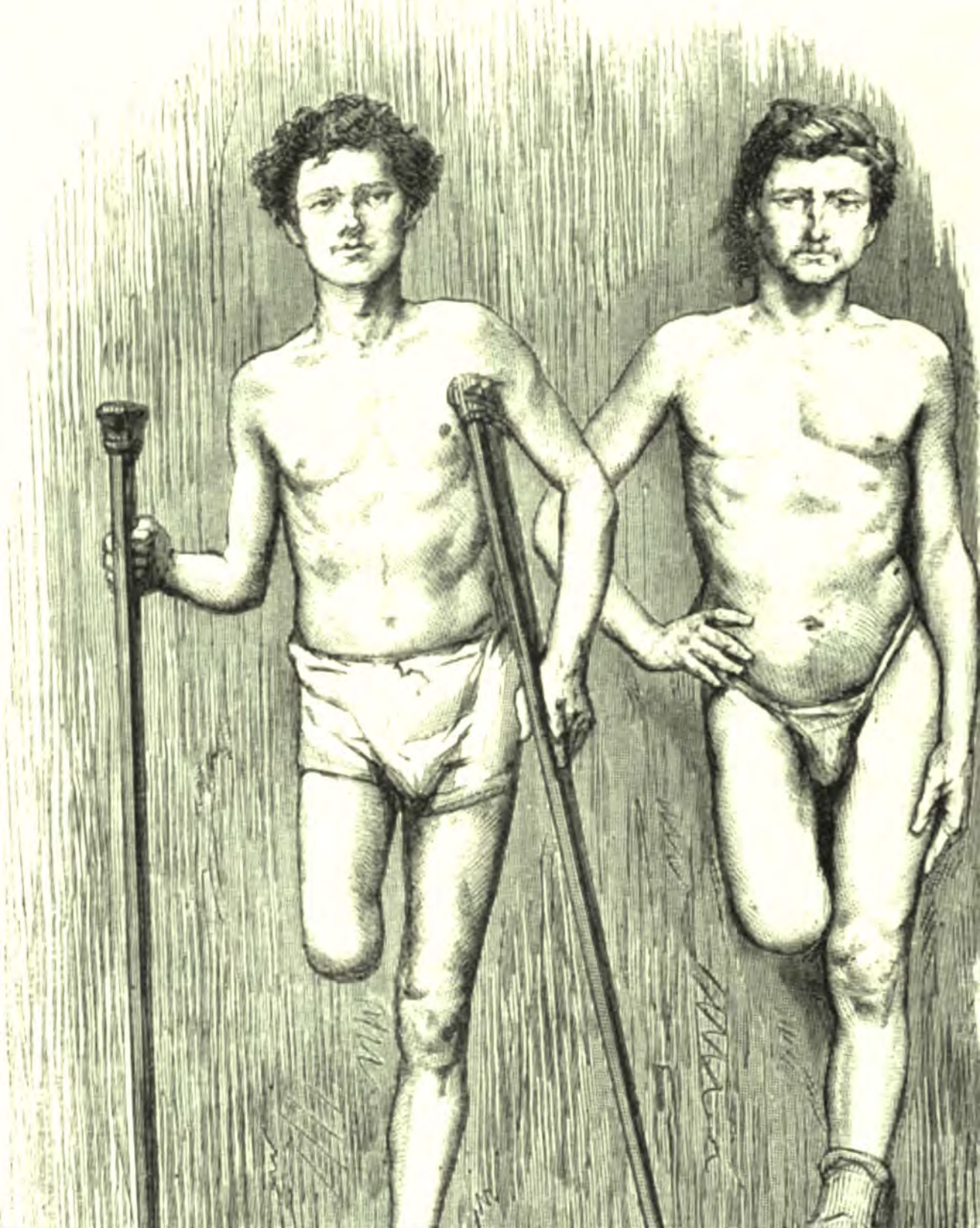




SANITARY ASSOCIATIONS DURING THE
FRANCO-GERMAN WAR
OF 1870-1871.

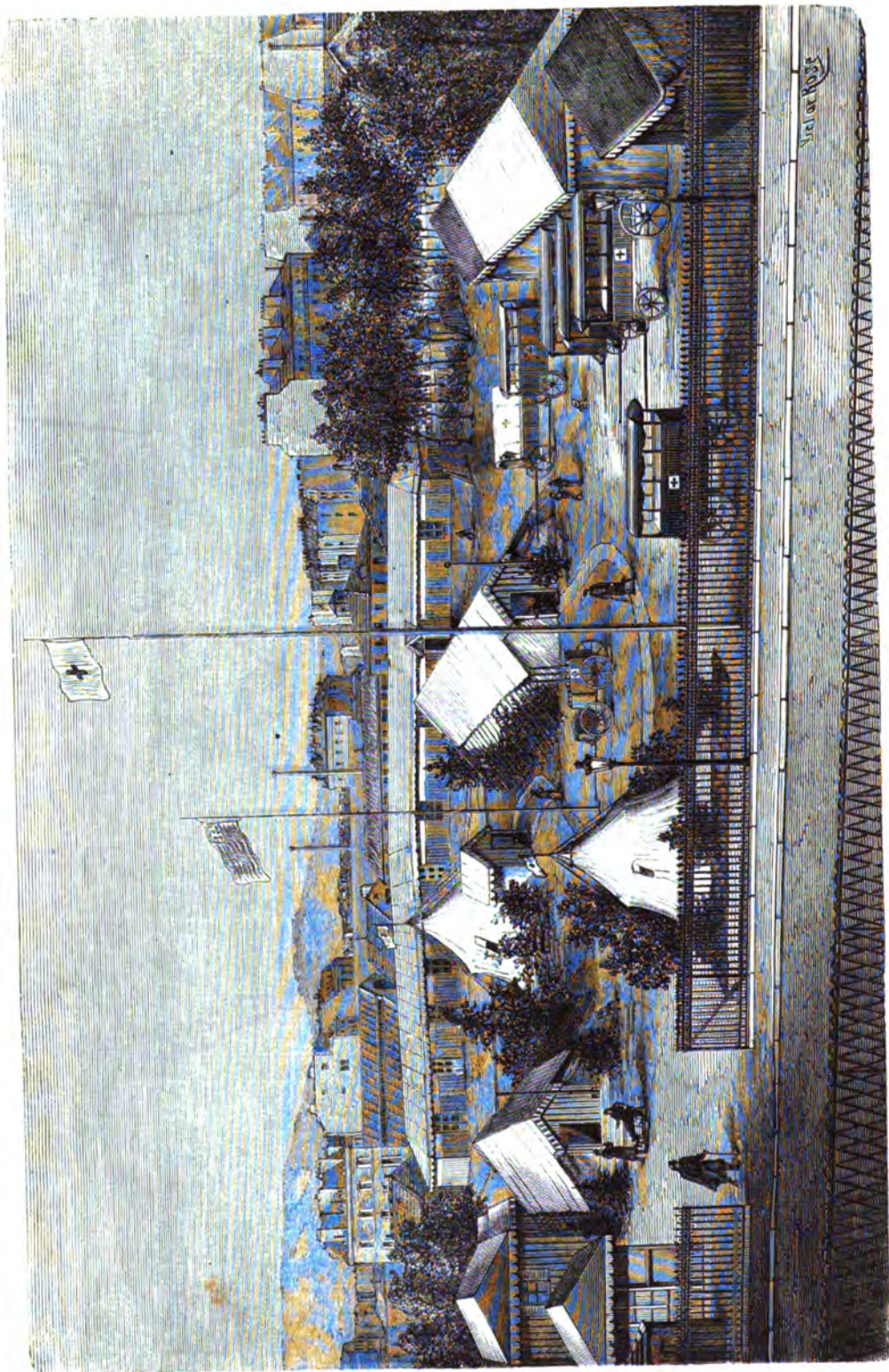
VOL. I.





History of the American ambulance established in Paris ...

Thomas Wiltberger Evans, Edward Augustus Crane,
John Swinburne, William Edwin Johnston



GENERAL APPEARANCE OF THE AMERICAN AMBULANCE.

HISTORY OF THE AMERICAN AMBULANCE

ESTABLISHED IN PARIS DURING

THE SIEGE OF 1870-71,

TOGETHER WITH THE DETAILS OF

ITS METHODS AND ITS WORK.

BY THOMAS W. JANS, M.D., D.D.S., PH.D.

PRESIDENT OF THE AMERICAN INTERNATIONAL SANITARY COMMITTEE, COMMANDER
OF THE LEGION OF HONOUR, GRAND-CROIX OF THE ORDER OF
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"Les Institutions Sanitaires pendant le Conflit Austro-Prussien-Italien,"

*"The History and Description of an Ambulance
Waggon," &c., &c., &c.*



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MOY WEN
JUN
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AMERICAN INTERNATIONAL SANITARY
COMMITTEE OF PARIS.

THOMAS W. EVANS, M.D.—*President.*

EDWARD A. CRANE, M.D.—*Secretary.*

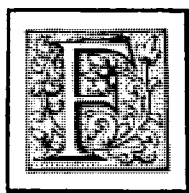
COL. JAMES MCKAYE.

ALBERT LEE WARD.

JAMES W. TUCKER.



P R E F A C E.



RANCE and Prussia had signed the Treaty of Geneva in 1864. During the two years that followed, this treaty, for the amelioration of the condition of wounded soldiers, had been accepted by nearly all the Governments of Europe, and national relief societies had been organized in each State in accordance with its terms.

The Austro-Prussian War of 1866 afforded to several of these societies the first opportunity for active work. The character and value of the services rendered to sick and wounded soldiers by voluntary associations during that war, I have myself endeavoured to show in a work entitled "Sanitary Institutions during the Austro-Prussian Conflict." The experience gained during the war of 1866 was moreover of great service to the voluntary societies. The field within which their action might be beneficial was more clearly marked out, and their position as institutions of public utility definitively established. In certain States the organization of the societies was modified and improved—in all it was invigorated and strengthened.

The great war of 1870-71 was a fearful contest between the two wealthy and powerful nations which had first given in their adhesion to the Treaty of Geneva, and in which the principle of creating popular aid for the wounded in war had been most

generally accepted, and the organization of the relief societies was most complete. The circumstances under which the action of these societies was then tested were not only rich in opportunities of usefulness, but seemed to offer the most favourable conditions for the practice of voluntary relief in behalf of the victims of battle-fields. During the war the popular sympathy for the wounded was intense, and the liveliest interest was taken in the movements and operations of the French and German societies. Since the close of the war the friends of charity and beneficence in every quarter of the world have been anxious to learn, to the fullest extent, the character of their services and the practical results of their labours.

Conscious, therefore, of the desirableness as well as the utility of assembling the facts concerning the action of the volunteer relief societies during this war, so classified that they might be easily compared, and so presented that they might clearly teach the lessons to be derived from them, I proposed before the close of the war to prepare a full and complete history of the labours of these societies. Such a work, however, could not be written until data covering a very wide field of operations had been collected, nor before the reports of the principal associations had been made public. The difficulties in the way of obtaining from official sources the necessary information have made it impossible for me to finish this work within the time originally proposed.

While, however, the relief societies founded upon the Treaty of Geneva were national in their organization, as also in their more immediate and specific purposes, they were the representatives of a common cause, and were closely affiliated in action as well as in sympathy.

The Franco-German War of 1870-71, in opening out a vast and comparatively new field for organized patriotic benevolence, offered also the first great occasion for the exercise of international sympathy and assistance. The occasion was not unheeded. If armies were never before more abundantly supplied by national voluntary effort—never before in human history have belligerents received from foreign and neutral States such generous aid. The action of the French and German societies for battle-field relief,

was largely sustained by foreign contributions, and the sufferings incident to the war assuaged by the liberalities of aliens. Foreign charities, however, were generally distributed through local organizations, and lost their national character in the process of distribution.

The American International Sanitary Committee of Paris was formed almost immediately after the declaration of war in 1870, for the purpose of being a direct agent of American charity in behalf of the victims of the war. It was, moreover, the only foreign association created for the general succour of the wounded that succeeded in preserving throughout the war, on belligerent territory, a complete independence in the direction of its operations and in the immediate distribution of its assistance. The committee began its labours by organizing an ambulance, or field hospital, at Paris.

Few organizations for the relief of the wounded during the late war, acquired a more noble celebrity than the American ambulance. As an expression of international goodwill, it at the time secured for itself the gratitude of the French people. As an expression of earnest personal effort, of the courage and generous devotion of compatriots, it cannot soon be forgotten by Americans. As an expression of modern sanitary science, however, it has been chiefly valued, and probably will be longest remembered, by all.¹ Its mission was significant—its work was one of usefulness. To commemorate, therefore, the services of those who laboured in the American ambulance, or contributed to its success, and to preserve a record of its acts and methods, are duties equally imposed.

This volume contains the history of that ambulance.

It was my original intention to publish it together with, and as a part of, my general history of voluntary effort in behalf of the

¹ Says a French medical authority, in speaking of the *American ambulance* :—
 “ Nous accordons à cet établissement une importance tout-à-fait capitale, moins pour les services qu’il a rendus, et qui sont du reste considérables, que pour les vérités importantes qu’il nous a fait toucher du doigt. Désormais *la mobilisation des hôpitaux temporaires est un problème résolu.*” (“ *Nouveau Dictionnaire de Médecine et de Chirurgie Pratiques.*” J.-B. Baillière, Paris, 1873 ; art, Hôpital, tome xvii. p. 726.)

sick and wounded during the late war. The causes mentioned have held in abeyance the publication of that work. But as most of the material which appears in this volume has been a long time ready for the press, it has not seemed to me expedient to retain it any longer. I accordingly now issue the "History of the American Ambulance," complete, in a single volume, which will form also the *first* volume of my general history of "Sanitary Associations during the Franco-German War of 1870-1871."

I have endeavoured to present in it a clear statement of the purposes of the American International Sanitary Committee, of the difficulties they encountered, of the labours they accomplished, and of the successes which finally crowned their undertaking. The admirable reports of the gentlemen who were especially entrusted with the administrative and executive work of the Committee—treating upon those subjects which are more particularly scientific and technical—complete the history of the ambulance.

The report prepared by Dr. Edward A. Crane is an exhaustive essay in which the writer has not only stated the essential facts connected with the material organization of the American ambulance, but has discussed at length the principles in accordance with which army hospitals have been, and should be, established, and the general character and qualities of temporary and portable shelter.

The surgical and medical histories of the ambulance will be read, I believe, with great interest by that portion of the public to which they are now more particularly addressed. Dr. Swinburne's cases are fully and concisely stated, as are also the peculiar difficulties under which he contended while treating them. Dr. Johnson's report, if brief, is nevertheless instructive.

In presenting this volume to the world I shall solicit a generous criticism not only in my own behalf, but in behalf of those who have laboured with me in its preparation. Verbal errors, and mistakes even in fact, may doubtless be found. These, as every one knows, are more or less unavoidable, especially in a work, parts of which have been edited for absent writers, and all of which has been hurried through the press in the midst of

numerous personal pre-occupations. I believe, however, that while the special subject of the volume may commend it to the favour of many, the facts it presents in connection with the general history of army hospitals will render it a valuable contribution to the medico-military literature of the day.


THOMAS W. EVANS.

PARIS,
Avenue de l'Impératrice, No. 41.
July 11th, 1873.





GENERAL SUBJECT HEADINGS.


	I.	Page
 N ACCOUNT OF THE FORMATION OF THE AMERICAN INTERNATIONAL SANITARY COMMITTEE OF PARIS, TOGETHER WITH THE HISTORY OF THE AMERICAN AMBULANCE.		1
II. ON THE ESTABLISHMENT OF ARMY HOSPITALS		93
III. ON TENTS AND TENT-BARRACKS		251
IV. ON THE SPECIAL ORGANIZATION OF THE AMERICAN AMBULANCE		445
V. ON THE SURGICAL HISTORY OF THE AMERICAN AMBULANCE		575
VI. ON THE MEDICAL HISTORY OF THE AMERICAN AMBU- LANCE		681
VII. APPENDIX		689





CONTENTS.

AN ACCOUNT OF THE FORMATION OF THE AMERICAN INTERNATIONAL SANITARY COMMITTEE OF PARIS, TOGETHER WITH THE HISTORY OF THE AMERICAN AMBULANCE.

	Page
 MOTIVE for issuing a call for a meeting of American citizens resident in Paris on the 18th of July, 1870	3
A statement of the object of the meeting	4
Resolution passed, committee appointed, appeal to citizens of the United States	5
Letters of the secretary to the president of the "American Association for the Relief of the Misery of Battle-fields"	6
Letter received in reply by the secretary	11
Purport of this letter—remarkable for certain misconceptions	12
Reply of Dr. Elisha Harris to a letter addressed to him by the committee	14
Prompt and generous action of the United States Government contrasted with the indifference of the American Association	15
Efforts of the committee to obtain funds and carry out its programme	16
Attempt made to organize a "Ladies' Branch Committee"	16
The work undertaken by the committee gradually assumes a definite form	17
Faults of the French ambulance system	17
The committee determines to retain its independence and to find a suitable locality for the establishment of its hospital	18
Not easy to find such a locality	19
Discussion of the question, "Shall we go or shall we stay?"	19
The question put to a vote	21
Opinion thereon of Col James McKaye	22
The divergence of opinion how settled	23
The committee proceed to the organization of an ambulance in Paris	23
The 4th of September	24
The Empress finds a temporary refuge in the house of the president of the committee, who subsequently conducts Her Majesty to England	25
Effect upon the committee of the sudden and unexplained absence of both president and secretary	25

	Page
Scandalous imputations as to the motives of the president's mysterious departure	26
Action of the committee restored to its former vigour	26
A long absence from Paris not anticipated by the president	26
Causes which rendered such an absence finally necessary	27
Unavailing efforts made by the president to guarantee the Paris ambulance against any crippling of its energies through lack of funds	27
Resolutions passed by the Paris committee in the attempt to enlist the sympathy of their countrymen in their work	28
Letter from the secretary to Dr. Elisha Harris	29
Straitened pecuniary circumstances of the committee	30
Letter addressed by Dr. Elisha Harris to the president	31
Appeal prepared for publication in the American press	32
Pecuniary history of the American ambulance	34
Certain characteristics of the ambulance	36
Gratuitous character of the services rendered	36
Visitors at the ambulance	39
One of the most eminently popular of the properties of the American ambulance	40
Patients treated with a success which rendered evident the superiority of the system pursued	43
Aim which the organizers of the ambulance had mainly in view completely attained	44
What was said of the ambulance corps by the "Électeur Libre"	44
What was said of the ambulance corps by "Le Réveil"	45
What was said of the ambulance corps by "L'Univers"	45
The ambulance the subject of a special notice	46
The ambulance gives the best results in the curing of wounds	46
The ambulance the object of numerous official visits	46
The Archbishop of Paris visits the ambulance	46
The ambulance as described by the "Constitutionnel"	47
"A Visit to the American Ambulance," from the "Official Journal" of the French Republic	48
"Le National" gives its opinion of the American ambulance	52
"La Liberté" pronounces everything to have been in the most perfect order	53
M. Gustave Lafarge writes about "L'Ambulance américaine"	54
Fifty or one hundred encampments after the manner of the American ambulance advised by "La Défense Nationale"	56
"That ambulance where the fewest wounded die,"—"La Patrie"	57
The general value of medical and scientific notices in popular French journals	57
The opinions of the physicians and surgeons of Paris	58
What M. Francisque Sarcey writes about the American ambulance	58
What Dr. Dusart says about the ambulance	63
What the "Gazette Médicale" reports of the prompt and efficient services of the corps of aids-volunteer	64
What Dr. de Ranse thought of the ambulance	65

CONTENTS.


xix

	Page
How the "Union Médicale" speaks of the ambulance	66
The opinion of M. Gustave Monsnereau	67
Why the American ambulance merits the special attention of the public and of the press, as stated by the "Gazette Hebdomadaire de Médecine et de Chirurgie"	69
Opinions of M. Nélaton and Baron Larrey	71
The committee greatly indebted to the medical gentlemen of Paris for constant kindly encouragement	71
The system employed for heating the tents attracts great attention	72
Paper prepared by M. Charles Joly upon the subject	72
Communication thereon addressed to the secretary by M. Delpierre	72
Plans and sketches of all the details prepared by General Morin for the "Conservatoire des Arts et Métiers"	72
An account of the waggons used by the transport corps of the ambulance	73
The model subsequently adopted by the French Société de Secours aux Blessés	73
The French Government adopts the stretcher used by the transport corps of the ambulance	74
The American ambulance largely instrumental in popularizing the use of oakum as a substitute for charpie	74
General Wolf, the Intendant-General of the Army of the Defence, recognizes the services rendered by the American ambulance	75
The letter addressed to the committee by Alfred Doucet	75
An article which appeared in "La Vérité"	76
Honours conferred by the French Government upon persons for services rendered at the American ambulance	76
The committee under great obligations to the Government for the uniform kindness and courtesy of all its agents	77
The success of the ambulance largely owing to the personal interest taken in the work by each member of the corps	77
The services rendered by the members of the committee	77
Dr. Swinburne and his surgical staff	78
Of the captains of the squads for the transport service—Mr. Joseph K. Riggs	79
M. Ranzi	80
M. Rillet, Messrs. Gunther and Dreyer, and Majors Hutton and O'Flinn	81
Of the ladies who served in the ambulance	82
Miss Bewick, Mrs. McFarlane, Mrs. Koch, Miss Chandon, the Marquise de Bethisy, Mrs. Conklin and the Misses Castri	83
A remarkable fact concerning all these ladies	83
Letter addressed to the Queen of Prussia	84
Letter received in reply from Her Majesty	86
Communication from the Central Committee for the care of the wounded of the German Army	87
Visit of the president to the seat of military operations in Eastern France	88
Organization of the "Society for Clothing the French Prisoners"	88
The labours of the president in this special field only a part of the general work upon which the American International Sanitary Committee originally proposed to enter	89

REPORT ON THE ORGANIZATION OF THE AMERICAN AMBULANCE.

PART I.

ON THE ESTABLISHMENT OF ARMY HOSPITALS.

	Page
 TTER to Dr. Thomas W. Evans	95
Silence of the most ancient records with regard to the care extended to the sick and wounded of armies	97
The earliest allusions to army surgeons in Greek writings	98
Statement of Herodotus (note)	99
Silence of Greek writers concerning measures to succour the wounded. Statement of Diodorus Siculus (note)	99
Equal silence of Latin writers upon the same subject	100
Subjects which have usually not interested historical writers, modern as well as ancient (note)	100
Passages cited to show that care was sometimes given to the sick and wounded in Roman armies	100
Official position of the <i>Medici</i> in the military hierarchy (note)	101
Popular charity among the Romans in behalf of the victims of war: instances in which it is said to have been exhibited	102
A remarkable example of voluntary effort in behalf of the wounded	103
Claims of sick and wounded soldiers upon the State practically unrecognized	103
Hospitals of all kinds unknown to the Romans	104
A passage in Velleius Paterculus (note)	104
Sickness rates in Greek and Roman armies: reasons why they may have been low	104
An ingenious suggestion (note)	105
The slaughter on ancient battle-fields. Character of the wounds received in battle	106
Reasons why an ambulance service was less needed in ancient than in modern times	107
Physicians and surgeons under the Byzantine Empire	107
No mention made of hospitals before the eleventh century	107
Care of the sick among the ancient Hindoos (note)	107
Xenodochia	108
Primary object of the establishment of hospitals in Europe	109
Hospitals for the sick	109
Special hospitals for the sick and wounded during the crusades	109
Care taken of the sick poor in the middle ages (note)	109
Hospitals without physicians—maintained by the clergy as a source of revenue and profit	110




	Page
Scandals arising from the mismanagement of these institutions	110
<i>Le droit d'oblat</i>	111
The beneficence of the middle ages	111
Measures adopted during the middle ages to secure immediate assistance for those wounded in battle	112
The armies of the crusaders unattended by physicians and surgeons	113
The practice of surgery held in general disrepute	114
Care taken of the sick soldiers in camp during the fifteenth and sixteenth centuries	115
Army surgeons in France until the reign of Louis XIII.	116
Army surgeons in Germany in the time of Charles V.	116
English army medical and surgical service in the fifteenth century	117
The expedition to St. Quintin	118
Instructions to Sir Thomas Leighton	119
Medical and surgical science during the middle ages	120
One of the causes which retarded the efficient organization of the health service in European armies (note)	120
The medical department—a result of the establishment of permanent armies	121
The first military hospitals established in Europe	122
<i>Le siège de velours</i> (note)	122
<i>Ordonnance</i> authorizing these hospitals	122
Hospital service during the reign of Louis XIV.	123
Royal edict of 1662	124
The Hôôtels-Dieu and communal hospital establishments of France	124
The Hôtel des Invalides	125
French military hospitals during the early part of the eighteenth century	126
Permanent military hospitals in the middle of the eighteenth century	127
Defective management of these hospitals	128
The Hôôtels-Dieu at Paris during the eighteenth century (note)	128
Suppression of the permanent military hospitals in France in 1788	129
Re-organization of French military hospitals in 1793	129
Establishment of permanent military hospitals in England	129
How the sick in English armies had been taken care of previously to the creation of these hospitals	129
Evelyn's project for the establishment of an "infermerie"	130
English permanent military hospitals during the eighteenth century	131
Cost of constructing permanent military hospitals in France in the eighteenth century	131
Character of the buildings	132
The hospital at Lille	132
General plan of these establishments	132
The material organization of the civil hospitals or Hôôtels-Dieu	133
Their limited capacity	133
Ecclesiastical character of the foundations	133
The monastic infirmary (note)	134
Light and ventilation little regarded in the construction of monastic hospitals	135
Administration of permanent military hospitals in France	135

	Page
Administration of civil hospitals in France	135
Radical vice in the administration of French hospitals	136
Surgeons-major of camps and armies first recognized in the French service in the reign of Louis XIII.	136
Regimental surgeons in the Swedish army	137
Regimental surgeons in the English army	137
Qualifications and duties of a military surgeon in the reign of Queen Eliza- beth	138
Clowes' opinion of his professional contemporaries	138
Provisions made for an army of 30,000 men in 1620	138
Number of surgeons attached to armies during the sixteenth and seventeenth centuries (note)	139
First reference to the ambulance or field temporary hospital	140
Article in the "Ordonnance" of January, 1629	140
Establishment of 1638	141
The field hospital service during the reign of Louis XIV.	142
Personnel of the field service according to the royal edict of January, 1708	143
Military hospitals first established by the French	143
<i>Service de Santé</i> during the reign of Louis XV.	144
"Instruction" prepared by D'Argenson in 1746	144
"Order" issued by Marshal de Belle-Isle in 1759	144
Former organization of corps for field service	147
Organization of the <i>Service de Santé</i> since 1792 (note)	147
French ambulance system scarcely improved since the beginning of the century	147
Personal composition of an ambulance organized by the French Société de Secours aux Blessés in 1870	148
Impracticability of the organization	149
Re-organization adopted in October, 1870	149
Its defects	150
Field service of the British army from 1750 to 1815	150
More importance attached to the duties of the army medical officer	150
Over-sensitiveness of the medical profession in matters relating to military rank (note)	150
Medical officer better educated	151
Medical and surgical stores more abundantly furnished	152
Control of the army medical service	153
Personal composition of the British army medical service before the Crimean War	153
Influence of more enlightened views upon sanitary subjects	154
The regimental hospital	154
The general hospital	155
Special hospitals for the wounded	156
Dispositions for the field service now observed in the British army	156
Principal defect of the English organization	157
The convalescent hospital	158
Medical field service in the United States army	158

CONTENTS.

xxiii

	Page
Act of Congress passed in March, 1864	159
English, French, and American organizations compared	159
Decree of the French Minister of War of January 4th, 1871	160
The initiation of a much-needed reform	161
Radical difference between the French and the English and American organi- zations	162
Dependence of the medical service upon the quarter-master's department	162
Functions of the officier de santé and of the intendant officially defined	162
<i>Ordonnance</i> issued May 3rd, 1832	163
The diet list and medicines limited to certain formulae	164
Personal independence of the surgeon subject to the assumptions of the inten- dant	165
Result of these restrictions and assumptions	165
<i>Rôle</i> of the French sanitary associations	166
Poverty of the <i>Service de Santé</i> with regard to the material means for hospi- talizing the sick	166
Qualifications of the <i>Société de Secours aux Blessés</i> for the direction of the ambulance service of an army	167
Offers of the society	168
Consequences of the false position it occupied	168
History of the <i>eighth</i> ambulance	168
History of the <i>first</i> ambulance	169
History of the <i>second</i> ambulance	170
History of other ambulances	171
Results of the assumption of this society to direct the field ambulance service	171
Selfish motives which prompted the opening of ambulances	172
Little popular interest shown for the sick	173
The rôle of the doctor	173
The name <i>Société de Secours aux Blessés</i> unfortunate	174
Evidence of the inefficiency of the volunteer system as applied in France	174
Inferences from the facts stated	174
How the offer of the <i>Société de Secours aux Blessés</i> came to be accepted	175
Who was responsible for the confusion in the administration of the health service	176
Basis on which the French army hospital service was established during the late war	176
Necessity of official and personal responsibility	177
The true province of voluntary effort misconceived by the French society	177
Causes which led to the formation of the United States Sanitary Commission	177
One of the glories of the United States Sanitary Commission	178
Purpose for which the army medical service has been created	179
If inefficient, the cause should be ascertained and removed	179
The mission of volunteer associations for the relief of the misery of battle- fields	180

	Page
 OST remarkable facts in the history of the hospitalization of sick and wounded soldiers	181
Reforms in army sanitation to be obtained only by the united efforts of many inquirers	182
Question whose solution appeared to the American International Sanitary Committee most important	183
 ILITARY hospitals	184
Sedentary hospitals	184
Ambulant hospitals	184
Hospitals established from reasons of convenience	185
The primary idea to be attached to the word hospital	185
The object to be accomplished in building a hospital	185
An accepted fact of sanitary science	186
Mortality rates in the first hospitals for the sick	186
The suppression of hospitals advocated	187
A curious fact	187
State of things in the early military hospitals	187
Causes to which the mortality existing in hospitals was attributed	187
A fact which could not escape notice	188
That air once respired was unfit for respiration—a fact not generally known	189
Earliest recognitions of the importance of pure air	189
History of ventilation in France	190
Different plans for obtaining a fresh air supply suggested during the eighteenth century	191
Too much importance ascribed to cubic space	193
Ventilation—its principal object	194
Why crowded habitations are unhealthy	194
The salubrity of all hospitals to be estimated by the degree of atmospheric purity maintained within them	195
 LANS adopted in the construction of permanent military hospitals	196
Military hospital at Vincennes	196
Military hospital at Bayonne	197
The chief faults of nearly all permanent hospitals	197
Objects to be kept in view in constructing a hospital	198
Hospitals not to be erected as monuments of architectural skill	198
Temporary hospitals indispensable in time of war	199
Principal reason for the construction of temporary establishments for the sick of armies	199
The idea of barrack hospitals a modern one (note)	201
The earliest wise conclusions concerning the relative fitness of buildings to serve as hospitals	201
The Crimean experience and its results	202

	Page
General character of the sedentary hospitals recently especially constructed to receive the sick of armies	204
The American ward-pavilion	204
A ridiculous statement (note)	205
The English model hospital-barrack	206
Crimean huts	207
Experimental barrack erected by Dr. Esse in 1867 at Berlin	207
German barrack hospitals during the Franco-German War	210
Prussian ward-barrack for thirty patients	211
Süvern's mixture (note)	212
Minden barracks	213
French barrack hospitals	214
Barracks of the Luxembourg and of the Garden of Plants	214
Barrack hospital at Passy	216
Barrack hospital constructed by the Société de Secours aux Blessés	216
Barrack hospital at Metz	216
Characteristics of the German barrack hospitals	217
One of the chief faults of the typical American pavilion	219
The use of paper in converting summer barracks into winter hospitals	219




FIXED hospitals respond only partially to the necessities of an active army	220
Means should exist for creating hospital accommodation within the army itself	220
Defective condition of the ambulance service in European armies	221
A want especially felt in each army	221
Sick and wounded soldiers crowded together in such buildings as chance offers	222
Consequences of the practice	222
Proof that no systematic effort has been made to procure suitable shelter for the sick and wounded of active armies	222
Why we find no accounts of the kind of shelter employed for the ambulances.	223
The employment of public and private buildings for ambulance purposes possesses certain advantages	224
Its disadvantages	224
Larrey's account of the condition of the wounded after the battle of Eylau	225
Gama's account	226
Gama's account of the character of the hospitals during the Russian campaign	227
Evacuation of the wounded, and its consequences	228
Vaidy's proposition	228
Suffering in the Crimean War from a want of shelter	229
Forced evacuations of the wounded	232
Hospitals at Solferino	232
Hospitals at Langensalza	234
Field hospitals during the late war.	234
Hospitals at Sedan	234


	Page
Hospitals at Metz	235
Hospitals in the army of the Loire	235
Object of the citations	237
Is it not possible to improve the hospitalization of active armies?	237
Objections to the employment of portable shelter	238
Economic motive to the employment of such shelter	238
Claims of the soldiers to profit by our science	239
Want often wastes an army more than fighting	240
A certain number of tent-hospitals should be established in each army	240
Advantages which they possess	240
Pure air of more consequence than shelter itself	241
Illustrations of the influence of the open air upon the sick	241
Tents afford all the shelter necessary	243
A great evil for which a remedy must be found	243
Dr. Sutherland's opinion	243
Baron Larrey's opinion	244
The transportation of the sick and wounded	245
Its advantages	245
Its disadvantages	246
Classes of sick and wounded not transportable	247
German system of evacuating battle-fields	248
Disastrous consequences of hurried evacuations	248
Opinion of Dr. John A. Lidell	249
The remedy	250




PART II.


ON TENTS AND TENT-BARRACKS.


	MOTIVES which induced the writer to treat these subjects at length in his report	253
---	--	-----

	TENTS used in the earliest ages	254
	Tents now used among primitive and nomadic tribes	254
	Tents used by the English during the Peninsular campaign	256
	First real improvements in the construction of temporary shelter	257
	Tents of the Israelites	257
	Arab tents	258
	Tents used within the walls of cities	259
	The use of tents in the East, in the summer	259
	Tents upon wheels	260


	Page
An Oriental story (note)	260
Atkinson's description of a Kirgis <i>yourt</i>	261


 ENTS at the siege of Troy	262
Tents in Persian camps	262
The word <i>σκηνη</i> (note)	263
Xenophon's allusions to the use of tents in the Greek armies	263
Splendid tents—their origin	264
A description from Athenæus	265
Time when tents were adopted in the Roman army	266
Qualities of early Roman tents	267
Allusions to Roman tents by Livy	268
<i>Tabernaculum</i> and <i>tentorium</i> (note)	268
Cæsar's account of the shelter used by his troops	269
Allusion to Roman tents by other writers	270
Camp shelter among the Germans and Gauls	270
Carthaginian encampments	271
The use of cabins in Roman armies	273
Roman winter quarters	273
The bas-reliefs on the column of Trajan	274
<i>Tabernacula</i> —huts	274
Difference between the <i>tabernaculum</i> and the <i>tentorium</i>	275
The <i>tentorium</i> —tent	276
The <i>papilio</i> —pavilion	278
The <i>prætorium</i> (note)	278
Why certain tents were called <i>papiliones</i>	279
Difference between <i>papilio</i> and <i>tentorium</i> (note)	282
Covering employed for the <i>papilio</i>	282
Woven stuff not mentioned as a covering for Roman tents before the second century	283
The <i>conopeum</i> (note)	284
Weaving an Eastern art	285
Roman commerce with the East—a probable result	285
Form of the <i>papilio</i>	286
A mistake explained (note)	287
Splendid tents not used by the Romans	288
Interior arrangement of the Roman soldier's tent	289


 HE use of tents in the armies of the Eastern Empire	289
The use of tents among the Goths and Huns	290
Tents in the armies of the Merovingian and Carolingian kings	290
Tents among the Anglo-Saxons	291
Tents in the armies of the Crusaders	291
Camp of King Edward II.	293
Froissart's allusions to the use of tents	293
Statements of French chroniclers	293


	Page
Huts preferred in sieges	294
Troops occasionally encamped in tents	294
Tents used by the Hungarians and Tartars	295
Remarkable accounts of Spanish camps and camp life	296
Tent-making a special service in armies	298
Ostentatious rivalry among the knights of the middle ages	298
Camp before Grenada	299
The splendid camp equipage of Charles the Bold	300
Magnificence of Philip the Hardy	300
The splendid tent of Conradine	301
The "Field of Cloth of Gold"	301
The tent of Nadir Shah	302
An encampment in the time of the Sultan Mahomet IV.	303
Love of display during the middle ages	304
Brilliant effects of colour in mediæval encampments	305
Tent of a French knight of the fourteenth century	305
Means existing in the middle ages for magnificent displays	306
Existing customs derived from the usages of mediæval camp life	308
 MBROISE PARÉ'S sketch of the imperial encampment before Metz	310
Disposition of a German camp according to Fronsperger	310
Hungarian encampment at the close of the sixteenth century	310
Camps of Maurice of Nassau	311
Use of tents at Oppenheim	311
Camps regularly laid out before the use of tents became general	312
Use of tents in the Imperial armies	313
Tents in the Levant	313
Old Turkish conical tent	314
The Turkish marquee	314
Turkish camping material	314
Tents first issued to the troops of modern armies	315
Use of "baraqucs and hutts" in English armies	316
Lodgings provided for the household of Henry VIII. (note)	317
Soldiers' quarters in the time of Elizabeth	317
Soldiers' quarters in 1649	318
What Orrery says of the hutting of troops	319
What Evelyn says of the camp at Hounslow	319
Soldiers' tents in the Prussian service	319
The <i>cannonière</i>	320
The <i>tente d'ancien modèle</i>	321
German tents anterior to the reign of Frederick the Great	321
Wedge-tents	322
Chinese tents	322
The <i>cortine</i>	323
The marquee	324
Origin of the word <i>marquee</i> (note)	325



	Page
Tents rarely employed during the winter months	327
Colombier's observations concerning encampments	327
Use of tents under the First Empire	328
Use of tents in the English army	329
Use of tents in the United States army	330
Use of tents during the Franco-German War	330
Interior of tents, how furnished	330
Floor-cloth	331
Criticisms	331
Observations of Jourdan Le Cointe and Colombier	332
Instructions of Frederick the Great (note)	332

 TENTS as a means of hospitalizing the sick	333
Sick treated in their quarters by the Greeks	334
Sick treated in their quarters by the Romans	334
The <i>valetudinarium</i>	335
<i>Contubernales</i> (note)	336
Reported establishment of a tent-hospital in the sixteenth century	337
Fray Antonio Agapida (note)	338
Subject of hospitalizing the sick of armies little thought about in the sixteenth and seventeenth centuries	338
A passage from Bombelles	339
Infrequent references to tents by medico-military writers	339
Munro one of the earliest writers who refer to the use of tents for hospital purposes	340
M. Bégue de Presle's allusion to tents	341
Tents first recommended in the organization of hospitals	342
Decree of the French Government	343
Terms of the decree seldom acted upon	344
Larrey's allusions to tents	344
Tent-hospitals in the British service	344

 CAUSES for differences in the construction of tents	345
Why the roof of the Western tent has a sharp pitch	346
Why Turkish tents are flat-roofed	347
Material of which modern tent coverings have been made	347
Classification of tents proposed by MM. Lévy and Boisseau	348
The classification of tents difficult	349





 THE British "marquee"	350
The British "bell-tent"	352
Edgington's "three-poled tent"	354
Major Rhodes' tents	355
Turner's tent	357
Shelter-tents in the British army	359

	Page
Shelter-tents used in ancient times	362
Account of the use of shelter-tents by the Scots in 1547	362
French account of the origin of the <i>tente-abri</i>	363
The French <i>tente-abri</i>	363
<i>Tentes-abri</i> of MM. Waldéjo and Barbe	364
The shelter-tent cannot be dispensed with	365
The French <i>tente nouveau modèle</i>	366
The French <i>tente elliptique</i>	367
The French <i>tente conique</i>	368
The French <i>marquise</i>	370
The French <i>tente de conseil du nouveau modèle</i>	371
"Surgeons' tent" of the Société de Secours aux Blessés	371
Model tent of M. de Moulmier	374
Model tent of M. Couette	374
The <i>manteau d'armes</i> (note)	375
Tents now in use in the Turkish army	376
The Prussian "troop-tent"	376
The Prussian "hospital tent"	376
A model Prussian "hospital tent"	377
Prussian "field hospital tent for twelve beds"	378
Prussian "tent for the treatment of contagious diseases"	381
Austrian and Italian "long tent"	382
Capt. Theurekauf's tent	382
Austrian "marching-tent"	383
Italian "shelter-tent"	384
Italian "conical tent"	384
Russian tents	385
United States "wedge-tent"	385
United States "shelter-tent"	386
The "half-faced camp"	386
A Comanche "lodge"	387
The "Sibley tent"	388
United States "hospital tent"	389
Certain advantages of the "fly"	392
The American "hospital tent" a component part of a large tent or pavilion	394
Some of the defects of this tent	396
Le Fort's tent	397
Le Fort's modified field hospital tent	398
Le Fort's tent as modified by the Société de Secours aux Blessés	400
 HE coverings of modern tents	403
French Government tent canvas	403
English Government tent canvas	404
Austrian Government tent canvas	404
Certain characteristics of flax tissues	404
United States Government tent canvas	405

	Page
Italian Government tent canvas	406
Certain characteristics of cotton tissues	406
The respective merits of cotton and linen tissues	406
How tents are destroyed	407
Wear from ordinary use and handling	407
Damage from exposure to the weather	408
Damage from mildew	410
Preservative preparations	411
Process of the house Husson	411
Of the greater strength of linen tissues	412
The question of cost	412
Cost of raw flax and of raw cotton in the French market	413
Waste in the manufacture of flax	413
Waste in the conversion of cotton into tent-duck	413
Prices of linen and cotton tent tissues in different countries	414
A conclusion	415
Relative merits and demerits of tissues of cotton and flax as tent coverings	415
Greater permeability of linen tissues	416
Linen tents hotter in the summer and colder in the winter than those of cotton	416
Results of the hygrometricity of linen	417
Relative capacity of tissues to hold water by <i>interposition</i>	418
Linen canvas easily saturated	419
Shrinkage of linen tissues	419
An objection made to the use of cotton canvas	420
Conclusion	420
 HE qualities a hospital tent should possess	421
Importance of using the best materials in the construction of hospital tents	422
On the choice of a location for a tent	423
A location under trees objectionable	423
Points to be observed in pitching a tent	424
 ENT-barracks	425
Their principal advantages	425
Their principal disadvantages	426
An opinion of competent judges	427
Tent-barracks used during the Austro-Prussian War of 1866	428
The tent-barracks of the ambulance at St. Cloud	429
The tent-barrack of the Hospital Cochin	432
The tent-barrack of the Charity Hospital at Berlin	434
Tent-barracks of two kinds or types	435
The expedient plan	436
Points to be observed in constructing a tent for a special service	436
Defects of the tent-barrack of the Hospital Cochin	436
Tent designed by Dr. Thomas W. Evans	43

PART III.

