212, 214, 331, 403, 415
Parasites, 290
Entamoeba coli, 287–88
Entamoeba histolytica, 287–88
Giardia lamblia, 288
hookworm, 260–63, 272, 277, 279*n15*, 402–03
Treponema pallidum, 349

Paratyphoid, 399, 402
Pasteur, Louis, 25, 95
Pathological anatomy, 27–28
Pathologists, 176, 287
Pathology, science of, 27–28
Patterson, Maj. Robert U., 324, 369, 405
Patzki, Capt. Julius H., 75, 76
Paulding, Lt. Holmes O., 69, 70, 71, 72–73
Pay
  hospital corpsmen, 21, 101, 331, 384–85
  medical officers, naval, 18–19
  medical officers, Regular Army, 13, 81, 319, 321, 381
  nurses, 174, 384–85
Pay Department, 33*n24*
Peking, China, 222, 223
Penrose, Maj. (Vol.) George H., 166, 167
Pensacola, Florida, 40–41, 81
Pension Bureau, 23
Pensions, Civil War veterans, 7, 23
Permanent Commission for the Suppression of Uncinariasis in Porto Rico, 262
Pershing, Brig. Gen. John J., 397, 399, 402
Personal hygiene, 49, 55, 216, 219, 231–32, 259, 291, 347–48, 404–05
  of Filipinos, 294–95, 299, 305
  of Indians, 83
  instruction in, 17, 134, 181, 325, 400–401
  post surgeon's responsibility for, 47, 96, 102
  on ships, 135
Petitions to Congress, 16
Phalen, Capt. James M., 288, 293
Pharmacists, 18–19, 54, 332, 370, 387
Pharmacy, schools of, 21
Philadelphia, Pennsylvania, 11–12, 184, 405
Philippine Commission, 295
Philippine Expeditionary Force, 133, 148
Philippine Insurrection, 201–04, 285, 306, 337, 339, 340
Philippine Islands, 117, 118, 122–23, 331, 340, 353, 355, 357, 360, 361, 389, 391
  Civil Service Board, 295
  medical boards, 254*n35*. *See also* Philippine Tropical Disease Board.
  medical care for Filipinos, 215, 219, 220
  medical evacuees, 336–38, 339
  prostitution, 351–52
  public health organizations. *See* Boards of health; Public health.
  U.S. expedition to, 133–36, 141, 148, 164–67, 183
  U.S. occupation of, 201–24, 225*n5*, 293–95, 296, 298, 329, 351, 361
Philippine Scouts, 291, 292, 304, 319, 329, 349–50
Philippine Tropical Disease Board, 113*n11*, 285, 287, 288, 289–90, 291, 292, 293, 295, 304, 305–06, 307*n4*, 308*n19*, 314, 326, 361
Philippines, Division of the, 202
Photomicrography. *See* Microscopic photography.
Physical exhaustion, 216, 397
Physical fitness, 28, 48–49, 103, 120
Physicians, civilian, 56, 109–12, 179, 321, 322, 334, 335, 349, 367, 368, 369, 370, 378, 379, 382, 414, 415
  fee-for-visit, 15–16, 18, 53
  foreign. *See* Physicians, foreign.
  shortages of, 16–17
Physicians, foreign
  Cuban, 147, 234, 237–38
  Filipino, 295, 296, 302, 305
  Puerto Rican, 258, 259, 262
  Spanish, 296
  Swedish Navy, 147
  training of, 295–96
Physicians, U.S. military. *See* Medical officers.
Pilcher, Capt. James E., 103
Pinar del Rio Barracks, Cuba, 238
Pine Ridge Reservation, South Dakota, 84–87, 90*n67*
Pinkham, Lt. Edward W., 289
Plague, 263, 273, 290–91, 294, 300, 302, 306, 324
  bubonic, 204, 218, 291, 293, 297
  pneumonic, 291
Planning (Medical Department), 112, 131, 134, 136, 141, 313–14, 332–36, 339–40, 381
Platte, Department of the, 67, 69, 84–85
Plattsburg Barracks, New York, 129
Pleurisy, 49
Plumbers, 44, 45
Pneumonia, 49, 273, 275, 360, 402
  broncho-, 82, 402
  causes of, 28, 95, 133
  epidemics, 402
  and plague, 291
Ponce, Puerto Rico, 160, 162, 163–64, 257, 258, 260–61
Pope, Lt. Col. (Vol.) Benjamin F., 24, 111, 112, 129, 130, 131, 132–33, 134, 138*n36*, 143–44, 145, 147, 150, 154, 156, 158
Port Tampa, Florida, 130, 131
Porter, Henry R., 71, 73
Porto Bello, Panama, 272, 273
Post surgeons, 3, 4, 12–13, 14, 17, 23, 39, 44, 47, 63–64, 69, 102, 107, 219, 296, 303, 319, 323, 331, 352, 353, 361, 368
  off-duty pursuits, 55–57, 321
  shortages of, 15–16, 64, 212–15
  teaching responsibilities, 53–54, 387