ON THE SPECIAL ORGANIZATION OF THE AMERICAN AMBULANCE.

	Page
 LAW of sanitary science	447
Opinions entertained by the American International Sanitary Committee	447
Resolutions passed	448
Development of the original plan	448
 HE first impression of the visitor	449
The tents	450
Furniture	451
Tent-barracks	451
Pavilion No. 7	452
Pavilion No. 8	452
Pavilion No. 10	453
Other constructions	453
The American ambulance, how composed	455
Essentially a sedentary ambulance	455
 HE American ambulance represented a new system	456
The tent-hospital at Varna	457
The use of tent-hospitals limited to the summer months	458
The opinion in France upon this subject	459
Recent European opinion upon this subject	460
English opinion upon this subject	461
Conclusions derived from the use of tents as hospitals during the late war	466
Conclusions of MM. Demoget and Brossard	467
Opinion of M. Grellois	467
Report of M. Leplat	468
Conclusions of M. Grellois	469
Tent ambulances of the Société de Secours aux Blessés	470
The practice among the Germans during the late war	471
Statement of Captain Galton	472
Statement of Miss Lees	472
The "Woolwich ambulance"	474
Hospital tents in the United States army	474
Attempts to treat the wounded under tents in the winter	476
American opinion concerning tent-hospitals	477
 HE use of tent-hospitals not limited to the summer months	478
The results of our experiment	479
Results obtained at Varna	479
Opinions of Quesnay and Pirogoff	480

	Page
Statement of Kraus	480
Statement of Dr. Hammond	480
Results obtained by Boerwindt	481
Remarks of Chantreuil	481
Facts to be considered in comparing results	482
Statistics vitiated by evacuations from one hospital to another	483
Statistics of the ambulance at the "Corps Législatif"	485
Statistics of the American ambulance	486
Results obtained at the ambulance "Rothschild"	486
Results obtained at the ambulance in the École des Ponts et Chaussées	487
Results obtained in other ambulances at Paris	488
Results obtained by the "first ambulance" at Metz	488
Results obtained in the civil hospital at Strasbourg	489
Results obtained in the ambulance of the "Petit Séminaire" at Strasbourg	490
Statement of Dr. Gordon	490
Recoveries most frequent in the American ambulance	491



HY tent-hospitals furnish the most satisfactory results	492
The sanitary influence of light	493
Conditions under which the wounded were treated at the American ambulance	494




SANITARY state of Paris	495
Causes of the great mortality existing during the siege	496
Quality of the bread issued	497
Suffering from want of food less than generally supposed	498
How Paris was able to feed its population for five months or more (note)	498
A tabular statement of the deaths in Paris	499
Remarkable exemption of certain classes from disease	500
The mortality from small-pox	500
The influence of cold weather upon the mortality rates	501
Incident mentioned by Dr. Gordon (note)	506
Diseases of the respiratory organs	506
Typhoid fever	507
Diarrhœa and dysentery	507
Influence of the sanitary state of Paris upon the wounded	508
Mortuary statistics of the siege (note)	508
Mortality table	509
Temperature table	510
Location—character of the grounds	511
The tents—how arranged	514
Tent-barracks	515
Lighting	517
Furniture—iron bedsteads	518
System for warming and ventilating the tents	519
The general practice in camps	519

	Page
Custom prevalent during the eighteenth century	520
Difficulties of heating tents	520
Methods of warming tents at different times suggested	521
The fireplace and chimney	522
How to warm tents—a difficult problem	523
A solution suggested	524
A practice in the English army before Sebastopol	525
The "California stove"	526
A method of applying the system	526
A second method of applying the system	527
The arrangement adopted at the American ambulance	528
Statement of M. Bréhan	531
Statement of M. Joly	532
Report of M. Cottard	532
A difficulty—its cause and its remedies	533
How uniformity of temperature was obtained	534
How the rate of the heat supply was regulated	535
Another advantage of the system	536
The relation between heating and ventilation	536
Natural ventilation	537
Artificial ventilation	537
Inefficiency of mechanical devices	538
The evil of draughts	539
The <i>cheminée d'appel</i>	539
The tents at the American ambulance ventilated by natural forces	541
Canvas full of natural openings	541
Why the air in tents becomes close	542
How the air escapes from a tent	542
Outlets and inlets should be numerous	544
Important condition in the ventilation of tents	545
"How do you know your tents are well ventilated?"	545
Conclusion	548
Cost of the apparatus	549
Water supply	550
Amount of water distributed in Paris in August and December, 1870	552
The composition of Seine water	552
Quality of Seine water	553
Kitchen	554
Wine room	554
Provision store	555
Linen room	555
Store room	556
Knapsack room	556
Operating room	556
Dormitory	557
Transport service	557
Baths	557

CONTENTS.


xxxv


	Page
Sinks	558
Latrines	560
Trenches	560
Fresh earth as a deodorant and disinfectant	560
Cabinets	562
Urinals	563
Importance of separating the urinal from the cabinet.	564
A grave abuse	564
How it can be prevented	565
<i>Cabinets d'aisance</i> a source of specific disease	567
Latrines how policed	567
Dead-house	568

 TRANSPORTABILITY an important point in constructing an am- bulance	568
Special advantage possessed by an <i>ambulant</i> hospital	569
Our tents subjected to an unusual test	570
The question of cost	570
Cost of a tent-hospital containing <i>fifty</i> beds	570
Cost of permanent constructions	571
Conclusion	573

ON THE SURGICAL HISTORY OF THE AMERICAN AMBULANCE.

 NTRODUCTION	577
---	-----


 ÉSUMÉ of the general treatment of wounds in the ambulance	578
General surgical treatment of compound fractures	581
Injuries which necessitate amputation	581
Fractures of the shaft or joints which are to be treated by conservation	582
The transportation of the wounded	584
The treatment of fractures by extension and counter-extension	587


 ENERAL facts in the surgical history of the ambulance	589
Table of fractures	591
Fractures of the thigh	592
Case 3	592
Case 4	593
Case 134	596
Report of the Surgeon-General of the United States	598
Report of Professor Legouest	600


	Page
Conclusions	601
Amputations of the thigh	602
Case 5	602
Case 9	604
Case 23	605
Excisions, amputations, and conservations of the shoulder-joint	607
Case 32	607
Case 56	607
Case 166	608
Shoulder-joint operations	611
Fractures of the tibia and fibula	612
Case 36	612
Case 244	612
Fractures of the arm	613
Case 130	613
Case 225	613
Case 31	614
Case 18	614
Case 115	614
Case 14	615
Fractures of the tarsus and ankle-joint	616
Case 41	616
Case 45	616
Fractures of the scapula	617
Case 43	617
Case 6	617
Fractures of the carpus	618
Case 191	618
Case 29	619
Fractures of the maxillaries	619
Case 62	619
Case 65	620
Case 73	621
Case 129	621
Case 145	622
Case 179	623
Case 200	623
Wounds of the abdomen	623
Case 239	624
Penetrating wounds of the chest	624
Case 13	624
Case 55	625
Case 64	625
Case 68	626
Wounds of the nerves	626
Case 108	627
Case 128	627


CONTENTS.

xxxvii


	Page
 ISTORY of each surgical case which terminated fatally	628
Case 7	628
Case 8	628
Case 10	631
Case 53	631
Case 54	632
Case 58	632
Case 59	633
Case 63	633
Case 72	634
Case 82	634
Case 83	634
Case 85	635
Case 96	637
Case 105	637
Case 106	638
Case 109	639
Case 116	640
Case 117	641
Case 120	641
Case 122	641
Case 126	642
Case 127	643
Case 131	643
Case 132	644
Case 133	644
Case 135	644
Case 147	645
Case 148	647
Case 150	647
Case 153	649
Case 155	650
Case 156	650
Case 162	651
Case 164	651
Case 168	651
Case 169	652
Case 178	652
Case 184	653
Case 188	653
Case 189	655
Case 204	655
Case 205	656
Case 222	656
Case 223	657
Case 229	657
Case 240	658


	Page
 PECIAL points	659
Causes influencing the surgical results	659
Cause of erysipelas, &c.	660
Conditions existing at the American ambulance	661
Case 106	662
Opinion of Mr. Erichsen upon <i>blood-poisoning</i>	663
Did anyone treated at the ambulance suffer from blood- or pus-poisoning?	664
Origin and character of the conditions observed	664

 HE medical and surgical staff	667
Conclusion	668

 ABLE of surgical cases admitted to the American ambulance	670
---	-----


ON THE MEDICAL HISTORY OF THE AMERICAN AMBULANCE.

 ONDITIONS influencing the public health	683
Temporary immunity from disease	684
Later history of the ambulance	684
Conclusions	686

 ABLE of medical cases admitted to the American ambulance	687
--	-----



A P P E N D I X.

 IST of the persons who served in the American ambulance	691
---	-----

P L A T E S.

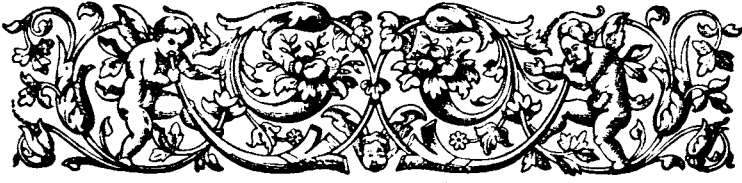
- I. Ground-plan of the ambulance.
- II. A pavilion, showing the system of heating, &c.
- III. A pavilion viewed in section, and without the fly.
- IV. Supplement to Plate III.
- V. A pavilion viewed from above.
- VI. Supplement to Plate V.
- VII. Front view of a pavilion.
- VIII. Sectional front view.
- IX. Sectional view of the trench tent-cords and keys.
- X. Dr. Evans' hospital-tent.



AN ACCOUNT
OF THE FORMATION OF THE AMERICAN INTERNATIONAL
SANITARY COMMITTEE OF PARIS,
TOGETHER WITH THE
HISTORY OF THE AMERICAN
AMBULANCE.

BY THOMAS W. EVANS, M.D.,
PRESIDENT OF THE AMERICAN INTERNATIONAL SANITARY
COMMITTEE OF PARIS.





HISTORY OF THE AMERICAN AMBULANCE.



WHEN, on the 15th of July, 1870, war had been virtually declared against Prussia by the statement made in the French Legislative Chamber, by the Duke de Grammont, I was strongly impressed with the importance of giving, in the struggle thus suddenly precipitated between the two great military powers of Europe, a practical demonstration of the value of the improved methods of treating the wounded, whose results, as illustrated by the experience of the "United States Sanitary Commission" and the American Government, I had been endeavouring for many years to bring to the knowledge of the friends of sanitary reform throughout the world. I therefore determined to call a meeting of American citizens, resident or sojourning in Paris, for the purpose of devising such measures as should best enable the friends of the cause to work together to that end, and thus render effectual and practical assistance to the French and German Ambulance Service, in the event of a Franco-Prussian war.

After I had conferred with the leading members of the American colony in Paris, a call for a meeting was immediately issued; and the meeting, attended by twenty or twenty-five gentlemen, was held in my rooms, 15, Rue de la Paix, on the 18th of July. I was requested to take the chair, and Dr. Crane was called upon to act as secretary. The chairman opened the

meeting with a brief address, in which he alluded to the imminence of war, and the painful results which must necessarily follow the breaking out of a military conflict between two such nations as those that were preparing to take the field; he referred to the eminent services rendered by the Sanitary Commission during the Civil War in America, and pointed out the importance of initiating some definite plan of action to the same end, in view of the approaching struggle, not merely as a means of providing additional succour for the wounded, but as the means which might seem most likely to shed light upon the more important problems connected with volunteer relief in war, and which might at the same time give a new impulse to popular charity, by setting a fresh example of international sympathy and assistance; and he defined the object of the meeting to be the consideration of the means to be employed for organizing this assistance, and rendering it beneficial.

The chairman called the attention of the meeting to the desirability of organizing a collective action of the Americans in Paris, in view of the approaching conflict, which seemed about to offer an excellent opportunity of showing the practical operation of the American system in providing for the transport, shelter, nourishment, and medical and hygienic treatment of the wounded. And he particularly insisted on this consideration, viz., that one of the chief objects with Americans, under the circumstances of the case, should be to make known to European sanitarians by practical examples, those systems of hospital construction, transportation, and appliances for the care of the wounded, which had received the sanction of American experience as most suitable in war; observing, that such an addition to the sanitary knowledge of Europe would be far more valuable and useful than any mere giving of material aid to either French or German ambulances, even though it were possible to collect millions of francs for that purpose; and that, therefore, a special aim of the proposed action on the part of the Americans in Paris should be the organizing of one or more model Field Hospitals, with their accessories, on the plans which had been found so satisfactory during the American war, for the purpose of demonstrating the superiority of the methods, adjuncts, appliances, and arrangements that had

been suggested by the experiences of that great struggle, over those which were still employed in the official ambulances of Europe. And, finally, he urged the meeting to take immediate action, in view of the impending events, by forming a Committee which might begin the work, which he had every reason to believe the "American International Association for the Relief of the Misery of Battle-fields," would ultimately conduct in the name of the whole American people. "It was," he said, "our duty and our privilege, here on the ground, to make, in behalf of our fellow citizens, the first response to any call for assistance in aid of the wounded."

Mr. Tucker then made a few remarks, expressing approval of the views that had been brought forward, and concluded by offering the following resolution:—

"Resolved, that under the existing circumstances, it is deemed expedient by this meeting to appoint a Committee of five persons, including the chairman and secretary, with power to add to their number, to act in connection with the 'American Association for the Relief of the Misery of Battle-fields,' the 'Société Internationale,' the 'Société de Secours aux Blessés,' and other kindred societies, for the purpose of relieving the wants and sufferings of soldiers during the war which is now anticipated between France and Prussia."

This resolution having been unanimously adopted, Drs. Evans, Crane and Pratt, Col. James McKaye, and Mr. A. L. Ward, were elected to constitute this Committee—Dr. Evans being named President, and Dr. Crane Secretary of the same. The meeting then separated.

The first step taken by the Committee was to issue the following Appeal:—

**"HELP FOR THE WOUNDED OF ALL ARMIES! AN APPEAL TO
CITIZENS OF THE UNITED STATES, RESIDENT OR SOJOURN-
ING IN PARIS.**

"The Committee appointed at a meeting of citizens of the United States, held on the 18th inst., at the rooms of Dr. Thomas W. Evans, to act in co-operation with the 'American Association for the Relief of the Misery of Battle-fields,' in pro-

curing help and care for the wounded of all armies in the impending war, deem it their duty to appeal to their fellow citizens for pecuniary aid.

"In the great war recently waged on the other side of the ocean, the appeal of the 'United States Sanitary Commission' to the humane men and women of Europe, for help for our wounded, met with a hearty and generous response.

"In their name, and in the name of a common humanity, we ask you to contribute, to a like great charity, such amounts as you may feel yourself willing to give, in money or in kind.

(Signed).

THOMAS W. EVANS, M.D., *President.*

EDWARD A. CRANE, M.D., *Secretary.*

COL. JAMES MCKAYE.

ALBERT LEE WARD.

THOMAS PRATT, M.D.

Paris, July 19th, 1870."

It having been decided at the first meeting of the Committee to establish, as a practical expression of its contemplated action, a field hospital for forty or fifty patients, combining and exemplifying all the improvements which it desired to bring to the attention of the heads of the sanitary service of the French army, the Secretary wrote, on the 19th of July, to the President of the "American Association, for the Relief of the Misery of Battle-fields," setting forth the motives which had determined the formation of the Committee, and the objects it proposed to effect, enclosing a copy of its "Appeal," and expressing the hope that, for the furtherance of the ends it had in view, the Association would give its co-operation to the Paris Committee.

The text of this letter was as follows:—

"15, Rue de la Paix, Paris,

"July 19, 1870.

"Henry W. Bellows, New York.

"MY DEAR DOCTOR,

"Long before having received this letter you will have learned that, living in what seemed at least a state of peace fairly

well secured, we have been startled by a sudden declaration of war.

“It is not necessary to consider the causes, either remote or immediate, which have brought this great calamity upon Europe. Whatever they may have been, we are now stupified by the consequences.

“As in America, when the rebellion began, so here, we have our hopeful ninety-days’ prophets; but there is an opinion, and I am inclined to entertain it myself, that the war will assume a character much more serious than such a limitation might imply. Aside from the numerous complications which may arise, this war once begun can never be terminated until the military ascendancy of one of the two states—France and Prussia—shall have been definitively established. This can be effected by no single victory, however decisive. I believe the war will be a long one—it can hardly fail to be a most serious and disastrous one.

“If coming events should justify this opinion, our different ‘Sociétés de Secours’ will have a wide field open to them for the exercise of that charity, for the proper direction of which they have been organized. ‘La Société Française’ held a meeting a few days since, and under the special patronage of the Empress, has commenced its preparatory work. An appeal has been issued to the people for contributions in money and in kind, and a warm response has already been made. The German societies, having had the experience of the war of 1866, are undoubtedly ready to meet, generously and efficiently, any demands which may be made upon them.

“But you will remember that our ‘Sociétés de Secours’ are leagued together—that they have been so organized that, in the event of a war, they may co-operate for the better accomplishment of a common good.

“Dr. Evans, as the chief American representative of sanitary work, in Europe, has felt that some immediate action on his part was necessary for the purpose of making known, not only his own interest in the welfare of the wounded of the contending powers, but the willingness of the American Association to contribute its share in the great work before us. Accordingly, a meeting was

held yesterday at his office, for the purpose of organizing an 'American International Sanitary Committee.' At this meeting—attended by some of the most influential American residents of Paris—a Committee of five persons was appointed, viz.: Dr. Thomas W. Evans, Dr. Edward A. Crane, Col. James McKaye, Albert Lee Ward, Dr. Thomas Pratt. Dr. Evans was appointed President, and myself Secretary. This Committee was authorized by a resolution to act in connection with the 'Sanitary Association of the United States,' the 'Société Internationale,' the 'Société de Secours aux Blessés,' and other kindred associations, and was also empowered to raise money by subscription or adopt such other measures as might seem necessary to best effect the object for which it was created.

"You will observe that we propose to call ourselves a *Committee*, as also in accordance with the terms of the resolution referred to, that we propose to act in connection with the 'American Association.' I write to you, the President of that association, to-day, for the purpose of securing, *first*, your co-operation.

"Dr. Evans and myself, as members of the Executive Committee of the American Association, are confident that our action in the present emergency—when time is all important—will receive the fullest approbation of our colleagues. Indeed, we cannot feel that the American Association will hesitate to regard our Committee as, at least *for the time being*, its representative.

"You will naturally watch with interest and sympathy all movements in behalf of the sick and wounded during the coming contest. That you should offer some visible and permanent evidence of such interest and sympathy to the European societies with which you are allied is most important. This may be partially accomplished by having representatives here; but something more may be necessary. Hence it is that, in the second place, we wish to secure your *material support*.

"I do not know to what extent we may be able to follow the armies in the field; but, should any great engagement occur, the number of the wounded will be much larger than the regular 'Service de Santé' can provide for. The hospitals must consequently be dependent, to a very considerable extent, upon volun-

tary aid, not only such as may be furnished by surgeons and nurses, but that which is represented by clothing, food, &c.

"We wish to furnish such material aid, and, moreover, we wish to introduce, if possible, what we believe to be the most practical and effective system of hospital management, the merits of which are most clearly shown by the remarkable military statistics of our late war. We would establish, for example, a tent hospital, or one or more pavilion barracks, put the same under the direction of American surgeons, and treat the inmates as we treated our own soldiers, confident that we should obtain the same results. We believe it to be the time, aside from considerations of practical beneficence, which I am sure cannot be without their proper influence upon us, to effect a work of sanitary reform, that may lead to benefits as substantial and permanent as they will certainly prove creditable to those who may have contributed to them.

"But it is impossible for me to-day to enter much into details. As I am greatly hurried at the present moment, I shall defer much that I should like to say until at least the next mail. We wish the American Association to take some immediate action in view of the troubles which now threaten us, and we have no doubt it will.

"Believe me,

"Yours very truly,

"EDWARD A. CRANE.

"P. S.—Should a great battle have occurred before you receive this, or immediately on receiving this, could you not send us a few hundred dollars' worth of condensed milk, Borden's beef, desiccated egg, &c. &c? *We will be responsible for the payment in any event.* We have to-day telegraphed to New York for ten American hospital tents. With these we will make a beginning.—E. A. C."

On the 27th of July, the Committee, through its Secretary, again addressed the President of that Association on the subject of its intended action.

This second letter was as follows:—

“ Paris, 15, Rue de la Paix,
“ July 27, 1870.

“ Henry W. Bellows, New York.

“ MY DEAR DOCTOR,

“ I wrote you by the last mail a brief account of what we Americans were doing in view of the present war, and of the opportunities we probably shall have of affording aid to the wounded. I also at the same time solicited, through you, the support, as well as recognition, of the ‘ American Association for the Relief of the Misery of Battle-fields.’

“ I could not, however, give you at that time a clear statement of what we proposed to do, since our action was necessarily contingent upon such dispositions as the Ministère de la Guerre might make in favour of voluntary aid, whether patriotic or foreign.

“ I am scarcely better able to-day to tell you, in what way we may be able to accomplish, during the present war, the greatest good with the means we may have at our disposition.

“ We know this much—that we shall be needed, and that we shall have an opportunity, at least, of showing what we can do.

“ As we have offered to the French society (‘ Société de Secours aux Blessés’) our support, we shall receive in return their cordial co-operation. When ten thousand wounded Frenchmen and Germans are to be cared for somehow, we shall have no difficulty in obtaining from the French Government every facility we can reasonably ask for. The French Society proposes to send to each *corps d’armée* a volunteer ambulance—that is to say, a medical and surgical staff, with attendants, waggons, stretchers, tents, and other material, sufficient for the maintenance of a field hospital of one hundred or more beds. It seems to us best to attempt something similar, on a scale proportionate to our means. Should a great battle occur, we would like to establish, on or near the field, a hospital, to be under our own special direction, and for the management of which we might become responsible. We shall have no difficulty in securing here the best American surgical skill, nor shall we have any difficulty in obtaining the funds necessary to *begin* our work with.

"Dr. Evans telegraphed to Mr. Ely (22, Pine Street, New York) a few days since, to send out immediately ten United States' regulation hospital tents ; these could not be obtained in Europe, and they seemed to be almost indispensable to the establishment of an American field hospital. The iron bedsteads, stretchers, &c., &c., we have ordered to be constructed here, but after American models.

"Should our tents arrive before any great blow has been struck, we shall go to the field *prepared*. Should a great engagement be announced this week, we may go forward with such means as we have, and do the best we can under the circumstances.

"I hope the American Association will consider carefully and conscientiously what it ought to do, not forgetting that every similar Association in Europe expects *something* to be done by it. The English and Austrian Associations are each preparing for the work before them ; and we shall doubtless soon have the generous concurrence of the Associations of all the neutral powers.

We have formed here a Ladies' branch committee, consisting of about twenty members, of which Mrs. Anson Burlingame is the President, and Mrs. Thomas W. Evans, Vice-President. A well-attended and interesting meeting was held by the ladies yesterday, and we shall obtain from them a warm-hearted support, both in Paris and at the front, should any occasion require them to be there.

"Mr. Ely telegraphs to-day that our tents have been shipped by the 'Scotia.'

"Believe me, my dear Doctor,

"Yours very truly,

"EDWARD A. CRANE."

To these letters the Secretary received the following reply:—

"Walpole, N. H.,

"Aug. 13, 1870.

"MY DEAR DOCTOR,

"Your favours, of July 27 and July 19, have both reached me, although somewhat behind time, by reason of my

absence in the country in this terrific summer, which has debilitated and scattered everybody. Never were our citizens so hard to get at! I am too feeble to do much myself at present, being more than usually worn out and unable to work, and am going to the Adirondacks on Tuesday to see what effect the open air and a colder climate will have. But I have written to New York, urging Dr. Agnew and Mr. Strong, in the absence of our colleagues of both Societies (the U. S. San. Com. and the American Association) to take the responsibility of appealing, under our own signature, to the public for help for the battle-fields of Europe. I can't say what they will do. I am also in correspondence with Dr. Harris on the same subject. A formal meeting is out of the question until October 1. If we act, it must be informally.

"I fear that the Sanitary Commission may think you have exceeded perfect truth and propriety in calling, in their name, upon American citizens abroad for assistance; but I trust the circumstances will be fully taken into account, and the license be allowed to pass without question. But I know the just sensitiveness of my colleagues to their own rights and duties, although I cannot speak officially for them.

"When I hear from them, I will write again. It is impossible to say what they, on the ground, in New York, may think feasible or judicious to do. But I hope for prompt action.

"Meanwhile I send you the expression of my earnest sympathy with all neutral endeavours for the relief of battle-fields. I have to-day written to the Count de Flavigny, President of the Paris Association at the Palais d'Industrie.

"Commend me to Dr. Evans, and believe me,

"Very truly yours,

"H. W. BELLOWS.

"P.S.—I can pay no direct attention, I regret to say, to your orders for condensed milk, except to forward your letters to Dr. Agnew at New York."

This letter, although expressive of a certain personal interest in the work which the Committee had engaged upon, was not

encouraging. Nothing could be done before the 1st of October—and that when every moment was of vital importance. Indeed, there were many reasons for believing the war might be finished before the 1st of October. In short, the purport of the letter was nearly equivalent to:—"Do not count upon our assistance or our co-operation in any way with the work you have undertaken." The letter, however, is chiefly remarkable for a singular misconception, which exposed the first public act of the Committee to a gratuitous criticism, and doubtless deeply prejudiced the super-sensitive members of the American Association against the Paris Committee from the very outset.

The parties in whose "name," in conjunction with "the name of a common humanity," the Paris Committee appealed to their fellow citizens for help in their undertaking, were not the "United States Sanitary Commission" (a Commission no longer having an official existence), as erroneously supposed by Dr. Bellows; but "the humane men and women of Europe," from whom, the appeal of that body for help during the American war is stated, in the "appeal" of the Paris Committee, to have "met with a hearty and generous response," and the remembrance of which "response," the Committee hoped, would suffice to call forth, on the part of the American Association, and, through it, on the part of the American people, a corresponding tribute of "hearty and generous" aid to the suffering soldiers of Europe.

Moreover, as if this misconception might not sufficiently arouse a sentiment of prejudice on the part of the American Association towards the Committee, another misconception would appear to have been brought forward. Dr. Bellows says:—"I can pay no direct attention, I regret to say, to your orders for condensed milk, &c." Who could have supposed that the following postscript in the Secretary's letter of July 19th, should have been construed as an *order* addressed to the Association, and, consequently, as presumptuous, impertinent, and offensive?

"P.S.—Should a great battle have occurred before you receive this, or immediately on receiving this, could you not send us a few hundred dollars' worth of condensed milk, Borden's beef, desiccated egg, &c., &c.? *We will be responsible for the payment in any event.*"

The Committee never had for a moment entertained the idea of supplanting the American Association in any portion of the circle of its legitimate duty, and had only assumed the position which seemed to be required alike to maintain its existence and its usefulness ; its single purpose was to make itself useful in the largest way, and to initiate at the very beginning of a threatened war the repayment of that debt of obligation which European generosity during our own war had imposed upon us as American citizens, and long continued European hospitalities had no less imposed upon us as American residents in France and Germany.

In pursuance of the same endeavour to interest the American people in the great conflict then pending, the Committee next addressed itself to Dr. Elisha Harris, who had formerly been one of the most influential members of the United States Sanitary Commission. This gentleman replied as follows :—

“ New Brighton,

“ Staten Island, New York.

“ August 24, 1870.

“ To the Secretary of the ‘ American International Sanitary Committee.’

“ MY DEAR DOCTOR,

“ The friends of humanity in our country yearn, with deepest sympathy, for the wounded in the terrible struggle now in progress in France. Our sympathy would find expression in earnest activities were not the Atlantic between us. And even now we must act.

“ Neutrality is enjoined ; but we can give money, and I hope our people will be so fully informed of the precise methods of succour, and the actual demands for pecuniary means and personal aid, that you shall not neglect to do any service you ought to do, or possibly can do, for humanity.

“ Of course we must be kept fully advised regarding the methods, facilities, and demands for your volunteer aid to the sick and wounded. The ‘ American Association for Relief ’ will meet as soon as its members return to the city. We are now widely scattered, have no funds, and only an organization and a plan.

"But until this association shall have begun its good work—say in October—I will freely do, individually, all in my power to aid your Parisian Association for succour. I can secure for the ambulance and hospital service much skilled and experienced personal aid—persons who read and speak French. Have you means for employing or securing engagements for such surgeons?

"The raising of funds would not be difficult, if it were to be known that all this voluntary aid is neutral and common in its administration. Is not the Parisian Association able to give some assurance of this kind?

"Every city and hamlet in France ought to have a perfect system of co-operation for succour. It was universality, catholicity, and patriotism, that gave us our wonderful control of material aid and unbounded sympathy in the United States, as you know. Our hearts bleed for the 100,000 wounded that have already fallen between the Saar and the Moselle. God grant that an honourable peace, and the preservation of the national rights and autonomies may soon be vouchsafed! My heart is with your association in all its endeavours and anxious labours.

"With most friendly memories,

"And my lasting respects,

"I remain yours,

"ELISHA HARRIS."

This answer was so warmly approbative and cordial, that the Committee felt itself justified in regarding it as the prelude to the "responsive" co-operation so greatly desired by it, on the part of their fellow-citizens. But the pleasing illusion was destined to be dispelled in the sequel; for, as will be shown in this history, not one particle of assistance, either in money, kind, or counsel, was ever received by the Paris Committee—notwithstanding their repeated appeals, during the entire duration of the Franco-German war—from those who had been the representatives of a magnificent example of civilian philanthropy, and who had also themselves received such generous European aid, during the great struggle in the United States.

In striking contrast with the indifference manifested by the American Association to the efforts made by the Paris Committee to popularize, in Europe, the important reforms which the Sanitary

Commission had been largely instrumental in introducing into the ambulance service of the United States, were the promptitude and efficiency with which the Government of that country responded to the call telegraphed to it by the Paris Committee, on the 19th of July, for ten of its hospital tents. These tents, through the kindness of General Meigs, were immediately forwarded to the Committee, and reached Liverpool within a fortnight of the sending of the telegram. And curiously illustrative, also, of the dilatoriness of proceedings in the Old World is the fact that, although eleven days had sufficed to bring the much-desired tents from Washington to Liverpool, and although the shipping agents in that town had been instructed to forward them to Paris, immediately on their arrival, by the speediest route, regardless of expense, such and so many were the delays occasioned by custom houses, trans-shipments, and railway arrangements on both sides of the Channel, that these tents, which were, in fact, the indispensable pivot of the Committee's undertaking, only reached Paris on the 22nd of August—that is to say, after several great battles had already been fought.

The Paris Committee, disappointed in its hope of obtaining pecuniary assistance from their countrymen in America, had in the meantime set diligently to work to obtain funds and aid from Americans in Europe. They published urgent appeals in various newspapers, issued circulars, and addressed demands for help to individuals in every direction ; but they had only succeeded in obtaining, during the months of July and August, about 19,000 francs. Determined, however, to carry out its programme by "hook or by crook," the Committee appointed Dr. Marion Sims to be the surgeon-in-chief of its future hospital, with authority to organize the requisite surgical staff; it purchased materials of every kind, laid in stores of food, medicines, &c., and pushed on its various preparations for fitting up its hospital as soon as the tents should arrive.

An attempt was made to organize a "Ladies' branch committee," as a co-operative and subordinate association. But many of the ladies who had intended taking part in it were forced to leave town, and the "Branch" as a distinct organization soon ceased to exist. Nevertheless a good many ladies used to meet daily for the

purpose of giving their aid to the cause, in the rooms of the Committee in the Rue de la Paix, where they made ready a liberal supply of linen, lint, bandages, clothing, &c., for the forty or fifty beds of the ambulance which the Committee proposed to establish. Conspicuous for zeal and perseverance in this group of lady workers were Mrs. and Miss Parnell, and Mrs. Koch, and Miss Benson, among its American members, and the Misses Bewick among its English ones; but all laboured diligently and effectually, and rendered valuable service in preparing the instruments of the benevolent work upon which the Committee was anxiously desirous to enter, while several of them continued to give welcome and efficient assistance to the Committee to the end of its labours.

The undertaking, which the latter had carried on under so many difficulties was, meantime, gradually assuming a definite form. Its tents had at length reached Paris, and the exertions of the Committee had succeeded in getting everything ready for organizing in them the hospital accommodations required for the reception of the patients, for whose treatment the proportions of this *first* American Ambulance had been combined. In addition to the objects obtained and prepared by the Committee, the president had placed at its disposal the whole of the large and valuable sanitary collection exhibited by him in 1867, and which had subsequently been maintained as a permanent exhibition, comprising four tents, six ambulance and medicine-waggons, medicines and medicine-panniers, surgical instruments, apparatus, and appliances, hospital-furniture, bedding, clothing, &c., &c. The Committee had also procured a large quantity of anæsthetics (especially of ether), and had laid in a good supply of stores, including wines, preserved beef, biscuit, candles and candlesticks, though it had not burdened itself with the addition of

“The butcher, the baker,
And candlestick maker,”

which the traditional “regulations” of the French ambulance system would probably have attached to its “establishment.”

The exceeding cumbersomeness and consequent inefficiency of the French ambulance system (which is still, in the main, what it

was a hundred and fifty years ago), had, indeed, suggested serious doubts to the organizers of the attempt whose history is here recorded, as to the possibility of any practical co-operation on their part with the official and extra-official arrangements made for taking care of the wounded, and led them to anxiously consider whether they would not be better able to carry out their special design by retaining a footing of complete independence. The cumbrous nature of the system alluded to, and, yet more, the utterly insufficient numerical proportions of its medical staff, render it entirely incapable of grappling with the formidable difficulties which we have seen to be inseparable from the results of a hostile encounter between the enormous masses of men brought together for purposes of mutual slaughter, by the vast developments of modern strategy; while the official routine of the French army, requiring each ambulance to follow the movements of the division to which it is attached, often compels the surgeons to leave their patients after a short period of treatment, so that they rarely witness the completion of any of the cases whose treatment they have begun, and have perhaps carried on to a certain point.

It was evident, therefore, that even if the American ambulance could obtain official permission to attach itself to the sanitary service of the French army (a permission which, being composed of foreigners, it was by no means sure of obtaining), it could not do so without sacrificing the special object which it had proposed to itself to accomplish, and to the realization of which the permanence of its hospital, to an extent which might enable it to carry on the treatment of the same patients to the completion of their cure, was an indispensable condition. The Committee, therefore, determined to retain the independent footing accorded to it and to other international Associations by the terms of the Convention of Geneva, which had been formally adopted by the French Government; and to go forward to some suitable locality, as soon as the theatre of the war should have been marked out with sufficient distinctness to allow of its ascertaining the precise spot most desirable for the establishment of its hospital. But the Committee soon found that it was by no means easy to decide where that spot was to be found.

Moreover, when the war first began, everyone supposed that the conflict, whatever might be its issue, would be waged on German soil; and the Paris Committee, sharing the general illusion, had expected to establish its hospital at some convenient point on the eastern side of the Rhine. But the progress of events soon rendered it evident that the war, instead of being carried into Germany, would be fought out on the territory of the presupposed invader; while the successive defeats of the French forces, the incessant changes which, as will be remembered, occurred from week to week, and almost from day to day, in the scene and direction of the military movements which succeeded one another with such startling rapidity, rendered it impossible for the Committee to fix upon any locality in which it might hope to effect such an establishment of its hospital as would enable it to accomplish the aim it had mainly in view—viz., the offering to the inspection of the governments and army surgeons of Europe, a practical illustration of the value of the modifications which had been introduced into the sanitary service of the United States, during the War of the Rebellion, by the joint action of the civilian and official elements. The Committee sent out agents to Châlons, Metz, and other places which were assuming importance as possibly destined to be the scene of more protracted operations than had hitherto taken place. But the French forces were constantly falling back, and the tide of war seemed to be so steadily setting in towards Paris, that it became a question whether this city might not prove, after all, to be the best place for the contemplated establishment of the American ambulance.

The Committee, however, notwithstanding these uncertainties, worked on as diligently as though its path were already marked out for it; being quite sure that, whether in or out of Paris, it could not fail to find a fitting field for the rendering of all the aid it would be in its power to give. By the 22nd of August all the preparations for an ambulance were fully completed; its packages were made, and its *personnel* and belongings were ready to start for any point of the compass at an hour's notice. From the 22nd to the 26th, the one question most anxiously discussed by the Committee was, "Shall we go, or shall we stay?"

The surgeon-in-chief was most impatient to leave Paris, as were also the persons attached to his staff. The theatre of war, just after the bloody battles of Gravelotte and Saint Privat, was irresistibly attractive to those curious to experience in their own persons the sensational excitement of witnessing the scenes of the terrible drama which was then being acted. Something of the surgery of the war might also be seen with profit to themselves, however uncertain might be the chances of their rendering any substantial aid to the wounded and the suffering. Two members of the committee—one himself attached to the surgical staff—were also in favour of going “somewhere to the front,” although not one of those who were so impatient to go *somewhere*, had the slightest notion of where there was a probability that his services might be needed, or ventured to suggest where he really wished to go, or even possessed one particle of information with regard either to the probable relations which a foreign volunteer ambulance might establish within the lines of an active army, or to the means of transporting its *matériel* and *personnel* a single mile over a military road. The president, uninfluenced by those motives which were acting most powerfully upon the surgical staff, concerned chiefly about the interests of the ambulance itself, and responsible for the success of the ambulance, not only to the public by reason of the contributions then received, but also largely personally responsible for its eventual maintenance and support, was decidedly of opinion that the greatest chance of usefulness might be secured by waiting in Paris for some seasonable and favourable opportunity.

First; because of the rapid and incessant shifting of the theatre of the war, which threatened to necessitate a perpetual shifting of the ambulance, from place to place.

Secondly; because of the extreme excitement and exasperation of the public mind, which, suspecting a Prussian and a spy in every one not officially connected with the army, and particularly in every foreigner, might have seriously compromised the safety of the *personnel* of the ambulance, as well as its usefulness.

Thirdly; because of the smallness of the pecuniary resources at the disposal of the Committee, which, on the one hand, rendered it unwise to waste those resources in moving about the country at a

venture, on the changing track of forces whose probable position it was impossible to foresee from day to day; and, on the other hand, would render a large additional outlay indispensable, unless the ambulance was to be broken up and dissolved, after a few days of amateur campaigning and sight-seeing.

Fourthly; because it was necessary for the ambulance to preserve its independence, which it could not do if attached to a division or corps d'armée; a position, it may be observed, which, although claimed, it is highly improbable would have then been accorded to it.

Fifthly; because of the wholly undefined relations, to the intendant and military authorities, of the volunteer ambulance corps, whether national or foreign.

Sixthly; because in an interview which he had the honour of holding, on the morning of the 26th of August, with the Minister of War, and the representative of the Government at the Foreign Office, he was assured that no guarantees could be given of the recognition of the ambulance as an "American Ambulance" at the headquarters of any army corps; as also, that no special passports could be accorded to it, and that any movement to the front must be made at the risk and peril of the ambulance, as well in regard to its material as to its *personnel*.

Seventhly, and finally; because of the constantly increasing probability that Paris, and its immediate neighbourhood, would become the scene of the final and most sanguinary act in the terrible drama of the war.

On the 26th of August the question of "going" or "staying" was once more thoroughly and anxiously discussed. Those who were desirous of making an immediate dash to the front, set forth their view of the case, and urged an immediate decision in its favour. More than ever convinced of the impolicy of moving at the moment when the German armies were rapidly converging upon Paris, when "the mountain" in fact "was coming to us," the president was, nevertheless, willing to let the question be decided, then and there, by a vote of the majority.

The question was accordingly put to the vote; but the result was a tie, half the members voting for an immediate move, the other half voting not to move, but to await in Paris until events

tr should have more clearly revealed the course to be pursued. The question was, therefore, undecided. Those who were in favour of going forward now advised that application should be made to the French "*Société de Secours aux Blessés*" for funds, and the ambulance be thus made subordinate to that Association ; a proposition which was disapproved by the rest of the Committee, as alike fatal to its own independence, and to the very aim the ambulance was mainly intended to subserve. If it was found to be impossible to maintain a distinctly American organization, it appeared to them that the sooner the Committee was dissolved the better, and for the very sufficient reason that it had been created for a specific purpose, and had delegated to it no powers to act in any other way than as the visible and immediate agent of American sympathy and benevolence.

It was particularly unfortunate, at this time, when the Committee needed all its strength, that one of its five members—Colonel James McKaye, was compelled to leave Paris. This gentleman having had a large experience in administrative affairs, would have been a wise counsellor, and thoroughly convinced as he was, of the inexpediency of engaging upon any doubtful and uncertain movement, would at least have relieved the Committee by his vote, of the awkward embarrassment of an equal division. On the 31st of August, Colonel McKaye wrote to the secretary from Geneva, warmly endorsing the resolution which had been supported by the president and himself, as the only one which could have reasonably been entertained, in view of the special and general circumstances which were influencing the action of the Committee, and which it would have been impossible to ignore.

"I am entirely," says he, "of the opinion that, in the present state of the war, and with the almost perfect certainty that the seat of the war will be shortly transferred to the vicinity of Paris, our hospital had better be set up in that city. If you had the means, and could without delay reach the field of the battle which is probably now going on, between MacMahon and the Crown Prince, you might do a great service, but as you have not the means of doing so, I advise you to prepare and wait, for my opinion is that you will have need of all your means and all your efforts, before many weeks, within the walls of Paris."

The divergence of opinion which existed within the Committee was destined, however, to be definitively settled by the incidents of the meeting referred to. One member of the Committee, and the whole of its surgical staff withdrew.

As it may perhaps seem to the reader that these passages in the general history of our Committee have been presented in too strong a light; it should be observed that they not only relate to matters which, at the time, threatened the very existence of the Committee, but that they also bring into relief those principles of action, which subsequently became the ground-work of whatever successes the ambulance may have finally attained. History, in determining the wisdom of a plan, seldom cares to know anything more than its results; but the plan which was considered by a majority of the Committee to be, under the circumstances, the wisest and the most expedient, as well as the motives by which they were influenced, should be clearly stated—and this, we trust, has been done.

The three gentlemen who were now left to represent the Committee, having very soon decided to remain in Paris, and to proceed immediately to the organization of an ambulance in that city, addressed a letter to Dr. John Swinburne, then in London, inviting him to come over to Paris, and take charge of its surgical department.

Having decided to make Paris the scene of its operations, the Committee communicated its intentions to General Bosq, general-in-chief of the French Intendance, and to Dr. Michael Lévy, chief health officer to the French army, both of whom felicitated the Committee most warmly on the decision arrived at, and assured it, that its efforts would in all probability be far more useful in Paris than they could be elsewhere.

The use of a fine plot of ground, of over an acre, in the Avenue de l'Imperatrice, No. 36, had been obtained from Monsieur Le Prince and Madame La Princesse de Bauffremont; and upon that ground, the Committee had the satisfaction of setting up, on the 1st of September, its two rows of roomy and airy tents, with its "Round Tent" advantageously placed in the centre of the plot.

As a precautionary measure, in view of the increasing gravity

of affairs at the front, the rapid advances of the German armies, and the excitement and panic which prevailed in Paris in consequence of the threatened transference of the field of conflict to its immediate vicinity, it was now proposed (and by virtue of the clause in the Resolution passed on the 18th of July, empowering the Committee to add to their number) to increase the Committee by the addition of two more members. Mr. J. W. Tucker and the Rev. Wm. O. Lamson were accordingly elected members on the 2nd of September; the first as Treasurer of the Committee, the second as its Storekeeper. It was also resolved to make another appeal to the Americans in Paris, not only for pecuniary aid, but for the formation of a corps of volunteer stretcher-bearers and nurses from among the young Americans whose social position might enable them to devote their services, gratuitously, to the task which each day's events were so evidently bringing nearer and nearer.

The fateful 4th of September, 1870, will not soon be forgotten by those who spent that day in the capital of France. The weather was magnificent. The beautiful city, in all the pride of its stately architecture, its broad thoroughfares, its long lines and clusters of noble trees, was arched over by a sky of cloudless azure, radiant with the glory of a warm autumnal sun. The Boulevards were thronged with promenaders, the Place de la Concorde was crowded; but the usual gaiety of Paris on a sunny day was replaced by the restlessness of anxious presentiment, apparent in every countenance. For the glowing, transparent air was thick with dark shadows of impending trouble, and heavy with conflicting rumours of some great disaster; shadows and rumours destined to be merged, as the day went on, in the certainty of a catastrophe so immense, so complete, so overwhelming, that the annals of the world could scarcely show a parallel to it. The rage of the great city, the downfall of the Empire, the establishment of the "Government of the National Defence," at three o'clock, at the Hôtel de Ville, the irruption of the yelling and infuriated crowd into the Tuileries, and the flight of the Empress, are matters of history, yet—however dramatic, however closely identified with the fortunes of the American ambulance—they are beyond the scope of this report.

Suffice it to say, in this place, that the illustrious Lady, who, from the date of her elevation to the throne of France, had taken so warm and active an interest in the relief of every form of suffering and distress, whether in hospitals or in the homes of the poor, and who had given to the plans and efforts of the International Sanitary Associations an amount of protection and support second only to that which had been bestowed upon them by the Queen of Prussia—on the afternoon of the 4th of September, deserted by all around her, found herself alone, save a single companion, at the eastern gate of the Louvre, and in the midst of a mob wild with the first frenzy of revolution. Nothing but her own brave self-reliance at the moment saved her. She immediately sought and found a refuge in the house of the writer of this narrative. Unfortunately it could offer no assurance of permanent security; this could only be obtained by an escape from France—and the success of such an undertaking would evidently depend principally upon the promptitude with which it might be conducted. Whatever the claims of private interest might be—with whatever of regret the abandonment of a work which had enlisted all his sympathies might be attended—here was a still stronger claim for sympathy, and one which appealed as well to the commonest sense of duty and of honour.

The Empress had entrusted her personal safety to him, and more than willingly, he accepted all the responsibilities it involved. He suddenly left Paris, without giving a word of explanation to any one, and after a few days happily succeeded in conducting Her Majesty, in safety, to the more secure and peaceful shores of England.

Dr. Crane was kind enough to accompany the writer a little way on this eventful journey; and, owing to various special circumstances, he only reached Paris on the following Thursday, where the sudden and unexplained absence of the president and secretary had plunged the Committee into a sea of wonderment and uneasiness that may be readily imagined. The position of the members of that body, in the absence of those by whom they found themselves, as it appeared to them, so unaccountably abandoned just when their presence was most necessary, was in fact, sufficiently embarrassing. Left without direction or means of

action, and their new surgeon not having yet arrived, it will scarcely be wondered at that the secretary, on returning to his post in the Rue de la Paix, should have found that the work of preparation had come to a standstill, and that the members of the Committee were half inclined to consider the undertaking as being virtually at an end!

Nor was this all, the apparently sudden disappearance of the president, which for reasons easily to be understood, could not be immediately explained, gave rise to various scandalous imputations as to the motives of his mysterious departure. These aspersions, which found their way into the public press of Europe, and even of America, were, however, much less a matter of personal concern to him, than a subject of regret in so far as they might call in question the honour of others, and expose the work of the Committee itself to the attacks of the malevolent.

Fortunately, the return of the secretary, and the arrival in Paris of Dr. Swinburne, restored the action of the Committee to its former vigour, and the work of organizing its ambulance was carried on with the utmost activity, in the confident expectation that the speedy return of the president would place the undertaking upon the satisfactory footing which its appeals to the generosity of the public had hitherto failed to secure.

The president, on his side, so unexpectedly called from Paris in the discharge of an unforeseen responsibility, had no idea that his absence from that city would extend beyond the few days required to secure the safety of the illustrious lady who had confided to him the care of ensuring her escape.

He had, accordingly, when separating from the secretary, advised him principally concerning such action as might be immediately required on his return to Paris. But in order that the work might in no way be compromised by the hazard of a prolonged absence, the president as a precautionary measure, gave to the secretary a written authorization to act as his representative in the council of the Committee, and in the direction of the ambulance.

On reaching London, the president wrote to the secretary announcing the fact of his safe arrival, and at the same time his

purpose of speedily returning ; but, being greatly occupied, he did not write to him at length, as he fully intended to return to Paris in the course of a few days. But the preparations for the siege rendering it every day more and more doubtful, whether, if he returned to Paris, he would be able to get out again (as the prosecution of the original plans in regard to the action of an American International Sanitary Committee, rendered it imperatively necessary that he should be able to do), he was compelled to linger in London, waiting, from day to day, for such indications of the probable course of events as might enable him to come to a decision as to the feasibility of his return. But the unexpected rapidity with which the operations for laying siege to Paris were carried forward, and the increasing probability that the Germans would succeed in their attempt to compass an investment which, when their plans first became apparent, appeared to all on-lookers to be an utter impossibility, speedily convinced the president that, even if he could succeed in getting back to Paris, it would be vain to hope he could leave it again ; and he therefore determined to remain in London, in order to secure the personal freedom of movement essential to the carrying out of his intended action in relation to the sanitary interests of the war. In order to guarantee the Paris ambulance against any crippling of its energies through lack of funds, in view of his unexpected absence from the field of its labours, he sent a *carte blanche* authorization to the secretary to draw upon Messrs. de Rothschild for any amounts that might be required for the fullest development of its possibilities of action during the siege. But although the completion of the investment was not officially announced until the 18th of September, all communication between Paris and the outside world was virtually cut off some days before that date ; and the letter, containing the authorization alluded to, only reached the secretary some time in December. That gentleman, on his side, wrote repeatedly to the president ; but his letters, like those addressed to him, were only received towards the middle of the siege, and then irregularly, so rigorously was the suspension of postal communication maintained throughout its duration.

Uncertain, under this suspension, whether his authorization had,

or had not, reached Paris, the president made three subsequent attempts to convey to the secretary, through different channels, the authorization alluded to. But none of these succeeded; and not a word was received by either party from the other until the month of December.

Finding that no action was being taken by the American Association in regard to the great struggle that had so suddenly broken out in Europe, and being more desirous than ever of obtaining the valuable assistance which that body was presumed to be so well qualified to give, the Committee in Paris, in view of the new aspect assumed by the war, determined to make one more attempt to enlist the active sympathy of their countrymen in behalf of the ambulance; and, to this end, passed the following resolutions:—

“Resolved,—That circumstances having prevented the removal of the staff and material of this Committee from Paris, it now finds itself, in view of the threatened siege of the city, in the immediate prospect of the largest need of all its resources, and to greatly extend and prolong its work, large expenditures would be required, far exceeding the means remaining in the treasury. It must, therefore, at once take a decision either to remain quite inadequate to the requirements of the wounded during the threatened siege, or to go forward boldly with firm confidence in the ample support of the friends of humanity in the United States. They prefer the latter course, feeling that their confidence will be fully justified, and that the contributions, for which they cannot wait, will be readily offered to pay the debts which must be incurred to carry on the great work of charity to the wounded and suffering which now lies before them. They beg, therefore, that prompt and vigorous efforts may be set on foot by their friends at home, in order that their obligations may be fully met, and that the American people may show themselves second to no other in generous response to this loud call upon the sympathies of the world.”

Resolved,—“That the secretary be instructed to communicate the foregoing resolution, accompanied by an urgent appeal from himself, to the proper parties at home for publication.”

The secretary accordingly drew up a new and pressing “ap-

peal" for pecuniary aid, as eloquent and forcible as he was able to make it, which, with a copy of the foregoing resolutions, and the following letter, was sent to Dr. Elisha Harris—with the request that the resolutions be published in the American papers:—

" Paris, 15, Rue de la Paix,
" Sept. 16th, 1870.

" Dr. Elisha Harris, New York.

" MY DEAR DOCTOR,

" Your letter of September 1st has much interested us. We thank you very much for your kind expressions of sympathy for the unhappy victims of this fearful war, as also for the good-will you manifest towards us, who have endeavoured to do what we have felt it to be our duty to do, not only as Americans, but as men.

" It is impossible for me in a single hurried letter to fully explain to you our present position, or at least the causes which have occasioned it. We have all believed that more or less success would attend the French army during this campaign. Our preparations were made in this belief—How we have been disappointed all the world knows!

" A series of remarkable defeats and retreats—the dead and wounded left in the hands of the Germans *invariably*; the volunteer ambulances of the French society unable to act, constantly under orders to fall back upon Paris, and crippled from the beginning by their subordination to an *intendance* as despotic as it was inefficient; our relations as an independent foreign ambulance undetermined; a subscription list so small that I should be ashamed as an American to report it; an attack upon Paris itself, constantly expected by the government, which was employing all its resources to meet it. These facts have caused us to feel, that the wisest course for us to pursue was to remain in Paris, and establish our hospital here. I may also say that our conclusion was partially determined by the advice given to us by officers of the government, several of whom have urged us by all means to establish our hospital in Paris. . .

"Our tents, fourteen in number, have been pitched on a beautiful piece of ground, just within the walls of the city, and before to-morrow night, we shall have fifty beds prepared to receive the wounded who may be sent from the fortifications. The French medical inspector who visited us to-day expressed very warmly the satisfaction which the inspection of our installation had afforded him, and referred to it as a substantial expression of sympathy from the great American Republic towards her younger sister. I am afraid, however, unless our friends at home come forward to help us, we shall fail to do all that is expected of us.

"We have been prevented from going forward with the army, to a large extent, by a want of the *means*. I certainly should be unable to conceal my mortification, if our modest proposal to maintain a hospital here, should fail to meet with any response from the people of the United States—so many of whom have enjoyed, in happier times, the hospitalities of this imperial city.

"Enclosed I send you some resolutions, &c.

"Believe me, my dear Doctor,

"Yours, very sincerely,

"EDWARD A. CRANE."

To this new attempt to obtain help from the United States no answer was ever received.

The Paris Committee, meantime, exerted itself diligently to maintain itself in activity. Reduced, by the circumstances referred to, to the lowest degree of impecuniosity, and having found that no sufficient help was to be obtained in the form of donations, the Committee was under the necessity of resorting to the expedient of borrowing money, and contracting debts, making themselves jointly responsible for their repayment. But the loans thus raised were soon expended. The purchases of bedsteads and blankets, of surgical apparatus, and other objects of elementary necessity for the completion of the arrangements of the ambulance, absorbed nearly the whole of the amounts thus obtained; and the enterprise would have been brought to an end, just when its material conditions had been entirely completed, had not the secretary determined to lay the state of the case before Colonel

Lloyd Lindsay, Chairman of the British National Aid Society (who had succeeded in obtaining an entrance into the beleaguered city about the middle of October) and endeavour to obtain from the ample funds which the English subscription had placed in his hands for the relief of the French wounded, the loan of a sum sufficient to enable it to go on with its undertaking. This application was received in the kindest and most liberal manner by Colonel Lindsay, who desired the secretary to name the amount he thought necessary, and handed to the latter, at his request, a sum of 20,000*fr.* which the receiver expressly stipulated should be regarded only as a loan, to be repaid as soon as possible. This seasonable aid enabled the Committee to continue its efforts for a time ; and, moreover, the return of Colonel Lindsay to London offered to it an opportunity of communicating its condition to the president, who at once repaid to Colonel Lindsay the sum he had advanced to the secretary, and took new measures to transmit to that gentleman an authorization to draw on him personally, through the house of the Messrs. de Rothschilds, for such sums as might be necessary to carry on and complete the work. This authorization did not arrive, however, until the sum advanced by Colonel Lindsay had been exhausted, and the Committee had been compelled to effect a new loan to the amount of 20,000 francs, contracted with the house of Mallet Frères—for whose obliging generosity in this matter, the Committee will always feel under deep obligations.

Towards the close of December, the president received from Dr. Elisha Harris the following letter :—

“ New York,
“ Dec. 7th, 1870.

“ To Thomas W. Evans, M.D. Ph. D., President of the American
International Sanitary Committee, London and Paris.

“ DEAR DOCTOR,

“ In the terrible struggle of the French for the salvation of their nationality, your grand endeavours to give succour to the sick and wounded, under the Red Cross, will become a chapter in the story of the war.

"We, in America, rejoice that your efforts have not been thwarted by the siege, and that, while in England, you are still able to press forward the cause of humanity, which finds its brightest illustration in the American Ambulance in the Avenue de l'Imperatrice.

"We began to collect funds for the Red Cross Service, but soon found that it was better to urge on the contributions through the channels which the two nationalities concerned in the war had formed. This was an imperative decision of the moneyed representatives of our cause. And although it now prevents us in New York from contributing to the international funds, the aggregate result of American contributions is increased. If the siege of Paris continues, New York must send donations to the American Sanitary Committee in Paris. And if the siege should be raised soon would not your ambulance and the Committee require even greater resources? I am of the opinion that an appeal from you, as president of the American Committee at Paris, would insure a rich return to the cause from your countrymen in America. Whenever the good time comes for the return of the French soldiers from Germany—from distant hospitals—we hope that your ambulance waggons and railway ambulance trains will be on duty. The benedictions of ten thousand homes will be showered on you, sir, for the grand endeavours and munificent gifts by which your faith in a good cause has been expressed and illustrated.

"With cordial regards,

"I remain, truly yours,

"ELISHA HARRIS, M.D."

Induced by this letter to believe, that a direct appeal to the American people for assistance might lead to some substantial expression of interest, at least in the special work of the Committee in Paris; the following appeal was prepared for publication in the American press.

"London, Jan. 1st, 1871.

"TO THE AMERICAN PUBLIC.

"ACTING on the earnest and pressing recommendations contained in a letter recently received from Dr. Elisha Harris, we avail

ourselves of the opportunity which it affords us of appealing to the sympathies of the United States, in support of the efforts of the American International Sanitary Committee.

"It is unnecessary for us to enlarge on the results already achieved by its labours. The disinterested testimony of the correspondents of the leading English and French journals has kept the world regularly informed of the extent to which it has succeeded in alleviating the sufferings of the dying and wounded of both armies. Our compatriots cannot but be deeply gratified at this, and they must feel additional pride in the personal gallantry and devotion of the American medical officers and assistants engaged in this perilous but glorious service. Great, however, as is their zeal or that of the Committee, they will unhappily be unable to meet the increased demands which will be made on their resources during the remainder of the campaign. Dr. Harris's active and far-seeing benevolence has enabled him to appreciate the fact, and therefore inspired by his suggestions, as well as impelled by the exigencies in which our Committee is engaged, we urgently ask such further aid as the ever active sympathies and benevolence of our compatriots on the other side of the Atlantic may be disposed to afford us.

"We are all the more entitled to their co-operation, from the fact that our society is the only one in Europe, now giving succour to the wounded, which can be said to be distinctively American.

"Subscriptions in furtherance of our labours will be received by the following banking houses.

(Signed).

"THOMAS W. EVANS, M. D., *President*.

"EDWARD A. CRANE, M. D., *Secretary*.

"COL. J. MCKAYE, } *For the Committee.*"

"JAMES W. TUCKER. }

It is doubtful if this appeal was ever published—it is certain that it elicited no reply. Indeed, not a dollar was ever sent from the United States in aid of the American ambulance, whether in response to private or public calls for help. That it is possible to make such a statement, is not the fault of the American people. Let the responsibility rest with those to whom it belongs—with those who assumed at the time to be, in the United States, the organs of American international charity.

For any personal effort which Dr. Elisha Harris, of New York, or any individual member of the "American Association," may have made in their behalf, the Committee will always entertain a grateful appreciation.

It may be as well to state in this place, by way of completing the pecuniary history of the American ambulance, that, although the Committee was frequently assured of receiving support from various quarters, it seemed always destined in the end to be disappointed. Thus encouraged to believe that it would receive "its proportional share" of the large donation of 500,000 francs sent by the British National Aid Society, "for distribution among the ambulances of Paris," sharing as probably did most of the independent ambulances in this generous international liberality, it got nothing, unless it may have been concealed in occasional gifts on the part of the French "*Société de Secours aux Blessés*" of a little wine, a few pots of jelly, pairs of shoes, and other objects of similar character, the whole of which, however, were not worth in any sense more than three or four thousand francs. With the exception of this trifling aid and the sums collected by the Committee on its first formation, and a few thousand francs' worth of articles of clothing and food, contributed at various times by the charitably-disposed residents of Paris, and the generous and unsolicited gift (5,000 francs), of an English gentleman—Sir Richard Wallace—the entire cost of maintaining the ambulance from first to last, was met by the president, who was also left to assume the liquidation of the debts contracted by the Committee. This is not said with any desire to call attention to the amount of pecuniary aid which the president may have extended to the ambulance, but to show how completely it was abandoned by those upon whom it had

the largest claim for sympathy and support, whether considered simply as a benevolent enterprise, or as a work which, from an international point of view, was reflecting while in operation—which always will reflect—more credit upon the American people than has come from all the gifts combined which were aimlessly sent from America to France, during the continuance of the Franco-German war.

The writer of this report can never forget, that when the gentlemen who had formed the Executive Committee of the "United States Sanitary Commission" having declined to make an exhibit at the Exposition Universelle of 1867, he offered to make, at his own expense, an exhibition of the hospital and sanitary appliances used in the United States during the War of the Rebellion, he was said by certain persons to have "brought himself too prominently forward," one of the commissioners even pronouncing the proposition, with a singularly patriotic appreciation, to be—"A sharp *Yankee* trick." Such is the "generous response" which men often accord, when an attempt is made to accomplish single-handed, what they themselves have abandoned!

When a meeting of American citizens was called on the 18th of July, 1870, to consider what action should be taken in the matter of offering relief to the sick and wounded during the then impending war, the call was made with the sincere wish and intention of merging individual liberalities and personal interests, in a general co-operative and patriotic work. If the financial history of the American ambulance brings into relief too strongly any one person, such a position was never sought, and the fault, should it be considered one, must be answered for by those who would have suffered a work of charity to die, and who, by their indifference, would have been instrumental in turning what had already become a national honour into a national disgrace. Whatever may be the satisfaction of the writer himself in having contributed in any way to the relief of the suffering incident to the late war, in having endeavoured to improve the ambulance service of European armies, by maintaining in the field an active American hospital—such satisfaction will always be diminished when he remembers that some of his own countrymen at home were so deaf to every

appeal as to leave to a few Americans abroad, the responsibility as well as the honour of sustaining a work, which always must hold a memorable place in the history of the siege of Paris. But to return to the more immediate purpose of this Report.

The fine, open character of the large piece of ground on which the American ambulance was established, enabled its organizers to give to it a gay and agreeable aspect rarely found to be associated with hospital-work. Its white tents, surmounted by the American, French, and International flags, its beds of gay flowers, its orange and pomegranate bushes in green tubs, its little grove and scattered trees, its two lofty flag-staffs, one of which displayed the star-spangled banner of the United States, while from the other floated the Red Cross flag, made up a picture as inviting as the usual aspect of a hospital-encampment is the reverse.

Besides the tents devoted to the reception of wounded soldiers, the round tent, in the centre of the plot, appropriated to the use of wounded officers, the kitchen, store-house, washhouse, &c., there were the large and handsome tent-barracks, set apart for the offices of the surgeon, the committee, the aids-volunteer, and the ladies who lent their valuable aid to the common cause. An ingenious system of drainage, and a cheap and simple, but extremely efficacious system of heating, by which every tent was constantly supplied with a current of fresh warm air, had secured the most excellent sanitary conditions for all the habitations of the ambulance.

Another marked feature of the establishment so beautifully located, and so well provided with the most essential elements of sanitary success, was the gratuitous character of the services rendered by nearly the whole of its *personnel*.

When the Committee originally decided to establish a field hospital, an essential part of its plan had been the formation of a volunteer transport corps, not simply as an adjunct to the hospital, but as an independent organization for general field service. Ten or twelve ambulance waggons, a large number of stretchers, and all the material necessary for the transport and care of the wounded *en route*, had been especially prepared with reference to this object.

Several young Americans, resident or sojourning in Paris, having expressed to the committee their desire to take part in the labours of the ambulance, the offer had been most gladly accepted; and these young gentlemen, to the number of nearly thirty, were formed into two "volunteer squads," each having its own captain—one being headed by Mr. Joseph K. Riggs, the other by Mr. William B. Bowles. The two squads divided between them the work of taking out the ambulance-waggon, collecting and bringing back the wounded, distributing provisions, &c.—in a word, all those duties which are usually discharged by an ambulance corps. Each squad was on duty every other day, assembling in the volunteers' headquarters at 8 A.M., and remaining on duty until 6 P.M., ready to turn out on receipt of a note to that effect, and being, in fact, almost constantly employed. But though the two squads thus alternated their discharge of the duties assumed by the corps, the whole body of the members generally assembled there each day; and, as the restaurants in the neighbourhood were nearly all closed, and they had come to feel quite at home in their tent-barrack, they usually breakfasted at the ambulance, paying for their repasts. Composed entirely of young men of property and standing, this corps of aids-volunteer not only added a new and invaluable element of strength to the *personnel* of the ambulance, but served as a sort of connecting-wire between it and the whole of the American colony in Paris.

It has been already stated that several ladies gave their zealous help and co-operation to the ambulance throughout its entire duration. Eighteen ladies gave their valuable services to the ambulance, and of these some eight or nine were always there. Some few of them became so much interested in the undertaking that they took up their abode in the quarters appropriated to them. It is needless to say that they nearly all proved to be excellent nurses; and that the linen, the cooking, and other branches of the hospital arrangements (no small matter where the wants of a daily average of a hundred persons had to be provided for during a period of several months), were admirably managed under their active superintendence.

With the exception, therefore, of a corps of thirty-one paid servants (twenty-seven men and four women), whom it had been

necessary to engage for the discharge of the most distinctly menial offices, and of one or two persons of higher social position—but compelled, by their want of means, to accept a small payment from the Committee—the entire work of the ambulance was done as a labour of love, and with all the zeal and devotion, that are only called out by the action of motives superior to considerations of pecuniary gain. But, even in the case of those who received ostensible wages, the modest amount of the latter was so utterly disproportioned to the amount and quality of the services rendered by them, that they, too, may justly share the praise of having acted from those higher motives.

In order to render the attendance of the aids-volunteer as little wearisome to themselves as was compatible with the nature of the arduous duties they had taken upon themselves, the Committee placed a fine roomy tent-barrack at the disposal of the corps; a second tent being appropriated, in like manner, to the use of Mrs. Conklin and the other ladies who took part in the work of the ambulance. Both these tents were comfortably and handsomely fitted up with furniture, lent for that purpose by their respective occupants, and were declared, by common consent, to be a very satisfactory species of "headquarters." The *salon* of the aids-volunteer was particularly well furnished; its walls being hung with pictures and mirrors, and its ample dimensions being well provided not only with chairs, lounges, tables, &c., but with books and newspapers, with chess, and other means of amusement, including a piano. The encampment possessed, moreover, several singing-birds which were the pets of its entire *personnel*, a tortoise-shell cat, and a yellow dog—which, having had the remarkable fortune of having been born at the ambulance, always held a high place in the general favour—as also, four cows, and several horses—lent for the service of its waggons by friends of the enterprise; a number of whom also used to send their carriages out with the procession of its ambulance-waggons, to assist in picking up, and bringing in, the wounded left outside the walls, after the desultory but almost continuous fighting that went on round the city. The theatres and all other places of public amusement were closed; the "Washington Club" was shut up; the parlours of the American bankers, usually places of

rendezvous for their countrymen in Paris, were entirely deserted; and everything like visiting and social enjoyment had come to an end through the painful pre-occupations of the siege. Under these circumstances the ambulance of the Avenue de l'Impératrice (or, of the "Avenue d'Uhrich," as the broad and beautiful approach to the Bois de Boulogne was then called, in honour of the defender of Strasbourg), naturally became an important social centre, not only for the Americans cooped up within "the circle of iron and fire," but for many foreign residents, who constantly dropped in to relieve the tedium of the time by a visit to the quarters of the aids-volunteer, where something interesting was always to be seen or heard; where the latest news was sure to be promptly known, and the latest rumour to have found an echo; and where the adventures of the "squad" of the previous day—recounted by the heroes of each stirring tale, while the alternate "squad" was taking its turn of adventurous duty outside the walls—afforded an unfailing supply of excitement, in the shape of narrative, description, incident, comment, inference, or surmise. The piano, also, was in frequent request; and, as several of the aids-volunteer were good singers, familiar strains, lively or pathetic, as the case might be, were frequently indulged in, by the squad not on duty; and, occasionally, when things were quiet in the town, and in the military zone outside it, the two divisions of the corps united their forces, and gave musical parties in their tent, performing duets, glees, choruses, &c., greatly to the satisfaction of the performers, and affording as beneficial an amusement to the wounded in the ambulance-tents, as to the guests assembled in their hospitable quarters.

For several weeks the American minister, Mr. Washburne, was a daily visitor at the ambulance; the consul-general for the United States, General Reed, used frequently to come in; General Burnside, General Sheridan, and nearly all the Americans admitted into the city during the siege by special passes, or who entered shortly after the surrender, also made it a point to show their sympathy with the undertaking of their countrymen by friendly visits. The ambulance was also visited by General Trochu and his staff, General Thomas and his staff, by the Archbishop of Paris, and many other French and foreign notabilities,

military and civilian; while General Ducrot and Admiral Duquilo, the commandant of the 5th military *secteur* in which the ambulance was situated, were almost daily visitors.

Many Catholic priests were constant in their attendance on the wounded of their church, who, of course, were in the majority; a few Protestants were visited by a minister of their own faith. All the wounded, without exception, were, however, attended with equal kindness and devotion by the ladies of the ambulance, who read to them, wrote letters for them, which took their chance of getting out in the mail bags sent off in the postal-balloons—and sometimes relieved the monotony of convalescence by playing a game of draughts or backgammon with those who were well enough to be amused by such pastimes.

One of the most widely known and most eminently popular of the “properties” of the American ambulance was its peripatetic “coffee-waggon,” an ingenious arrangement of enormous coffee-pots, and other reservoirs for tea and soup, with receptacles for sugar and for crockery, and three large boilers for heating water. The whole was set upon wheels and was drawn by two horses; it was provided with a seat for the driver and distributors, and with a fire-place so judiciously contrived beneath the boilers, that the fire, kept alight by the current of air created by the motion of the “establishment,” brought the water to the boiling point, by the time the vehicle reached its destination; when the coffee and tea being placed in their respective receptacles, the welcome brew was ready, in the course of a very few minutes, for distribution among the multitude of eager applicants that never failed to gather around it on its passage.

This “coffee-waggon,” the especial pride of the American ambulance, had been constructed by Messrs. Dunton, of Philadelphia, for the “United States Christian Commission”—an organization, set on foot during the war of the Rebellion, for the purpose of administering religious admonitions, consolations, and publications, to the soldiers of the Federal army, but which, finding its special ministrations to be at a rather considerable discount among the latter, was fain to supplement these with gifts of creature-comforts, and, having found that warmth was the quality most feelingly appreciated by the recipients of the latter,

devoted its benevolent energies, with the aid of this ingenious contrivance, to the work of distributing the hot drinks of tea and coffee, and the basins of steaming soup, that won for it the hearty gratitude of so many thousands of cold and weary soldiers. The waggon in question, had ended its original career of usefulness at the Battle of Appomatox Court-house, the final struggle in which the surrender of General Lee brought the great conflict to a close.

On the conclusion of the war, the "coffee-waggon" was broken up, and its various constituent portions were sold to different parties. When Dr. Crane was travelling through the United States in search of the various objects which formed a part of the "sanitary collection" of the Paris Exhibition, he heard of the famous "coffee-waggon," its patriotic and humanitarian exploits, and the ignominious conclusion of its brilliant career, and forthwith determined to hunt up its scattered members, and to perform, in regard to them, the feat of "putting together again," which, in regard to the "Humpty-Dumpty" of the nursery-rhyme, "all the king's horses and all the king's men" are said to have failed to accomplish. Fired with this bold resolve, that gentleman set off to a factory in the interior of Pennsylvania, where he had learned that the boilers of the "coffee-waggon" were doing duty in the manufacture of soap; traced the fore-wheels to a village in New Jersey, the hind wheels to another point, the coffee-pots to a third, the fire-place to a fourth, and so on, gradually picking up the *disjecta membra* of the useful public functionary whose services, he felt, should have ensured for it a more honourable treatment. Having thus succeeded in recovering the various portions of the "coffee-waggon," with the exception of one or two small pieces that could not be found, he put the whole into the hands of a clever carriage-builder of Philadelphia, who supplied the lacking bits, and restored the whole concern to its primitive state of serviceable completeness.

The resuscitated coffee-waggon, having figured with all due honour in the Paris Exhibition, was destined to render admirable service during the siege of the great capital; it accompanied the ambulance waggons when taken out on their sad errand among the victims of the battle-field, and distributed its welcome

largesses among the shivering crowds that hailed its appearance with demonstrations of satisfaction whose sincerity could not be a matter of doubt. By a singular coincidence, in keeping with the rest of its career, the "coffee waggon" was taken out by a party of the aids volunteer, to distribute its comforting beverages at the battle of Montretout, which wound up the last of the ill-omened *sorties* from Paris, and induced the surrender of the capital. As at the battle which concluded the American war, so at this concluding act of the sanguinary drama of the Franco-German campaign, the "coffee-waggon" worked bravely all through the fight; and it had the honour of numbering Baron Larrey, surgeon-in-chief to the French army, among those to whom it furnished coffee on that eventful day, and of calling forth from him enthusiastic expressions of admiration and approbation. And as though to complete the parallel in both cases, this vehicle, which had once more escaped the dangers of the conflict, was doomed to be again broken to pieces after it was over. It is not unlikely its strange and sinister appearance, its black smoke stacks, from which, from time to time, rolled out a still blacker smoke—may have caused it to have been taken for some monstrous engine of destruction, which was "firing up" for its deadly work. However this may have been, as the waggon was most pacifically standing at the close of the day in the neighbourhood of the little village of Rueil, a German battery suddenly opened upon it, and with such success, as to explode a second or third shot immediately under the waggon. Whereupon the terrified horses started off at a gallop, and tearing back into Paris, dashed it to pieces on the way; when they reached the ambulance, only the fore-part of the waggon was left. All the rest of the mechanism had been broken up, and had disappeared. But Dr. Crane having declared his fixed determination to regain possession of the pieces, a detachment of aids-volunteer set out at once to look for them, and succeeded in finding them, scattered in different places along the road, punctured with shot, and twisted and bent up, but, singular as it may appear, none were missing.

The various parts of the vehicle, thus again collected together, were put once more into the hands of a skilful carriage-builder,

and in forty-eight hours the coffee-waggon was brought back to the ambulance, so thoroughly repaired and rejuvenated, that it is now in better and stronger condition than ever, and ready for another campaign should the scourge of war be again let loose in Europe.

Desirous of rendering as much service as possible to the French wounded in the midst of the disasters of the time, the Committee had increased the capacity of its hospital to 100 beds. Some of the neighbouring landowners had also placed their villas at the disposal of the ambulance, for the reception of the wounded. It was thus able to receive a total of 150 patients, who were treated with an average of success that rendered abundantly evident the superiority of the system pursued, and, in the opinion of the most competent judges, settled the question of the relative merits of tents and of solid buildings, as receptacles of the wounded, decisively in favour of the former. Dr. Swinburne's highly successful exemplification of the beneficial action of conservative surgery, and of the re-formation of bone, excited the greatest interest among the medical men who visited the ambulance, in which oakum was employed in preference to lint, on account of its antiseptic qualities, and compresses of hot and cold water were mainly employed for dressings, to the exclusion of many of the usual applications. Of *seven* cases of amputation of the thigh, only *four* resulted in death ; while at the ambulance established in the Grand Hotel—with deficient ventilation, with carpets and hangings that absorb the impurities of the atmosphere, and thus generate gangrene—nearly *every case of amputation terminated fatally*, just as is always the case in one deadly ward of the great hospital of the Hôtel Dieu (the largest and oldest in Paris) where scarcely a patient amputated has ever yet escaped death from gangrene or pyæmia.

At the ambulance of the Grand Hotel the deaths have been said to have exceeded 45 per cent. of the number of cases treated. However this may be, the administration up to the present time has declined to make public its record. Now, in the far more economically conducted American ambulance, the proportion of deaths, before the engagement of Bourget, was only 3·33 per cent. After that date, fuel and provisions growing

short, and cold and hunger killing many of those whose wounds were healed or healing, the death-rate in the ambulance rose to an average of 19 per cent. But even this greatly increased mortality, due to circumstances beyond the control of the ambulance, and altogether independent of its system of medical and surgical treatment, still gave a result immensely in favour of the latter, when compared with the proportion of deaths and cures in nearly every other hospital of Paris. A comparison of the results obtained in the American ambulance with those obtained in all the other ambulances of the capital shows, therefore, that the aim which its organizers had mainly in view in setting it on foot, viz., that of demonstrating the superiority of tents over solid buildings in the treatment of wounds, the immense importance of hygienic conditions as means of preventing disease and facilitating cures, and the excellence of the surgical system developed in the United States through the experiences of the great American war, was completely attained. And lest he may be thought to advance rather his own opinion, or the opinion of those personally connected with the ambulance, the writer will here present certain extracts from articles which appeared from time to time in the Paris press, during the winter of the siege; and he does this with all the more satisfaction, since he is confident that while our pleasure and pride, as members of the American ambulance, will not be lessened by "seeing ourselves as others see us," he shall have also added to his narrative a few pages which may increase its historical value, and which may perhaps, at the same time, make better known to many of our countrymen the character, relations, and general importance of the ambulance and of our organization, when regarded simply from an international point of view.

Shortly after the battle at Chevilly, the editor of the "*Electeur Libre*," M. Picard, writes:—"Yesterday we visited the 'American ambulance' . . . is it necessary that we should dwell upon the scrupulous cleanliness of this ambulance, on the assiduous care with which our wounded are there treated. It is truly touching to see foreigners of wealth thus giving themselves up without reserve to this humane work. We have seen these gentlemen assisting the surgeons in their difficult work—holding the limbs

of patients, engaged in all the details of dressing wounds, and that, after having yesterday been even under the fire of the enemy, to pick up these same wounded. These generous men would be unwilling to have us give their names to the public; all that we are able to say is, that their benevolent devotion and their indefatigable ardour assure to them the gratitude of France, whose friendship was long since gained by the States of the American Union."¹

In another journal published about the same time, we read:—"A vast ambulance has been established by our American colony, whom neither the prospective bombs of M. de Bismarck, nor the dreary and desolate Grand Hotel, where the grass is now growing between the flagstones of the court, nor the want of butter and fresh eggs, nor that dire extremity—which we are already beginning to touch with our finger-ends—of being reduced to eat horseflesh, instead of truffled partridges, have driven from our walls. Never was a sacred work of sacred humanity better conceived, or better put in practice, than by this band of generous and devoted men, who, able to find security everywhere else, for themselves, their families, and their fortunes, have preferred to remain in our midst, to encourage us by their presence, and with open hearts and open hands, to give us their sympathy, their aid, and their succour—fraternal and so practical—in the terrible crisis through which we are passing."²

And we are told not only that the members of the ambulance were at work in the wards of the hospital, but that they were no less active in the field. "For the third time," says the Abbé * * * "I went yesterday morning to Bourget, in the hope the Prussians would give up to us more of our wounded. In fact, the evening before, after having sent us a few, they said on dismissing us, 'Come back to-morrow, and we will give you the rest!' Upon the Flanders road, deserted and gloomy, obstructed at every step by trees which lay in the way, we met the American ambulance, always at the very front (*au premier poste*), whenever it was a question of comforting courage in misfortune. I stopped to salute it," &c.³

¹ "L'Electeur Libre," Oct. 3, 1870.

² "Le Réveil," October, 1870.

³ "L'Univers," November 1, 1870.

It was about this time also that the ambulance was the subject of a notice, which, although it cannot here be easily reproduced, is nevertheless quite worthy of being mentioned, as it brought to the eye of many readers the character of the installation, and several of its distinctive features in a way more effective, perhaps, than could have been done by words. We refer to the large woodcut engraving of the ambulance which appeared in the "Illustration," of October 22nd, 1870.

We soon, however, began to hear it admitted not only that the Americans were labouring most earnestly in a humane cause, but that unusual successes were rewarding their efforts. "The American ambulance, established in the Avenue Uhrich, is one of those which up to the present time has given the best results in the curing of wounds. After the combat at Chevilly, Dr. Swinburne and his assistants obtained from the Prussians the restitution of a number of wounded French, all severely wounded, and their care has saved them all."¹

The attention of the Government was now particularly directed to the ambulance, and it became the object of numerous official visits; among these was one made by the Military Governor of Paris. His opinion has been recorded as follows:—"Last Sunday General Trochu visited the American ambulance, and expressed his complete satisfaction with the admirable installation of the different services as well as with the care taken of the wounded."²

About a fortnight later, "On Monday, the 21st of November, the Archbishop of Paris³ visited the ambulance, called American, because it was established by a society of Americans who have offered their services to France. In the tents we have a sample of an ingenious disposition shown at the Exposition Universelle; under these sails gracefully stretched out, so well ærated, so well warmed, our soldiers receive those cares for which we should show our gratitude. The skilful surgeon who performs the operations,

¹ "Paris Journal," October 31, 1870.

² "Le Petit Moniteur," November 6, 1870.

³ Archbishop Darboy, who fell a victim to the fury of the Commune the following May.

and all those who aid him, bring as much of heart as of science to this generous work, to which their sympathy for our country has inspired them. . . . The archbishop expressed his sincere thanks to the *personnel* of the ambulance, which he left after having blessed all the tents.”¹

So much general interest now began to be awakened by the establishment on the Avenue de l'Impératrice, that the journals gave up whole columns to descriptions of the ambulance, its pavilions, its organization, different services, &c.

In one of these descriptions, the writer says:—“The great American Republic was the first to recognize and salute her young sister—La République Française. If the doctrine of non-intervention in European affairs, which has been accepted as a principle by the statesmen of the New World, has not permitted the sending out of an army of succour to violently break the neutrality, proof is being offered at this very moment by acts that the sympathy of one people for the other is not affirmed solely by protestations and good wishes. Near the Bois de Boulogne, nobly mutilated, upon the right hand of that avenue which we used to call the Avenue de l'Impératrice, I do not know what they call it to-day, may be seen the ‘Stars and Stripes’ of the American Union. This pavilion floats over the entrance of the enclosure in which stands the American ambulance.

“During the long and rude trials which the terrible war of secession imposed upon them, the Americans had both the time and the occasion to study the most efficacious methods of taking care of the victims of battle-fields. It is the bloody fruit of their experience which they bring to us. Their ambulance may also be said to be a model of its kind. Setting out with the principle that hospital wards where the sick are commonly heaped together, are, to use the expression of Cabanis, magazines of corrupt air, the Americans have lodged our wounded under tents grouped together in picturesque disorder, yet separate one from the other The whole medical apparatus is carefully concealed, it only appears when indispensable. There are no herb teas, these are replaced by wine ; the drugs are

¹ “La Semaine Religieuse de Paris,” Nov. 26, 1870.

purchased of the butcher, and the apothecaries are left to advertise.