Postoperative care, 106–07
Potassium permanganate, 43, 51
Powder River, 69, 70, 73
Powell, Junius L., 75, 89*n32*
Pratt, Enoch, 95
Presidio military post. *See* San Francisco, California.
Preventive health measures, 4, 39–49, 97, 102–06, 134, 318, 413. *See also* Sanitation.
Prisoners of war
  Filipino, 208, 210, 215, 291
  Spanish, 146–47, 160, 218
Promotions
  of contract surgeons, 14–15, 320
  of dentists, 383
  of hospital corpsmen, 330
  of medical officers, 13, 14–15, 16, 34*n29*, 120, 319–20, 321
  of veterinarians, 385
Prophylactics, 352–53, 354, 394, 395, 399, 401–02
Prostheses, 7
  commutation payments in lieu of, 22
  dental, 108
  for President Cleveland, 108
  for veterans, 7, 13, 21–22, 96
Prostitutes, 218, 239, 351–52, 395, 399, 401–02, 403
Providence Hospital, 23
Provost Marshal General's Office, 9–10
Prussian Army, 355, 360
Public health, 28, 58*n2*, 94, 97
  in Cuba, 229–51
  laboratories, 93–94
  in the Panama Canal Zone, 263–76
  in the Philippines, 285–306
  in Puerto Rico, 257–63
Public Health and Marine Hospital Service, 253*n21*, 262, 265, 273, 296, 305–06, 319. *See also* Marine Hospital Service; Public Health Service.
Public health campaigns, 229, 232–34, 236, 238, 247–51, 257–78, 285–306, 414
Public health movement, 3, 39, 43, 229
Public Health Service, 253*n21*, 263, 389. *See also* Marine Hospital Service; Public Health and Marine Hospital Service.
Publications (Medical Department), 28–29, 37*n73*
Puerto Principe, Cuba, 232
Puerto Rico, 141, 148, 156, 157, 160–64, 166, 178, 277, 324, 329
  public health organization. *See* Board of health; Public health.
  veterans of, 128, 186
Puerto Rico, Department of, 258, 260, 279*n11*
Pullman cars, 128–29, 401
Pullman Company, 109
Pulmonary tuberculosis, 49
Punitive expedition. *See* Mexico.
Purgatives, 176–77
Purging, 4

Quarantines, 42–43, 157, 164, 187, 189, 235, 236, 246, 248, 265, 273, 302, 304, 402
Quartermaster Corps, 364, 385, 390
Quartermaster's Department, 4–5, 6*n8*, 16, 33*n24*, 124, 125, 127, 131–32, 166, 176, 177, 183, 187, 188, 219, 224, 277, 340, 341, 357, 359, 362, 364
Quemados, Cuba, 238–39, 240–41
Quinine, 3, 70, 112, 124–25, 130, 131, 150, 151, 156, 192, 217, 219, 221, 272, 289, 395

Rabies vaccine, 25
Racial differences
  alcoholism, 354
  in disease susceptibility, 40, 42, 150, 291, 304, 306, 353, 355–56
  in fatalities, 40, 42, 304, 305
Railroads, 4, 39, 46, 64, 75, 84, 86–87, 184, 208, 210, 212, 219, 223, 275, 362–63, 369. *See also* Hospital trains.
  and labor unrest, 109–11
  problems with shipping by, 124, 125, 126, 131, 187, 188
Ration. *See* Diet.
Rats
  as disease vectors, 273, 290, 291, 302
  eradication of, 273, 297, 301
Reconstruction, 11, 13
Record and Pension Division (War Department), 24
Records management, 18–19, 24–25
Recreational activities, 48–49, 103
Red Cross. *See* American Red Cross.
Reed, Charles A. L., 267–68
Reed, Maj. Walter, 10, 82, 86, 95, 96, 98, 99, 105, 191, 192–93, 232, 236, 239–47, 248, 250, 251, 255*n58*, 265, 270, 276–77, 285, 290, 315, 338–39, 348, 357
Reenlistment rates, 21
Refugees
  camps for, 368–69, 370, 371, 393
  Civil War, 21
  Cuban, 152
  from Mexico, 393
  from San Francisco earthquake, 367, 368–69, 370–71
  Spanish, 152

Refugees, Freedmen, and Abandoned Lands, Bureau of, 21
Regimental surgeons, 119, 121, 129, 138*n29*, 144, 153–54, 166, 179, 182, 218–19, 221, 333, 365
Relief (hospital ship), 132, 144, 147, 157, 163–64, 174, 206–07, 214, 222, 223
Reno, Maj. Marcus H., 71
Report of the Hygiene of the United States Army, With Descriptions of Military Posts, A, 27
Report on Barracks and Hospitals, With Descriptions of Military Posts, A, 27
Respiratory diseases, 49, 273
Retirement
  disability, 17
  laws pertaining to, 7, 8–9, 11, 17
Rheumatism, 70, 130
  causes of, 45, 74, 77
  discharges due to, 40
  treatment of, 52
Richard, Charles, 138*n33*
Ridgely, John, 73, 74
Rinderpest, 286, 304, 305, 310*n61*
Ringworm, 218
Roads
  in Cuba, 143, 145–46, 152
  in Mexico, 389
  in the Philippines, 166, 167, 201–02, 210, 213, 218
  in Puerto Rico, 160, 258
Rockefeller Foundation, 380
Rockefeller Institute, 262–63
Rocklin, California, 111
Roentgen, Wilhelm C., 148
Roosevelt, Franklin D., 345*n53*
Roosevelt, Theodore, 149, 150, 159, 264–65, 268–69, 321
Root, Elihu, 202, 313, 314, 317, 321, 345*n64*
Rosebud Creek, 67, 73, 75
Ross, John W., 265, 281*n26*
Ross, Ronald, 139*n41*, 230, 277
Rough Riders, 149, 169*n19*
Royal College of Physicians, 26
Rubber gloves, 51, 60*n39*, 357–58
Rushville, South Dakota, 86–87
Russell, Maj. Frederick F., 113*n11*, 348, 349, 358–59, 372*n2*
Russia, 220, 223
Russian Army, 344*n42*, 360
Russo-Japanese War, 325, 344*n42*
Rutherford, Capt. Henry H., 367–68

Sacramento, California, 110–12
St. Augustine, Florida, 81
St. Louis, Missouri, 369–70
  supply depot, 11–12, 126, 180, 340, 370, 388–89
  water supply, 45
St. Louis Barracks, Missouri, 72
Salvarsan, 350–51
Samar, Philippine Islands, 213, 215
San Antonio, Texas, 363, 364, 401
San Diego, California, 363, 364
San Fernando, Philippine Islands, 210
San Francisco, California, 174, 218, 316, 328, 337–38, 361, 391
  death rate, 229
  earthquake, 365–71, 375*n66*
  general hospital, 288, 328, 361, 367. *See also* Letterman General Hospital.
  and Philippine expedition, 133, 134
  Presidio military post, 112, 133, 288, 328, 337–38, 355, 361, 367, 369–70, 371
  supply depot, 11–12, 126, 133, 340, 370, 388–89
San Francisco Earthquake Research Project, 367
San Juan, Puerto Rico, 163, 263
  hospital, 257
  supply depot, 257, 340
San Juan Hill, Cuba, 141, 145, 146, 147, 153–54, 157
Sanarelli, Guiseppe, 240–41
Sanger General Hospital, 178
Sanitary inspectors, 233–34, 247, 258, 260, 262, 269, 271, 272, 297, 299, 322, 335, 357, 364, 365, 370, 400
Sanitary train, 363
Sanitation
  at Army encampments, 109, 120, 129, 152, 175–76, 178, 181, 182, 183, 184, 185, 194, 195, 258, 325–26, 335, 347–48, 363, 364, 379, 394
  in Cuba, 229, 231–34, 236, 247, 250–51
  and disaster relief, 368
  at hospitals, 180–81, 194, 236, 258, 270, 347–48
  at Indian prison facilities, 81, 83, 84
  inspections, 194, 233–34, 236, 247, 249, 258, 260, 262, 270, 297, 299, 364, 365, 369, 400
  in Mexico, 395
  municipal, 229, 233–34, 236, 247, 250–51, 296–97, 395
  National Guard detachments for, 386, 387
  at National Guard encampments, 55, 112, 173, 363, 400–401, 403
  in Panama, 264, 266, 267, 270–75
  in the Philippines, 216–17, 219, 294, 296–301, 302
  planning for, 93–94, 379
  on posts, 13, 39, 43, 44, 96, 102, 180–81, 347–48
  in Puerto Rico, 258, 260–62