"The ladies of high social position, who serve as nurses, give to these tents the appearance of drawing-rooms, they possess an amiable charity, and double by their grace the value of their services. They read to the sick, tell them stories, and do not refuse, in case of need, to play with them a simple game of *écarté*. If our wounded generals were not thirsting for revenge, there are some of them, I am sure, who would fear lest they might be cured too soon

"We have visited with grateful emotion the American ambulance, and we rejoice, even in the midst of our sadness, to see the knitting of those bonds, already so strong, which unite two great peoples. Let the benignant smile of peace fall upon us, and of this frightful catastrophe we will only preserve the remembrance of the generous sympathies of those who showed themselves to be our friends in spite of all. It is the *quarum meminisse juvabit* of the poet, an expression profound—alike sad and consoling." ¹

A few days later, a remarkable editorial article, entitled "A Visit to the American Ambulance," appeared in the "Official Journal" of the French Republic. This article, which nearly filled the journal, extending as it did over two whole broadsides, entered into many descriptive details, which it is unnecessary to repeat here; its character and sentiment, however, will appear in the following extracts. "Do you remember—so thoroughly has all Paris forgotten the way—do you remember that broad long avenue, to-day without a name, which from the Arc of Triumph leads to the entrance of the Bois, as we still lately said? It is there, upon that splendid and frivolous highway, a sort of neutral ground for the world of fashion, that as evening came on so many carriages used to pass, bearing—some towards the lake, and some towards the Champs Elysées—all those magnates, and all those parvenus, *magnates* by inheritance or through their own personal successes, *parvenus* by the politics of December, or by schemes of finance, *interlope*, or other. On

¹ "Constitutionnel," November 22, 1870.

the horizon, on the summit of a green hill, rose a large white mass, like one of those constructions which our Poussin loved to throw into the background of his landscapes ; the *silhouette* was beautiful to look upon when flooded with the golden mist of sunset ; it still is—it will always be. The white mass is the noble fortress of Mont Valerien ; and should you perchance go towards the Bois, where to-day are encamped so many brave and resolute troops, it is not unlikely you may hear the formidable reverberations which come from that now unwooded hill. . . .

“ In one of the largest villas, on the left of the great highway to the Bois, is the military hospital of Ducrot’s corps, skilfully and intelligently directed by Dr. Sarrazin. Exactly opposite, on the other side of the avenue, you observe some tents and flag-staffs. ‘ What’s that singular encampment ? ’ you inquire, or perhaps even you ask in a careless way, ‘ What’s that ? ’—indifferent, before you see the red-cross flag. ‘ That ? That is the American ambulance, let us go in, and take my word for it, we shall have there many things to see as well as to learn. . . . When we first made this eminently profitable pilgrimage, by a chance fortunate for us, it was at the very time General Trochu was himself visiting the ambulance, distributing well-merited felicitations to those heroes who have been wounded before Paris, and putting one down for the military medal, and another for the ‘ Cross.’ The day was declining ; the attendants were passing holding in their hands the spherical lanterns, which they were about to hang up in the tents ; and when, not having yet gone within them, we perceived without, the light shining through the walls of simple canvas, upon which were sketched even the profiles of the beds on which the wounded were lying, we were unable to refrain from exclaiming ‘ How is it possible to keep within these constructions a suitable and uniform temperature ? ’ A Frenchman—let us confess it, in a whisper and *entre nous*—a Frenchman could scarcely be a Frenchman, if he did not begin to doubt a little about the excellence of what he has not seen. We are all of us born with a critical sense extremely developed, and we are very fortunate, if it is not with a fixed determination to admire nothing which is not made at home. However low we may have pronounced these

words, perhaps our guide may have overheard them ; be this as it may, we were simply invited to ' Come in.'

"The day was sombre, cold and damp, nevertheless, the moment we had entered, we found that we were breathing an atmosphere pure but not dry, and at the same time comfortably warm. The temperature was uniform throughout the whole length of the pavilion, ranging from 15° to 18° (centigrade.)

"The atmosphere was healthful, as we have already said—and that is easily to be understood, renewed as it constantly is by an ingenious system of heating, and doubtless also by its easy passage through the thin walls ; thin—we admit it, but which only let the air escape which has been utilized in respiration, or rendered impure by vitiated emanations from a thousand causes readily understood, without permitting, the least in the world, that without to enter except by the ways desired and beforehand prepared. In fact, nothing could be simpler, or altogether more ingenious than the system of heating and of ventilation employed here, for it is the system of heating which secures the ventilation." Here follows a long and very clear account of the system of heating and ventilating employed, after which the writer thus continues:—"Is it now understood how it is brought about that one may breathe under the tents only an air warm and healthful ; and is there occasion for being astonished that, as a consequence, where the American system is applied, everybody should be absolutely ignorant, or as much as it is necessary to be, not only of what purulent absorption (scientifically called pyæmia) and hospital gangrene may be, but even of the fever, which is not a necessary consequence of a wound ? In truth, none but those who have been really wounded are admitted to the tents ; no sick are received there, and this in the common interest of both. . . . We have dwelt at length upon that single point aëration, and we do not regret it . . . yes, this secured, the air constantly revived and maintained at a temperature always uniform (we do not pretend to say that in France we have not sometimes obtained this desirable result by other and less simple means), this point secured, it was for us an assured guarantee that the rest of the American system was conceived in the same eminently practical spirit. Our anticipations have not

been disappointed. Go there, if you will, in doubt, you shall leave with faith!

“To understand it all, you should go out with the ambulance waggons, pick up one of our wounded in the field, and sympathetically follow him day by day until, convalescent, he is sent to the branch establishment on the other side of the avenue. But how can we describe in all their details, which we ought perhaps to do, these ambulance waggons, so light, so comfortable, so simple, and so perfectly suspended that the jolts of the road are scarcely felt by the wounded? Whatever our desire to do this, it may suffice in this place to say, that each one of these waggons can carry anywhere in the field four men seriously wounded, and consequently lying down; that these men can be placed in the waggons without change from the stretchers and leather-cushioned seats, which become stretchers in the twinkling of an eye, by pulling out handles encased in telescopic slides at the four corners. The seats or mattresses are furnished with wheels, which, when the mattresses are open upon the floor of the waggon, rest on strong and flexible springs. The stretchers above are sustained by leathern thongs. The air circulates freely within the waggons, and finally there is a water tank in the side of each to provide a supply of water, that supreme demand at certain moments, and the indispensable auxiliary of the first dressings. . . .

“Every morning Dr. Swinburne, a gentleman as modest as he is well informed, accompanied by his aids, attends to the dressing of the wounded. Formerly Port physician of the city of New York, he was travelling in Europe when the war broke out; his devotion has kept him here, to assume the noble task which he is fulfilling with such admirable zeal. . . . Aid nature, instead of affronting her, such is their device, and such is henceforth, we know, that also of our greatest French practitioners; it is for ever the admirable and simple expression of our own Ambroise Paré, ‘I dress his wounds—God cures him!’

“Our helpful Americans do not make use of the common lint—that lint which so many charitable fingers here among us laboured painfully to prepare—theirs is made of a sort of tow, obtained from old ropes coarsely picked, the tar with which it is impregnated playing an important antiseptic rôle in the course of the cure.

"We hardly need to add, after all this, that at the American ambulance every one is a declared partizan of conservative surgery—that delicate art which is, happily, also in honour among us. . .

"And now a word about those who extend these unremitting attentions to our wounded, who generously offer them these effective consolations, shall they find us indifferent? No. How could we fail to recognize that which they are doing for us, if it was only by showing how singularly practical are the ideas of those excellent surgeons, who have come from the other side of the Atlantic to place at our service, with so much generosity, their incontestable science and their indefatigable devotion? How could we forget to thank them for their sacrifices and their humanity, those Americans of Paris, who have borne among themselves all the expense of this hospital establishment? How could we fail to find a word of grateful acknowledgment for those ladies of the American colony, who have remained in our invested capital, when they come to seat themselves by the pillows of our wounded, on whom they wait with all the affectionate grace which a sister could show a brother? Do we not know them all by name, these noble voluntary nurses, from whom we have so many times seen, and never in vain, our brave boys asking help with filial deference? We shall be excused for having passed over in silence many technical details to which we might have usefully referred, but we should not have accomplished, even now, half our task had we stopped, only to enumerate, the new curative expedients—perhaps still unemployed in France—in a word, the innovations of every sort for which hospital science is indebted to the Americans, who themselves were taught by that long and cruel war in the course of which Lincoln fell by the assassin's hand, and Grant became so illustrious."¹

In another journal we read:—"Among all these ambulances, whether old or new, which exist at Paris, there is one distin-

¹ "Journal Officiel de la République Française," November 27, 1870. The whole article was republished in the "Gazette des Hôpitaux," January 26, 1871, under the title of "Documents pour servir à l'Histoire du Mouvement Scientifique pendant le Siège de Paris."

guished by its organization, and particularly by its system of installation, the American ambulance, No. 36, Avenue Uhrich. A rich and sumptuous residence was not selected for the establishment of this ambulance, but simply a large unoccupied plot of ground, now marked in the distance by two enormous flag-staffs, one of which supports the Geneva flag, the other the American national colours. Here, since the beginning of the war, a little colony of assistance and benevolence has been at work, which owes its origin to Dr. Thomas W. Evans, who, while in England preparing many things necessary for the completion of this ambulance, wholly American, was prevented from returning to Paris by the investment of the city. . .

"The grounds have been agreeably improved, by the setting out of a great number of pines, which have been brought in from the Bois de Boulogne. It is amongst this shrubbery that the tents have been pitched, and it is under these tents that every comfort for the care of the sick has been collected. . . A visit to the ambulance waggons is worthy of a special mention, by reason of the comfort with which the wounded are carried in them. The "Société de Secours aux Blessés" has, in fact, recognized and adopted the different ameliorations of this service. There is no occasion for us to render homage to the devotion of the persons attached to this ambulance, nor to the united efforts of the American colony which contributes to its support. The attentions which our wounded receive there are the best testimony to this fact. In front of the ambulance is a large house which serves as a convalescent establishment, for those who have been cured, and they are many."¹

Another journal of nearly the same date observes :—"It is but just to acknowledge how nobly the citizens of the United States have recognized and returned, during this war, the fraternal hospitalities which we have extended to them in times of peace. Neither the minister, Mr. Washburne, nor the First Secretary, Mr. Hoffmann, has left the American legation ; and this is saying not a little when, as is known, there is in Paris

¹ "Le National," December 11, 1870; and republished in the "Gazette des Hôpitaux," March 21, 1871.

with the exception of the honourable gentleman whom I have just named but one other foreign minister—M. Kern, of the Swiss Confederation. This, however, does not express the extent of the earnest goodwill of the Americans towards us; they have also established an ambulance for our wounded, and the curious construction of their improvised hospital brings to mind those which they so happily devised during the War of Secession. . . . Everything is in the most perfect order, and the cleanliness is most exemplary. Here ladies take care of the wounded—ladies of society—and they tend our wounded with that earnest solicitude, that watchful and maternal attention, of which woman—in every country, in every climate—alone has the secret. These precious cares will contribute not a little to the healing of our brave soldiers. Among these American ladies who are taking care of our wounded, I have seen more than one still young and pretty—that which can do no harm, and may even singularly assist the cure.

“All are delighted thus to recognize the hospitality, which France has always so generously exhibited to all the world, and especially, in these later years, to the American people, who, it may be said, have made of Paris their veritable capital. As I was leaving the ground with emotion, after all I had seen, ‘We owe you all this,’ said one of the ladies to me; ‘we are trying to pay off a part of the debt contracted by America with France in the time of Lafayette, and at the same time we wish to return something of the gracious hospitality which we have always found in Paris.’”¹

M. Gustave Lafarge thus writes about “L’Ambulance Americaine” :—“About half way down the Avenue de l’Impératrice, on the right, you perceive a number of tents, not a large number—a veritable little city of canvas—it is the American ambulance. You are at first surprised that the wounded can be treated almost in the open air, but if you enter you will very quickly change your first impression. It was in the United States, during the Secession War, that tent-hospitals, or open-air ambulances, were for the first time used on a large scale. There

¹ “La Liberté,” December, 1870.

were not in that country, as in Europe, vast and ancient edifices, convents and churches—everything had to be created; and the portable tent—*la tente volante*—established in the rear of armies constantly in movement, played a very important rôle. It offered the double advantage of securing immediate care for the wounded, and of leaving these wounded, who are young and vigorous, in the same conditions as they were in previously—that is to say, in the free air, instead of heaping them together in close and badly-ventilated quarters. Let no one fear that bronchitis and other diseases of the respiratory organs have been occasioned by this practice. Facts have settled this question. Fresh air has, moreover, the effect of increasing the appetite; and in this way, consequently, has also contributed to re-establish the strength of the sick.

“The most exact statistics have confirmed what European science has been affirming, under every form, since the war in the Crimea. Dr. Evans liberally placed at the disposal of the American ambulance all the *matériel* exhibited by him, in 1867, in the section of the International Society; and through his efforts the ambulance of the Avenue de l'Impératrice was thoroughly organized. His fellow-countrymen, imitating his zeal, have outdone one another in generously consecrating their time and their labour to the relief of our wounded. Let our warmest thanks be given to all those generous foreigners who, in these times of trial, forget their nationality to listen only to the voice of the heart, to the cry of humanity.”

After having described the tents, the heating apparatus, &c., M. Lafarge sums up the advantages secured by these arrangements as follows:—

“1st. The service of the establishment is carried on outside of the tents.

“2nd. All the heat of the stove—even that of the smoke, which is considerable—is utilized.

“3rd. One can at will, by means of the simplest registers—of sheet-iron, oil-cloth, and boards—regulate the temperature in all parts of the tent.

“4th. The temperature of the ground is equal to, if not above, that of the floor—it is constant, healthy, and free from humidity;

the ventilation is perfect; the air is regularly displaced in every part of the tent.

"In the very coldest weather, a sufficient temperature can be maintained inside of these American tents. During the severe weather of December, when the cold was 10° or 12° below zero (centigrade), the temperature was maintained within the tents at from $+12^{\circ}$ to $+15^{\circ}$, and that without forcing the fires.

"The waggons for the transport of the wounded are of the most comfortable kind, and, by an ingenious system, can be rapidly fitted with either seats or beds. Double interior springs prevent the least shock.

"The American ambulance has been established by an American Committee, who have met all the expenses necessary to maintain it

"Go and visit the American ambulance; not only will you meet there with the most gracious reception, but you will obtain from the lips of the wounded themselves the expression of their lively gratitude for the intelligent care they are receiving."¹

As the ambulance became more and more an object of interest to the public, so more and more frequent allusions were made to the remarkably excellent surgical results obtained there.

"It is already possible, by comparing the results obtained, to perceive the relative inferiority of certain of our great ambulances, and of the infinitely preferable hygienic conditions of certain others. But it has been absolutely demonstrated to-day, to every one who does not shut his eyes to the evidence, that the constant renewal of the respirable air is the principal curative agent in all those places where large numbers of wounded are brought together. The good aëration of hospital shelter concerns us more than anything else. A place where the air is constantly renewed, with an indifferent surgeon, would appear to us greatly preferable to an infected establishment, in which the operations were performed by the most skilful practitioner of the day. We are of those who, a truth once established, hasten to the application of that truth. The day when, for example, it

¹ "Le Figaro," 26 Janvier, 1871.

had been proved that the system of tent ambulances was the only one which rendered purulent absorption and hospital gangrene impossible, on that very day we should have established in Paris, cost what it might, fifty or a hundred encampments after the manner of that American ambulance, about which so much has been said during the last three months, but which it would have been much better to have simply imitated."¹

In the course of a review of a work written by M. Augustin Cochin, entitled "Le Service de Santé des Armées, avant et pendant le Siège de Paris," the reviewer observes:—"We shall close with this word 'virtues,' since every one in France has exhibited them in so far as the service of the wounded is concerned. There is room, however, for thanking M. Cochin for his book, which has accorded to each one the part which belongs to him in this humanitarian work. He has taken care, as a conscientious writer should, to obtain information about persons as well as things. Thus he has not attributed, as a journal recently did, the conception and the establishment of the American ambulance—that ambulance where the fewest wounded die—to any other than its founder, Dr. Thomas W. Evans."²

It possibly may be said by some cynically inclined person:—"But these are mere newspaper compliments, and everybody knows as well how cheaply they are obtained, as how to appreciate them." The writer of this History can only reply that, although absent from Paris during the whole period in which the ambulance was the subject of these friendly criticisms, he has every reason to believe them, as well as the expressions of recognition already cited, to have been the unsolicited and spontaneous utterances of a people who, whatever their faults, possess a delicate and instinctive sense of justice, which never suffers a service to pass unrecognized, or a favour unrequited. No ; they are not merely casual newspaper paragraphs. Every one acquainted with French journalism knows that one of its peculiarities—one of its excellences it should be said—is that scientific subjects are rarely alluded to, even in the most trifling way, except by scientific

¹ "La Défense Nationale," Dec. 14, 1870.

² "La Patrie," Jan. 19, 1871.

men. There is scarcely a newspaper which does not have its scientific editor, who is responsible for everything which appears in his department. Many of the finest contributions, even to French general medical literature, have made their first appearance in the columns of popular journals. But he will not discuss further the value of these opinions. Fortunately, it is needless for him to do so, as the same opinions have been expressed, and by others whose sincerity, whose competence, and whose inability to be deceived by *humbug*, even though it come from America, can scarcely be called in question—by the physicians and surgeons of Paris, nearly the whole of whom—of those whose names are as well known abroad as at home—have borne personal testimony to the excellence of the system exhibited in the American ambulance, and to the efficiency with which it was directed. Larrey, Nélaton, Ricord, Gosselin, Verneulle, Daremburg; how many names might we not recall! But we must let these gentlemen speak for themselves, and, perhaps, such written testimony offered by them as we now possess cannot better be introduced than by some extracts from an article written for the “Temps” by M. Francisque Sarcey, a well-known and distinguished, French literary gentleman. If M. Sarcey writes, it will be observed that Dr. * * * speaks, and we can assure the reader that Dr. * * * is no literary fiction. Says M. Sarcey:—“I met a few days since one of the thousand acquaintances which every Parisian, a little known, has upon the Boulevard—a physician by profession, distinguished, I might almost say celebrated, in a certain surgical specialty, and who like most of his *confrères*, is attached to one of our numerous ambulances. The conversation fell naturally upon the subject of ambulances. He was full of it, and it happened also that I was a little acquainted with it, being very intimate with one of those persons most occupied with the direction of the ambulances of the Press. I had also once studied with great care the remarkable work of Dr. Chenu, with the intention of making, in my turn, and with his facts, a campaign against the organization of the medical service in our armies.

“‘You are interested in this?’ said he, ‘very well; and you have probably visited the American ambulance?’ I con-

fessed that I had not. 'Then I must take you there. Ah! my friend, those people there are our masters. How simple, ingenious, and practical, in everything connected with its organization. It is made of nothing, as we should say. Their installation has scarcely cost twenty thousand francs, and they have a hospital the most healthful, the most convenient, and the best furnished with all needful things—the model hospital—the hospital of the future; and permit me—you can render a great service, you journalists.' What service do you allude to? 'I will tell you. Our most eminent physicians have visited this ambulance. I have met there Nélaton, Ricord, Jules Guérin, Démarquais, and others. They have pronounced it excellent; but to get excited upon the subject, to burn resolutely the false gods, to create a revolution in our whole system, I will not say of ambulances, but of hospitals, this is a very different matter. Every physician in Paris should go and see, and convince himself with his own eyes of the superiority of the American installation. The public should come to the rescue, that administrative routine may be forced out of its absurd paths by a vigorous and irresistible pressure of opinion. We have long known these things by theory, and we have said them; but to-day the facts are before us—evident, and flashing light into the most prejudiced eyes. Profit by the opportunity, cry out in the journals—in yours; for the medical gazettes are only read by a profession which it is useless to convince. It is through the ignorant and the humble, through the crowd, that important reforms and great revolutions are effected. Remark,' he added, 'what a distance there is between theory and practice. You have occasionally had the pleasure of talking with Dr. Chenu. You have read his great medical and statistical work concerning the wars of Italy and the Crimea. You know the conclusion to which he arrived, and which he has presented with marvellous force. He has demonstrated, and by an infinite number of invincible proofs, that every agglomeration of wounded shut up in close and badly ventilated places was exposed to hospital gangrene and death. He was the source in France of that great movement of opinion which has condemned vast sedentary hospitals. Very well; he is now at the head of an

ambulance, and where is it established? In the very heart of Paris, at the Grand Hotel! In rooms, which, on one side, only receive their light from passage-ways, and on the other, from a closed court covered with a glass roof. Observe that these apartments are stuffed with curtains, which absorb and become impregnated with miasms; that the passage ways are covered with carpets, which perform a similar office; that the air circulates badly, and is unrenewed, and yet air is the first of our restoratives. What shall I tell you? I doubt if I ought to give you the figures, for they are terrible. There have been twenty amputations of the thigh at the Grand Hotel, and out of these twenty cases there have been twenty deaths. We cannot doubt the skill of our surgeons. I assure you, all false modesty aside, that we operate as well, not to say better, than our American neighbours. But the surrounding circumstances are unfavourable. You cannot imagine—you people of the world—the subtle influence of infection on open wounds. There is at the Hôtel Dieu a ward which faces the river, where hospital gangrene is endemic. Never has an amputation succeeded there.' Very well, said I, let them put the amputated somewhere else, that is very simple. 'Very simple! I see you are still an innocent, my dear fellow. Nothing is simple in administration in our country. A sick man is brought in, there is an empty bed. The sick man has a number, and so has the bed. The sick man is put in the bed, and he dies; but there is nothing to be said, the number was in its place, good order is preserved, and the register is correct. Everything is for the best in the best of administrations. And what if I told you that the rent of the Grand Hotel costs the 'Société de Secours' 500 francs a day,—500 francs! when for 30,000 francs upon the Trocadéro, or in any one of our avenues, these gentlemen could have established barracks, healthy, convenient, elegant even, as the Americans have done!'

"He said to me many things besides, which I do not repeat, some because I do not remember them, and others because I remember them too well, and all truths are not to be written out in a journal. The next morning, however, he took me in his carriage to the Avenue de l'Impératrice, and to the

American ambulance. I had invited one of my *confrères* to accompany me, M. Armand Gouzien, who was the director of one of the ambulances of the Press, and was much occupied with their organization. I was very desirous that he should see with me these pretended marvels, and give me his opinion of them.

"The interior appearance is charming, it is that of a camp in a grove, the tents are pitched at intervals." After describing the tents, barracks, heating apparatus, &c., the writer continues:—"Nothing could be neater, more convenient, and I shall also say more beautiful, than this installation. On entering, you do not perceive that insipid sickening hospital odour, which occasions a nausea among those little accustomed to these places. It is clear that when dressings are being made, the gases which rise may be disagreeable, and it may require a little practice to get over the disgust which the spectacle occasions, but the odours escape quickly, thanks to the abundant openings, and it is scarcely, if at all, that they pass from one tent to the other. . . .

"We were received by the surgeon in chief, M. Swinburne . . . and by M. M***, who speak our language with the greatest purity, and who gave us answers to all our questions with the most perfect courtesy; and it would be impossible to accuse them of having had in view, by so doing, any publicity through the press. My name, I confess it very humbly, seemed to suggest nothing to them, and whatever special attentions were paid, were offered, as was proper, to my two friends, who were of the party. And they were in ecstasies over the admirable simplicity, according to them, of certain methods of placing the person in bed and of dressing wounds, which Gouzien declared he would have tried for certain cases of fracture in the ambulances of the Press. Not being learned in such matters, I must confess that I only half appreciated the ingenuity of these inventions; but that which struck me there was the evident fondness for practical methods, in the solution of the most complicated problems of surgery—methods which were at the same time convenient and elegant. To do much with little, without trouble and without expense, to employ that which is at hand, modifying it ingeniously to suit the case presented—this is the ground-

work of their system; no outlay for the apparatus, none for setting it up—they have no other vanity than that of curing their patients. . . .

“And here again my doctor spoke, ‘When it was a question of constructing the Hôtel Dieu, the medical commission then consulted did, in fact, write a report condemning the project. But it was satisfied with this platonic and sterile protestation. We all should have had the courage to say, we have no wish to be the accomplices of the assassinations which are about to be perpetrated in that vast charnel house; we shall, as a body, send in our resignations. Perhaps the proposition would have been withdrawn, and yet I am by no means certain of this; for in France, and this is a truth which cannot be too often repeated, hospitals are not constructed for the sick who die in them, but for the officials who live on them.

“‘Of all the Parisian hospitals, the best arranged, the one which has been constructed with the greatest care according to all the rules of science, is the hospital Laripoisière, and the mortality there is frightful. In other words, it is a *great* hospital. It is in vain to ventilate, the miasms penetrate the floors, incrust the walls, dance in the air which is breathed, and transform in a twinkling an illness of little consequence into a mortal malady. The Cochin hospital, on the other hand, was *devilishly* built; but it is small; there are very few sick there, and they get well. . . . The Americans have given the last blow to the prejudice—the hospital as it exists in France, as routine has constructed and maintains it, must be *killed*, and we shall reach our end.’

“So spoke my friend, and with an eloquence of conviction which I cannot render. Is he right in all respects? this I am unable to affirm, but his ideas have appeared to me to be worth at least a public presentation. A visit to the American ambulance will, I have no doubt, prove useful to persons who are occupied with these questions, and they are now many. Already the Direction of the ambulances of the Press are about to establish on the Rue de la Pompe, barracks constructed on the same system, and they hope to derive from them excellent results. This deplorable war will have had at least the advantage of introducing into practice

those principles of hygiene already commended by most of our great surgeons.”¹

Says Dr. Dusart:—“The approval with which my article in the “*Rappel*” on the ambulance of the Champs Elysées has been received, has convinced me that my opinion is one shared by the immense majority of the medical profession. The rôle of the physician should not be limited to a criticism of established things; he ought, above all, to seek out the means of doing better. Acquainted therefore with the admirable results obtained by American surgeons during their own late war, and wishing to examine, *de visu*, the means employed to obtain them, I went to the ambulance established by the American International Sanitary Committee, in an open lot on the Avenue Uhrich—ex-Avenue de l’Impératrice. Very cordially received, I have been able to see for myself all the details of the organization, concerning which the gentlemen in charge were anxious to give me every possible information, with a courtesy which I am here extremely pleased to recognize.

This ambulance is composed of several long tents, in each one of which are twenty or twenty-five beds, disposed in two lines, and only separated from each other by a distance of about five feet. At first one is inclined to fear lest such a number of wounded, in so restricted a space, might produce a serious vitiation of the atmosphere. One is therefore not a little surprised on entering, to breathe an air absolutely pure, without any trace of odour, and maintained at a mild and uniform temperature—results which are scarcely obtained in the best kept wards of our Paris hospitals, and which offer a striking contrast with the disagreeable smells and frosty air of the wards in the Palais d’Industrie. This is due to the free circulation of air obtained by the construction of the tents and the system of heating.

“We may notice also the system of dressing wounds—oakum and warm-water dressings, covered with oil silk. Under these circumstances, we have in no wise been surprised, to find all the

¹ Francisque Sarcey, in “*Le Temps*,” December 21, 1870. A large part of this article appears in M. Sarcey’s “*Le Siège de Paris*,” a book which had the rare fortune to run through *twenty-four* editions in the course of about six months.

wounded with fresh, rosy complexions and cheerful countenances—signs of a well-being which all were earnest to announce. All the men whom I questioned affirmed that the only fever they had had occurred during the twenty-four hours immediately following the fight. . . . The chief surgeon and his aids are surrounded by their compatriots—rich for the most part—who, under their direction, go on to the field of battle to pick up the wounded (we know that their bearing and their zeal were much remarked during the action of the 21st), and who accept within the ambulance the humblest functions. The female nurses are American ladies, who, in a simple, unaffected way, take the most devoted care of our wounded, who acknowledge the same in never-ending praises. . . . We will not finish without saying a few words in regard to the means of transportation, and especially of the waggon (Evans's), in which the stretchers are suspended by means of leathern thongs. It can carry ten men slightly wounded, or four men seriously wounded, who can lie down comfortably and be lifted in and out upon their beds, without change or jolting. A water-tank under the seat supplies water, either for drinking or for use in the first dressings. The ambulance thus organized is capable of receiving one hundred patients, and yet all this material—tents, pharmacy, offices, &c.—cost only the extremely small sum of 25,000 francs. Let a comparison be made between these figures and those of the "*Société de Secours aux Blessés*," and especially let the *results* on both sides be compared, and it will be seen that, upon the matter of hospitalization, as well as in many other subjects, this people, so essentially practical, has the very best title to be considered as our model.

"France will owe to the intelligent and devoted efforts of the American colony the privilege of seeing many of her soldiers returning to the army after a short treatment, while many of the wounded will have preserved their limbs, which anywhere else would have certainly been cut off."¹

As with the secular press, the praises of the medical journals were by no means restricted to the organization and administra-

¹ "Le Rappel" du 16 Novembre, 1870.

tion of the hospital on the Avenue de l'Impératrice. The transport corps, the "aids volunteer," and their prompt and efficient services, were fully recognized. Represented at every battle or important skirmish in front of Paris, we have been told by the Abbé * * * how they were always first in the field; a medical writer has told us how they were the last to leave it. It was at the battle of Champigny; the corps had been out all day, having left the ambulance before daybreak; twice had the waggons returned loaded with wounded; the day was severely cold; the men were greatly fatigued, and the horses perhaps still more so, for it had been impossible to obtain a change. Just after sundown a squad of volunteers left the ambulance on a third trip to the field. The results of this trip are thus alluded to:—"The firing had ceased. We were not the only ambulance corps on the ground. The ambulance Chaptal, under the direction of M. de Pressensé, I think, and the American ambulance had there each their waggons and a squad. We went forward with the chief and two stretcher-bearers of the American corps, one of whom, understanding German, served as our interpreter. It was dark, but we had a lantern and our flag, and we went on towards the Prussian outposts. . . . One of us cried out in French, 'Ambulance,' and our interpreter repeated this in German, and the Prussians permitted four of us to advance. The chief of the American squad declined to give his titles, and presented us as French doctors. We found a number of wounded. . . . The chief of the American squad was alone permitted by the Prussian officers, to go on farther. . . . He, however, soon returned, telling us he had found fifteen or twenty more wounded . . . but all our waggons were full, it was now ten o'clock, our stretcher-bearers were exhausted, and we were forced to return," &c.¹ But to complete this incident, it may be said, that the "chief of the American squad" did *not* return, until he had placed in his own waggons several of the wounded whom he had found, and whom he conducted safely to the ambulance late at night.

In an article in the same journal, the "Gazette Médicale de

¹ "Gazette Médicale," Dec. 1870, tome xxv. p. 610, and reproduced in the "Gazette des Hôpitaux," March 9, 1871.

Paris," Dr. de Rause, the editor, writes as follows:—"There is a very general disposition in France to give credit to whatever may come to us from abroad. The American ambulance was therefore, from its very origin, destined to have a certain success. In the 'Gazette Médicale' we never yield to such considerations, but we like to be just towards every one, and to point out the good wherever we may chance to find it. We have visited the American ambulance twice." The writer here enters upon a description of the *matériel* of the ambulance, &c., and observes, *en passant*, "American surgeons are accused generally of an over fondness for operating, on the contrary, we have noted with pleasure the efforts—efforts crowned with success—of their conservative surgery. We have thus seen several cases of comminuted fracture of the femur in the course of cure. . . . M. Swinburne is the only surgeon at the ambulance (Dr. Johnson having the title and acting as consulting physician). His aids are for the most part gentlemen devoted to this charitable work, and who support it alike with their services and their fortunes. The artists appear to even rival the bankers, and we have seen one of the latter dressing a man whose shoulder had been resected—one of our *internes* could have done no better."

Dr. de Rause compares the results of his inspection of the various ambulances of Paris, and unhesitatingly awards the palm to the American tent-hospital in the Avenue de Uhrich. Having shown the superiority of its arrangements in regard to ventilation, temperature, and all the other details of its material installation, and emphatically affirmed the immense superiority of its hygienic arrangements, and of the results of its "conservative surgery," Dr. de Rause thus sums up his convictions on the subject:—"A revolution in our system of hospital hygiene is therefore necessary, imminent, and, we may add, already begun; witness the tents just established in the Luxembourg Garden, the huts in the Garden of Plants, and those which are about to be inaugurated in the ambulances of the Press. Let us hope that this revolution will be complete, and that in a few years' time, not a stone of our present hospitals will be left standing, unless, indeed, those buildings shall have been devoted to some other use."

The "Union Médicale" speaks of the ambulance as follows:—

"Not far from the barrack-hospital at Passy, in the Avenue Uhrich, formerly Avenue de l'Impératrice, is the American tent-hospital; we visited it recently." After having described the construction and organization of the ambulance, the writer observes:—"We entered all the tents, where were assembled a number of wounded relatively considerable, and we can assert that we noticed no disagreeable odour. . . Such, in a word, without entering into further details, is the American tent-ambulance. We have mentioned it in connection with the barrack-hospital near by to show our readers the differences in the two systems. We shall be able later to appreciate by comparison the services which each may have rendered. It was useful, it was desirable that an experiment should be made on a large scale as to the value of temporary constructions for the sick and wounded, as compared with convents, old buildings, and ordinary hospitals. It was necessary to abandon the old routine, and to test the new system which had already been tried in the United States during a four years' war, and whose advantages had been recognized by all the surgeons of the country.

"Let us hope this new experiment will not be fruitless, and that it may confirm the results already obtained. While the genius of destruction multiplies its ravages and accumulates ruins, it is a consolation to believe that the genius of conservation—less powerful, alas—has been able at the same time to make a step forward. We shall be happy if in the midst of this bloody orgie of force we have been able to save a few lives more than usual."¹

In a *Thèse*, entitled "A comparative Essay on the relative Merits of the Principal Military Hospitals established in Paris during the Siege of 1870-1," presented by M. Gustave Monsnereau on the 17th of March, 1871, to the Faculty of Medicine of Paris, the author, after alluding to the extreme obligingness manifested in almost every case on his visits to the various military hospitals of the capital, "and especially by the heads of the American ambulance in the Avenue de l'Impératrice," and

¹ "Union Médicale," Feb. 4, 1871.

having observed that he reserves his remarks on the latter until the last, "its special arrangements demanding a special study," thus sums up the results of his examination:—

"I have reserved for the last, as being the most important, the American ambulance, for it has, in fact, appeared to me to deserve an attention altogether special, in consequence of the peculiar arrangements by which it is distinguished, arrangements which deserve to be studied, especially by those who in future would establish an ambulance.

"At the American Ambulance there are no houses, there are not even boarded barracks, excepting for the offices, pharmacy, kitchen, guard-room, &c.; there are only simple sail-cloth tents, supported in the centre by wooden standards, and fixed outside by ropes fastened to solid wooden stakes driven into the ground. The covering of each tent is double; the inner one is furnished with small square windows which can be raised outwards, and which, when thus raised, push apart the two coverings of the tent. The cloth (*cotton-duck*) of which these coverings are composed, is impermeable, and not a drop of water can penetrate it, even though it should remain for a long period exposed to the rain; but this impermeability to moisture does not prevent the air and the light from entering, and the tent is lighted only in this way. The air, passing through the entire covering of the tent, and not as in our best constructed ambulances, only through a few windows, is renewed incessantly but gradually, and without draughts of air; a renewal which is facilitated by the openings of the inner covering, and which, as there is no opening in the outer covering, cause none of the draughts which are so prejudicial to the sick." After a detailed account of the system of heating, &c., the writer continues:—"I feel justified in affirming that the American ambulance is the best of all the ambulances established in Paris. . . . This superiority of the American ambulance has been admitted by the most eminent surgeons of Paris, and an attempt has already been made, by Dr. Depaul, clinical professor of midwifery, and Dr. Dubreuil, assistant professor and hospital surgeon, to apply the American system by establishing two similar tent-hospitals, of thirty beds each, in one corner of the Luxembourg Garden; and

these tents appear destined to give excellent results." After alluding to the beneficial effects of the substitution of oakum instead of lint, and of the liberal system of feeding the patients according to the requirements of their state of health, and not according to wholesale regulations, often insufficient or wholly inapplicable, the author thus sums up his conclusions in regard to the subject of his essay:—"At the American ambulance the deaths have been only five per cent.; of seven amputations only three have died; there has not been a single case of hospital gangrene, and not one case of purulent infection. These figures speak for themselves, and suffice to demonstrate the superiority of the American ambulance."¹ In an article which appeared in the "*Gazette Hebdomadaire de Médecine et de Chirurgie*," entitled "*Les Ambulances pendant le Siège—l'Ambulance Americaine—une Expérience sur les Hôpitaux Tentes*," Dr. Hénocque writes as follows:—

"The American ambulance merits the special attention of the public and of the press. The installation of its little camp in the Avenue de l'Impératrice presents a most charming appearance; while its fine ambulance-waggons, drawn by superb horses, have carried the American flag to every point of the field on which an engagement has taken place. Several newspapers gave accounts of the successes achieved by this system of ambulances, and the favour of the public was speedily acquired by the tent-hospitals. But the winning of public favour was by no means the aim which the organizers of the American ambulance had proposed to themselves; what they wished to do was to demonstrate, by actual experiment, that tent ambulances are as suitable for the treatment of the wounded in a besieged city as in the wake of armies in the field. It is because the conditions of this experiment have been rigorously observed that it becomes our duty to call attention as seriously to the methods employed as to the results obtained by them. . . . The interest of the wounded, as well as that of science itself, demands this study." After describing the peculiarities of the ambulance, and of the

¹ These statistics were true when given to M. Monsnereau.

treatment adopted in it, Dr. Henocque continues:—"Such was, in short, the nature of the establishment; but, to render evident its advantages, it was important to bring the wounded to it under the best possible conditions. We know how greatly the death-rate varies among the wounded, according to the longer or shorter time they have been left upon the field of battle—according to the degree of promptitude with which they have received a first dressing—according to the degree of temperature to which they have been exposed during their transport from the field—and according to the violence of the shocks (so often fatal) to which they may have been subjected during their transport. In regard to this last condition, thanks to Dr. Evans, the American ambulance has been able to make use of the most perfect methods of transport that have ever been seen in Paris. The waggons, which were offered to the examination of the public during the Exhibition of 1867, have excited equal admiration on the battlefield, by the rapidity with which they effected the carrying off of the wounded, and also by the eminently convenient and easy transport obtained by their method of construction. . . . One result of the siege must be to settle the question as to the relative value of tents, barracks, and ambulances established in large buildings. When this point is settled, we shall no longer have the right to be found unprepared; we shall understand the necessity of preparing, in time of peace, the elements of the most effective help that can be given to the wounded in time of war. . . . In conclusion, I must be permitted to thank Dr. Evans, who has been the promoter and the support of the American ambulance, Dr. Crane, who has been its organizer, and Dr. Swinburne, for the extreme goodwill with which they have facilitated my examination of all the details of the experiment so skilfully conducted by them."¹

Such have been the recorded opinions of the medical press. But we have mentioned the names of some who were our frequent visitors, and who are the most illustrious living representatives of French medical science—all expressed the interest they

¹ "Gazette Hebdomadaire de Médecine et de Chirurgie," tome viii. pp. 113-117; 17 Mars, 1871.

took in the experiment, and their gratification in view of the manner in which it was being conducted—how unreservedly, how completely, the simple lines written by M. Nélaton upon a card which he left at the ambulance, will perhaps best show:—“ You have here shown what great results may be obtained with small means.” And Baron Larrey, when he declared before the Académie des Sciences, in June, 1871, that “ the question of employing tents and tent-barracks seems to have been judged to-day by an experimental trial the most complete as well as the most favourable,”¹ bore testimony to the value attached to our labours so complete, that had we been able to record no other, we still should have felt more than rewarded for all our efforts to introduce into European armies an improved system of field hospitalization.

Indeed, the interest taken by the medical profession of Paris in everything which concerned the ambulance was very great. Scarcely a day passed during which some well-known name was not entered in the list of visitors—during which some new testimonial of approbation had not been offered. No sentiment of professional jealousy was ever exhibited; no exclusive feeling of nationality was ever manifested. There was but one sentiment, but one feeling, among all: that inspired alike by an earnest desire that the history of the experiment might tend to the establishment of some new truth to the honour of science and the benefit of mankind, and by a generous recognition of the good-will which had prompted strangers, in a time of general gloom and disaster, to participate in their fortunes, and aid them and assist them in such ways as they could. And it would be unjust—impossible, indeed—for us, not to recognize our deep indebtedness to the medical gentlemen of Paris for their many amenities, for the uniform courtesy and the kindly encouragement they constantly gave us—us who had brought, with perhaps something of our national hardihood, the first fruits of a New World’s experience, to the very shrines of venerated oracles, to there compete with the established principles of ancient tradition, and even with the practice of classic surgery.

¹ “ Comptes Rendus de l’Académie des Sciences,” tome lxii. p. 750.

Probably no special detail connected with the establishment of the ambulance attracted so much general attention as the system of heating there employed. "How can these tents be kept warm?" was almost invariably the first question which came to the lips of the visitor; and every one was anxious to see as well as hear the answer—for it was evidently the pivot upon which the success of the experiment of using a winter tent-hospital must necessarily turn. The system adopted was explained, as we have seen, in many of the public journals; but in the month of December, M. Charles Joly, the author of a popular work on "Heating and Ventilation,"¹ prepared a paper, illustrated with lithographic plates, for the special purpose of directing the attention of scientific people to the principles and practical details of the system, which he very pertinently called, "The rational system of heating tents." Greatly interested in this matter, especially as a means of improving the hospitalization of the sick, M. Joly distributed his pamphlet freely; shortly after the ambulance began to be visited by large numbers of architects and others interested in the general subject of ventilation, and various written inquiries and communications thereon began to be addressed to the Secretary, of which the following is a sample:—

"Paris, Jan. 19th, 1871.

"SIR,

"The American Ambulance has been pointed out to us as a type to be followed, as also a subject to be examined with the greatest care,—this we did yesterday, but we were disappointed in not having had the pleasure of meeting you there. I have the honour therefore of asking you to be so good as to complete our information upon a number of points, viz. &c. &c.

"Believe me, &c.

"DELPIERRE,

"Inspecteur des travaux de la Gare du Nord."