Sanitation—Continued
in refugee camps, 368–69, 370–71
regulations, 231–32, 250–51, 260, 262
responsibility for, 13, 96, 119, 175, 184, 192, 324, 347–48, 363, 386–87, 400
training, 324, 335, 363, 400, 406
on transports, 135, 157, 158
in trench warfare, 404–05
and typhoid, 192, 216–17
and volunteer troops, 130, 133, 173
and yellow fever, 229, 237–39, 246, 247, 264, 266, 267
Santa Clara, Cuba, 238
Santa Cruz, Philippine Islands, 212
Santa Mesa, Philippine Islands, 206, 208, 225*n9*, 300
Santiago, Cuba, 129, 131, 141, 143, 145, 147, 148, 150, 152, 153, 154, 155, 156, 157, 174, 230, 232, 233–34, 235–36, 238, 241, 253*n14*
Santiago and Puerto Principe, Department of, 237, 238, 239, 252*n6*, 253*n14*
Santiago Bay, Cuba, 156–57
Savannah, Georgia, 186
Scandia (hospital ship), 206
Schofield, Maj. Gen. John McA., 95
Schwan, Brig. Gen. (Vol.) Theodore, 185, 209
Scientific medicine, 25–26
Screens, 243–44, 245, 247, 266, 269–70, 271, 275, 277, 305–06, 357
Screwworm, 259
Scurvy, 3, 46, 67, 73, 74, 77, 149, 291–92
Seattle, Washington, 229
Second Reserve Hospital, 204, 205, 207–08, 225*n9*, 300
Semig, Bernard, 80
Senn, Col. (NG) Nicholas, 117, 120, 123, 149, 152, 156, 169*n18*, 189
Serums, immunizing, 285–86, 291, 293, 301, 304
Sewage systems, 3, 43, 94, 204, 229, 347–48, 358–59, 363, 365
in China, 221
construction of, 44–45, 52
in Cuba, 232, 234, 236, 237
lack of, 165
in Mexico, 395
in Panama, 265, 273, 275
in the Philippines, 297–98, 299, 306
problems with, 180–81
ventilation, 44–45
Shafter, Maj. Gen. (Vol.) William R., 129, 131, 132, 133, 141, 145, 147, 149, 150, 152, 153, 154, 155–56, 157, 158, 159–60
Shakespeare, Maj. (Vol.) Edwin, 191, 192–93
Sheridan, Lt. Gen. Philip H., 76, 78
Ships
cargo identification, 131–32, 134, 156, 162–63
Concho, 158
disinfection of, 157, 247–48, 317
Far West, 70–71, 72, 73, 76
hospital. *See* Hospital ships.
Iroquois, 156
Maine, 117
Marine Hospital Service, 234
medical personnel on, 134, 206, 208, 214, 221, 222, 362, 383–84
quarantines of, 248, 273
Seneca, 158
shortages of, 207
steamers, 70–71, 72, 73, 144, 147, 156, 162
as supply depots, 64
as transporters of disease vectors, 40, 159, 246, 248, 273
transports, 132, 135, 156, 160, 207–08, 212, 222
unloading difficulties, 143, 146, 147, 156, 165, 166–67
used to transport medical supplies, 70, 130–32, 134, 141, 147, 156
used to transport patients, 72, 73, 147, 156–59, 164, 188, 190, 206–07, 208, 209–10, 212, 213, 223
ventilation problems, 132–33, 135, 158
Shoes, 219, 359–60
Siboney, Cuba, 141, 143, 144, 146–47, 149, 150, 152–53, 154, 155, 156, 157, 158, 230
Sick and wounded reports, 23
Sioux, 67–73, 76, 84–85
Sisters of Charity, 163, 189, 276
Skin problems, 218, 293
Slaves, freed, 7, 21
Slim Buttes, Dakota Territory, 77
Sloan, Maj. William J., 69, 70, 72, 73
Smallpox, 249, 294
epidemics, 218, 237–38, 257–59, 301–02
immunization, 3, 37*n75*, 39–40, 133, 231, 237–38, 248, 258, 259, 273, 301, 347, 370, 387, 393, 395, 399
isolation of patients with, 204, 236, 237, 300, 301
protection from, 164, 301
Smart, Lt. Col. Charles, 29, 104–05, 182
Smithsonian Institution, 57
Snow, John, 41
Society of American Bacteriologists, 245
Solace (hospital ship), 156–57, 222
Soldiers' Home (Hot Springs, South Dakota), 86
Soldiers' Home (Washington, D.C.), 22–23, 96, 190, 339, 356
South Carolina, 185
South Dakota, 84

Southern Department, 386, 390, 391–92, 400, 401
Spain, 117, 118, 131, 135, 141, 164, 230–31, 257, 258, 285, 293, 296, 300, 303
Spanish-American War, 118–36, 141–73, 194, 313, 314, 316, 318–19, 322, 337, 340–41, 364, 377, 378, 413, 415
Spanish troops, 141, 143, 160, 164–65, 167, 230–31
  repatriated, 160
  sickness among, 148, 160, 233
Spink, Wesley W., 41–42
Spotswood, Dillon J., 83
Sprue, 263
Stanton, Edwin M., 7
Staphylococcal infection, 98
Starvation, 46, 64, 76–77, 78
Stephens, Charles R., 73, 74
Sterilization, 25, 107, 130, 148, 187, 401
Sternberg, Brig. Gen. George M., 30, 37*n75*, 40–41, 42, 80, 94–98, 99–100, 101, 102, 105, 106, 107, 108, 112, 117–19, 122, 123, 124, 125, 126, 128, 129, 131, 133, 134, 139*n41*, 146, 150, 151, 152, 158–59, 162, 164, 173, 174, 177–78, 181–82, 186, 187, 190, 191, 192, 194, 212, 214, 220, 230, 231, 237, 239–41, 243, 244, 246, 250, 251, 264, 290, 291, 293, 314, 316, 319–20, 338, 340, 347, 355, 361, 413
Stevens, Richard H., 75, 76
Stiles, Charles W., 260, 261, 290
Stimson, Henry L., 313–14, 359
Storage facilities, 4–5, 126–27
Straub, Maj. Paul F., 325
Street cleaning, 233–34, 236, 258, 266, 295
Streptococcal infection, 74
Stress, 397, 399
Strong, Lt. Richard P., 287–88, 290–91, 293, 295, 307*n4*
Strychnine, sulphate of, 104
Subsistence Department, 4, 47
Summers, Maj. John E., 69, 72, 73, 76, 77, 78
Sulphonal, 177
Sunstroke, 149, 158
Supply depots
  location of, 4, 11–13, 70, 100, 340, 341, 370, 388–89, 397
  for military expeditions, 70, 75
  for occupation armies, 231, 257
  ships used as, 64
  for Spanish-American War, 125–26, 131
  wartime, 117, 119, 180, 333, 388–89, 397
Surgeon general
  annual reports, 19, 28, 31, 34*n29*
  rank, 4, 12, 380, 407*n3*
  responsibilities, 118, 119, 128, 174, 178, 380
Surgeon General's Library, 26–27, 30, 40–41, 317, 319, 326, 338–39
Surgeon General's Office, 118, 316–18, 415
  Army Nurse Corps Division, 123
  Finance Division, 12
  Hospital Corps and Supply Division, 96
  Library and Museum Division, 25, 36*n57*, 36*n58*, 96, 99, 381
  Property Division, 12
  publications, 27, 47, 119
  Record, Correspondence and Examining Division, 96, 381
  Record and Pension Division, 23–24, 129
  responsibilities, 7, 118, 341*n13*, 381
  Sanitary and Disbursing Division, 96, 182
  staffing of, 12, 96, 315, 316–17, 381
  veterans' dealings with, 22
Surgeons, contract. *See* Contract surgeons.
Surgeons, corps. *See* Corps surgeons.
Surgeons, division. *See* Division surgeons.
Surgeons, National Guard, 51, 61*n55*, 101–02, 336, 385–88, 390, 400, 403
  examinations for, 55, 120, 335–36, 387
  numbers of, 382, 386, 415
  shortages of, 386
  training of, 55, 120, 314, 319, 320, 324–25, 326, 334–36, 363, 364, 382, 383, 388, 415
Surgeons, post. *See* Post surgeons.
Surgeons, Red Cross, 158, 162, 369
Surgeons, regimental. *See* Regimental surgeons.
Surgery
  abdominal, 50–51, 67, 77, 98, 106–07, 148, 165, 166, 216, 289, 347, 357–58, 414
  dressings for, 131, 144
  emergency, 275
  exploratory, 49–50
  facilities for, 25, 86, 107–09, 112, 130, 135, 147–48, 165, 189, 204, 221, 361, 401, 414
  fear of, 3, 49–50, 347
  gynecological, 106
  instruments for, 25, 146, 148, 340, 388
  oral, 108
  performance by hospital stewards, 18–19
  prevention of infection during, 25, 31, 51, 86, 96, 107, 148, 347, 414
Surgical chests, 117, 124
Surra, 304
Sutherland, Brig. Gen. Charles, 9, 11, 17, 26, 49, 52, 54, 55, 56, 94, 95
Syphilis, 52, 93, 130, 217–18, 293, 349, 350–51, 352, 353, 391, 394, 399, 402