In the month of January, General Morin, the director of

¹ "Traité pratique du Chauffage, de la Ventilation," &c., par M. Ch. Joly. Paris, 1869.

the "Conservatoire des Arts et Métiers," made the system of heating employed in the tent-pavilions of the ambulance the subject of a special study; and plans and sketches of all the details of the installation, in so far as they related to heating and ventilation, were carefully prepared by M. Brehan, under his direction, for the National Conservatory.

Several allusions have been made in the preceding pages to the waggons used by the transport corps of the Ambulance. The model of these waggons was first shown at the Exposition Universelle in 1867, and was then pronounced, by nearly all who saw it, to be far superior to any other known model. It was a light four-wheeled carriage designed to carry *ten* persons seated, with the driver; or *four* persons lying down, and *two* seated with the driver. It differed from all other waggons which had been previously constructed to carry more than two persons lying down—principally, in having no mechanism in the interior which could in any way interfere with what must always be the most common use of an ambulance waggon—its use as a transport for persons seated. The seats were constructed in such a manner that they could be employed as stretchers, and also as mattresses, on the floor of the waggon. While a few straps had been so placed that any two common field-stretchers could be easily suspended above the floor, and so securely as to render any disagreeable oscillation impossible. The waggon was light, could be drawn by two horses over the most difficult roads, and was fitted with drawers, &c., for the carriage of the usual and needful accessories of an ambulance waggon.

The waggons made after this model, and used at the American Ambulance, attracted much attention during the early period of the siege; their theoretical excellence was often severely tested, and never did they fail to respond in the completest manner to the objects which their inventor had had in view. So excellent, so well adapted to all the contingencies of waggon transportation were they soon publicly shown to be, that the French "Société de Secours aux Blessés" ordered a large number of waggons to be constructed on the same model for its own use. After the 1st of January, the transportation of the wounded in the city of Paris was principally effected by means of these

special carriages—whose introduction into the French service must always be counted as one among the many beneficial results of the establishment of an American Ambulance in Paris.

Nor was its influence, in introducing new methods and instruments of working, limited to those of the highest importance; many of a comparatively secondary value were thought to be useful improvements, and were at once adopted. Thus it was that the American stretcher—that model which has been described as the “pattern folding up lengthways, in which the poles are separated by folding iron braces”¹—which was used by our transport corps, was introduced into the French service, as is shown in the following letter addressed to the Secretary:—

“Gouvernement de la Defense Nationale.

“Paris, December, 1870.

“SIR,

“I have the honour of returning the stretcher which you were so good as to loan me, and which has served as a model for those which I have ordered to be made.

‘I take this occasion to thank you for the attention shown me at the time of my visit to your Ambulance, which is as beautiful as it is charitable.

“Believe me, &c.,

“Le Chef du Cabinet du Gouvernement,

“LEON BÉQUET.”

Among the appliances more directly connected with surgical practice, the use of which the American Ambulance was largely instrumental in popularizing, may be mentioned the employment of oakum as a substitute for charpie. This substance, the virtues and merits of which were previously practically unknown in France, found great favour among the hospital and ambulance surgeons of Paris in the treatment of suppurating wounds.

The novelty of the system of hospitalization employed, the originality displayed in the installation, the excellence of the

¹ “Circular No. 6.” War Department, Surgeon-General’s Office, Washington 1866, p. 81.

transport material, and the general efficiency of the whole administrative service, very early secured for the Ambulance the favour as well as the attention of the Intendance, that department which, in the French army, is charged with the direction of the *service de santé* and the administration of the hospitals. On no occasion, when a sortie was to be made, did the American Ambulance fail to receive official information that its services would be required; and on no occasion, it may be added, did the transport corps fail to respond to the call.

These several merits, exhibited alike on the field and in the wards of the Ambulance, are recognized in a letter, addressed to the Committee on the 3rd of January, 1871, by General Wolf, the intendant-general of the Army of the Defence, in which he says:—"Since its creation, the American Ambulance has rendered to the army substantial services—*des services très-réels*—which I was one of the first to recognize."

Nor among these general proofs and testimonies of efficiency and usefulness should we neglect to present one, which if coming from an humbler authority, is not less conclusive, and is certainly far more eloquent than any.

A few days before the Ambulance was closed, one of the three patients who had recovered after amputation of the thigh, the *doyen* among all our mutilated and convalescent, came to the bureau of the administration, and asked to see Dr. * * *. He seemed to be labouring under some emotion, which he was struggling to conceal, and hastily putting a paper into the hand of the doctor, hurried away. On opening the paper, it was found to contain the following letter, which is here given in the original, as it would be almost impossible to reproduce in English the *naïveté* of the sentiment.

"MESSIEURS,

"Je vous écris ces quelques lignes; c'est au nom de tous mes collègues pour vous remercier tous—des soins que vous nous avez prodigués. Soyez persuadé que dans nos cœurs il y aura toujours une place réservée à votre mémoire; car sur la terre, après nos parents, nous ne pouvons pas avoir d'êtres plus chers que ceux qui nous ont arrachés des mains de la mort, qui ont

disputé, heure à heure, notre existence avec les décrets célestes.

“Notre reconnaissance envers vous ne sera jamais assez grande, quoique nous fassions. Ainsi, Messieurs, recevez les remerciements que je viens vous offrir, en mon nom et au nom de mes camarades d'infortune.

“ALFRED DOUCET.”

Just as the American ambulance was about to bring its labours to an end, an article appeared in the “*Vérité*,” with which we shall close our citations from the press. The article explains itself:—“We are happy to learn that Dr. Swinburne, the surgeon-in-chief of the American ambulance, and Dr. Johnson, physician-in-chief of the same ambulance, have just received the Cross of the Legion of Honour.

“The services rendered during the siege by the American ambulance are known. The devotion exhibited by the members of that ambulance is also known. In the accomplishment of their charitable work they have recoiled before no effort—before no sacrifice. . . . The distinctions which they may have received are the merited recompense of their zeal and their earnestness to aid those afflicted with the gravest misfortunes. We may add that long experience and great skill assured to most of the wounded confided to their care cures, often unexpected, and that the excellent system of tents, which had already been tested during the Secession War, has offered at Paris, as well as in America, the most surprising results. The leaders of the American ambulance have nobly proved their sympathy for France, and they have gained what is worth more even than honorary distinction—the esteem and the gratitude of all.”¹

Not including the honours conferred by the French Government upon several members of the Committee—no less than *five* gentlemen—Drs. Swinburne and Johnston, and Messrs. Joseph K. Riggs, and William and Emile Brewer, were made, in recognition of their services, KNIGHTS OF THE LEGION OF HONOUR. These unusual distinctions, which the French Govern-

¹ “*La Vérité*,” Mars 17, 1871.

ment thought it proper to award to the members of the American ambulance, may fairly be considered as the official seals and vouchers to the justice of that popular opinion which obtained in Paris during the siege, in regard to the exceptional merits of the ambulance, and the devotion of those who served in it. And it may not be uninteresting for our fellow countrymen to know that these honorary recompenses were not only of a higher grade, but were greater in number than those awarded to citizens of the United States in connection with the great Exposition of 1867.

But the writer cannot let this occasion pass, while thanking the Government for the honours conferred by it upon the members of the ambulance, and for the unusual distinction conferred upon himself personally, without expressing his grateful recognition of the kindness and encouragement the Committee uniformly received during the whole period of their service from every one of its agents. To the officers of the regular "Service de Santé" and to the officers of the Intendance especially, with whom their relations were most constant, the Committee can never forget how deeply they were indebted for every opportunity of usefulness, and how their very name—*American*—instead of being suggestive of the foreigner and of national rivalries, seemed to serve as a pass-word everywhere, and to be itself a sufficient reason for granting every request.

Whatever of success may have attended the attempt to establish in Paris an American ambulance on the volunteer system, was largely owing to the earnest desire of every one who engaged in the work to contribute in every way in his power to the common end—the maintenance of a model ambulance service.

Of his colleagues, members of the Committee, whether within or without Paris, it is unnecessary for the president to speak. The task assumed by those shut up within the beleaguered city was not an easy one; but a disposition to shrink from responsibilities was never manifested, and the special work as originally forecast was in the end accomplished. To those members of the Committee who were without the city, the president must express his deep sense of obligation, as well for counsels given as for the unfaltering interest they took in whatever concerned our common

undertaking. To have conducted a work so widely known, to have, each in his own special sphere, shaped its ends, is in itself an honour not soon to be forgotten, while in the results achieved we all shall find our principal satisfaction.

In securing the services of Dr. John Swinburne as surgeon in chief of the ambulance, the Committee was particularly fortunate. Dr. Swinburne was a surgeon *par excellence*. He had had an extensive professional experience, and had obtained a justly acquired and widely known home reputation. Thoroughly acquainted with military medicine, and the constitution and management of army hospitals, an earnest advocate of conservative surgery, an enthusiast even as regards the conservative treatment of compound fractures, a skilful operator whenever operations were required, he possessed a rare and highly valuable quality—a knowledge of the way to deal with men; in a word, he knew how to manage both his patients and his assistants; and not unfrequently was he called upon to exercise this special knowledge.

Associated as he was constantly with a body of forty or fifty persons, all volunteers, holding a certain social position, uncontrolled by the restraints of a military discipline, all naturally ambitious to excel, and perhaps occasionally even over jealous of the successes of their fellows, Dr. Swinburne knew how to direct these energetic elements, obtain from them the largest amount of labour, and maintain in every department of his service his own personal ascendancy.

Dr. Swinburne was assisted by a surgical staff, who, although receiving no compensation for their services, were always prompt and indefatigable, faithful and zealous in the discharge of their duties, and as deeply interested in the issue of each case as the surgeon himself. To Mr. Cormac and the two Brewer brothers, to Mr. Riggs, to Mr. O'Connel, Mr. Louis Swinburne, Mr. Peet, and Mr. Du Bouchet, especial credit is due.

Dr. W. E. Johnston at an early day volunteered to serve in the ambulance as its physician, and to take charge of such cases of illness as might be received in it, or might declare themselves during the course of surgical treatment.

Dr. Johnston ably assisted Dr. Swinburne, and proved a

judicious adviser in all those cases where the special knowledge of the physician could be of avail to the surgeon.

The two captains of the squads organized for the field transport service—Mr. William B. Bowles and Mr. Joseph K. Riggs—disciplined and directed their commands with great intelligence. The squads were drilled in the art of carrying the wounded on stretchers, in placing them in and removing them from the ambulance waggons. The waggons were kept in a constant state of readiness—everything in its place—stretchers, blankets, water, lanterns, &c.; every man having also his assigned place and clearly defined duty. One of the captains, in a note sent to the Committee, says:—"The squads, engaging to hold themselves in constant readiness, generally got the wounded home more quickly than the French Ambulance Corps did. We were present at skirmishes and sorties at Chevilly, Chatillon, Clamart, Malmaison, Champigny, Bric, Villiers, Bourget, Bondy, Rueil, Buzenval, &c., and we tried to do our duty." How entirely and unshrinkingly this duty was always done has already been shown.

It would be perhaps invidious, where all the members of a corps worked for so long a time faithfully, generously, and often heroically, to make any personal distinctions. It is only just, however, to say that, in the common opinion of all connected in any way with the ambulance, if a pre-eminence were to be indicated, it should be assigned to Mr. Joseph K. Riggs. A gentleman of fortune, married, and with a family, Mr. Riggs, before a wounded man had been received at the ambulance, offered his services to the Committee as an aid volunteer to go with the ambulance waggons and serve as a stretcher bearer. Shortly after he was named captain of a squad. On the 30th of September he went with his command to Chevilly, and brought off from the field a large number of wounded. This service, arduous as it was, was not sufficient for a nature, zealous and indefatigable, such as Mr. Riggs possessed. "I never shall forget," said a gentleman to the writer, "the surprise I felt on the very day of the affair at Chevilly, at seeing Mr. Riggs in the operating-room assisting Dr. Swinburne, then engaged in amputating a thigh, and that with all the *sang froid* of a veteran surgeon." Such an interest did Mr. Riggs take in everything connected with

the surgery of the ambulance, that, daily accompanying Dr. Swinburne in his visits, he soon qualified himself to discharge all the duties of a surgeon's assistant, was appointed to Dr. Swinburne's staff, was assigned a ward, Pavilion No. 1, became perhaps the most expert dresser in the ambulance, and continued to fulfil all the offices of a surgeon's aid in the most conscientious manner until the close of the ambulance, and all this without in the meantime in any way neglecting his special duties as a captain in the field transport service. These offices, which Mr. Riggs accepted, were no sinecures; they brought with them work, night watching, and exposure, they required a constant daily presence for duty, and were often exceedingly fatiguing. If it were in any way remarkable that a person whose previous life and social surroundings had been entirely foreign to surgery, should have been induced to assume the discharge of its simpler duties in the wards of a hospital, it is not less remarkable that those duties should have been performed so well, and with a zeal so conscientious, as to know no flagging.

Another name may be specially mentioned, that of M. Ranzi, an Italian by birth, an American by marriage, a scholar by education, and a gentleman by instinct. Ranzi was one of the first to enrol himself in the corps of aids volunteer. Endowed with all the enthusiasm of his race, energetic to a degree rare even among Americans, bold as his Roman ancestors, he was always ready for every sortie, and never shrank from exposing himself where the dangers were greatest. At Champigny he particularly distinguished himself. Having been out with the waggons all day—a bitter day of wind and frost—he returned to the field in the evening, exposed himself to the fire of the Prussian pickets, but succeeded in picking up several half-frozen wounded, whom, as the night shut in, the retiring ambulance corps had left to their fate.

Ranzi always had at heart the interests of the ambulance, and laboured for them scarcely less earnestly than, when the occasion offered, he did for the wounded themselves. He was always ready to do anything, charged himself with obtaining forage for our horses, searched the markets and the country around Paris for provisions, appealed to the municipal authorities in

behalf of the ambulance for rations, and rendered various services of a similar character. Possessed of a generous sympathetic nature, Ranzi had many friends in the American ambulance, and all who may have known him will assent to the justice of this passing tribute to his memory. Ranzi is dead. Scarcely had the American ambulance closed its doors when Paris was again besieged by the investing army of the Government. Then followed those long, terrible weeks of ceaseless fighting—of incessant bombardment. Ranzi remained in Paris, and, ever ready to lend a helping hand to a wounded man, did not make that casuistic distinction between a Communist and an enemy which was too frequently entertained by the friends of the Government. Daily he went wherever there was fighting, picking up the wounded and conveying them to some of the many ambulances in the city. On the morning of the 22nd of May the troops of the Government entered Paris, the Communists falling back towards the Garden of the Tuileries, and the barricades erected in its neighbourhood—the troops, in the meantime, pushing them actively with artillery. Shells were exploding at every moment in the Place Vendôme, around the Palais Royal, and in the quarter adjacent. Ranzi had entered the Rue Alger, to arrange for the reception of some wounded in a house in that street, when he was struck in the side by a large fragment of a shell, which, frightfully wounding him, caused his death almost immediately.

Mr. Rillet was well known to the corps of aids-volunteer as an active and indefatigable worker. An amiable young man, he attached to himself many friends during the winter of 1870-71. Rillet is also dead, but his good deeds will live in the memories of his associates.

Messrs. Gunther and Dreyer were always prompt and ready for any service, and the former distinguished himself by his coolness at Bourget, where for a time he was a target for the Prussian outposts. Messrs. May, McFarland, Piperno, Maleherbe, Duprez, Washburne, Pollock and Meslier were worthy of all the praises which may have been given to them.

Major Hutton always manifested a lively interest in whatever concerned the well-doing and the well-being of the ambulance,

while Major O'Flinn not only rendered good service with the ambulance waggons, but seemed to have made it a point of honour, during the earlier weeks of the siege, never to return from an expedition beyond the walls, without bringing back in triumph the largest pumpkin he could contrive to find in the market gardens outside the town ; a contribution to the hospital dietary, whose importance can only be truly estimated by those who have conducted the arduous work of treating the sick and wounded, under the constantly increasing scarcity of a siege. Unfortunately, the progress of the military operations restricted the limits within which the gallant Major could prosecute his foraging expeditions ; and the pumpkin fields being ploughed up, and well-nigh obliterated by shot and shell, the Major's return from the front was no longer followed by the jubilant exhibition of the precious esculent which had been welcomed each day, with ever fresh enthusiasm, by the entire *personnel* of the ambulance, from the head-surgeon to the cook ; and this invaluable addition to the alimentary resources of the ambulance was brought to an untimely end.

Nor should we fail to remember the services rendered by Mr. Hugo and Mr. Meakes, who although not members of the volunteer corps, yet, as the executive agents of the administration, always discharged their respective duties with fidelity and intelligence.

Among the ladies who especially distinguished themselves in connection with the ambulance, it would be difficult to assign a first place to any one. Several devoted their whole time, during many weeks and months, to the difficult and uneventful work of nursing the wounded. The cares of this kind given to the patients at the ambulance were offered almost wholly by women, and were of a character such as to leave nothing to be desired. The system was this : a hired male nurse was attached to each ten or twelve patients both day and night ; at night, a hired female assistant watched with the male nurse in each pavilion ; during the day from five to ten patients formed the special charge of each *dame volontaire*. Never did men, sick or wounded, receive more personal attention, and never were these attentions offered with a larger desire to do for each one everything which could be done.

Miss Bewick associated herself with the ambulance before it had been decided whether it was to remain in Paris or join the Army of the Rhine, and devoted herself during several weeks to the preparation of the bandages, compresses, &c., which it was presumed would be needed. On the opening of the ambulance on the Avenue de l'Impératrice, she asked to be received as a nurse, and was accepted and assigned to the officers' tent. Here she remained until the close of the siege, constantly occupied, always busy in attending to the least wants of those in her charge. Observant and thoughtful by nature, in manner quiet yet energetic, calm but always cheerful, and apparently happiest when the forced watchings were longest, Miss Bewick was, in all respects, a hospital nurse such as her own illustrious countrywoman, Miss Nightingale, might have chosen as an example of what a female nurse might be and should be.

Mrs. McFarland will long be remembered by the *personnel* of the ambulance, and perhaps longer yet by those who were the receivers of her kindly care, and to whom she was only known as *la petite mère*. Not strong physically, but with that strange power which generous natures seem to possess of never growing weary, she was always present and always doing. Mrs. Bowles and Mrs. Koch were in the same pavilion, where, if the patients seemed happier than in the rest, it could only have been because, there nothing was left undone which ought to have been done. In Ward No. 4, Miss Chandor and Mrs. Howland were most efficient, and in Barrack No. 5, equal services were rendered by Mrs. Huggard, Mrs. Ricker and Miss Cameron. The Marquise de Bethisy came daily to visit the wounded in Pavilion No. 2, as did also Mrs. Moulton and Miss Wissembourg. Mrs. Meslier and Miss Maas also rendered most valuable services in the same pavilion.

Too much praise cannot be given to Mrs. Conklin, and her two assistants the Misses Castri, for the efficiency with which they managed their departments, the linen room and special diet kitchen; both were most important accessories of the ambulance, and could not have been better directed.

A remarkable fact may be mentioned concerning all the ladies whose names have been mentioned; there were no backsliders

among them. They remained in the ambulance almost without exception, from the very beginning of its history until its close. The interest which they took in it was neither sentimental, nor one which had its origin in a morbid curiosity; they came, one and all, with the serious purpose of making themselves useful, and in proportion as they found they were so, their interest in their patients and their interest in the ambulance grew strong.

Although the good accomplished by these ladies was great, in its immediate influence upon the well-being of the sick, another good effect resulted from these weeks of continued hospital service, which although personal to those who gave their time and strength to the sick, was scarcely less valuable—the direction given to newly awakened sympathies which in many cases must have led to an established conviction, that to every woman with a pure heart and willing hands a vast field of usefulness is open, which lies entirely within the limits of existing conventionalities.

This narrative would scarcely be complete did the writer fail to allude to operations with which the Committee had proposed to occupy itself, before its sphere of action had been restricted by the circumstances to which references have elsewhere been made.

On the 5th of August the following letter was addressed to the Queen of Prussia:—

“ Paris, 15, Rue de la Paix,
“ Aug. 5th, 1870.

“ MADAME,

“ I address your Majesty to-day for the purpose of informing you of the action taken by the Americans of Paris in view of rendering aid to the wounded during the present war.

“ On the 18th of July an American International Sanitary Committee was organized in this city, and we have since received contributions, in money and in kind, to a considerable amount, in furtherance of our object, which is to give succour to the wounded alike of all armies.

“ We have reason, however, to believe that its strictly international character may secure to our Committee the common

favour of the Sanitary Associations of the belligerent powers, and that our agents may, on that ground, possibly have the means of being, occasionally, even more useful than the representatives of the German and French Societies.

"Should it, therefore, at any time seem desirable to you to have the representatives of any of the German Societies placed in communication with us, we shall be most happy to give them any information, or render them any aid in our power, which may not be in contravention to the laws of war.

"Should any one in Germany wish to know the condition of any prisoner, wounded or otherwise, within the French lines, if it is possible for us to ascertain the information requested, we shall be most happy to communicate it, if permissible.

"Should any one wish to send material aid to any wounded, we will charge ourselves with transmitting the same to those to whom it may have been given.

"We feel that various services of this kind can, occasionally, be rendered by us in a manner more satisfactory than may be possible with any other Association, and we shall consider that we have accomplished no small part of the object of our organization, should we be able to be a channel of communication between the Sanitary Associations of Germany and the wounded of your armies who may be within the French lines.

"We may also wish, either in our own behalf or in behalf of the French, to obtain information, or aid of a like kind, from the German Associations, and we shall be greatly pleased to establish a correspondence with these associations, which may be mutually beneficial.

"Communications may be addressed to the 'American International Sanitary Committee,' 15, Rue de la Paix, Paris.

"Your Majesty will believe me,

With the profoundest respect,

"Yours most sincerely,

"THOMAS W. EVANS.

"President of the American International
Sanitary Committee."

To this letter Her Majesty graciously replied as follows:—

“ Berlin, August 30, 1870.

“ The Queen of Prussia has, with great satisfaction, seen from the letter which Dr. Evans has addressed to her as President of the ‘American International Sanitary Committee,’ that the Americans residing in Paris have devoted themselves to the noble task of giving succour to the wounded of all nations in the present war. The Queen is convinced that the Committee will be of great use, and particularly from being able to avail itself of the experiences of the American war. She has been anxious to give notice of Dr. Evans’ communication to the Central Committee of all the German Sanitary Associations, which has been established in Berlin, and which expresses, in the enclosed answer, its readiness to give any information wished for by the American Committee. The Queen states, with satisfaction, that in the German army the care of the wounded is conducted strictly according to the articles of the Convention of Geneva; that, in all the hospitals established throughout Germany, whether by Government, by communities, or by private associations, all the wounded, German or French, are treated alike; as also that of the many hospitals founded for the war, the greater number have been built according to the American system, which has also been adopted for the Queen’s own hospital (Augusta Hospital).

“ To give an idea of the activity developed by the different associations formed in Germany for the aid of the wounded, the Queen encloses a list of objects sent from Berlin by the German Central Committee alone, by the side of which other associations are working, among which may be mentioned the Hülfsverein, and the Vaterlandische Frauenverein, which was founded in 1866, and is now spread over all Northern Germany, and is assisted by three hundred and thirty-eight auxiliary societies.

“ In spite of the co-operation of all these different societies, which are besides aided by the Knights of St. John and the Knights of Malta, by the sisters of mercy, both Catholic and Protestant, by many thousands of ladies of all classes, who devote themselves to the attendance of the wounded, and by a great many men—too young or unfit to serve in the army—who go out

to render aid wherever it is required ; in spite of all this, the Queen believes, that every accessory succour must be hailed with expressions of gratitude, and therefore begs Dr. Evans to convey her thanks to the Committee for the support which it promises to give to the wounded of the German army.

“ To DR. THOMAS W. EVANS.”

The communication to which Her Majesty refers in her letter, is as follows:—

(Translation.)

“ Berlin, August 28, 1870.

“ We have been informed by Her Majesty the Queen, our Gracious Protector, of the communication which you sent to her in the name of the ‘ American International Sanitary Committee of Paris,’ on the 15th of August. It is with the greatest joy that we have heard of the spirit of sacrifice which has united your compatriots, in order to help the suffering in the two belligerent armies. This will surely increase the profound sympathies which exist all over Germany for the American people. We shall willingly do our best to contribute to your sacred work, and we are already prepared to put at your disposal everything which you may require from us, and which it is in our power to give.

“ Receive from us the assurance of our profound esteem,

“ R. VON SYDER,

“ For the Central Committee for the care of the wounded of the German army.”

“ To Dr. Thomas W. Evans, President of the American International Sanitary Committee, Paris.”

These letters mark out a circle of action and usefulness which seemed to the president most important, especially so long as he still cherished the hope of receiving the co-operation and aid of those who in the United States might be interested in a work of international assistance, and therewith an extension of the pecuniary resources at the disposition of the Committee. Indeed it was from a sense of the great importance of this more general work, that he had been principally reluctant to immure him-

self in Paris before the field had been so far explored as to render possible an appreciation of the needs within it, and of the value of the services which there might be rendered. One of his first resolutions, therefore, after the investment of Paris had been announced, was to proceed forthwith to the seat of military operations in Eastern France, for the purpose of ascertaining, so far as he might be able to do so, the general sanitary condition of the French and German armies, the character of the hospital accommodations provided, the action and character of the health service in the respective armies, whether voluntary or official, and the condition of the military prisoners, the number of whom, at this time even, had become enormously large. He accordingly, towards the close of the month of September, left England for the Continent on a tour of general sanitary inspection, in the course of which he visited Sedan and the hospitals in its immediate vicinity, Luxembourg and Thionville, the German army around Metz, and at the neighbouring posts, Pont à Mousson, Courcelles, &c., the hospitals at Coblenz, Mayence, Carlsruhe, Heidelberg, Frankfort, Homburg, and vicinity, as well as many of the prison camps established on the lines of military transit between France and Germany. Although thoroughly convinced of the large opportunities of usefulness offered in nearly all these places to any independent and neutral association which might be willing to work in behalf of the sick and wounded, or in aid of the German associations—upon which a double task had fallen, as well from the immense numbers of French wounded and sick, who had suddenly become the most necessitous claimants of their charities, as from the entire absence of any organized measures of assistance on the part of the French for this class of their unfortunate countrymen—he was particularly impressed with the unhappy condition of the prisoners.

Feeling, however, that it would be impossible to engage in any general work of relief, even in a special direction, without the co-operation of others, he returned to London. Here, having called the attention of a number of benevolent ladies and gentlemen to the needy condition of the French prisoners, a society was almost immediately organized, under the name of "Society for Clothing the French Prisoners." Mr. Hankey, M.P., was pleased to accept

the presidency of the society, and the writer of this history, nominated to fill the office of hon. secretary, at the same time volunteered to become its agent in the field. This offer he was prompted to make, because it opened to him an immediate field of active duty, at a time when his colleagues in Paris were winning golden opinions by their sacrifices and energetic and unselfish devotion, and promised very large opportunities for investigations and experience, which might prove of the greatest value to the American International Committee in the development and execution of its plans. Money and clothing were liberally sent forward as gifts to the society, and its secretary and agent was soon enabled to go forward upon his mission to the prison camps of Germany. But of their condition, of the sufferings assuaged, of the wants there supplied,—of the results of observations made, during voyages which occupied most of his time for many weeks, and even months, in the winter of 1870-71—it is not his purpose here to speak. And if he has alluded to this special labour in this history, it has been only because he is unable to consider it as anything but a part of that general work upon which the American International Sanitary Committee originally proposed to enter, and which he has no reason to doubt would have been as successfully and as gloriously conducted in all its operations, had it been properly supported, as it was in one—in that ambulance which, established and maintained in Paris during the siege of 1870-71, has, itself alone, secured to those who were devoted to it a nation's gratitude, and brought to us all, who bear even the American name, lasting honours.

THOMAS W. EVANS, M.D.,
President of the American International
Sanitary Committee.

Paris, 41, Avenue de l'Impératrice.
1872.



REPORT ON THE ORGANIZATION
OF THE AMERICAN
AMBULANCE.

BY EDWARD A. CRANE, M.D.





PART I.

ON THE ESTABLISHMENT OF
ARMY HOSPITALS.



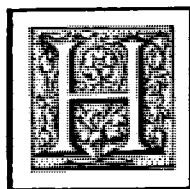
"Science sans experience
N'apporte pas grande assurance."
AMBROISE PARÉ.





THOMAS W. EVANS, M.D., PRESIDENT OF THE AMERICAN
INTERNATIONAL SANITARY COMMITTEE.

SIR;



HAVING been requested by you to prepare a statement which should exhibit the essential facts connected with the material organization of the American Ambulance, established in Paris during the siege of 1870-71, I have the honour of submitting to you herewith my Report.

Two sections of my subject—one relating to the history and functions of army hospitals, the other to the use of tents for hospital purposes—have received a much larger development than I had originally proposed. The importance of these special subjects in their relation to the American Ambulance seemed, however, to warrant an extended consideration. I have accordingly presented them in the Report, in separate parts, preliminary to Part III. which contains those facts which relate most immediately to the material organization of the Ambulance.

Very respectfully,

Your obedient servant,

EDWARD A. CRANE, M.D.

Paris, 15, Rue de la Paix,
August 26, 1872.



ON THE ESTABLISHMENT OF ARMY HOSPITALS.



THE history of hospital establishments for the sick and wounded of armies is, unfortunately, a very short one. The most ancient records which have been preserved are almost uniformly silent as regards the care which may have been extended to the sick and wounded of armies; and it is even remarkable that the same silence should have been observed in the collection of Jewish sacred writings, which contains not only a narrative of the general political history of the Jews, but embraces as well a very extended and detailed account of the economical and social customs of that people.

Whatever care may have been given either to the sick or wounded soldier, in the early life of ancient states, was doubtless limited to such aid and assistance as relatives and companions were prompted by affection and pity to offer.

The first allusions to army surgeons represent them as having been either priests or soldiers.¹

Æsculapius, according to Greek tradition, was the first

¹ "Histoire de la Médecine," par Daniel Le Clerc. A La Haye, 1729; première partie, liv. i. chaps. ix.-xx. liv. ii. chap. iii. "Histoire de la Chirurgie," par M. Dujardin. Paris, 1774; tome premier, liv. i. Haeser, "Lehrbuch der Geschichte der Medicin." Jena, 1853. "Review of the History of Medicine among the Asiatics." Thomas A. Wise, London, 1867; vol. i. p. 53. "Histoire des Sciences Médicales," par Ch. Darembourg. Paris, 1870; tome i. pp. 25-73. See also "Diodorus Siculus," book i. chaps. xxv. lxxxii. lxxxiii.

man (although divine honours were rendered to him after death) who gave himself up wholly to the practice of the healing art. He accompanied Castor and Pollux on the Argonautic expedition, but seems to have been distinguished not less as a master of mystic rites and a dispenser of charms than as a physician and a surgeon. Still Aristæus, king of Arcadia, and Theseus, and even Jason, the leader of that expedition, are said to have been renowned for their skill in healing wounds.

The sons of Æsculapius, Machaon and Podalirius, who have been immortalized by Homer, were doughty chieftains "in arms, encircled with their native bands," to whose heroic martial feats a knowledge of the "sovereign balm, which Chiron gave and Æsculapius used," only lent an additional lustre. Homer's surgeons, whether Greek or Trojan, were all soldiers.

At a later period the Greek armies appear to have been followed by physicians and surgeons, whose only duty was to take care of the sick and wounded. It is doubtful, however, if they ever formed a recognized corps in the army, and their number must always have been small. Nearly all the allusions to army physicians and surgeons, in Greek writings, are in connection with their services to princes and generals. So Quintus Curtius introduces to us Critobulus, as "one of the most skilful men of his profession," and gives a very interesting description of the operation which he performed on Alexander for the extraction of an arrow; he also speaks of Philip, as "one of several famous physicians who followed the king when he left Macedonia."¹

Xenophon, in the *Cyropædia*, insists upon the obligation which rests upon a commander to secure the services of good physicians. This obligation, he says, was recognized by Cyrus, who was even himself ready in case of need to assist his surgeons in their work.² Still, as we learn from Herodotus, long after

¹ "Q. Curtii Rufi de Rebus Gestis Alexandri Magni, Argentorati," 1801; lib. ix. p. 175; lib. iii. p. 109.

² "Cyropædia," book i. chap. vi. *et passim*. When Xenophon ventured to attribute these humane sentiments to Cyrus, he was probably considering rather what moral effects such an example might have upon the Greeks themselves, than the historical accuracy of his account. That the Persians were particularly

Homer's time, it was the common practice among the Greeks, after general engagements, for the soldier to rely upon his fellow soldiers for surgical assistance.¹ Occasionally, if the number of the wounded was large, certain persons were detailed from the ranks to take charge of them.²

Xenophon has intimated, that during battles the wounded found a refuge, and received perhaps some sort of first treatment, in the quarter of the camp where the baggage was placed.³ While according to Justinian, the Lacedemonians, occasionally at least, opened their houses to the wounded.⁴

Aside from a few facts like these, we know nothing of the measures taken by the ancient Greeks to succour the wounded.⁵

kind to their wounded is certainly not a fact of general history. Herodotus represents them as in the habit of abandoning their sick in camp in a shameful manner; (Herod. lib. c. 135); and Darius, just before the battle of Issus, is even said to have "put to death all the sick who were then in the city of Issus." (Rollin, "Ancient Hist." New York, 1837, vol. iii. p. 101.)

¹ The statement of Herodotus appears in a rather curious connection. Artabazus was besieging Potidæa, and Timoxenus, the chief magistrate, had made an arrangement to deliver over to him the city. A correspondence was carried on between the two by means of letters attached to arrows shot at points agreed upon. One day the arrow of Artabazus went so far astray as to bury itself in the shoulder of a besieged Potidæan. The conspiracy was of course revealed. But in describing this incident, Herodotus, probably quite undesignedly, makes us acquainted with a custom among the Greeks. "Immediately," says he, "a crowd gathered around the wounded man, as is generally the case in battle"—τὸν δὲ βληθέντα περιέδραμε ὄμιλος οἷα φιλεῖ γίνεσθαι ἐν πολέμῳ.—HERODOTUS, lib. viii. c. 128, p. 419, ed. Firmin Didot, Paris, 1858.

² See "Anabasis," book iii. Coming to a certain village "they appointed eight surgeons, for there were many wounded."

³ Xenophon, "Rep. de Sparte," c. xiii.

⁴ "Patentibus omnes domibus saucios excipiebant, vulnera curabant, lassos reficiebant." "Justinian Hist." lib. xxviii. c. 4. See also Herodotus, book viii. c. 115, where we are told how Xerxes imposed upon the inhabitants of Thessaly and Macedonia the care of his sick.

⁵ From the statement made by Diodorus Siculus, that in Egypt, "in military expeditions the sick are taken care of gratuitously, inasmuch as the physicians are supported at the public expense" (lib. i. c. 82); and from the fact that the Greeks for a long time derived from the Egyptians their knowledge of practical medicine and surgery, it may be inferred that the Greeks were at least not entirely ignorant of what might be called an established army health service. Still, it is altogether probable that such a service was never at any time considered by the ancient Greeks as an essential part of the military organization.

An equal obscurity obtains also, concerning the measures adopted by the Romans to provide for their sick and wounded. "It seems," says M. Peyrilhe, "as if the historians had concerted together to conceal from posterity everything relating to the healing art in the Greek and Roman armies. Could anything astonish one more than that so many judicious writers, who seem to have taken pleasure in reporting the minutest circumstances of the smallest wars, of the most inconsiderable revolutions, who describe with the greatest care the order of battles, retreats, encampments, the slightest change in military discipline, &c., should have said nothing in their writings concerning the care given to the sick, and, particularly, to the wounded of armies?"¹ A few passages, however, may be cited, to the effect that some care was at times bestowed upon both sick and wounded in Roman armies.

In one place Cæsar says, he broke up his camp, "no obstacle interposing, the wounded and sick having been taken care of" (*sauciorum modo et ægrorum habita ratione*).² And in another place he says, he "was obliged to go to Apollonia to leave his

¹ "Histoire de La Chirurgie," par M. Peyrilhe, tome second, pp. 396, 397. M. Peyrilhe is in error when he says that Greek and Roman historians have described with the greatest care *encampments*, as I shall have occasion to show in another part of this report; nor is the fault to which he alludes peculiar to ancient historians. Writers of history have almost uniformly occupied themselves with political incidents, and have rarely referred to customs, habits of living, and the material expressions of human civilization, more frequently than was absolutely necessary for the *mise en scene* of their *dramatis personæ*. For example, I have now before me the "Rise of the Dutch Republic, a History," by J. L. Motley, a new edition, London, 1871. It is a recent, well-known, and brilliant narrative of certain events which occurred within a period of less than thirty years (1555-84), a period of almost constant warfare and slaughter; and yet I find not an allusion in this bulky volume of a thousand pages either to an army surgeon or to an army hospital. Nor is there a single word in the book which informs us how the troops engaged were encamped or lodged, or even how they were maintained. In the index, the "people" are referred to in eleven lines, and the "army" in one line, while "Orange, William of Nassau, Prince of, his personal appearance," &c., fill eight solidly printed columns.

Whatever the merits of this book—and they are certainly very great—like most so-called histories, it is much less "a history" than a biographical dictionary, in which the incidents of each life have been skilfully grouped, with reference to the general dramatic effect.

² "De Bello Civili," lib. iii. c. 74.

wounded" (ad saucios deponendos.)¹ But army surgeons are neither mentioned by him, nor by preceding Latin writers. Ælian (A. D. 70), is one of the first writers who intimate that surgeons were in the habit of following the Roman army; and he classes them with the sutlers and the train of menial followers.² Arrian (A. D. 110), also speaks of army surgeons, but only to class them as did his predecessor.³ So Achilles Tatius, a Greek erotic writer of the third century, speaks of a camp or army physician;⁴ and in short, several inscriptions have been discovered, containing the words, *medicus cohortis*, *medicus legionis*, &c.⁵ These inscriptions have induced Salmasius, Guischart, and others, to affirm that

¹ "De Bello Civili," lib. iii. c. 78.

² Ælian, "Tactics," c. ii.

³ Arrian, "Tactics."

⁴ Τὸν τοῦ στρατοπέδου ἰατρόν. "Achillis Tatii Alexandrini De Clitoph. et Leucip. Amoribus;" lib. iv. c. x. Paris, Firmin Didot, 1856.

⁵ See "Gruterus et Muratorii Thesaur. Inscriptionum." Also, a book received by me while this report was in press, "Du Service de Santé Militaire chez les Romains," par le Dr. René Briau, Victor Masson, 1866. In this work twenty-five mortuary inscriptions are reproduced, which contain the words, *medicus cohortis*, *medicus castrensis*, etc. Whether Dr. Briau's conclusions are to be accepted or not, he is certainly entitled to the credit of having presented to his readers most of the inferences which can be drawn from these titles. And I may here add a few words upon this subject. After the Christian era, Roman armies were generally followed by a certain number of *Medici*, who seem to have been for the most part either Greeks or of Greek extraction. It is doubtful if these medici ever held an official position in the military hierarchy; in any event, it is certain that in the time of Aurelian they depended for their emoluments upon those whom they treated. (See "Vopiscus in Divo Aureliano.") It appears, however, that they were recognized, at least as camp followers, and even allowed certain privileges. Thus, the Emperor Antonine is said to have addressed a legionary physician in these terms:—"Since you announce yourself to be the physician of the second legion adjutrix, you will not be compelled to support municipal charges as long as you are absent in the service of the state, but should you wish to be relieved from them at the expiration of your exemption, for the reasons given, such immunity will only be accorded in case you are enrolled among those physicians whom these conceded privileges concern." (Cum te medicum legionis secundæ adjutricis esse dicas, munera civilia, quamdiu reipublicæ causâ abfueris suscipere non cogeris. Cum autem abesse desieris, post finitam eo jure vacationem, si in eorum numero es, qui ad beneficia medicis concessa pertinent eâ immunitate uteris.) See "Code of Justinian," lib. x. tit. 52. This is a most important statement, as it tends to confirm opinions rendered highly probable by other facts, viz., that the legionary surgeon was a sort of volunteer, who offered his services to the legion for a longer or shorter time, and was not necessarily entitled, by reason of having been engaged in such a service, to the civil immunities accorded to the better class of physicians.

each cohort commonly had its physician.¹ But to say nothing of the probably apocryphal character of some of these inscriptions, they are without exception of a late date, and in the absence of any account of the functions which were connected with such titles, are almost meaningless. There is no evidence to show that the *medicus* was commonly anything but a slave in the service of his master, or a freed man, attracted to the camp in the hope of finding a better market for his ointments and balsams,² and to whom the privilege of attaching himself to a legion, a cohort, or a camp may have been accorded. It is certain that his duties were very limited, and that the little personal consideration shown him fairly measured the estimated value of his services.³

In the absence of organized surgical aid, it has been supposed that the Romans were in the habit of alleviating in a spontaneous and popular way, the sufferings of those, who in war might have become the victims of disease or wounds; and certain statements would seem to support this supposition.

Very early in the history of Rome, we are told that the Tuscans, having been defeated near that city, were received by the inhabitants "into their own houses," and that they there, "gave them food and dressed their wounds."⁴

A certain Fabius, seems to have gained an immense popularity by reason of his care for the wounded, whom he distributed among the patrician families, providing in his own family for the largest number, who were there taken care of, even better than elsewhere.⁵

Tacitus may have had in mind some such case as this, when

¹ "Mémoires Militaires," par Charles Guischart, à la Haye, 1758; tome ii. p. 114, note.

² Suetonius, "Caius Caligula," c. 8.

³ "Sed rei militaris periti, plus quotidiana armorum exercitia, ad sanitatem militum putaverunt prodesse, quam medicos."—VEGETIUS, "De Re Militari," lib. iii. c. 2. Mead, while repudiating the idea that medicine was ever regarded by the Romans as a servile art, admits that surgery was so considered, and was only practised among them by slaves and people of low condition. (Address delivered in the Amphitheatre of the Royal College of Physicians, October 18th, 1723.)

⁴ "Dionysius of Halicarnassus," lib. v. c. 5.