Taft, William H., 250, 267, 321, 370

Tampa, Florida, 128–29, 130, 131, 132, 141, 144, 146, 159, 180, 184, 187
Telegraph, 84
Tennessee, 126, 185
Tents, 71, 77–78, 84–85, 86, 125, 132, 143, 144, 146, 147, 149, 154, 155, 163, 165–66, 167, 173, 176, 177, 178–79, 181–82, 183, 184, 204, 231, 300, 347, 356, 367
Terrain, 70, 78, 79, 143, 201, 202, 204, 208, 209
Terry, Brig. Gen. Alfred H., 67, 70–71, 72, 73, 76
Tetanus, 28, 93, 105, 251, 305
Texas, 42, 47, 387, 392, 394, 401, 402–03
Texas City, Texas, 354, 365
Thomason, Capt. Henry D., 335, 336, 364
Thoroughfare Gap, Virginia, 183–84
Thymol, 261
Tientsin, Battle of, 221–22
Tientsin, China, 221, 222, 223
Tilton, James, 36*n61*
Tokyo, Japan, 291
Toral, General Jose (Spain), 160
Torney, Brig. Gen. George H., 289, 316, 317–18, 322, 323–24, 326, 327, 331–32, 333–34, 335–36, 339, 341, 342*n13*, 349, 350–51, 352, 353, 354, 356, 357, 359, 360, 362–63, 364–65, 368, 369–70, 371, 380, 383
Training
  of ambulance attendants, 19
  camps, 182, 363–64, 383
  for evacuation of wounded, 53–54, 55, 84, 85, 98–99, 324, 332, 363
  in first aid, 20, 53–54, 100, 101
  of foreign physicians, 295–96
  of hospital corpsmen, 21, 53–54, 85, 96, 100–101, 122, 155, 173, 181, 183, 184, 185, 213, 330–31, 334–35, 338
  of hospital stewards, 19, 213
  of laboratory personnel, 176, 330–31
  of litter-bearers, 53–54, 85, 96, 101
  maneuvers, 332, 345*n64*, 347, 363–64, 392–404
  manuals, 54
  of medical officers, 14, 17–18, 173, 332, 334–35, 338, 382
  of Medical Reserve Corps officers, 322, 323, 378, 382–83
  of National Guard hospital corpsmen, 101–02, 173, 334–35, 388
  of National Guard surgeons, 55, 101–02, 173, 334–36, 363, 378, 383, 388
  of nurses, 19, 100, 174, 327, 328, 384
  of sanitary inspectors, 262
  for war, 332, 363
Transportation
  of medical supplies, 64, 69–70, 74, 76, 124–26, 127, 162, 223, 340–41
  of patients. *See* Ambulances; Evacuation, medical; Travois.
  problems, 4, 64, 67–68, 128–29, 131, 143–44, 147, 149, 152, 154, 167, 176, 187, 188, 194, 219, 224, 362–63
Travois, 65–66, 71–72, 74, 76, 77, 167, 209, 362
Trench warfare, 404–05
Truckee, California, 111
Tuberculosis, 394
  in cattle, 259
  causes, 28, 82, 84, 93, 98, 355
  in China, 224
  in Cuba, 249, 351
  diagnosis, 355–56
  among Indians, 82, 84, 102
  isolation of patients with, 208, 256, 351, 355–56, 391
  in Panama, 273
  in the Philippines, 294, 296, 306
  among soldiers, 355–56, 360
  treatment of, 339, 356–57
Typhoid fever, 3, 67, 73, 77, 130, 132–33, 159, 160, 288, 360
  antibodies to, 115*n46*
  carriers, 192, 349
  causes, 28, 29, 44, 93, 98, 103, 180–81
  in China, 221, 223–24
  in Cuba, 150–51, 153, 231–32, 236, 251
  diagnosis, 93, 115*n46*, 151, 176, 178–79, 182, 186, 192, 195, 217, 232
  epidemics, 173–74, 175–78, 180–81, 183, 186, 191, 229, 251
  immunization, 192, 348–49, 364, 387, 393–94
  immunity to, 197*n20*
  in Mexico, 399
  in Panama, 275
  in the Philippines, 165, 212, 216–17, 305–06
  prevention, 102–03, 192, 195, 365, 370
  in Puerto Rico, 162, 164, 258
  study of. *See* Typhoid Board.
  transmission, 176, 191–93, 223–24, 349
  treatment, 105, 176–77, 349
  in the United States, 173–75, 180–81, 182–85, 187, 363
Typhoid Board, 191–93, 314, 348
Typho-malaria, 173, 182
Typhus, 393, 400–401