⁵ "Neque immemor ejus, quod initio consulatus imbiberat, reconciliandi animos plebis, saucios milites curandos dividit patribus. Fabiis plurimi dati: nec alibi majore cura habiti. Inde populares jam esse Fabii."—LIVY, lib. ii. c. 47.

he says that on the occasion of the falling of the amphitheatre of Fidenæ, a vast multitude having been wounded, "The Roman nobles opened their houses, medicine and surgeons came in from every quarter, and Rome took on the image of former times, when after great battles, the wounded were succoured with care and rewarded with bounties."¹

So Alexander Severus, after a great battle, is said to have found quarters for his wounded in the neighbouring towns, in the houses of the rich. Indeed, several other instances might be cited, in which the Roman wounded are said to have been sent to the towns and cities in the neighbourhood of the battle-field.

Certainly, one of the most remarkable examples of voluntary effort in behalf of the wounded is one mentioned by Tacitus, who in speaking of Agrippina, says, "This noble-minded woman then assumed the duties of a general, and gratuitously gave to the soldiers who were in want or wounded, clothing and medicines."²

However interesting this statement may be, as perhaps the first record of "woman's work" among the sick and wounded in camp, it is scarcely less so, by reason of its containing the implied assertion, that to see the wounded were properly taken care of, was one of the duties of a General. That it was considered to be a duty of every commander to have some care of his sick, and to show them certain attentions, is unquestionable. Early in the history of Rome, Fabius Gruges is said to have been condemned, after having been beaten by the Samnites, not so much on account of his having lost three thousand men, as because he had neglected to give to the wounded the care they should have had; and Trajan has been praised, by Suidas and Pliny, because of his constant solicitude for the weary and the sick.³ But so long as the duties of a general towards his soldiers, whatever they may have been presumed to be, were unprescribed, and he was unprovided by the state with the means of discharging those which he himself might consider as most important, it is very evident, that the claims of sick and wounded soldiers upon the state for care and succour were practically unrecognized.

¹ Tacitus, "An." lib. iv. c. 53.

² "Sed fœmina, ingens animi, munia ducis per eos dies induit, militibusque, ut quis inops aut saucius, vestem et fomenta dilargita est."—TACITUS, "Ann." lib. i. c. 69.

³ C. Plinii "Panegyricus Trajano Dictus," c. 13.

The exhaustive researches of Percy and Willaume,¹ and other writers, have established, most unequivocally, the fact, that the ancient Greeks and Romans had neither civil nor military hospitals; and it appears to me as well, that even the allusions in classical writings to the opening of private houses for the reception of the wounded, are alike too infrequent and too vague to warrant the inference, that it was a common practice to call upon the people of the country where the battle might be fought to provide a shelter for the wounded. Doubtless such shelter was occasionally resorted to, but, in view of the fact that no mention is made by any ancient writer of a service, in the Greek and Roman armies, corresponding to that now represented by the sanitary service, it is most probable, that the seriously sick as well as the wounded were generally left to take care of themselves as best they could. That there was no field or ambulance service is almost certain, and Lucan's lines, in which he depicts the savageries of Marius, may be considered very justly as representing the common background of every battle-sketch—

Nobilitas cum plebe perit : lateque vagatur
 Ens : et a nullo revocatum est pectore ferrum.²

The infrequent reference to the presence of the sick in Greek

¹ "Mémoire couronné par la Société des Sciences, Belles-lettres, et Arts de Macon." Paris, 1813.

² "Pharsalia," lib. iii. If I have not referred to a passage often quoted to show that the sick in Roman armies were carefully provided for, it is because the statement therein contained by no means warrants the inference which has been occasionally drawn from it. Velleius Paterculus has said :—"During the whole of the Pannonian war, no one of us, whatever his rank, was ill, whose health was not sustained by Cæsar's care; although he was so much occupied with the load of weighty affairs, he seemed to be occupied with this work alone. A harnessed waggon was ready for those who might need it—his own litter was public property, and I profited by it as well as others. Doctors, cooking utensils, a bathing apparatus, carried for this single use—everything was for the sick. We were far from our own homes and domestics, but of these nothing was wanting which we could either prefer or desire." But who is this of whom Velleius speaks? Tiberius! Suetonius and Tacitus have made us well acquainted with the character of this man. Stript of its verbiage, the passage informs us that Tiberius took care of the sick of his army by sending to them his doctor, his sedan chair, and his bathing tub—which was certainly very gracious on his part—but considered as a provision for the whole army, the simplicity of the material and the service is remarkable.

Of all the courtiers who have written history, Velleius Paterculus was notoriously one of the most servile flatterers. His own vanity also seems to have been im-

and Roman armies has led to the supposition, that the sickness rates among soldiers, in ancient times, were generally much lower than those with which modern warfare has unfortunately made us familiar; and various reasons have been assigned for these supposed small sickness and death rates—men were more robust and vigorous, more capable of enduring hardships formerly, &c.—even the Platonic doctrine of eliminating the feeble and deformed, and the Greek practice of exposing such new-born children, have been said to “explain how, except in great calamities, so few sick are to be seen in the Greek armies.”¹ Such explanations

measurable. He is particular to tell us how he stood behind Tiberius' triumphal car—how he was the last tribune nominated by Augustus, and the first nominated by Tiberius, &c., and the passage in question was doubtless written, quite as much for the purpose of stating that he himself had been carried in the litter of Cæsar, as to pay adulatory compliments to his chief—but these he has certainly not forgotten. “O rem dictu non eminentem, sed solida veraque virtute atque utilitate maximam, experientia suavissimam, humanitate singularem! Per omne belli Germanici Pannonique tempus, nemo e nobis, gradumve nostrum aut præcedentibus aut sequentibus, imbecillus fuit, cujus salus ac valetudo non ita sustentaretur Cæsaris cura, tanquam, distractissimus ille tantorum onerum mole, huic uni negotio vacaret animus. Erat desiderantibus paratum junctum vehiculum: lectica ejus publicata, cujus usum quum alii, tum ego sensi. Jam medici, jam apparatus cibi, jam in hoc solum importatum instrumentum balnei, nullius non succurit valetudini. Domus tantum ac domestici deerant; cæterum nihil, quod ab illis aut præstari, aut desiderari possit.”—(VELLEIUS PATERCULUS, lib. ii. c. cxiv.)

I should hardly have cited this passage, had not Percy (“Dictionnaire des Sciences Médicales”) used it as authority for the sweeping statement:—“Que pendant la guerre de Pannonie, tout avait été si bien prévu pour les infirmeries que les blessés n’y manquaient de rien, et que les voitures pour leur transport y étaient aussi nombreuses, que les vivres et les médicaments pour les traiter y étaient abondans.”

This sort of historical criticism is altogether too common, and occasionally leads to conclusions remarkable, not to say absurd. Homer tells us towards the close of the eleventh book of the “Iliad” that Eurypylos, having been wounded, asked Patroclus to lead him to the “black ships,” and to there take out a dart and bind up his wounds. In a historical sketch, “Sur le Service de Santé,” which appeared in the “Gazette des Hôpitaux” during the year 1871—I forget the exact date—the Homeric incident above mentioned is referred to, and the writer most ingeniously suggests that of these *black ships* some may have been *hospital ships*, like, for example, the floating hospitals employed in American waters, during the war of the Rebellion, and that Patroclus was an active member of a Hellenic “Société de Secours aux Blessés.” It would be interesting to know, if this connection with the ships entitled him to wear a blue-cloth naval cap; it might serve to explain the origin of that *casquette d’ambulance*, which has puzzled so many of us.

¹ “L’Administration Militaire dans l’Antiquité,” par Adolphe Gauldrée Boilleau, Paris, Dumaine, 1871, p. 402.

are, however, quite fanciful. There are many good reasons for believing, that the average power of endurance of modern men is greater than that possessed by the ancients; and for the same reasons, it is probable that the sickness rates in armies were even higher in ancient than in modern times. The existence of only a small amount of sickness *might* have been the cause of the silence referred to; but a much more probable cause was the indifference which formerly prevailed concerning most subjects not immediately connected with selfish and personal interests. If the actual sanitary condition of Greek and Roman armies was ever, in any respect, better than that common to modern armies, the only plausible general explanations which can now be offered are, that Greek and Roman armies were usually small—the soldiers may, therefore, have possibly been better selected—that the period of service was almost always short, and that in the event of any serious disability the soldier was probably immediately discharged.

With regard to the wounded it should be remembered, that of those put *hors de combat*, in ancient warfare, a much larger number were killed than is usual upon modern fields of battle. Men then met in battle hand to hand, and for the wounded there were few chances of escape. The soldier struck down was, if possible, at once dispatched by his antagonist. Flight also was often impossible, as Roman historians have told us, by reason of the very thickness of the fight; and the wounded, unable to get away, frequently perished from loss of blood alone, or were trodden under foot in the general *mêlée*. With regard to those who were not killed outright on the field, it may be observed, that they were of two classes—those *mortally wounded* and those *slightly wounded*. With the use of firearms, the number of the *severely wounded*—an intermediate class—has been enormously increased. In ancient times, fractures of the bones were comparatively rare,—so rare, that amputation¹ in the case of such fractures seems never to

¹ Mortification was the only condition which was supposed by the ancients to indicate the expediency of removing a portion of a limb. Paul of Ægina, who probably lived towards the close of the sixth century, and of whose "Surgery," it has been said, that "No other work of antiquity presents the art in so advanced a state, and treats every subject in so complete a manner" ("Chirurgie de Paul D'Egine, texte Grec, avec traduction Française etc. par René Briau." Paris, 1855, p. 20) writes only

have been thought of ; the wounds were for the most part only *cuts* and *punctures*, and when death followed it was usually from loss of blood. Where wounds were necessarily mortal, death was generally speedy, either from the direct loss of blood, or because some important visceral organ had been pierced. Where wounds were not mortal, most were really very slight, or, at least, were wounds which would be so considered at present. It will be understood, therefore, that where the relative number of wounded who escaped from the field was small, for the reasons stated, and where, of such wounded the mortally wounded died quickly from the nature of their wounds, and those not mortally wounded recovered speedily from the superficial cuts and punctures they might have received, the necessity for an ambulance service was by no means as apparent as in modern times.

During the period of the Byzantine Empire, some little attention was paid to the wounded on the field. We are told that there were among the troops, "trumpeters, and physicians, and surgeons," and that there "were persons who on the day of battle followed the army to pick up the wounded, and apply the first dressings ; we call them now, Scriboni."¹ But no information has reached us as to how these wounded were subsequently treated. No mention is made before the eleventh century, of hospitals, either temporary or permanent, established in the interests of the sick or wounded.² The Xeno-

a few lines "*About cutting off extremities*"—ΠΕΡΙ ΑΚΡΩΤΗΡΙΑΙΣΜΟΤ—in which he says mortification may sometimes render it necessary to cut off the *hand* or *foot* ; but he speaks of the danger of hemorrhage, and advises the most cautious procedures. Paul, in his article "*About the extraction of darts*"—ΠΕΡΙ ΒΕΛΩΝ ΕΞΑΙΡΕΣΕΩΣ—quotes Homer ("Iliad" xi. 515) to show that this kind of work must principally occupy the army surgeon ; but he nowhere speaks of fractures produced either by darts, arrows, or javelins ; he only alludes to the possible *wounding* of the bone (ὁστέου τραυθέντος) and remarks in that connection that when arrows *stick* in the bones, we know this has happened because they resist our efforts to move them.

¹ "Institutions Militaires de l'Empereur Léon. Traduites en Français, par M. de Maizeroy," Paris, 1778 ; part i. inst. 4, p. 36.

² It is said that Asoka, the great Buddhist Emperor of Hindostan, who reigned B.C. 220, caused certain edicts to be cut upon the rocks in his empire, and that among these was one relating to the care of the sick and to hospitals. It directed, among other things, that caravansaries be erected in the public highways for the use of travellers, and that the sick and wounded be carefully attended to by the erection of medical houses or hospitals and dépôts of medicine. These hospitals

dochia,¹ said to have been created by the Emperor Julian, were established, principally, in the interest of travellers, and responded, in the absence of inns, and in the general poverty and want of hospitality among the people, to the caravansaries which have existed in the East since a time quite immemorial,² as may be inferred from a remark of Paula, a friend of St. Jerome, who caused several Xenodochia to be erected near Bethlehem, "in order," as she says, "that the devout idlers might fare better than the mother of God, who on her necessary journey thither could find no inn."³

So also, the celebrated hospital of St. John of Jerusalem, was established in the middle of the eleventh century, by certain pious merchants of Amalfi, because, when the pilgrims had passed the day in visiting the holy places, "it was not without great pain, and even peril, night having come, that they were able to find a shelter in the city."⁴

were to be provided with all sorts of instruments and medicines, "and skilful physicians are to be appointed to administer them at the expense of the state" ("Review of the History of Medicine among the Asiatics," op. cit. vol. ii. pp. 390-91). Wise considers this as perhaps the oldest reference to the establishment of a hospital, although it will be observed that the date of the edict is comparatively modern.

Of pre-Homeric Greek medicine we really know nothing. But M. Darembourg, in his "*Histoire des Sciences Médicales*," a work as remarkable for the critical and philosophical spirit which pervades it, as for its profound erudition, while admitting that the history of Greek medicine begins with Homer, "whose poems constitute our oldest archives," advances the opinion that among the ancient Hellenic tribes the art of medicine was not less esteemed and cultivated than among the Hindoos. "Heureusement le passé d'un peuple ne meurt jamais complètement, si nous ignorons ce que pensaient au moment où quittant leur berceau les divers tribus qui furent plus tard confondues sous le nom d'Hellènes, commencèrent à couvrir l'Asie Mineure, les îles et le continent de la Grèce, c'est à dire bien longtemps avant Homère, nous pouvons à l'aide du *Rig Véda*, essayer de déterminer ce que pensaient et ce que savaient leurs proches parents, les Aryas de l'Orient, il y a près de trente-cinq siècles. . . . Ainsi nous sommes autorisés à chercher dans les vieux hymnes des *Védas* une esquisse de l'état probable de la médecine chez les Hellènes durant une partie au moins de la période qui a précédé Homère." (Darembourg, op. cit. p. 72.) The ancient Hindoo writings are, however, by no means rich in illustrations of medical history, and the art of healing was cultivated in India in those far distant ages, as in Greece during the mythological period, principally by the sacerdotal castes and as a means of obtaining and retaining power.

¹ From *ξένος*, a stranger, and *δέχμαι*, to receive.

² Jeremiah, ch. ix. v. 2.

³ Hieron, "Epitaph. Paulæ."

⁴ "*Histoire des Chevaliers Hospitaliers*," par l'Abbé De Vertot. Amsterdam, 1732; tome i. p. 14.

The primary object of the establishment of most of the hospices in Europe, was rather to extend hospitalities to religious pilgrims, and perhaps, indigent wayfarers, than to provide an asylum for the sick. As it was for the advantage of the clergy to increase the number of pilgrims, religious establishments were quite ready to add to the facilities of travelling. Indeed, certain Hospitallers are said, not only to have covenanted to entertain strangers, but also to keep the roads in repair, construct bridges, &c.¹

But in the course of time, many of these hospices became richly endowed, and seem to have so far widened the circle of their charities, as to have received the sick. Muratori quotes from a life of St. Lanfranc, Archbishop of Canterbury, a passage to the effect that, even as early as the year 1070, the archbishop caused a hospital to be built at Canterbury, so arranged that one part of it could be occupied by sick men, and the other by sick women.² And it was during the same century, that the first asylum for disabled and aged soldiers is said to have been established by Alexius Comnenus. But whatever may have been the original purpose of its founder, fatherless and motherless children constituted so large a majority of its beneficiaries, that the institution became known to the world as an *orphanotrophium*, or orphan asylum.³

During the Crusades, in addition to the hospices, special hospitals for the sick and wounded returning from those expeditions, including even pesthouses, are reported to have been opened in several of the Mediterranean ports, as well as in other localities in Europe.⁴

¹ "Génie du Christianisme," par Chateaubriand. Hachette, Paris, 1863, p. 605.

² Beckmann's "History of Inventions," art. Infirmaries, Hospitals for Invalids, Field Lazarettos.

³ "Histoire de la Médecine." Traduite de l'Anglois de I. Freind; Paris, 1728, p. 115.

⁴ As a proof of the care taken of the sick poor in the middle ages, the astonishing assertion has been made, and often repeated, that *twenty-eight thousand* hospitals and lazarettos were at one time maintained and supported at the expense of the Templars and Hospitallers alone. The authority quoted is Matthew Paris. What that writer really said is as follows:—"Moreover, the Templars in Christendom have nine thousand *manors* and the Hospitallers nineteen, besides the emoluments and various revenues arising from their brotherhoods and from procurations, all of which are

But upon many important subjects connected with the internal economy of the hospices and hospitals of the middle ages, we have very little information. It was not until long after the creation of the great medical schools of Salerno, Bologna, Padua, Montpellier and Paris—until, in fact, the middle of the fifteenth century—that either physicians, surgeons, or apothecaries appear to have been in any way connected with them.¹ Most of these hospitals appear to have been simple dependencies of religious establishments, and frequently to have been maintained much less in the interest of the sick than as a part of the ecclesiastical machinery of the period, and as a source of revenue and profit to those connected with their administration.

Thus we are told that:—"The monks of St. Anthony have established a hospital which has neither foundation nor revenue, but which, from the abundant contributions which they have the secret of getting, brings unto them immense wealth. Bell in hand, and preceded by relics and the cross, they go about soliciting money, not only over all France, but through Germany and Spain as well. There is not a fair, not a city, not a bakery, not a mill, where they do not hold out their box, &c. . . . In their hospice they buy and sell. They are traders ; they are rich. Each one has his woman ; they marry well their daughters ; they keep a well-furnished table, but in all this, St. Anthony makes but a poor figure." ²

Indeed, the final assumption by the crown of the direction of hospitals was occasioned by the scandals arising from the mismanagement of these institutions by the clergy.³ Nevertheless,

increased by their privileges ; and every manor can furnish, without grievance, one soldier well armed and fully equipped," &c. The statement was only intended to show the wealth and material resources of the orders mentioned—resources which, so far from having been devoted to works of charity, were consecrated to the development of the ambitious political and military schemes of these semi-ecclesiastical organizations. (See Matthew Paris' "Chronicle." Bohn ; London, 1852 ; vol. i. p. 484.)

¹ "Histoire des Chevaliers Hospit." Op. cit. Tome iv. (Anciens et Nouveaux Statuts de l'Ordre), titre iv.

² Guiot de Provins. See "Histoire des Hôtelleries, Cabarets," &c., par Francisque Michel et Edouard Fournier. Paris, 1851 ; tome i. p. 315.

³ The monastic hospitals were suppressed in England just at the close of the reign of Henry VIII. and almost immediately after the confiscation to the state of the

during the whole Capetian dynasty the kings of France exercised what was called *le droit d'oblat*, or the right of sending to monastic institutions officers and soldiers who, having been disabled by wounds, disease, or age, were unfit for further military service. These soldiers were called *moines lays*, and assisted the monks, so far as they were able, in the discharge of the menial services of the establishment to which they had been sent.¹ In fact, as late as the sixteenth century it seems to have been the common opinion, that it was the duty as well as the prerogative of the Church to provide alike for distressed bodies and souls ; at least Seissel relates, that, in an abbey in Languedoc, there was a tradition that a certain abbot had been punished by Louis XII. for refusing to receive a convoy of sick soldiers sent to the abbey.² Indeed, after the time of Henry IV. it was a constant practice to billet the sick and disabled upon the convents, and it was only as late as 1629, that a royal ordonnance permitted a partial commutation of the "oblat," to the payment by the convents of 100 francs a year to each pensioner. But there is little reason for believing, that the convents were more exact in the payment of such forced assessments, than they had previously been willing to receive within their walls these unwelcome claimants to the rites of hospitality.

Without wishing to asperse in the slightest degree the humane sentiment of any time, I may observe, that there are many reasons for believing that the active and practical beneficence of the

abbeys and convents. Says Burnet:—"There passed another act of this parliament (1542) that made way for the dissolution of colleges, *hospitals*, and other foundations of that nature." (Burnet "History of the Reformation of the Church of England." London, 1857; vol. i., p. 229.) "The visitations which preceded the suppression of the monasteries (in England) discovered, if credit be due to the inspectors, crimes the most degrading to human nature . . . These crimes were apparently notorious,—nor is their existence doubtful, or the licentious lives of the regulars disputable, when their debaucheries had already attracted the Papal indignation, and their crimes incurred the censures and menaces of Morton the Primate." ("An Historical Account of the Origin of the Commission appointed to inquire concerning Charities in England and Wales." By Nicholas Carlisle. London, 1828; p. 7.)

¹ In England the same practice long obtained, and was termed "having *garisona* in a monastery." (Archæologia, Society of Antiquaries, London, vol. xxxi. p. 343.)

² See Beckmann's "History of Inventions," art. "Infirmaries, Hospitals for Invalids, Field Lazarettos."

middle ages has been greatly exaggerated. Charities of every kind were monopolized as well as dispensed by members of ecclesiastical orders, and in the presence of the ignorance and selfishness prevailing everywhere, and the disorder which existed in every state, in every department of its administration, the most trivial and limited acts of public benevolence could scarcely fail to be noticed, while the smallest organized effort, in behalf of the suffering and needy, appeared all the more resplendent in contrast with the general abandonment and darkness of the times. The Church was also strongly interested in encouraging the idea of its vast, incessant, and altogether sufficient labours in every field open to the commonest human sympathies; and it is, therefore, that to the Church itself we are now principally indebted for the records of mediæval benevolence, which have found a ready echo in the disposition universal and ever-existing, among sects, to discover in their own peculiar dogmas and doctrines the sources of those social developments or reforms, which are only expressions of the common conscience of the age.¹

Concerning the measures adopted, during the middle ages, to secure immediate assistance for those wounded in battle, we are quite ignorant.

The Gallo-Roman armies were probably attended, as were the later Roman armies, by wound-dressers; but whether the Gothic armies, or even those of Charlemagne, were followed by such persons is by no means certain.² By the convention of Ratisbon (A.D. 742), every commander was to have with him two bishops, as well as a certain number of priests, chaplains, and confessors—no mention is made either of physicians or surgeons. In William of Malmesbury's Chronicle of the First Crusade there is

¹ Chateaubriand himself ingenuously declares that "Il n'y a pas un beau souvenir, pas une belle institution dans les siècles modernes que le Christianisme ne réclame;" ("Génie du Christianisme." Op. cit. p. 559); and for him *Christianisme* was a synonym for Romish Catholicism *par excellence*.

² Physicians are mentioned in the codes of the Visigoths, promulgated in A.D. 504 and 608; but as to what may have been their relations to the armies of that people, the codes would appear to be silent. (See Malgaigne, "Œuvres d'Ambroise Paré," Introduction, pp. xvi. xviii.), and also "Histoire de la Chirurgie" par M. Peyrilhe, Paris, 1780. Tome second, pp. 727-728.

no allusion to the presence of either physicians or surgeons in the Christian armies. In Vinsauf's Chronicle of Richard the First's Crusade the wounded soldiers are said to have been carried to the "Standard," which was always kept near the centre of the army. The old chronicler also says:—"The weak and sick would have been in danger of perishing if it had not been for the care of King Richard, who sent out messengers on all sides to collect them together and bring them to Ramula." These two references—one to the wounded, the other to a special effort on the part of Richard to aid his suffering army—are the only ones I find in this Chronicle which give the least intimation that the disabled were the subjects of care and attention. In the chronicles of the eighth Crusade, that of Edward I. and Saint Louis, physicians and surgeons—leeches—are occasionally spoken of, but the general provisions for the sick still appear to have been of the most indifferent character.¹

It is certainly remarkable that, during the centuries Christendom was maintaining these immense expeditionary armies, the necessity of providing for the vast multitude of sick and disabled, which must have constantly encumbered the movements of such hosts, was never seriously considered. But there is no evidence that physicians and surgeons were appointed to attend upon them, or that hospitals of any kind were maintained in their immediate vicinity. Such medical and surgical assistance, as might at times be obtained by the common soldiers, was that

¹ In Joinville's "Memoirs of St. Louis" (1226-1271) the allusions to physicians and surgeons are quite frequent, but their quality is indicated in the following passage:—"The whole army was infected by a shocking disorder (1249) which dried up the flesh on our legs to the bone, and our skins became tanned as black as the ground or an old boot that has long lain behind a coffer . . . The *barbers* were forced to cut away very large pieces of flesh from the gums to enable their patients to eat. It was pitiful to hear the cries and groans of those on whom this operation was performing." But we are also told, and this is perhaps more important, that "the good King St. Louis" not only stipulated with the Sultan that his sick should be taken care of at Damietta, but that he also "issued his commands to the masters of the galleys to have them ready to receive on board the sick, and convey them to Damietta," and that "the king's seamen made great fires on board their galleys to *cherish the unfortunate sick*." But as to the existence of hospitals for the disabled, whether at Damietta or elsewhere, the memoir is silent.

charitably given by the medical attendants of princes, or that offered by itinerant leeches, or by the members of various religious orders, who were, in those times, the self-elected custodians and dispensers of human knowledge in nearly all its varieties. The priests, however, who assumed to practise the healing art, too frequently found it easier to appeal to the superstitious fancies of their patients, and to surround their practice with the mystic forms of pagan worship, than to investigate the causes of disease and discover remedies for the same. It was certainly unfortunate that the exercise of surgery, so necessary in the treatment of those disabled in war, should have been especially proscribed by the Church,¹ which thus practically for a long time impeded the work of a few faithful labourers in a wide field of usefulness.

It is a remarkable fact that the Arabs, notwithstanding the ardour with which they cultivated science, particularly medicine, when at the height of their political and military power, should have held the practice of surgery in disrepute.² To this fact, however, must be attributed the almost total silence of Arabic writers upon all questions connected with military medicine, as, perhaps, also to some extent the prejudices against surgery which subsequently existed in Europe.

Perhaps no more striking proof could be offered of the disrepute in which medicine, as well as surgery, was held in every Christian state, than is furnished by the fact, that for several centuries the Jews were the chief depositaries and disseminators of medical science.³

¹ The Councils of Lateran (1139), Montpellier (1162), Tours (1163), Montpellier (1195). Malgaigne, *op. cit.* Introduction, p. xxviii.

² "Anatomy seems to have been in no respect improved among them; while surgery rested upon the same footing, and they carried it no further than the latter Greeks, until the time of Albucasis." (Freind, *op. cit.* p. 211). Albucasis was one of the last of the Arab medical writers, living at the close of the eleventh or the beginning of the twelfth century. He wrote quite extensively on surgical subjects, and even gives some of his own experiences in connection with military surgery; but he observes that in his time surgery was so far forgotten that there scarcely remained a trace of the art. (Freind, p. 178).

³ "Il faut même avouer que c'est à eux que la Faculté de Montpellier doit une

During the centuries which immediately followed the Crusades it is not altogether clear how the soldier who fell sick in camp was taken care of, as may be inferred from the following passage in Bardin. "After the establishment of permanent garrisons the communal authorities, *perhaps*, came to the relief of the sick soldiers; *probably*, the captains gave temporary furloughs to the sick; *probably*, in besieged cities, chambers were prepared for the sick and wounded," &c.¹ As for the soldiers engaged in active campaigns, at this period, it is quite evident that they generally cured themselves as they could. When the communal militia were called out, they sometimes took with them their wives, that they might be taken care of by them in case of need. But as, until the sixteenth century, these troops were rarely paid, and were rarely called out for more than sixty days,² it is very probable that they were discharged from further service, and permitted to go home as soon as they were in any way unfitted for duty. This practice was certainly adopted in some instances. Thus Grose says:—"Immediately after a battle, such of meaner sort of soldiers, whose wounds seemed to require a considerable time to cure, were dismissed with a small pecuniary provision to carry them home," and he supports his statement by a

grande partie de la réputation qu'elle a eu dans son origine, parce qu'ils étaient aux 10^e, 11^e, et 12^e siècles, presque les seuls dépositaires de cette science en Europe, et que c'est par eux qu'elle a été communiquée dès Arabes aux Chrétiens.—ASTRUC, *Histoire de la Faculté de Montpellier*, p. 168.

¹ "Dictionnaire de l'Armée de Terre," par le General Bardin; art. Hôpital Militaire.

² "Li baron et li home le roy doivent le roy servir soixante jours et soixante nuicts."—*Établissement de St. Louis*, chap. 59 (A.D. 1250), "By the feudal law (in England) every tenant *in capite*, that is, every person holding immediately from the king the quantity of land amounting to a knight's fee, was bound to hold himself in readiness with horse and arms to serve the king in his wars, either at home or abroad, at his own expense for a stated time, generally forty days in a year, to be reckoned from the time of joining the army. Persons holding more or less were bound to do duty in proportion to their tenures; thus, one possessed of but half a fee, was to perform service for twenty days only."—*Military Antiquities*, by Francis Grose, Esq. London, 1801, vol. i. pp. 4, 5. See also Blackstone's "Commentaries," book i. chap. 13, "On the Military and Maritime States." I find, however, in the Rolls of Parliament (Edward II. anno. ix.) that the English militia enrolled for the Scotch war were called out for *sixty* days—as also, that they were paid 4*d.* per day.

reference to Barnes' "History of Edward III.," in which it is said the wounded were so disposed of, after the battle of Poitiers.¹

In France, until the reign of Louis XIII. army surgeons were attached to the persons of those commanding troops, and not to the company or troop itself,² and if the soldier profited by the presence of a surgeon in the camp, it was because his services were voluntarily rendered. Such was the relation of Ambroise Paré to the Duke of Guise, at Metz; his presence, although welcomed with joy by the whole garrison, was an assurance of skill and personal devotion to but a few. The great mass of the wounded at this time were uncared for, and the only bed a wounded soldier was sure to find, to use the sad expression of the old Huguenot, De la Noue, was "the ditch into which he might have fallen."³

According to Fronsperger, who wrote about the middle of the sixteenth century, field surgeons and barbers had been employed for a considerable time prior to his writing, in the armies of Germany. He recommends the employment by each commander of a chief surgeon, rather old than young, who should be able not only to work himself, but to teach his subordinates how to cure the diseases which arise when many men are crowded together. He should be present at the inspection of the troops, and see that his instruments as well as those of his subordinates

¹ "Military Antiquities," op. cit.; vol. i. p. 242.

² The only instance, with which I am acquainted, which might be cited in controversion of my statement is one mentioned by M. Malgaigne:—"Charles the Bold," says that writer, "first took measures to meet this necessity of every regular army, and he established a military surgical service. Thus he attached a surgeon to each company of one hundred lances. As each lance represented eight combatants, there was a surgeon for every 800 men; and as he had 2,200 men of arms, the military surgery of Burgundy counted a staff of twenty-two surgeons for a total of about 20,000 combatants, not including the surgeons of the barons and those of the Duke himself." ("Œuvres d'Ambroise Paré," par J. F. Malgaigne. Paris, 1840; Introduction, tome i. p. clxvii.)

The statement will lose, perhaps, none of its historical interest to the reader on his learning that all these surgeons, without exception, were simply *barbers*.

³ "Voilà quelles sont les belles galleries et les beaux promenoirs de gens de guerre, et puis leur lit d'honneur est un fossé où une harquebusade les aura renversés." —*Memoires de F. De la Noue*, ed. Panthéon, p. 335.

were in good condition ; should they have been injured, a corresponding deduction should be made from their pay. He should have charge of the medicines, and issue them to his assistants, as also, decide, in all contested cases, how much the soldiers should pay to the surgeon who claimed to have cured them.¹

It is apparent from the concluding statement that at the time when Fronsperger wrote, that of Charles V., if it was considered important that surgeons should be attached to the imperial armies, their general relation to those armies was still very much what it had been for centuries previously in France and other European states, where armies had been habitually followed "by a swarm of ignorant empirics and avaricious charlatans, attracted by the thirst of gain, and who sold at high prices the elixirs, balsams, and even charms of which they pretended to have the secret."²

With regard to the medical and surgical service in the English army, we are told in Rymer's "Fœdera," that Henry V. of England when about to engage in a war with France, in 1415, employed as a field physician, Nicholas Colnet. He was to take with him three mounted archers, and to accompany the king in person. Morstede, the chief army surgeon, was to take with him three archers and twelve surgeons. The nature of the services of these surgeons is nowhere recorded.³ Their rank or grade, however, may be inferred from the fact, that the following year Morstede and Bredewardyn, having been engaged as surgeons, were at the same time commissioned to *impress* as many additional surgeons, as they thought necessary for the expedition; as also, from an allusion to the *medici*, in a military code published at Le Mans in 1416, which is as follows:—"Whether soldiers, shoemakers, tailors, barbers, physicians or washerwomen."⁴

¹ "Von Kayserlichen Kriegsrechten Malefiz und Schuldhändlen Ordnung und Regiment." Frankfurt, 1566; p. 81.

² "Études sur le Service de Santé Militaire en France," par L. J. Bégin. Paris, 1849; p. 2.

³ Colnet and Morstede were indentured on the same day (April 29, 1415), the former as "Phisition" and the latter as "Surgien."

⁴ Grose, "Military Antiquities," vol. i. p. 236.

The expedition to St. Quintin (1557) is the first in which many surgeons were employed by the English, the number being definitely stated ; fifty-seven surgeons are said to have accompanied the army then formed, which numbered about six thousand men. Thomas Gale served as a surgeon in this expedition. He subsequently became celebrated in his profession at London, and published various surgical writings, among which was a "Treatise on Gunshot Wounds." He also gives us much information concerning the state of military surgery in his time, information which detracts considerably from the apparent completeness of the surgical outfit of the expedition against St. Quintin. "When I was at the wars," says he, "there was a great rabblement there, that took upon them to be surgeons. Some were sow-gelders and horse-gelders, with tinkers and cobblers. This noble sect did such great cures, that they got themselves a perpetual name, for like as Thessalus's sect were called Thessalians, so was this rabblement for their notorious cures called dog-leeches ; for in two dressings they did commonly make their cures whole and sound for ever. But when the Duke of Norfolk, who was then general, understood how the people did die, and that of small wounds, he sent for me and certain other surgeons, commanding us to make search how these men came to their death ; we according to our commandment made search through the camp, and found many of the same good fellows which took upon them the name of surgeons, not only the name, but the wages also. We asking them whether they were surgeons or no, they said they were. We demanded with whom they were brought up ; and they with shameless face, would answer, either with one cunning man or another, who was dead. Then we demanded of them what chirurgery stuff they had to cure men withal ; and they would show us a pot or a box, which they had in a budget, wherein was such trumpery, as they did use to grease horses' heels, and laid upon scabbed horses' backs ; and others that were cobblers and tinkers, they used shoemakers' wax, and the rust of old pans, and made therewithal a noble salve, as they did term it. But in the end this worthy rabblement was committed to the Marshalsea, and threatened by the Duke's Grace to be hanged for their worthy deeds, except they would declare the truth,

what they were, and of what occupation, and in the end they did confess, as I have declared to you before."

Although Gale may have employed in his account more energetic denunciation than is usually consistent with a rigid observance of truth, it is very certain that the English army medical service was in his time most defective; defective not only because of the ignorance and incompetence of those who often succeeded in introducing themselves into the army as surgeons, but, because the Government itself understood but very imperfectly how immediately its own interests were concerned in the health of the army, and perhaps still less perfectly understood the obligations by which it was, at least tacitly, bound to offer some equivalent to those who had given away their health and strength in the service of the King. I find in Rymer's "*Fœdera*," among the instructions sent to Sir Thomas Leighton, who was with the English army in Flanders in 1592, a passage which is not without interest in this connection. It is as follows:—"Item: where it appeareth, by all certificates sent from hence, that the one-half or more of the nomber that weare there in Paye, are sicke and ympotente and unable to serve, it shall be considered how many of them may likely be recovered in short tyme to be able to serve, and those to be retyened; and for the others, whose infermites and sickness are such as there is no lykelyhood of their recovery in short tyme, order is to be given bothe to discharge the Queen of her paye and to return them to their own country."¹

There is such a thorough heartlessness pervading this order, the object of which was to get rid of the inconvenience and expense of supporting sick servants who had lost their health by their devotion, that one is quite willing to attribute it to ignorance, to the moral darkness which still lingered behind the walls

¹ And how they were returned we learn from "*Certain Discourses*," by Sir John Smythe, knight, 1590:—"Besides that great numbers of such their sicke and starved soldiers, by order of the Earle of Leicester, were in those parts (Flanders) embarked and transported into Essex and Kent, and other partes of England, to recover health; of which foresaid great numbers of miserable and pitiful ghosts, or rather shaddowes of men, the Essex and Kentish carts and carters (that carried them) can testifie; of which scarce the fortieth man escaped with life."

and in the closets of Government offices, during the freshness and early radiance of that morning of English national life. Bacon was then laying the foundation of every exact science, and Shakespeare was revealing the inexhaustible depths of human passion and sympathy, and Sydney, among these same troops, "sicke and ympotente and unable to serve," was leaving to mankind as a dying legacy the immortal example of an unselfishness, of an abnegation so complete as to inspire him to give to a wounded soldier near him the draught which had been brought to quench his own thirst as he lay pierced with mortal wounds. But the world was still ignorant, cold, and selfish, and a long dreary period lay between the seed-time and the opening harvest.

As I only propose to give an outline of the history of military medicine and surgery, and more particularly in its relation to the subject of hospitals, it is quite impossible for me to notice many facts of great importance, but which belong rather to the general history of medical science. But I may here remark that, although the medical service of European armies was for many centuries undertaken, as we have seen, principally by charlatans and ignorant pretenders, from the opening of the school of Salerno in the eleventh century, there never was a time in which there were not a few men who fairly represented medical and surgical science, whatever may have been their attainments as measured by modern standards. Hugh of Lucca, Pitard, De Mondeville, and several surgeons of perhaps equal distinction, even followed the armies of the Crusaders. At the close of the thirteenth and at the beginning of the fourteenth century the study of surgery was introduced into the Universities of Paris and Montpellier, and for a time obtained a certain reputation through the names of Lanfranc and Guy de Chauliac. The study of medicine was still more actively cultivated subsequently, but whatever may have been the beneficent results of the increase and extended distribution of medical knowledge, it is only very recently that the soldier has been able to secure that share to which he is rightfully entitled.¹

¹ Doubtless one of the causes which tended to retard the efficient organization of the health service in European armies is to be found in the intense jealousy with

It should be remembered that until the time of Louis XIII. European armies were usually very small, as also that shelter and succour might occasionally be obtained by the poor and needy, as already stated, in the *hospices* established by charity, as well as in the numerous monasteries then existing in almost every part of Europe. Indeed, it was probably only with the establishment of large and permanent armies that the necessity

which, during the sixteenth, seventeenth, and eighteenth centuries, those who claimed to practise surgery were regarded by all who had regularly obtained the title of "Doctor." After the priests had exhibited all the hostility towards surgery of which they were capable, then came the turn of the Faculties of Medicine, and the efforts made by these bodies during this time to degrade the surgeon and his profession were often almost incredible. "In France the Faculty called in the barbers to entrust to them the administrative work of surgery; afterwards it instructed them how to perform the principal operations; and at length it succeeded in having the barbers made members of the surgical corps. Surgery, thus degraded by its association with workmen, was exposed to all the contempt which naturally resulted from so unworthy an alliance. In 1660, by a formal decree, it was stripped of all literary honours, and if learning fled not utterly from surgery, it could only remain connected with it in shame and humiliation." ("Encyclopédie," art. Chirurgien.)

The 24th art. of the "Statuta Facultatis Medicinæ Parisiensis," published in 1696, is as follows:—"Si quis inter Baccalaureos sederit, qui Chirurgiam aut aliam Artem manuariam exercuerit, ad Licentias non admittatur, nisi prius fidem suam astringat publicis Notariorum instrumentis, se nunquam post hac Chirurgiam, aut aliam Artem manuariam exerciturum; idque in Collegii Medici Commentarios referatur. Ordinis enim Medici dignitatem, puram integramque conservari par est."

In England, during this period, surgery was in equal disrepute. The London Company of Barber Surgeons had grown to be an ancient and powerful corporation, but the practice of surgery had become so abased, that even in the reign of George II. the question was brought before the Chief Justice of England:—"Whether a surgeon was an inferior tradesman, within the meaning of a certain statute of William and Mary?"

After long and frequent contests, in which the surgeons and the doctors scrupled little as to the measures employed to maintain their respective pretensions, the strife in France was turned in favour of the surgeons by a decree of July, 1750, which established a complete course of studies in all the branches of the art and science of surgery, which should extend through three consecutive years; it was also decreed that the "masters" in surgery should enjoy the prerogatives, honours, and rights recognized as belonging to the other liberal arts, as also the rights and privileges enjoyed by the well-to-do burghers of Paris. It was scarcely, however, before the beginning of the present century that French military surgeons succeeded in obtaining for themselves the rank and consideration to which they were rightfully entitled, as well in the hierarchy of letters as of arms.

for a medical department and for a well-organized and systematic disposition of the sick, began to be seriously felt.

Montluc, when speaking, in 1575, of the wounded at the siege of Metz, says:—"I caused money to be distributed among them from the *hospital* which the admiral had erected." An ordonnance issued by Henry IV. at the time of the siege of Amiens, considers the subject of a military hospital, and shows how one might be supported by a tax on the sutlers and camp followers. At this siege (1597) Sully did establish a hospital, which soon became so favourably known as to induce people of quality to enter it for treatment. These two instances in which military hospitals, or, rather, sedentary ambulances, were established are the most ancient which can be cited in Europe. It seems, however, that the good results obtained in the ambulance at Amiens, and which have been said to have gained for that siege the name of the "velvet siege,"¹ *siège de velours*, were soon forgotten, for we hear no more of military hospitals until the time of Richelieu, when temporary hospitals were erected in the rear of certain armies. But that these hospitals were by no means equal to the necessity which had suggested their establishment is shown by the following article, taken from the ordonnance authorizing these hospitals:

"If on the march certain soldiers should fall sick, so as to be unable to follow the flag, the captain, or whoever conducts the company, may give to them a passport, praying the mayors or sheriffs of the nearest city to receive them into their hospital, and to this city the mayors of the place, where they are, shall be obliged to see them conducted, and the mayors and the inhabitants of said city to receive and treat and medicament them carefully until their entire and perfect cure in the hospital, *if there is one*, and if not, at the expense of the city. And to this

¹ This siege has been commonly said to have been called the *siège de velours*, on account of the hospital then established. The reason assigned is probably erroneous; in any event, the term was at that period frequently used to indicate a siege in which the labour was slight and the hardships few. Thus La Fère was besieged in 1580, and we are told that although the siege was long, "the season was fine, the provisions abundant, and the soldiers called it *le siège de velours*." ("Histoire de l'Ancienne Infanterie Française," par Louis Susanne. Paris, 1850; tome ii. p. 24).

end the captains and governors shall aid on their part, and the bishops and curés shall be exhorted to commend them. And the said soldiers being cured and in a condition to return to duty, shall take a certificate from the magistrates of the place where they have been treated, upon which, and the above-mentioned passport of their captains, the cities upon the route prescribed by the magistrates, in order to join their companies, shall likewise be held to receive, lodge, and feed them in their hospitals, or elsewhere, that they may enable them by this charity to go from city to city until they reach the army or garrison.”¹

This statement is especially interesting, as it shows that permanent military hospitals did not then exist; that the *droit d'oblat* had ceased to be enforced as a means of securing a shelter for the sick, as also that the common practice of the time was to leave sick and disabled soldiers to the charity of the public, or as a charge upon the municipalities. And this condition of things prevailed in France until near the close of the reign of Louis XIV. That sovereign is said to have made use of temporary hospitals in the rear of his armies in 1672, and Voltaire gives a glowing account of the excellence of the hospitals at the siege of Lille, in 1707; but their exact relation to the army is not well known. Indeed, it is very singular that Chénovières, De Presle, Coste, and the several French authors who wrote particularly upon military hospitals during the middle and latter part of the eighteenth century, should have said so little, or written so confusedly, upon the organization of such hospitals during the period immediately preceding the time in which they wrote.

The hospital service was certainly not greatly improved during the reign of Louis XIV. There is no indication that permanent military hospitals were then established anywhere in France, or that the army was relieved of the care of its sick and disabled in any way other than that just described.

Nor is this fact particularly remarkable, since the functions of civil hospitals were at that time most imperfectly understood, and the limits of ecclesiastical, state, and municipal jurisdictions

¹ “Ordonnance de Janvier, 1629.” Art. ccliii.

and responsibilities, had been by no means definitely established. As late as 1662 a royal edict was published, decreeing that:—"In all cities and great boroughs there shall be hospitals to lodge, shelter, and nourish *the poor invalid beggars*, natives of these places, or who shall have been there a year; as also children, *orphan*, or *born of mendicant parents*, all of which poor shall be there instructed in Christian piety and in those crafts of which they may be capable." It will be seen that when this edict was published, the popular idea of the mission of a hospital was still that which had obtained during the middle ages, and which, in the eleventh century, had been represented by the orphanotro-
pium of Alexius Comnenus.

The Hôtels Dieu and communal hospital establishments of France owed their foundation, however, principally to an edict of Louis XIV. issued in 1693, in accordance with which the goods and estates nominally belonging to pest-houses, but the revenues of which had been for a long time diverted to other purposes, were to be thenceforth employed according to their primitive destination; that is, as stipulated in the terms of the act, the revenues were to be applied to the maintenance of asylums for the support and care of the poor, and the relief of the sick poor of the localities in which the pest-houses had previously existed.¹ In a word, the Hôtels Dieu were nothing but great municipal pauper-houses, in which a medical service was maintained, and to which the state claimed the right of sending its disabled servants. Indeed, these establishments, as well as those more directly connected with monastic institutions, will always hold a much more prominent place in the general history of mendicity than in the history of asylums for the sick.²

¹ "Recherches sur l'Origine de Ladreries, Maladreries et Léproseries," par L. A. Labourt. Paris, 1854; p. 15.

² It was only after the French Revolution had broken up the whole structure of traditional government in France that an attempt was made to sweep away the last vestiges of the public *hospitality* of the middle ages. On the 10th of Thermidor, in the year III., an order was issued closing the hospitals to vagrants, and suppressing practices which, in the existing state of society, were a detriment to the sick, and an encouragement to the idle and vagabond. (See Husson, *op. cit.* p. 483.)

The necessity of making a special and permanent provision for those disabled in war found its first serious expression in the project of a grand national asylum, which has since become celebrated in the military history of France.¹ And yet the Hôtel des Invalides, the foundation of which was laid in 1674, was established, in accordance with the terms of the royal edict, rather as a home for disabled officers and soldiers, than as a hospital properly so called.² It was only in 1707 that a surgeon-in-chief was appointed, and for many years after, the surgical organization of this asylum seems to have been sadly wanting in authority as well as efficiency. Nevertheless, the establishment may be considered as a hospital, and as one of the first of those institutions which, erected in the name of charity and humanity, have been intended rather to perpetuate the magnificence of their founders. The Hôtel des Invalides certainly offered better facilities for the treatment of disabled soldiers than had previously existed, and one can well understand how the courtiers of "Le Grand Monarque" should have said:—"The centuries the most distant shall see in it the substantial evidence of his liberality, of his magnificence, of his justice, and his piety." We are told that:—"All which is beautiful, grand, or majestic in architecture has been here employed, as well on the inside as on the outside. Gold, marble, exquisite paintings, nothing which sculpture or joinery-work, and all the other arts, could contribute to ornament an edifice, has been omitted;" and that the interior was arranged for the sick, as well as for those in health, with an "attention merveilleuse;" and, more than all the rest,

¹ An attempt was made by Henry IV. to establish a "*maison royale de la charité chrétienne aux pauvres gentilshommes, capitaines et soldats estropiez, vieux et caducs*," by an edict issued in June, 1606; but it was found difficult to obtain revenues sufficient to support the establishment, and the house was soon suppressed, and the "*gentilshommes vieux, caducs, et soldats estropiez n'ayant moyens d'ailleurs de vivre*," were redistributed as "*religieux laïcs*" among the abbeys and priories. (See Doc. cited by Gama, op. cit. p. 50 *et seq.*)

² "*Le dit hôtel n'étant destiné que pour le logement, subsistance et entretenement des dits officiers et soldats estropiés et invalides*," &c. Versailles; Édit du Roi, Avril, 1674. (See "*Code Militaire, ou Compilation des Ordonnances des Rois de France concernant les Gens de Guerre*, par M. de Briquet." Paris, 1761; tome 5me, titre cxxii. p. 196.)

that "on ne voit rien en tout cela qui sente la crasse des Hôpitaux."¹

The history of the Hôtel des Invalides, in its immediate relation to our subject, is, however, chiefly important in view of the attempt there made, about the middle of the last century, to organize a course of anatomical and surgical instruction in the special interest of military surgery.²

The military hospitals which were established during the early part of the eighteenth century were for the most part merely sedentary establishments, created at the several bases held by active armies, and which disappeared with the special causes which had called them into existence. Their capacity was generally too limited to enable them to receive the number of sick inevitable in an army, and they were constantly dependent for supplementary aid upon the civil hospitals of the kingdom.³ Although fairly well provided with physicians, surgeons, apothecaries, and the usual aids and subordinates, the physicians and surgeons seem never to have had that right of direction in the organization of the hospitals, which has always been an essential condition of efficiency. Scarcely had they escaped from the tutelage of the ecclesiastics of different degrees, who for ages had had the general control of such establishments, when they fell into the hands of the *commissaires des guerres*,⁴ who, as the agents of the war department, have ever since successfully maintained their supremacy as well as their jurisdiction. Another evil which befell these establishments was occasioned by the system adopted by the French Government for their maintenance, a system practised at that time in several if not most of the states of Europe. The food, medicines, bedding,—everything, connected with the material organization and the daily maintenance of these hospitals, was furnished by contract; and more than this, the hospitals were as a common

¹ "Histoire de la Milice Française," par Le R. P. Daniel. Paris 1721; tome ii. pp. 567-74.

² "Fragments Historiques et Médicaux sur l'Hôtel Nationale des Invalides," par M. F. Hutin. Paris, 1851; p. 37.

³ Audouin affirms that, so late as 1727, not even a *sedentary* military hospital had been created, and that the civil hospitals, such as they were, were the only establishments open to sick soldiers.

⁴ Gama "Esquisse du Service de Santé Militaire," p. 107.

rule farmed out, the sick and wounded being provided with "everything necessary," at so much per head for each day. As the original contractors usually sold out their bargains to sub-contractors, who in their turn sublet portions of the work to under-farmers, one can readily imagine the abuses, and even atrocities which would inevitably exist under such a system. Turpin de Crissé declares that he saw in the wars, between the years 1733 and 1741, vastly more soldiers perish in the hospitals from a want of proper care than lose their lives in combat.¹ Indeed, the parsimony of the administration and the avarice of contractors, in everything which concerned the organization and maintenance of military hospitals, were causes of unceasing complaint, and sources of scandal and disgrace to the government itself, during nearly the whole of the eighteenth century. This pernicious system was finally abandoned in the seventh year.

The importance of constructing permanent military hospitals was by no means generally recognized until about the middle of the eighteenth century. At this time it is said that there were eighty-five permanent military hospitals in France.² It will be understood, however, that these establishments were generally small. Coste, in 1790, recognized but *four* which could really be considered as of the "first order;" these were at Lille, Metz, Strasbourg, and Toulon. Tenon, however, in 1788, speaks of that in Paris as being "distinguished by a spirit of order and good management," and as the hospital in Paris, where the sick were best distributed;³ and Coste says of these establishments in general:—"They are national and characteristic, and worthy of all the admiration of foreigners, who cannot compare them with their own, without confessing the superiority of ours."⁴ A

¹ *Commentaires sur les Institutions Militaires de Végèce*, par M. le Comte Turpin de Crissé. Paris, 1783; tome ii. p. 85, *et seq.*

² "There are in the kingdom eighty-five military hospitals of the king, under the orders of the Minister of War, and erected in favour of sick soldiers. In each hospital there is a controller, a physician, a surgeon-major, and a contractor, to provide and take care of the troops of his Majesty. Besides these hospitals which are *fixed*, &c." (*"Dictionnaire Militaire,"* par M. D. L. C. D. B. Paris, 1758; art. *Hôpital.*)

³ Tenon, "*Memoire 2me*," p. 45.

⁴ Coste, *op. cit.* p. 3.

number of these hospitals were reserved for the treatment of special diseases ; at Thionville there was a hospital for the subjects of scrofula ; and special hospitals and *sanitaria* were established in the neighbourhood of certain mineral waters. Indeed, as early as 1730, a hospital, still maintained, was opened near the springs of Bourbonne-les-Bains.

Nevertheless, before the latter part of the eighteenth century, hospital establishments in France, whether military or civil, were in many respects badly conducted ; within them there was a general insufficiency of food and clothing ; but one bed, and that a narrow one, was allowed for two patients, and many of the commonest conditions of health as well as comfort were neglected.¹ Some of the causes of this state of things, I have already alluded to ; but the principal cause, was the profound ignorance of the most elementary principles of hygiene on the part of the whole body of official administrators, who had been charged with the direction and control of these establishments. Notwithstanding the boasting of Coste, and other French writers, there are many good reasons for believing that if in Europe generally during the latter part of the eighteenth century, military hospitals were less numerous and splendid in their external appointments, such hospitals also suffered less frequently from overcrowding, and were quite as well maintained as those of France.

The period from 1750 to 1788 is that within which the system

¹ During the eighteenth century the Hôtel Dieu at Paris, containing but six or seven hundred beds, occasionally received within its walls three or four thousand patients. In a ward reserved for small-pox patients there were sometimes as many as six adults or eight children in *one bed, four feet and four inches wide*. They lay dovetailed together, the feet of one set resting against the shoulders of the other. (See Arago, "Annuaire du Bureau des Longitudes," 1853, p. 458.) "A l'Hôtel Dieu il y a des jours où l'on purge ; il y a des jours où on ne purge pas." ("Du degré de Certitude de la Médecine," par P. J. G. Cabanis. Paris, An. ix. 1803 ; p. 178.) "It is the largest, the most frequented, the richest, and the most frightful of all our hospitals" ("Encyclopédie," 1765 ; art. Hôtel Dieu). One may easily infer, from the frightful state of things said to exist at "the largest and richest of our hospitals" in 1765, that the administration of those less liberally endowed left much to be desired ; so much, that the soldier who for a hundred years after the nominal creation of military hospitals, had almost uniformly been imposed upon these establishments, might, perhaps, have fared better had he been left by the wayside to the charity of chance and of Heaven.

of permanent military hospitals received its largest development in France. In 1788 all the permanent hospitals, then numbering sixty-six, according to Coste, were suppressed, with the exception only of eight, which were preserved under the name of *auxiliary hospitals*. It was proposed to economize the funds of the state by the suppression of the fixed hospitals, and by an extension of the attributes of the surgeons-major attached to the troops, as well as of the functions and importance of the regimental hospital. Although a certain number of French medico-military writers have spoken of this change with regret, there is little reason to doubt that in 1788, the number of permanent military hospitals in France, was much greater than it was for the interest of the administration to maintain, as also that the project of giving more importance to regimental and temporary field hospitals, was an attempt to improve the French army-medical organization, precisely at those points, where it has always shown itself to be weakest.

The military hospitals were re-organized in France in 1793 by the National Convention, and the number of the permanent establishments was fixed by the Decree of the 4th Germinal at thirty. It is doubtful, however, if this number were really opened, as "in 1814 there were but eleven military hospitals in France which merited the name."¹ In 1828 the whole number, including those of instruction and *d'Invalides*, was thirty-four.

The necessity of establishing permanent military hospitals was very generally recognized about the same time all over Europe. Bardin says the English *imitated* the French in the construction of these hospitals; but this statement is not strictly correct, as the magnificent soldiers' hospital at Chelsea was founded in 1682, and the plans for the seamen's hospital at Greenwich, a construction still more imposing, were prepared by Sir Christopher Wren in 1695. Previously to the establishment of these hospitals, however, no permanent provision seems to have been made for those disabled in the English service. So late as 1664, we are informed by Mr. John Evelyn, who that year was appointed "a commissioner

¹ "Bégin," op. cit. p. 150.

for the care of the sick and wounded in the Dutch war," that the custom was to billet the sick and wounded upon the civil hospitals, or quarter them in private houses; that no stores of medicines, provisions, or money were kept on hand; but that the sick were maintained from day to day as best they could be; and that the arrearage of the Government to the victuallers, and those who had furnished lodgings, medicines, &c., was occasionally such that their distress was scarcely less than that of the sick themselves. Evelyn says, that but about £34,000 was allowed for the taking care of the sick and wounded during this war—from 1664 to 1668—including the maintenance of all the prisoners. Writing on the 30th of September, 1665, to Sir Philip Warwick, he says:—"One fortnight has made me feeble the utmost of miseries that can befall a person in my station, and with my affections; to have 25,000 prisoners, and 1,500 sick and wounded to take care of, without one penny of money, and above £2,000 indebted. Is there no exchange or pecuniary redemption to be proposed? or is his Majesty resolved to maintain the armies of his enemies in his own bosom? whose idleness makes them sick, and their sickness redoubles the charge!" Elsewhere he complains bitterly of the suffering occasioned by this parsimony and want of foresight, not only to the prisoners, but to his own countrymen. "It is very hard there should not have been a sufficient fund consecrated & assigned as a sacred stock for so important a service; since it has been a thing so frequently & earnestly pressed to their Lordships; and that this is not an affair which can be managed, without present monies to feed it; because we have to deal with a most miserable, indigent sort of people, who live but from hand to mouth, & whom we murder if we do not pay daily or weekly: I mean those who harbor our sick & wounded men, and sell bread to our prisoners of war." ¹

Early the following year Evelyn laid before Charles II. a

¹ John Evelyn, "Diary and Correspondence." Alexander Murray and Son, London, 1870; pp. 638, 640. Pepys also refers to the wretched treatment of the sick at this period. Under the date of Oct. 5th, 1665, he makes this entry in his "Diary":—"Item: to Mr. Evelyns to discourse of our confounded business of prisoners and sick and wounded seamen, wherein he and we are so much put out of order."

project for the establishment of an "infermerie" for the treatment of the sick and wounded. The king, "with great approbation recommended it to his R. Highnesse;" but nothing came of the project but approbation. To use Evelyn's own words:—"I saw no mony, tho' a very moderate expense would have saved thousands to his Majesty, and ben much more commodious for the cure and quartering our sick and wounded, than the dispersing them into private houses, where many more chirurgions and attendants were necessary, and the people tempted to debaucherie."¹

The fact is, that the necessity of making a settled provision for the sick and wounded in the English service only became apparent, as elsewhere, after the army had been organized on a permanent footing, and this was very long after the establishment of standing armies in France, as well as in most of the European states. It is certain, however, that during the eighteenth century hospital establishments for the troops were organized in England, upon a basis substantially similar to that considered as necessary to secure the best results in civil hospitals. Indeed, since the establishment of permanent military hospitals wherever they may have been created, such hospitals have been constructed with the view of obtaining the hygienic conditions deemed essential in civil establishments. But it must be borne in mind that all these establishments, whether civil or military, have, until very recently, been constructed with little reference to those requirements which modern sanitary science has shown to be most indispensable.

Coste estimates that the establishment or *building* of the sixty-six military hospitals, which were maintained in France in 1790, involved an original outlay of money, as follows :

Each of the Four hospitals of the 1st class, 200,000 francs.

„	Nine	„	„	2nd	„	60,000	„
„	Twenty-two	„	„	3rd	„	24,000	„
„	Fourteen	„	„	4th	„	20,000	„
„	Seventeen	„	„	5th	„	12,000	„

¹ John Evelyn, "Diary and Correspondence," op. cit. p. 312.

The buildings forming these hospitals¹ were most of them old convents, palaces, and private houses, transformed more or less extensively to meet the presumed requirements of the new service.² Most of the buildings, constructed especially for hospital purposes, were built in accordance with the plan known as the rectangle of Vauban, that is to say, two or more stories of wards were so erected as to enclose a quadrangular court. The military hospitals at Strasburg and Metz were examples of this sort of construction, which in its form is certainly one of the worst ever proposed. The space, moreover, within these buildings was generally exceedingly limited, but eighteen or twenty cubic metres of air being allowed each patient, with an interval of two and a-half feet between each bed. Overcrowding, and all the evil results of a defective ventilation, were inevitable in these establishments.

The hospital at Lille—of the first class—was, perhaps, one of the best examples of the hospital construction of the eighteenth century. In this hospital the principal buildings were so arranged as to form a cross, the four pavilions meeting in a central vestibule. Here was placed a large spiral staircase, which ascended to the roof. The well, which served as a sort of ventilating shaft, was covered by an open dome or lantern.

As a rule, however, the plan was simply to secure a large covered shelter, under which a multitude of persons might on an occasion be crowded, so disposed that the general service of the establishment might be performed with as little inconvenience as possible. Says a writer of that time:—"In most European hospitals, four or five wards may be seen, more or less spacious, all communicating and mutually transmitting the unwholesome and epidemic vapours, which it was an object to isolate. These ancient plans, which religion seems to have consecrated to suffering humanity, have only been perpetuated because the service could in this way be the more easily performed. It is the fear of having to take a hundred steps more which

¹ "Du Service des Hôpitaux Militaires," par M. Coste. Paris, 1790 ; pp. 27, 28.

² According to the "Encyclopédie Méthodique," most of these hospitals were established in private houses. (Art. Hôpitaux, art. vii.-viii.)

developes this enormous complication of incurable diseases, devouring rocks, against which the profoundest observations that medicine can suggest are wrecked without the least success.”¹

The material organization of the civil hospitals, or Hôtel-Dieu, which had been used previously to the creation of military hospitals, and which were always relied upon by the military administration for supplementary aid, had been and then was even more defective. Limiting, however, my observations to points connected with their construction, I may observe first: their capacity to receive the sick was generally small as compared with the magnitude of the establishment, the ecclesiastical character of these foundations always predominating, even after a general direction over them had been assumed by the state. Previously to this, the various dormitories, refectories, chapels, sacristies, &c., usually occupied the greater part of the establishment. A church itself, on whose façade and walls had been lavished the moneys solicited for the poor, frequently formed the most prominent construction in the group of buildings; the church connected with the old Hotel-Dieu at Paris is said even to have “equalled in richness of ornamentation the most superb churches of the sixteenth century.”² M. Viollet le Duc has observed, in speaking of the hospitals erected in the reign of Louis XIV. “It would be difficult to say that the hospitals of the seventeenth century are models worthy of imitation in their construction as regards salubrity, hygiene, or the respect which should be shown the sick poor;” but, as is quite natural for a lover of art and the archæologies of architecture, he nevertheless discovers in the remains of the hospitals of the middle ages “a sentiment of charity, delicate as well as intelligent.”³ M. Viollet le Duc, in his admiration of certain national monuments, and the dispositions for the care of the sick and infirm therein exhibited, does not consider, when he makes this statement, the very limited capacity

¹ “La Santé de Mars,” par Jourdan Le Cointe. Paris, 1790; p. 438.

² “Étude sur les Hôpitaux,” par Armand Husson. Paris 1862; p. 481.

³ “Dictionnaire Raisonné de l'Architecture Française du XI^e. au XVI^e. Siècle,” tome vi. p. 117.

of these foundations. This capacity was limited, both relatively and absolutely ; relatively, because the need of public hospitals was then vastly greater than at present, not more on account of the general poverty of the lower classes than because of the enormous sickness rates which then weighed constantly upon the whole population ; and absolutely, because the infirmaries connected with conventual establishments were rarely capable of containing more than a small number of beds, while these beds were originally intended rather for the inmates of the establishment itself, or for sick and infirm members of the same or allied religious orders, than for the poor and destitute among the general population.¹ Says Husson :—" Aside from the ancient pest houses, where the separation of the sick was a forced consequence of contagion, and aside from a few other foundations of less importance, where charity assumed the character of private hospitality, we find in all the hospital constructions of the middle ages the same principle, absolute and exclusive, of large halls. Nearly everywhere the hospital was a great gallery, divided into two or three naves, built out from a cloister or a chapel. Sometimes, as at Lubec, the Hôtel-Dieu, unprovided with any of the general arrangements necessary for the treatment of the sick, was only composed of a church with three symmetrical naves that served as an entrance, and at the extremity of which was a large hall. Assuredly that was not a hospital, as we understand the word to-day, it was rather a charitable refuge, the ancient Xenodochium, which the church opened so widely to pilgrims, weary travellers, or the indigent without shelter."²

¹ "The infirmary itself was almost a second monastery. Hither came the procession of the convent to see the sick brethren, and were greeted by a blazing fire in the hall, and long rows of candles in the chapel. Here, although not only here, were conducted the constant bleedings of the monks. Here, in the chapel, the young monks were privately whipped. Here the invalids were soothed by music. Here also lived the seven 'play-fellows,' the name given to the elder members, who after they had passed fifty years in the monastic profession, were exempted from all the ordinary regulations, were never told anything unpleasant, and themselves took the liberty of examining and censuring everything."—*Historical Memorials of Westminster Abbey*. Dean Stanley, London, 1869, p. 448.

² Op. cit. p. 482.

Secondly: these hospices and hospitals were usually constructed with very little reference either to light or ventilation. The very best of them had nearly all the objectionable qualities now generally attributed to churches, when used as hospitals. Often the hospitals were constructed exactly as churches, and served, in fact, at the same time as chapels and infirmaries; such buildings still exist at Angers, Chartres, and Tonnerre. At Tonnerre the body of the building contains on each side twenty cells or alcoves, in each one of which was placed a bed; galleries were established over the alcoves, which gave access to the windows, and permitted also a supervision of the interior of the cells, a disposition which was also subsequently adopted in the Hôtel-Dieu at Paris.

Although the special administration of permanent hospitals is not immediately connected with my subject, its relation to the care which the wounded have there received has always been most important. The direction of the permanent military hospitals in France has been uniformly entrusted to officers of the intendant or quarter-master's department, and one of these officers, called a *comptable*, has had the absolute direction of everything connected with the material organization and maintenance of each hospital, subject only to the general control of a central bureau.

In the management of the civil hospitals, it was only with the Revolution that the exercise of the right of administration was directly assumed by the state.¹ In 1801 M. Frochot, then Prefect of the Seine, in view of the disorganized condition of the hospitals in his Department, proposed to constitute an administration on the following basis, viz.: a central council of administration, *conseil d'administration*, to be constantly represented in each hospital by a *surveillant* (general director), and an *économiste* (special director). The proposition was adopted, and it substantially represents the system upon which French civil hospitals are now generally conducted.

¹ By a law of the 23rd Messidor of the year II. (13th of July, 1793), the property of the hospitals was attached to the domain of the state, and the expenses connected with the establishment and maintenance of hospitals, were assumed as a part of the annual budget.

Thus it was only with the beginning of the present century that the distribution of the assistance to the sick, had been subjected to a central control, and the service and the administration of the hospitals, were directed in accordance with a plan which, whatever its faults, was at least uniform and regular.

The radical vice in the administration of French hospitals, whether military or civil, is that power is exercised within them without sufficient direct responsibility. The *officier comptable*, and the *économé*, do everything and are responsible for nothing, while the *intendance*, and the *conseil d'administration* do nothing, and are responsible for everything.¹ Nothing could be more simple, or perhaps methodic, than the division of administrative duties adopted, but the practical results are too frequently disastrous in the extreme. The worst of it is, that this system is not one peculiar to hospitals, but is one of the most distinctive and salient features of French bureaucracy in general. Whoever may have once made the vain attempt to discover the *person* responsible for the management of a French hotel, can readily understand the abuses likely to arise, when it is not always for the interest of those connected with an establishment, to see that nothing is wanting with regard to the food, shelter, and attendance of those to whom its doors are opened.

Closing here my general account of permanent military hospitals, I will now resume that part of the narration which relates to the immediate care of the sick and wounded in camp or on the battle-field, and which I had traced down to about the middle of the sixteenth century.

We have seen that, whenever surgeons were then mentioned as present in armies, they were quite uniformly represented as attached to the retinue of commanders. Indeed, there is no reason for believing that surgeons were ever engaged, in the French army, on any other recognized footing, before the reign

¹ The responsibility, however, of the *intendance* for the proper administration of military hospitals is merely nominal, as it is only responsible to itself. Thus, the *officier comptable* is an agent appointed to execute its orders in the hospitals. If the administration of the hospital becomes a subject of complaint, the *intendance* sends a *contrôleur* to investigate matters. In short, the *intendance* holds in its own hands both the authority of administration and the supervising power.

of Louis XIII., when, for the first time in the royal ordinances of France, "surgeons-major of camps and armies" are mentioned.¹

Gustavus Adolphus (1611-32), is said to have first appointed four surgeons to each one of his regiments, which, numbering two or three thousand men, were subsequently reduced to twelve hundred, and afterwards to one thousand and eight men; and the credit has occasionally been given to him of having first established a regular military sanitary service. But it is by no means probable that this service in the Swedish army, at the beginning of the seventeenth century, was either more efficient or better equipped than the corresponding service in the armies of Germany, France, and England.

Ballingall says:²—"The appointment of regimental surgeons in the English army was, it is believed, coeval with their corps;" a statement not particularly satisfactory, as it is very uncertain when troops were first enrolled by regiments in the English service.³

There is every reason to believe, however, that at the beginning of the seventeenth century the character of the surgeons employed in the English army had considerably improved upon that which

¹ M. Fournier Pescay, "Dictionnaire des Sciences Médicales," art. Chirurgiens Militaires.

² As a matter of fact, it is very doubtful whether Ballingall makes the statement quoted. I find it in "Outlines of Military Surgery, by Sir George Ballingall, M.D., F.R.S., and F.R.C.S.E., Surgeon to the Queen and to H.R.H. the Duchess of Kent; Regius Professor of Military Surgery in the University, &c., &c., &c., Edinburgh, 1838," a book in which the nominal writer has not scrupled to attempt to palm off as the fruits of his own research, and as the work of his own pen, whole pages taken *verbatim* from Beckmann's "History of Inventions," "The Conquest of Granada," and, apparently, from pretty nearly every book upon which he could lay his piratical hands.

³ According to Duane (in "A Military Dictionary," Philadelphia, 1810), and who in fact only repeats a statement made by Smith (in "A Military Dictionary," London, 1779), it was not before 1660 that a regimental organization was adopted in the English army. The statement is certainly rather surprising, as the word *regiment* was in common use long before. Bardin, however, observes that this word was employed in camp, as a synonym for *troup*, *band*, and *legion* long before it received an official recognition, and that the doubts and disputes which have arisen as regards the time when regiments were first created, are to be attributed principally to this circumstance.

fifty years before had stirred Gale to indignation. Grose¹ quotes from a manuscript in his possession, written by Ralph Smith during the reign of Queen Elizabeth (1558-1603), a description of the qualifications and duties of a military surgeon. The passage is as follows:—"Surgeons shoulde be men of sobrietie, of good conscience, and skillfull in that science, able to heal all soares and woundes, specially to take oute a pellett of the same. All captains must have suche surgeons, and ought to see them to have all their oyles, balmes, salves, and instruments, and necessary stuffe to them belonginge, allowinge and sparinge carriage for the same. That every souldier at the paye daye doe give unto the surgeon 2*d*. 'as in tymes past hathe beene accustomed' to the augmentation of his wages; in consideration whereof, the surgeon oughte readilie to employ his industrie uppon the soare and wounded souldiers, not entermedlinge with any other cures to them noysome. Regarde that the surgeon bee truelye paid his wages, and all money due to hym for cures that bye the same hee maye bee able to provide all such stuffe as to him is needfull. Such surgeons muste weare their baldricke, whereby they may be knowen in the tyme of slaughter, it is their charter in the field."

This statement is interesting; it shows that, as in the imperial armies of the time of Charles V., the English army surgeon in the sixteenth century received pay from the soldiers, as also money for cures, in addition to his salary; that he was expected to provide at his own expense the medicines, &c., needful; that he wore in action a baldrick or shoulder-belt as an *insigne* of his office; and that "all *captains* must have suche surgeons." Clowes, a military surgeon who lived and wrote at the end of the sixteenth century, often speaks favourably of the attainments and character of his professional contemporaries, although he occasionally complains of "runnagate surgeons" as well as of the laxity which still permitted empirics to enter the service.² In 1620, for an army of thirty thousand men, which King James

¹ Op. cit. vol. i. p. 240.

² The following passage from Clowes expresses very clearly what he thought of those who brought "the worthy artist into very great discredite:"—"It is most

proposed to send into the Palatinate, every regiment of foot, consisting of twelve companies of one hundred and fifty men each, had a "chief surgeon" and a "surgeon" for each company; yet no allowance or provision whatever appears in the estimate for medicines or for the establishment of hospitals, although there is a very minute detail given of nearly all the other necessary stores.¹ It is evident, therefore, whatever improvements may have been effected, that the field sanitary

truly said, there is no coine so current but hath in it some counterfaits, which make it suspitious; so is there no profession so good, but hath also some counterfaits, which breede in it disgrace, and none so much (I suppose) as there are some in these daies, that take upon them the honest titles and names of travelling surgeons, nay these are idle and ignorant menslaiers, or wandering runnagate surgeons, that I speak of, which very boldly, with most glorious facings, challenge unto themselves to be the only masters of Chirurgery in the world, because they have a little travelled: nevertheless, a number of these od, arrogant, & frivolous fellows are known to be men altogether ignorant in the art, both in reason, judgement, and experience, howbeit, some one of them will use more comparisons, prating and babling words, than fower wise men would willingly answer; and you shall also farther know them by this note: They are most commonly unfurnished of all good medicines, either medicinal or instrumentall, unlesse it be some such palterie stuffe, which a man would scarce lay to a gauld horse back, with other furniture answerable to the same. And so they are no more able to performe any good cure they take in hand, than they be able with one puffe of their winde to turn about a mill stone, for their cures at their comming home are plaine demonstrations of their beastly ignorance, and thus they bring themselves into ignominie and shame, and the worthy artist into very great discredite. Therefore frændly reader, let this be a warning unto thee to take heede of these unclean birds who do daily abuse many worthy persons, captains, gentlemen, masters of ships, &c. . . . and have been and daily are entertained to be principall surgeons for great ships of war, &c. . . . But, good reader, what hath issued hereof? Truly many a brave soldier and mariner hath perished, and sometimes the general and captains themselves, and so by this meanes, partly the whole voyage hath been overthrowne, by reason they had no helpe or succour, either of Physicke or Surgerie to releeve or comfort any of them."—*A Profitable and Necessary Booke of Observations, for all those that are burned with the flame of Gun powder*, &c. By William Clowes, one of hir Maiesties Chirurgions. London, 1596; ch. 27.

¹ During the sixteenth and seventeenth centuries it was also not uncommon on the continent—particularly in Germany and Italy—to allow a surgeon to each company or troop. The number of surgeons, in an army of 10,000 men, was thus often several times greater than is at present provided; still, the general ignorance and low social position of the so-called "surgeons," and the wretched measures adopted by the administration for the care of the sick, were radical defects which were not to be in any way compensated, by the presence of a crowd of vagrant nostrum vendors and barbers.

service at this time was still on a very indifferent footing; and there it remained, until about the middle of the eighteenth century, when, as we learn from Pringle, Munro, and Brocklèsby, its important relations to the army had begun to be more generally recognized, and measures had correspondingly been taken to increase its efficiency.

As to the ambulance, or the temporary field hospital, it is difficult to say when it first came into use. It has generally been considered in France as a creation of Cardinal Richelieu, from a statement, made by the Cardinal in his "*Testament Politique*," commending the organization of hospitals which might follow the movements of the army, and asserting also, that in the campaign of 1639 this plan had been put in practice.¹ Chennevières is inclined to believe that ambulant hospitals were in use at an earlier period.² He, however, founds his opinion on the ordonnance of Henry IV., made in 1591 in the camp before Rouen, levying a tax on the wine and cider sold in camp, "to be expended in defraying the expenses necessarily occasioned in taking care of the wounded during the siege;" as also, upon the establishment created by Sully in the camp before Amiens six years later. But these provisions for the wounded were evidently quite exceptional, as we hear nothing more upon the subject for many years.

The first French official allusion to the establishment of temporary army hospitals is to be found in an article in the Ordonnance of January, 1629, which is as follows:—"Hospitals shall be maintained in the rear of armies for the relief of soldiers who are wounded or are sick." And it was by virtue of this article, that the same year a hospital was established at Casal, the direction of which was, very naturally, according to still accepted traditions, confided to the Archbishop of Bordeaux, "with full power to

¹ Richelieu's words are these:—"Si l'on continue les missions militaires pratiquées en 1639, pour les (*les soldats*) empêcher de tomber malades; si lors qu'ils le sont, on a des Hôpitaux qui suivent l'armée en tous lieux, ainsi qu'on a fait en la même année, et qu'en assurant la vie à ceux qui auront esté estropiez en servant le Roy, dans la Commanderie de Saint Louis destinée à cette fin; j'ose répondre que l'Infanterie de ce Royaume sera bien disciplinée à l'avenir.—*Testament Politique*. Amsterdam, 1689; p. 334.

² Chennevières, "*Détails Militaires*." Paris, 1750; tome ii. p. 137.

choose the officers who are to serve there, as also, to establish the expenses which are to be incurred for food, the treatment of the sick and wounded, purchase of furniture, drugs, utensils, and everything which shall concern the maintenance of said hospital. His majesty also wishes, that the herein-named archbishop may give to the soldiers who shall have been wounded, or who shall have been treated, certificates of their wounds, as evidence, when he shall accord to those maimed, in testimony of their services, places in religious establishments."¹ The year following (1630) two hospitals, one for the sick and one for the wounded, were established at Pignerol, for the army of Italy. Nevertheless, that the relations of these establishments to the general administration of the army were very imperfectly understood, or at least defined, is shown by the fact, that whether he should or should not avail himself of their succour, were questions left entirely to the option of the soldier himself. Indeed, in 1638, a special establishment was made in favour of those soldiers who did not wish to go to the hospital, in virtue of which, in addition to the hospitals organized as at Pignerol, there were to be in each army:—"Jesuits and cooks, who shall give broths and soups to all those sick who do not wish to go to the hospital, and moreover a surgeon and an apothecary, to take care of and treat with medicines those who shall need them.

"The grand army shall have six Jesuits; viz., four priests and two lay brothers; together with a cook and five aids, a surgeon and an apothecary. The said Jesuits shall have two two-wheeled carts, provisions, and six sheep every day.

"Each of the small armies shall have half of this attendance, viz., three Jesuits, a cook, three aids, an apothecary, a surgeon, a two-wheeled cart, and three sheep.

"The said Jesuits are particularly charged with the consciences of the sick, and to be near by on perilous occasions, for the purpose of giving absolutions, after obtaining from the soldiers "confessions of their sins and promises not to fall into them again."²

¹ Brevet, cited by Gama, in op. cit. p. 86.

² Établissement fait en faveur des gens de guerre qui ne veulent point aller aux hospitaux. Année 1638. Doc. cited by Gama, in op. cit. p. 94.

This is the first account which we have of the organization of a veritable *ambulance*, although this word did not enter into the French language until a century and a-half later. Its means must have been very limited ; its *personnel* was absurdly composed, but the account is none the less interesting for that reason. During the reign of Louis XIV. the field hospital service was conducted substantially in accordance with the provisions of the ordonnances cited, that is to say, the sick and wounded were treated in *quarters*, a few temporary hospitals being erected in the rear of active armies, as a means of partial relief, while it was the practice to evacuate the sick upon the Hôtel-Dieu or civil hospitals, or throw them as a charge upon the first municipalities who were able or willing to receive them. Nevertheless, in the opinion of the time, not only had the military sanitary service been greatly improved during this reign, but it had attained a degree of perfection, to improve upon which would have been nearly impossible. According to a military writer of this time :—" Never was war carried on so conveniently as to-day in France. The care which has been taken by our monarch is inconceivable, and his prudence has so entirely anticipated everything, that one may say it has forgotten nothing which could be necessary. The hospital is of great service to the sick and wounded, who under the care of surgeons, physicians, apothecaries, and the ecclesiastics, organized under the supervision of a director, are as well off as if they were in the hospitals of the finest cities of the kingdom.

" The hospital constantly follows the army, until a proper and convenient place has been found for its establishment ; to it all the sick are brought ; and it is the practice to leave in the camp only a section of the hospital—*un détachement de l'hôpital*—to respond to pressing necessities. There is an abundant provision of every sort of remedies, instruments, and appliances for diseases and wounds. The service of the hospital is discharged by the Franciscans (Recolets), who also confess the wounded on the field."¹

¹ " Le Nouvel Art de la Guerre," par De Gaya. Paris, 1692 ; p. 41. The inference from this citation is that but a *single* hospital was established in the immediate neighbourhood of an army ; and Le Père Daniel, writing in 1721, says it is the duty of the Maréchal des Logis de l'Armée to mark out the quarter of the king, the

In one respect there was an improvement. The number of the physicians, surgeons, and apothecaries, and of the whole *personnel* of the field service, was greatly increased. According to the royal edict of January, 1708, there were to be "*four* medical inspectors-general of the land forces and the hospitals on the frontier, *fifty* consulting physicians-major for the hospitals, *four* consulting surgical inspectors of armies and hospitals, *fifty* surgeons-major for the hospitals, and *eighty-eight* surgeons-major for the eighty-eight regiments of our infantry ;" and the cavalry and the other arms appear to have been equally well provided with medical attendants. The medical officers were also accorded, as we are informed, *wages, appointments, privileges, immunities, exemptions, lodgings, rights, &c., &c.* We are at least made acquainted in this edict with all the elements of an effective organization, and however loosely they may have been bound together, or chaotically they may have at times come in contact with certain parts of the machinery of the general administration, or indifferently they may have been provided with the means of treating either sick or wounded, they, doubtless through individual and personal efforts, often did good service. Says Audouin:—"Admitting ambulances to have only been established so late as the sixteenth century, and sedentary military hospitals in the seventeenth century, France still would have the priority over all other nations, for no one in those times, and not even after the example given by France, had military hospitals. Every people continued to treat the wounded and the sick in tents and quarters. The Austrians, the Prussians, the Danes, and the Swedes, imitated the French only towards the middle of the eighteenth century. The English had hospitals only a little earlier, but long after the French, and were still experimenting with their regimental hospitals And it must be said, to the glory of French surgery, that if the hospital administration was more complete than abroad, the excellence of the surgical service contributed most powerfully to that difference."¹

position of the artillery, the market place, and the place for the *hospital*. See "*Histoire de la Milice Française*," tome i. p. 359.

¹ Audouin, "*Histoire de l'Administration de la Guerre*." Paris, 1811; tome ii. p. 65 *et passim*.

During the early part of the reign of Louis XV. the *service de santé* in the French army was the subject of various ordonnances, which, if they added very little to its efficiency, began at least to develop the outlines of what shortly and suddenly, in 1746 and 1747, under the administration of Count d'Argenson, became a minutely systematized service.

By the "Règlement General" of January 1st, 1747, the military hospitals were divided into the *fixed*, the *sedentary*, and the *ambulant*; and the functions of each class are pretty clearly defined. Those of the ambulant hospital are very well indicated in an "Instruction for the Commissary in charge of the Ambulant Hospital," prepared by d'Argenson in 1746:

"When an army moves from one place to another, the commissary ought to go with the camping material to establish the hospital in its assigned place, in order to be ready to receive the sick who may be sent in from the army.

"Before the action commences, the commissary should establish the hospital in the nearest and most suitable houses, and should get the surgeons and nurses together, as well as everything necessary for dressing the wounds. He should neglect nothing to remove the wounded from the field, and to secure for them the promptest succour.

"In the case of a siege, he should choose the most suitable places, and those nearest to the trenches, for the ambulant hospital; he should have beds placed within it, and everything prepared for receiving the wounded. One is almost always obliged to have recourse to barns, and in this case it is well to have a floor laid down, should the nature of the ground and the season require it, as also to have sashes put into the windows, in order to protect the sick against the vicissitudes of the weather. A separate ambulant hospital should be maintained at each point of attack,"¹ &c., &c.