Uncinariasis. *See* Hookworm.
Uniforms. *See* Clothing.

Union Army, 3, 12, 29
U.S. Infantry and Cavalry School, 17
U.S. Marine Corps, 110–11, 222, 394
U.S. Military Academy. *See* West Point.
U.S. Navy
  in Cuba, 129, 131, 144, 281*n26*
  hospital ships, 156–57
  medical officers. *See* Medical officers, U.S. Navy.
  in Panama, 265
  in the Philippines, 133, 164–65
  quinine pills for, 131
  vaccines for, 348–49
U.S. Signal Corps, 23, 403–04
U.S. Volunteers, 118, 120, 121, 122, 129, 130, 133, 135, 137*n7*, 148, 156, 169*n19*, 173, 197*n32*, 216–17
  in Cuba, 230, 231
  hospital corpsmen, 122, 133–34, 135, 163, 165, 166, 329
  medical supplies for, 124–25, 131, 181–82
  in the Philippines, 202, 216–17, 318–19
  physicians. *See* Medical officers, U.S. Volunteers.
Utley, Robert M., 81

Vaccines, 391–92, 402
  cholera, 293
  paratyphoid, 402
  rabies, 25
  smallpox, 37*n75*, 218, 258, 259, 301, 347
  typhoid, 348–49, 393–94, 399
Vaughan, Maj. (Vol.) Victor C., 149–50, 191, 192–93, 348
Vedder, Capt. Edward B., 292–93
Venereal disease, 163, 349–54, 401–02
  causes, 93, 134–35, 349–50
  in China, 224
  diagnosis, 322, 349–50, 353, 391
  discharges due to, 40
  examinations for, 351–52, 353
  among Indians, 82
  in the Philippines, 217–18, 349–50
  prevention, 351–53, 394, 399, 401–02
  among prostitutes, 351–52, 395
  rates, 49, 349–50, 353–54, 355, 395, 399, 401–02
  treatment, 52, 339, 350–51, 352, 353–54, 391, 399
Veneral Disease, Second International Conference for the Prevention of, 351
Ventilation
  of hospitals, 45, 51–52, 204
  of living quarters, 43, 44, 102, 185, 356, 359
  of sewage gases, 44
  on ships, 132–33
Vera Cruz, Mexico, 244, 388, 394–95
Vermin, 43, 102, 135, 322, 399, 400–402, 404–05, 410*n66*
Veterans, 4
  Civil War, 21–25
  hospitals for, 128
  housing for, 11
  medical care for, 22–23, 52, 108, 339, 356
  pension applications, 7, 23
  prostheses for, 7, 13, 21–22, 96
  records, 23–24
  travel expenses for, 22
Veterinarians, 179, 379, 385, 386, 399
Veterinary Corps, 379, 385, 414
Vibrio cholerae, 25, 41, 42
Villa, Pancho, 377, 397
Virchow, Rudolph, 16, 29–30, 37*n73*
Visayan Islands, Philippine Islands, 213, 301
Vitamins, 291–92, 308*n23*

Walter Reed General Hospital, 328, 338–39, 382, 383–84
War, secretary of
  directives of the, 117–18
  responsibilities, 12–13, 20
War Department, 56, 128
Washington, D.C., 128–29, 328, 331, 369
Washington Barracks, D.C., 100, 122, 127, 129, 174, 213, 326, 338–39, 362
Wassermann, August von, 113*n2*
Wassermann test, 93, 113*n2*, 349, 350–51, 353
Wastes, human
  disease spread by, 173, 229, 269–70, 294–95, 296
  disposal of, 43, 44, 269–70, 298, 363
  management of, 364
  problems with, 175–76, 181, 221, 294–95, 297–98, 299, 303, 358–59, 363
Water filters, 43, 103, 105, 111, 176, 184, 219, 258, 358, 363
Water supply
  in China, 221, 222
  contamination of, 3, 41–42, 43–44, 45, 52, 103, 150–51, 165, 176, 180–81, 192, 217, 222, 224, 265, 287, 294, 299, 303, 305, 347–48, 358–59, 363
  in Cuba, 151, 152, 232
  in Mexico, 395
  at military facilities, 43, 47, 52, 102–03, 178, 185
  municipal, 43–44, 45, 111, 178, 204, 229, 232, 235, 236, 258, 273, 299, 306, 370, 395
  in Panama, 265, 273
  in the Philippines, 165, 166, 285, 287, 294–95, 297–98, 299, 302, 303, 305, 306

Water supply—Continued
in Puerto Rico, 258
purification of, 43, 102–03, 105, 111, 130, 150–51, 176, 204, 219, 236, 258, 263, 299, 302
quality of, 149, 165, 183, 184, 285, 363, 370
on ships, 135, 157, 158
shortages, 67, 75–76, 132, 165, 181, 185, 231
testing of, 43, 93–94, 391
Weather, 69–70, 71, 72, 73–74, 75–76, 77–78, 79, 133, 144, 149, 152, 164, 165, 166–67, 176, 185, 186, 187, 188, 189, 190, 206, 208–09, 210, 216, 217, 219, 220, 221, 223, 260, 286, 297–98, 326, 355, 356, 392, 397
Weigley, Russell F., 19, 52
Welch, William H., 30, 107, 115*n54*, 245, 266, 268–69
West Point (U.S. Military Academy), 48, 54, 325, 362, 380
White automobile company, 389
Widal, Fernand, 113*n2*
Widal test, 93, 105, 113*n2*, 115*n46*, 176, 192, 349
Williams, Capt. John W., 69, 70, 71, 73
Wilson, Woodrow, 277, 377, 399
Women employees, 317. *See also* Nurses, female.
Women nurses. *See* Nurses, female.
Wood, Maj. Gen. Leonard, 78–80, 233–35, 236, 237, 243, 250, 253*n14*, 264, 313–14, 318, 333–34, 397
Wood, Maj. Marshall W., 129, 130, 144–45, 146, 147, 155
Woodbury, Maj. (Vol.) John McG., 258, 259
Woodhull, Lt. Col. Alfred Alexander, 47–48, 54, 177, 226*n24*, 325
Woodruff, Maj. Charles E., 303
Woodward, Maj. Joseph J., 27, 28, 29, 50
Woodworth, John M., 27
World War I, 345*n53*, 377, 380–81, 404–06
World's Columbian Exposition (1893), 99
Wotherspoon, Lt. William W., 83
Wounded
care of, 162, 165–66, 167, 394, 414
in China, 222, 223
mortality among, 49, 148
Wounded—Continued
numbers of, 166, 168*n2*, 172*n73*, 216, 397
in the Philippines, 208–10, 212, 213
on punitive expedition, 397
Wounded Knee, Battle of, 84–87, 90*n67*

X-rays, 99, 148, 157, 332, 337, 338, 356, 359, 401

Yangtsun, China, 223
Yaws, 293
Yellow fever
causes, 40, 41, 95, 130, 229, 239–46, 254*n41*, 254*n42*, 290
convalescents from, 235–36
and Cuba, 129, 149–50, 151–55, 157, 159, 186, 229, 230, 233, 234–51, 276–77
detention camps, 230, 234, 235
detention ships, 235–36
diagnosis, 151–52, 154, 235, 237, 238, 242, 244, 269–70
epidemics, 27, 40–41, 43, 150, 152, 155, 159, 186, 234–36, 238–39, 240–41, 246, 247, 251, 266–69, 272
fear of, 151, 155, 157, 159, 162, 186, 189
hospitals, 234, 235, 238, 242, 248
immunity to, 40–41, 123, 155–57, 174, 242, 244, 245, 248, 273
isolation of patients with, 154–55, 157, 186, 189, 230, 235–38, 244, 248
in Panama, 257, 264, 266–70, 272, 276–77
in the Philippines, 135
prevention, 41, 164, 185, 189, 238, 247–51, 266–70, 273, 276–77, 380–81
in Puerto Rico, 160, 164, 263
transmission, 229, 239–46, 254*n41*
treatment, 41, 155–56, 244
Yellow Fever Board, 239–46, 247, 248, 254*n35*, 265, 277, 314
Yellow Fever Commission, 239–46, 254*n35*
Yellowstone River, 67, 70–71, 73
Yokohama, Japan, 206

☆ U.S. GOVERNMENT PRINTING OFFICE: 1995 360–566