An order, "to be observed on the march by the employés of the ambulant hospital," issued by Marshal de Belle-Isle in 1759, shows a completeness at that time, in the organization of this portion of the hospital service of the French army, which is cer-

¹ "Détails Militaires," par M. De Chennevières, tome ii. pp. 152, 154, 155.

tainly surprising. The hospital was to move with an escort, divided into three corps, one at the head of the convoy, another at the rear, the third being distributed along the line—all under the charge of a sub-director, “whom they are expressly enjoined to obey.”

“The *architect*, the *captain* of the workmen, at the head of the *joiners*, the *masons*, the *locksmiths*, and the other workmen of the ambulant hospital, will precede the vanguard, to repair the road, fill up the hollows and the ruts, and cut the wood necessary for their reparation, but they will pay great attention that they spare the fruit-trees. Each workman will carry in his hand the tool of his trade, which he can use to the best advantage *en route*, in order that this tool may make known who he is, and that he always may be ready to work usefully.

“When the convoy approaches the place where it is to pass the night, and its march may no longer be retarded by bad roads, the architect and captain of the workmen, conducted by one of the clerks, who shall have reconnoitred the country, will go to the place selected, to make, with all diligence, the reparations necessary, and render the place where the sick are to be received the most suitable, according to the season.

“Two of the best mounted employés will march every day in the rear of the troops, whose line of march may be within reach of the convoy, for the purpose of picking up the sick soldiers whom they may find upon the way, in the woods and thickets and in the houses of the villages, on the right and on the left, to the distance of a quarter of a league. They will visit carefully the houses, one beginning at one end of the village, the other by the other end, and without exposing themselves. They shall have, each one, under their orders an *infirmier-major* and twelve *infirmiers* (nurses or hospital corps men), carrying two stretchers. In case the *infirmiers* are not sufficient for the transport, they shall obtain the aid of well disposed soldiers, whom they shall pay reasonably for their service. The sick shall be placed upon carriages, or empty caissons prepared to receive them, and which shall form the line of the convoy. Those who accompany them will take care to give the sick, immediately, the assistance which they are expected to give.”

“ As soon as the sick are thus disposed of, the two employés will make a new search, and always separately, except there be in a single place enough sick to occupy both at the same time. If they have occasion for one or several waggons to go after the sick, they will demand the waggons of those who have charge of them; they will understand how contrary it would be to humanity to abandon by negligence any of these poor sick, or to fail to treat them with the gentleness which charity and their situation require.

“ The infirmiers shall be divided into squads of twelve—a ward clerk and an infirmier-major shall be at the head of each squad. The infirmiers-major and all the others shall wear in the button-hole of the coat a tin slip, marked “H,” to indicate who they are. Those who shall conceal this mark shall be subject to a fine of six *livres* on the first offence, and shall be expelled in case it is repeated. The sub-director shall distribute the squads at the head, in the rear, and along the line of the convoy—that they may watch the things placed in the waggons, cause these to follow without intervals, aid the drivers when the waggons are stuck in the mud—and principally, that they may give prompt succour as well to the sick who are in the convoy as to those who may be brought to it,” &c., &c.¹

I have here presented some of the most interesting passages from the forty-two articles which compose this order, and which indicate the duties of the chief director, the sub-director, and the inspector, the employés, officers, and stretcher-bearers, domestics, teamsters, butcher-boys and drovers, master-butchers, architect, captain of workmen, carpenters, joiners, masons, locksmiths, chaplains, (3) infirmiers-major, bureau clerks, heads of bureau, cashiers, aid-major-surgeons, students, captain of equipages, lieutenants, farriers, harness-makers, cartwrights, head store-keeper, storekeepers’ aids, storekeepers’ boys, coachmen, chief baker, master-bakers and boys, chief butler, coopers, apothecaries, washermen and washerwomen, sutler; escort and officers.

The duties of each person attached to the ambulant-hospital,

¹ Order cited by Chennevières, op. cit. tome v. p. 173.

as also the several functions of the establishment, are described with great detail.

This organization was evidently altogether too complicated and unwieldy; but a more complete and elaborate system it would have been very difficult to have created. The modifications which have since been adopted in France have added nothing to the organization; with certain simplifications it represents the system now existing.

Formerly the surgeon-in-chief had under his orders all the other surgeons, whether attached to hospitals or regiments, and an engagement being imminent, those surgeons not absolutely necessary, either in the hospitals or among the troops, were called together at head-quarters, and assigned to the *ambulances*—or corps for field service.¹ During the wars of the first Empire, the surgical staff of the ambulance corps became an independent branch or section of the general service *de santé*.²

The transport service was improved by Larrey and Percy, who introduced special and lighter waggons, and partially reformed its *personnel*; indeed, it is in this respect more than in any other that the ambulance system has been improved, since the beginning of this century. Perhaps I could not better show how little the constitution of the French Ambulance service has changed since

¹ Décret du 16 ventôse, an. II. Arrêté du 24 thermidor, an. VIII.

² Since 1792 the Service de Santé in the French army, has been the occasion of various decrees, which have changed its relations to the administration, as well as the organization of its *personnel*. Nevertheless, its organization has always had reference to three distinct branches of the health service. Surgeons and physicians have, accordingly, been assigned to the *hospitals*, the *ambulances*, and the *regiments*.

To the hospitals medical officers are assigned, both in number and in rank, "according to the importance of the establishment."

To the troops they are attached according to the following schedule:—

To a regiment of infantry, (strength about 3,000)—

One surgeon-major of the 1st class.

One surgeon-major of the 2nd class.

One aid-major.

The ambulances are divided into those attached to the head-quarters of the *army*, the head-quarters of the several *corps*, and the head-quarters of the *divisions* forming those corps; and the personnel varies both in number and rank in a descending scale, or in accordance with the importance of the service. The ambulances attached to the head-quarters of the army, and to a division of infantry, are usually composed about as follows:—

1759, than by giving the personal composition of the ambulances organized by the French "Société de Secours aux Blessés," in July, 1870.

The ambulance corps which were then, successively, sent from Paris, to join the army of the Rhine were formed as follows:—

- 1 Surgeon-in-chief.
 - 4 Surgeons.
 - 9 Assistant surgeons.
 - 10 Sub-assistant surgeons.
 - 1 Apothecary.
 - 1 Book-keeper (comptable).
 - 2 Assistant book-keepers.
 - 1 Quartermaster.
 - 1 Draughtsman.
 - 3 Chaplains.
 - 6 Corporals and sergeants.
 - 1 Overseer.
 - 1 Farrier.
 - 10 Waggon drivers and cooks.
 - 60 Infirmiers (nurses and stretcher-bearers).
-
- 111 Total strength of the corps.¹

	Ambulance of Head quarters.	Ambulance of Divisions.
Médecin Principal	1	0
Médecins Major	2	1
Médecins Aides-Major	4	3
Pharmacien Major	1	0
Pharmaciens Aides-Major	2	1
Officier d'Administration Comptables	1	1
Adjudants d'Administration	4	3
Infirmiers de Visite	10	6
Infirmiers	50	30

Unfortunately, however, the numerical strength of the regular medical corps of the French army is by no means as considerable as these statements would seem to indicate. Thus, during the recent war, it was frequently the case that but a single medical officer was connected with the regiment, and he often held only the rank of an aid-major. In the organization of the regiments of the *garde mobile* but one medical officer was allowed.

¹ I here give the personal composition of *one* of these ambulance corps, but they

An ambulance company such as this, however theoretically complete it may be, has within it all the elements of disorder and inefficiency, which will speedily make their appearance after the corps is sent into the field. A hundred years' experience had nevertheless, not convinced the French of the impracticability of the organization ; it had dazzled the eye of whoever had heard of it, or read about it, with a show of having provided one or more persons for each special service connected with an ambulant hospital, while its mobility, its co-operative power, and its capacity for work, have always been pretty much inversely as the numerical and apparent force of the corps. The disastrous campaign of 1870-71, showed, at least, the worthlessness of such complicated organizations. They were found not only too clumsy to be anywhere efficient, but unprovided with an amount of hospital material proportionate to their personal strength, the services rendered by them were almost always simply primary ; without breaking up the corps by details, it was found impossible to maintain a field hospital or sedentary ambulance. The result was, that these enormous companies were most of the time, until disbanded, either marching about the country, or idly waiting for a battle to furnish them the occasion for a little short-lived activity.

On the 4th October, 1870, the "Société de Secours aux Blessés" disbanded the thirteen ambulance corps which it had sent into the field. Several of the corps were, however, immediately re-organized on the following basis, viz : The *personnel* was to consist of *one* surgeon in chief, *ten* surgeons, *one* chaplain, and *five* stretcher-bearers or nurses. The material was to consist of one two-horse waggon, a small one-horse carriage, and a saddle-horse. In the waggon, all the baggage and surgical and medical appliances were to be carried ; the small carriage was to be used on the field, to convey rapidly from point to point assistance and supplies for the wounded ; the saddle-horse was employed by the surgeon, who served in the ambulance as a *scout*. An am-

seem never to have been constructed upon any well-defined basis. Thus, the "Fifth Ambulance" contained 41 surgeons and assistants, 5 *comptables* or book-keepers, and 121 *infirmiers*, waggon drivers, corporals, &c.

balance corps thus constituted was divided into two sections.¹

It is very evident that much more of mobility must have been secured by this simplification of the organization. These new corps were, however, not provided with sufficient material, they had no ambulance waggons, properly speaking, they could carry but few surgical supplies in their two-horse waggons, and there were few if any well organized and well provisioned depots accessible. Moreover, their relations to the military administration were quite undefined, and consequently unsatisfactory.

Whatever improvements may have been introduced into the field service of the British army from 1750 to 1815, indeed I might say down to the present time, have been of a character rather general than special. In the first place: more and more official importance has been attached to the duties of the army medical officer, and more respect has been shown him personally. It may be true that, so late as 1788, the surgeon was sometimes overlooked on ceremonial occasions. Indeed this seems to have been a cause of great grief to Hamilton, who takes the special pains to tell us that "when his Majesty, in the year 1788, reviewed the camps, no surgeon was allowed to *kiss his hand*"²—a *dishonour* considered all the more intolerable, because *even* the chaplain was considered worthy of this osculatory favour.³ Nevertheless, the position of the surgeon had greatly improved. His pay

¹ "Bulletin de la Société Française de Secours aux Blessés Militaires," publié à Bruxelles. Oct.-Mars, 1870-71; seconde édition, p. 20 *et seq.*

² Hamilton, "Duties of a Regimental Surgeon." London, 1794; vol. ii. p. 187.

³ I believe the medical profession has always been rather over sensitive, in all matters relating to military rank, and that a greater effort has been made, by military medical officers, to prove that in certain cases they have been treated with disrespect, than to prove that they have in general been held in modern armies in quite as much consideration as other non-combatant officers. Thus, the following advertisement, which appeared in the *London Gazette* in 1689, has been quoted a good many times. (See "Remarks on Army Surgeons and their Work," by Charles Alexander Gordon, M.D.) "Run away out of Captain Soames company in his Grace the Duke of Norfolk's Regiment of Infantry, Roger Curtis, a barber-surgeon; a little man with short black hair, a little curled; round visage, fresh-coloured; in a light coloured cloth coat, with gold and silver buttons, and the loops stitched up with gold and silver; red plush breeches and white hat. Whoever will give notice to

had been increased,¹ and with the prospect of rising in his profession, he actually possessed, if not the companionship of kings, at least that of such men as Munro, Rollo, Home, Hamilton, John Bell, and of one greater than all—John Hunter. The necessities of the great continental wars, in which the English Government was shortly after engaged, led to a variety of liberal concessions which enabled it to secure the services of many able and skilful surgeons. Sir James Macgrigor, after having alluded to the difficulty of obtaining well qualified surgeons at the outbreak of these wars, a difficulty which forced the Government to have recourse to advertisements in the newspapers, the posting of placards in the great cities of England, and the adoption of a very low standard of professional requirement, yet was able to say at the end

Francis Baker, the agent of the same regiment in Hatton Gardens, so that he may be secured, shall have *two guineas* reward!" But it will be noticed, that this "run away" was qualified as a "company and barber-surgeon." Many army surgeons at this time were doubtless "barber-surgeons;" nevertheless, the English regimental surgeon is generally spoken of with respect during the whole of the seventeenth century, and seems to have ranked with the "preacher" and "quartermaster." Thus I find in manuscript No. 6008, of the "Harleian Collection," and dated 1649, that "ye preacher, quartermaster, chirurgian, and ye waggon master of ye regiment" are spoken of in the same connection—"whos huttes are to be placed even with ye captains huttes." The pay of "preachers" and chirurgiens" seems to have been nearly the same, during the whole of the seventeenth century. Thus, in a pay-list for the year 1639, four regimental preachers are entered at 3s. each per diem, and four chirurgiens at 4s. each per diem. In a list for 1697 the (regimental) chaplain is entered at 3s. 4d. per diem. In the middle of the seventeenth century, the chaplain appears to have had the advantage of the surgeon in the matter of pay, as he is inscribed in a "marching regiment of foot" at 6s. 8d. per diem, and the surgeon at 4s. But during the seventeenth and eighteenth centuries, the pay of both the surgeon and the chaplain was considerably above that of the quartermaster, as also of every officer below the rank of a captain. (See papers cited by Grose, vol. i. pp. 291-322.) The surgeon, it is true, was expected to provide medicines, &c., but his allowances and special perquisites, of one sort or another, were presumed to cover the expenditure necessary for that purpose. Company surgeons and surgeon's mates were for a long time noncommissioned officers, and were subject to the same discipline as the private soldier, however ignominious might be the consequences. (See Hamilton, op. cit. vol. ii. p. 163, and Gordon, op. cit., p. 56.)

¹ See "Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army." Appendix xiii. London, 1858. In 1793 the surgeon's pay was raised to ten shillings per day, with an allowance of two horses "for self and medicine-chest," and an annual money allowance for the horses of £37 16s. (Grose, op. cit. vol. i. pp. 320-322.)

of the wars:—"In the ranks of the medical officers of the army, men are to be found upon a level, at least, with those in the Colleges of Physicians and Surgeons of London, Edinburgh, and Dublin," and that, "taking the profession in civil life generally, there are comprised in the body of the medical officers of the army not fewer men of literary attainments and university education, than in the ranks of civil life."¹ Indeed, since the beginning of the present century, the English army medical officers have been, as a body, both better educated and of a better class, and a higher social tone has obtained among them. A singular evidence of this is shown in the practice, quite common among them at the close of the last century, of obtaining, in addition to the medical commission, a military commission which secured not only rank to the holder, but placed him in the line of regular promotion.

In the second place: medical and surgical stores have been more abundantly furnished.

One of the faults of the old system was, that surgeons, although miserably paid, were nevertheless expected to provide, at their own cost, the medicines, &c., to be given to the sick; and they seem, at a time not very remote, to have been even expected to pay out of the meagre pittance allowed them, the hire of buildings used as hospitals.²

At the close of the eighteenth century, the surgeon received an allowance of £30 per annum, for the rent of the regimental hospital, and £70 per annum for the purchase of medicines,

¹ "Autobiography," p. 191. Quoted by Gordon in *op. cit.* p. 97.

² "The great difficulty found by most regiments in procuring an hospital for their sick, renders a clause in the Mutiny Act for that purpose much wanted; it would be a very considerable benefit to the service, if the magistrates of every district wherein troops should be quartered were obliged to provide a convenient barn, stable, or other building, at a reasonable rent. For want of some such regulation, the most exorbitant demands are usually made for the most wretched hovels, though the slender allowance to a regimental surgeon enables him to afford very little, particularly where the regiment is in scattered quarters, as in that case he must have two or more hospitals; the consequence is, that many a life is lost, which, with proper accommodation, might have been saved; in villages, parish officers might be obliged to take sick soldiers into their parish poor houses, assigning them one or more rooms, according to their numbers."—*Grose, op. cit. vol. ii. pp. 76, 77.*

and that, in addition to a medicine chest furnished by the government.¹ Subsequently, the hospitals were furnished with medicines, clothing, and food even, through a purveyor's department; although the English hospital surgeon has very generally enjoyed the liberty of making purchases at discretion, to supply the wants of the hospital, a relic of the old system, with this difference—if justifiable, such purchases have been allowed by the government. Thirdly: as early as 1756, the army medical service was placed under the control of a hospital board; in the words of the ordonnance “for the medical service of the army intended to take the field, that under their constant direction this part of military service (relating alike to medicines, hospital stores, and every other requisite provision for the sick) might be carried into execution with ability, regularity, and despatch.”² Two years later, inspectors and deputy-inspectors of hospitals were created, who assumed the administrative functions of the hospital or army medical board. Subsequently, in 1810, a director-general was appointed.³ Before the late war with Russia there were in the English army:—

Inspectors-general of hospitals	5
Deputy inspectors-general	8
Staff surgeons, 1st class	31
Staff surgeons, 2nd class	49
Staff assistant surgeons	83
Apothecaries	4
Dispensers	0
Regimental surgeons	140
Regimental assistant surgeons	226 ⁴

Since that war a few changes have been made in this return, but they are non-essential.

The regimental surgeons have been subordinated to the staff surgeons; while all have been subject to the orders of the principal medical officer; who has detailed, as occasion seemed

¹ Hamilton, *op. cit.* vol. i. p. 7.

² “Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army.” 1858; p. 421.

³ *Ibid.*

⁴ *Ibid.* p. 249.

to require, the subordinate officers to the various duties connected with the general service—such as the giving of first relief, the superintendence of transportation, or executive or administrative work in the brigade, division or general hospitals. Thus, for more than a hundred years, the medical service in the English army has been directed by medical officers, and since a time almost equally remote, the expenses incurred by the establishment and maintenance of army hospitals, have been supported by the state, and not by the surgeons.

Fourthly: the condition of the hospitals has steadily improved, as well from a clearer understanding of their just relations to an army, as by the general diffusion of more enlightened views upon sanitary subjects.

The regimental hospital has always, since the organization of regiments, been a very important establishment in the English army, and here a large part, often the largest part, of the soldiers have been treated, whether for disease or wounds.¹ It was, however, to Sir John Pringle that the English service was principally indebted for the system of treating the sick within the regiment. Pringle had a great and wholesome fear of general hospitals, and strenuously advocated the dispersion of the sick in small establishments, and that, so far as possible, under the direct superintendence of their own medical officers.

“Regimental hospitals,” he observes, “are of the greatest consequence . . . and regimental surgeons are to treat as many as they can conveniently attend or accommodate in the regimental hospitals. As for the general hospital, let it receive such only as the regimental ones cannot conveniently contain, and the sick that cannot be moved with the army.”²

Says Sir James MacGrigor, in his account of the Peninsular campaigns:—“The divisions of the army composed of from eight to fifteen or sixteen regiments, under the command of a lieu-

¹ According to Sir James MacGrigor, in the Peninsula, between the 21st of December, 1811, and the 20th of June, 1814, 163,803 soldiers were admitted into the general hospitals, and 176,067 into the regimental hospitals.—“Sir James Macgrigor on Diseases of the Army”—*Medico-Chirurgical Transactions*, vol. vi. p. 478.

² Pringle, “Observations,” p. 107 *et passim*.

tenant-general, were each of them under the medical superintendence of an inspectorial officer, to whom the surgeons reported and who regulated all the medical concerns of the division. It was his duty to see that, however short a time a battalion or corps rested in one place, a regimental hospital was established, indeed, as they carried with them medicines, bedding, stores, and all the materials of a hospital, a regiment might be said to have its hospital constantly established even on the march. It was frequently established in the face of an enemy, and nearly within reach of his guns. When a regiment halted, after getting the men under cover in some building, and constructing chimneys, the first object was to make bedsteads, getting at the same time additional mattresses of straw, rushes, &c. It was really surprising to see with what rapidity this was done; so much were regiments in the habit of it, that latterly I found the hospitals complete in everything, and the men most comfortably lodged in a few days after a regiment had halted. In short, by making every corps constantly keep up an establishment for itself, we could prevent the general hospitals being crowded; much severe and acute disease was treated in its early and only curable stage, and no slight wounds or ailments were sent off from the regiments, by which means the effective force of the army was kept up, or perhaps increased by several thousand men.”¹

The motives which induced Pringle and MacGrigor, to advocate the establishment and maintenance of regimental hospitals, have equally influenced the opinions of a large part of the officers, who have since had charge of the health service in the English army. The regimental hospital has always been intended, however, for the sick rather than the wounded, as also for the treatment of mild rather than severe cases.² For the care of the latter, general hospitals were created. Of these, Pringle says, there “are two kinds, viz: the flying hospital attending the camps at some convenient distance, and the

¹ “Medico-Chi. Trans.” vol. vi. pp. 475-476.

² Macgrigor states that of the 176,067 soldiers treated in the regimental hospitals in the Peninsula, 3,841 died, while of the 163,803 treated in the general hospitals 14,672 died. Ibid. p. 478.

stationary hospital which is fixed to one place.”¹ The flying hospitals were generally attached to divisions, or special corps and like the regimental hospitals were for the sick rather than the wounded.

To meet the requirements of the wounded, special hospitals have been created under the direction of the principal medical officers. These hospitals have sometimes been intended to serve the whole army, although commonly they have been created for each division or brigade, and have accordingly been placed under the immediate direction of the respective division or brigade staff-surgeons.

Millingen, who served in the Peninsular war, commends the following dispositions for the field service, which are substantially not only those accepted at the close of the last century, but are also those at the present time generally observed in the English army.²

“Staff-surgeons of brigade will minutely inspect the field equipment of the regimental medical officers under their orders, &c.

“In the rear of each brigade, and within range of musketry, will be stationed a proportion of the hospital corps with their bearers ready mounted, and their canteens filled with water. They will be under the medical direction of an assistant surgeon, one being selected for this duty in every brigade. This officer will not delay the wounded for the purpose of dressing them, but merely check any alarming hemorrhage, and accelerate their removal to the rear

“The drummers and pioneers of regiments, that can be spared, will assist the wounded from the ranks to this first station

“In the rear of the first line of assistance, and out of the range of musketry, should be established the brigade hospitals These hospitals should be attended by the surgeons of regiments and their assistants, and when practicable be formed under cover. Here will be assembled the spring-waggons, long cars, and surgeons’ bāt-horses, the wounded be dressed, cases

¹ “Observations,” p. 109.

² See Ranby, “Method of Treating Gunshot Wounds.” London, 1744; and Hennen, “Observations.” Edinburgh, 1818, pp. 28-29.

requiring immediate operation attended to, the transports loaded, directed to the divisional hospitals, and the bearers immediately sent back to the first line.

"In the rear of the centre of each division will be established a divisional hospital, out of the range of artillery. These will be attended by the staff-surgeons of brigade and their assistants. Here the wounded will be operated upon, and assembled for the time being." From thence, however, he directs that all cases that can be moved, are to be sent off, as soon as possible, to the general receiving hospitals, which it is presumed have been opened at some base, still farther in the rear; while those who cannot safely be removed, are to be made "as comfortable as circumstances permit" at the field division hospital.¹

The ambulance, in the sense of a special organization for the care of the wounded in the field, has had no existence in the English army. Field work has usually been done by details of regimental and staff-surgeons, selected for each occasion; while the stretcher bearers and hospital attendants have likewise commonly been detailed from the ranks, accordingly as there seemed to be a necessity for their services. "At the close of the last century, when troops were on active service, if a man fell wounded, the officer commanding his company, ordered one or two of his comrades to take care of him to the rear, or, if the troops were actively engaged, he remained unheeded on the ground until the fighting was over. It was not only in the field that no regularly trained men were provided, for meeting the wants of disabled soldiers, but no special corps until recently existed, for ministering to the wants of the sick or wounded, or for assisting the surgeon in attending upon them, even in the stationary military hospitals; the only plan was for a certain proportion of soldiers from the ranks to be sent as occasion might require, to act as attendants upon the sick."²

Indeed, the principal defect of the English organization, ap-

¹ "The Army Medical Officers' Manual," by J. G. V. Millingen. London, 1819; p. 213 *et passim*.

² "A Treatise on the Transport of Sick and Wounded Troops," by Deputy Inspector-General T. Longmore, p. 33.

pears to have existed in the transport service ; while the absence of a trained corps of hospital nurses, has also, not unfrequently, been seriously felt ; it would have been even more so, had not the details for hospital work been made from among regularly enlisted men. And I may take this occasion to observe, that one of the faults of the French ambulance has arisen from the circumstance that the *infirmiers* have often been men not regularly enlisted in the army, and who in case of a neglect of duty, could only be fined or expelled from the service.

If English armies have been unprovided with ambulances, whose functions were similar to those attached to French corps, they have usually possessed a hospital service, perhaps not less important, but which has obtained a comparatively small development in the French army—I refer to that represented by the *convalescent* hospital.¹ This is an establishment to which have been sent, from both regimental and general hospitals, all those persons so far recovered from disease or wounds as to no longer require constant medical or surgical attention. The active hospitals of all classes have thus been relieved, and the more rapid recovery of the patient assured.

In this brief account I have shown, perhaps with sufficient clearness, the general system in accordance with which the medical field service has been conducted in the English army in modern times. In the United States army, the medical department has been organized and conducted after the English plan. The hospitals bearing the same names, have the same relations to each other, and have been directed by a similar administration. The work of the French *ambulances volantes* has also been done in the United States army by special details of surgeons, organized by the “Medical Director” as the occasion seemed to require. The experience, however, of the war of the Rebellion, by exposing the defects of a system which drew from the ranks, for each occasion, stretcher-bearers and hospital attendants, led to the formation of special “Ambulance corps” for field and hospital work. These corps differed somewhat, for a time, in the several armies ; but on the 11th

¹ The French *dépôt de convalescens* is by no means the equivalent of the English or the American convalescent hospital.

of March 1864, Congress passed "An Act to establish a uniform system of ambulances in the armies of the United States." The character of the system is shown in the first two sections of the Act.

"Sec. 1. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That the medical director, or chief medical officer of each army corps shall, under the control of the medical director of the army to which such army corps belongs, have the direction and supervision of all ambulances (waggon), medicine and other waggons, horses, mules, harness, and other fixtures appertaining thereto, and of all officers and men who may be detailed or employed to assist him in the management thereof, in the army corps in which he may be serving.

"Sec. II. And be it further enacted, That the commanding officer of each army corps shall detail officers and enlisted men for service in the ambulance corps of such army corps, upon the following basis, viz.: one captain who shall be commandant of said ambulance corps; one first lieutenant for each division in such army corps; one sergeant for each regiment in such army corps; three privates for each ambulance (waggon), and one private for each waggon (medicine or other)."

As by the terms of the same Act, three ambulance waggons were "allowed and furnished to each regiment of infantry of 500 men or more," the regimental ambulance corps consists of nine privates and a sergeant.

Comparing the several organizations for the administration of the health service, which I have had occasion to notice, I may observe, that in England and the United States, the army health service forms a free and independent department of the war office. In France, this service has been a mere adjunct of a department, which unites under one control, everything connected with the subsistence, clothing, pay, &c., of an army. Again, in looking over the almost innumerable "*Règlements sur le service des hôpitaux militaires*," which have been issued in France since 1747, one cannot fail to be impressed with the exactitude with which the functions of this service have been defined; no detail seems to have been so small as to have been overlooked,

no possible contingency to have been unanticipated—a law has been laid down for everything. On the other hand, the regulations of the English and American army medical service have entered comparatively seldom into administrative details, these having commonly been left to be determined by circumstances, and particularly, by the intelligent judgment of the officers who were immediately responsible for the efficiency of the service. The great object in England and the United States seems to have been to secure an efficient administration. The great object in France appears to have been to secure an economical administration. The English system has been reproached, in France, as one encouraging extravagant outlays, as one which from an absence of control leaves a door open to speculation, &c. The English system is certainly much more costly than the French; not so much, however, because surgeons as a class are less honest than quarter-masters, as because, in France, hospital stores have been issued in accordance with a system of *rationing*, which would appear to be the legacy of some siege or famine, rather than the normal supply schedule of a well-provisioned army. Indeed, the mania for saving has been carried to such an extent, as to pretty nearly stop all movement.¹

Hampered, also, as it has been by endless clerical forms, checks, and *contrôles*, which repress all individual initiative as well as destroy all sense of personal responsibility, it is questionable if the French system does not so completely fail,—is not so entirely impracticable—as to defeat its own object—as to be extravagantly costly, however modest the estimate which appears in the annual budget.

On the 4th of January, 1871, the French minister of war, then at Tours, issued a decree, and with the following preamble:—
“Whereas the multitude of private ambulance corps in our armies,

¹ The first question asked in France, whenever an administrative reform is proposed, is, *Et le prix?* and if the first cost of the system proposed involves a *centime* of additional expenditure, the custom has been to condemn it as *impossible*—and that quite without reference to any gain of power, or even to any saving which ultimately might be secured by the use of more perfect machinery. The additional cost has, almost uniformly, been considered as a *reality* which was more than an offset, to gains which were only *theoretical*.

outside of the superintendence and control of the military authority, is calculated to lead to grave abuses, and it is possible to prevent them, by causing these corps to be represented by a single society duly qualified ; and whereas, important services have been rendered to the cause of humanity, by the ' Société Internationale de secours aux blessés des armées de terre et de mer '—It is decreed :

"Article 1. All the volunteer field ambulance corps, and other societies, having in view the care of the wounded on the field of battle after the conflict, are henceforth placed under the direction and the responsibility of the International Society for aiding the wounded, which accepts the obligation and charges resulting from this commission. . . .

"Article 2. The field ambulances corps, French or foreign, once accepted, shall be subject to the orders of the general and of the chief intendant of the army, who in concert with the general delegate (of the " Société de Secours aux Blessés ") at the War Department, shall assign them the places where their services may be required. . . .

"Article 9. The minister of war shall have the right of nominating, with the assent of the Society, the delegate who shall represent it at the War Department." . . .

It is not my purpose to criticise the terms of this decree. I wish here only to say, that the provisions of the decree were most necessary under the circumstances existing, and, that it has, I trust, initiated a much-needed reform. I say designedly "initiated," for it only announces a beginning. It has permitted the ambulances to be represented in the council of the administration, that is to say, the field hospital service is not by virtue of this decree, subject to the sole and absolute control of the intendant or quarter-master's department. Those most directly concerned and responsible for the care of the wounded, are not only to be consulted as to the disposition of the field hospital corps, and the organization of hospitals, whether ambulant or sedentary, but the general and chief quarter-master are to *act in concert* with the officer representing them.

In one respect, the organization of the health service in the armies of Great Britain and the United States, has differed

radically from that which has hitherto found favour in France. English and American medical officers have long been comparatively independent, as much so, perhaps, as the officers of any special corps in the army. They have been subject only to the general orders of the military officer commanding the post, or the force to which they may have been attached,—they have had the full direction—so far as is possible in a military organization—each one of his own service, and have been held directly and personally responsible for the proper and efficient conduct of the same. Of the hospital, once established, whether regimental, brigade, division, or general, the American army surgeon is not simply the administrator, but he is the *commanding officer* in the most absolute military sense of the expression; while the whole hospital service of the army is under the direction of the surgeon-general, who is immediately responsible solely to the Secretary of War.

The medical service in all armies, has always been, and will always be, greatly dependent upon the quarter-master's department. It is this department which moves its material, and furnishes the means for transporting the sick. It is this department which provides the medical service with the necessary shelter, as also with much of the material indispensable to its efficiency and even existence. But the extent to which the *Service de Santé* in the French army has been and still is subordinated to the Intendance or Quarter-master's department, is quite incredible. It may not be unprofitable to state in this connection, specifically, some of the relations of the *Service de Santé* to the Intendance. It may prepare the way for a clearer understanding of the causes which led to the creation of an organization, to which I have already alluded, and which during the late war played no inconsiderable role in the direction of the French health service.

The functions of the *Officiers de santé en chef*, in relation to the Intendant, are thus officially defined:—"The chief health-officers attend the chief Intendant on the field, they execute all the missions with which he charges them, are consulted by him as to the salubrity of the places to be converted into hospital establishments, and report to him on everything concerning the service under whatsoever head it may come.

"Every order which they give is to be submitted to the chief Intendant."¹

If it is a question of the duties to be discharged during an action, the regulation establishes at length, and with precision, those of the officer of administration—an intendant—charged with the affairs of the ambulance; he is nominally responsible even for the service of the barley-water and the catnip tea. The regulation also shows how these officers of administration, the head-nurses, and stretcher-bearers, are placed in the rear with the stretchers to pick up the wounded; "it gives in detail what the officer of administration, *chief of the ambulance*, is to do in order to insure a speedy evacuation of the wounded on to the neighbouring hospitals; it goes even into such minutiae as to point out the precautions which this same officer should take in burying the dead in certain soils. This part of the regulations has anticipated everything, there is but one thing wanting, the health-officers are not even named."²

In the ordonnance on the general organization of the army and its staff, issued May 3rd, 1832, there is no mention made either of the chief medical officers of the army, or of their subordinates, nor is there even an allusion made, either directly or indirectly, to the Health Department, in the detailed index at the end of the ordonnance. In accordance with this ordonnance, "*all the employés and details connected with the administration*," were subjected to the control of the agents of the intendance, that under their immediate orders the execution of the different services connected with the administration might be assured. "In the event of a siege, the chief of staff is to take measures with the quarter-master (l'intendant), that means are organized for the transportation and care of the wounded, and should stretcher-bearers and nurses be wanting in the army, they will be taken from among the inhabitants."³ It will be seen that by the first passage, which I have quoted, the medical

¹ "Règlement Général du 1er Avril, 1831." Titre xi.-cii. sec. ii. arts. 1063, 1064.

² Bégin. op. cit. p. 290.

³ "Ordonnance du 3 Mai, 1832," arts. 12 and 209.

officers are classed with "all the employés," and subordinated to the control of any acting quarter-master, while in the second paragraph they are altogether ignored. Nor is this all, in the 136th article of the ordonnance, the duties of quarter-masters, and under quarter-masters are specified as follows:—"The quarter-masters (*les intendants*), and under quarter-masters (*sous-intendants*), are responsible for the Health Department. They are charged with the bringing together of the means of assistance and transport for the wounded. Before and after the action they should be occupied with these important duties; they are to report to the general officers." In fact, the French army-surgeon is entirely under the control of the chief quarter-master of the column or hospital to which he may be attached. This official is the judge of the surgeon's professional skill, and assigns him to any special duty he may choose. In matters concerning camp hygiene, it is he who decides as to the value of this or that sanitary measure. Every hospital is administered by a *sous-intendant*, or *officier d'administration comptable*, an officer of a minor grade; he directs everything; the surgeon, whatever his rank, is not able even to punish a nurse for a neglect of duty; the case must be brought before this quarter-master.

Moreover, the diet list and the medicines to be employed, are strictly limited to certain formulas. For example, hospital surgeons are forbidden to serve more than five cutlets, on any one day, in a ward of fifty sick, no matter what their condition; and it is said that M. Leuret, a medical officer of high rank, was compelled at the close of the Italian campaign, to pay to the Government 1,500 francs for the supplementary cutlets he had served to his patients; while M. Lacronique, a medical officer of equal rank, was found in debt to the Government 84 francs for omelettes not provided for in the regulations.¹ There is no such thing as prescribing at the bed of the patient. Formulas have been prepared, anticipating all possible complications, and to these the physician must limit himself. The rule is absolute.²

¹ Caubert, "Thèse," 1871.

² "Les médicaments portés au Formulaire Pharmaceutique sont les seuls qui puissent être employés dans les hôpitaux militaires."—*Règlement du 1er Avril, 1831*; titre vi. chap. ii. sec. i. art. 30.

These formularies enter into the minutest details, and inform the physician to whom sugar and water may be given, and to whom it shall not be given.¹

Not only is the army physician bound by such restrictions, but the autocratic assumptions of the intendance, and the power which it possesses, even as regards his personal independence, are almost incredible. Says M. Le Fort:—"While I was at Milan in 1859, the *chief physician* of the hospitals of that city, M. Cuveiller, now inspector of the *Service de Santé*, thought it to be his duty to write a letter of thanks to the physicians of the city who had assisted us in taking care of the wounded. One morning all the army physicians in Milan were summoned to meet at the hospital San Ambrogio, the sub-assistants included, of whom I was one, and, doubtless, that the glory of the intendance might be the better established, the Italian civil physicians attached to the various hospitals. The object of the meeting was soon explained. The *sous-intendant*, De Lavalette, came forward and began to read a letter, commencing in terms nearly as follows:—"An army physician has thought he could address a circular"—"I beg pardon," replied our eminent *confrère*, "that letter written by me is not a circular." "*You shall have fifteen days' arrest for that observation.*" Such was the reply of Monsieur le Sous-intendant."²

It is scarcely surprising that, crushed by such despotic restrictions and assumptions, the Regular Medical Department of the French army should have had, at the outbreak of the recent war, neither the ability nor the courage to assume to provide for the multitude of sick and wounded, which it was certain would have to be taken care of during the campaign. The result was, that before a blow had been struck, the Regular Medical Department had so far resigned what might well be presumed to be its special prerogative, as to leave to the "*Société de Secours aux Blessés*," a civil society, the work of organizing nearly all the ambulance

¹ "Il est expressement interdit aux pharmaciens comptables d'édulcorer des tisanes qui ne sont pas désignées comme devant être sucrées ou miellées."—*Circulaire Ministérielle* du 11 Sep. 1839.

² "*La Chirurgie Militaire*," par Leon Le Fort. Paris, 1872; p. 13.

corps, intended to follow the moving columns of the army into the field and assist in the active work of battle-field relief; as also to resign to this same society, and kindred societies, and private charity, the organization of most of the sedentary hospitals which it might become necessary to establish in the towns and cities of France. Not only have these civil associations and private individuals, sent into the field ambulance corps and organized local hospitals, but they have supported nearly all the expenses incident to such establishments. The salaries of the surgeons, and the wages of the nurses, the cost of the material necessary, houses, hospital furniture, waggons, horses, medicines—even the food, of the sick and wounded treated in these hospitals—all these have been furnished largely, if not principally, by private charity.¹ It will be seen from this statement, that during the recent war, the rôle of the French Sanitary Associations was not that of *supplementing* any existing military service; so far as they acted they *supplanted*, not only the Medical Department, but the Government itself; they supplanted the Medical Department completely, and the Government,—to speak exactly I should perhaps say the Intendance—to this extent, that just in proportion as it yielded to the demands made by private charity to assist in taking care of the sick, it abandoned to such charity its responsibility (to the public) for the care and treatment the sick and wounded might receive.

A cause, which also powerfully contributed to this result, was the absolute poverty of the regular *service de santé*, when in the field, with regard to the material means for hospitalizing the sick. No hospital establishments were especially created for it. “The organization of the regular medical service in the French army stops at the ambulance of head-quarters”²—a field hospital established in the most accessible churches, houses, or barns. If this is unable to receive the wounded, on account of their numbers, they are sent back to the first towns, and thrown in upon the civil hospitals, or, these not existing, are placed in such buildings

¹ By a Ministerial Decree, after the 1st of October, a *franc* a day was allowed by the Government to the “Société de Secours aux Blessés” for each soldier taken care of in its ambulances.

² M. Leon Le Fort, “Revue des deux Mondes.” Tome xvi. p. 122.

as can be used temporarily as hospitals. Such hospitals as English and American General Hospitals, and the Prussian Etappen Lazareth Hospitals, regularly organized at important points behind active armies, provisionally created to afford relief to the field hospitals, and to obviate the necessity of distant and rapid transportations, are unknown in the French service. The sedentary hospitals, the so-called *hospitals* of the *second* and *third* line, are always established in public or private buildings, hastily appropriated to the purpose. In speaking of them, M. Michel Lévy says:—
 “Indeed, it is a piece of good fortune when one can, as in Italy, count upon a vast group of richly furnished establishments, civil hospitals and asylums, convents and palaces, scattered through a series of great cities and rich towns, united by railways,” &c.¹

It will be understood, therefore, that when voluntary associations had opened sedentary hospitals—“ambulances”—in all the principal cities and towns of France, those nearest to the field of action, or on the lines of evacuation from it, were eagerly accepted by officers who, burdened with convoys of wounded, were often utterly ignorant as to where they were to be placed, and were thankful for the first opportunity to relieve themselves from a heavy charge, and an irksome responsibility.

I have said, that the admission of a delegate from the “Société de Secours aux Blessés” to the councils of the administration, initiated a reform; it certainly did, it was a blow struck at an old tyranny. But, as might have been inferred, the evils incident to the system, or rather want of system, which grew out of this arrangement were immense.

In the first place, the “Société de Secours aux Blessés” possessed no special qualifications for the direction of the ambulance service of an army. In fact, it was thoroughly incompetent. Founded in 1864, nominally to assist in taking care of the wounded of armies, always feeble in numbers—without funds—unrecognized officially—it was sleeping in a cataleptic repose when the declaration of war in July, 1870, like a sudden peal of thunder, startled all France. The council of this society was composed when the war broke out, of a body of gentlemen, with a single

¹ “Traité d'Hygiène.” Paris, 1869; tome ii. p. 542.

exception, wholly unacquainted with military life and the machinery which moves an army, and this exception was a medical gentleman, who moreover was the only person in the council whose name was possessed of any scientific reputation whatsoever. The council had had no experience of any kind, had projected no plans, and for the simple reason that it had no clear ideas of its own mission.

But war had been declared, and it was necessary that something should be done. The society, accordingly, offered its services to the Government; it offered to take care of the wounded, and also at the same time to furnish for that purpose its own surgeons, nurses, waggon, and hospitals; it thus volunteered to assume at once the functions of a department.

These offers were vaguely accepted by the French Government, and the Society immediately began to organize and send off its ambulances.

Coming into the field as a volunteer organization, forming no essential part of the military hierarchy, largely ignored by the intendants—whose prerogatives it had encroached upon, but upon whom it was necessarily dependent, not only for its information, but for its means of moving, and even of existing—the efficiency of the society was immediately paralyzed by the abnormal and false position it occupied. It was almost constantly ignorant of the necessities of the several armies in the field; it, at least for a long time, neither possessed nor could furnish any exact information on those very subjects, a knowledge of which was most essential before any intelligent executive measures could be adopted. Even the position of the different corps and divisions, as well as the means of reaching such sections of the army, was unknown to it. Ambulances were sent off one after the other to grope their way, as they might, to the corps to which they had been assigned, or to hunt up some special field of usefulness. Everything was done in the dark, and while the majority of the ambulances were wandering about the country, signal services were rendered only by the few which blundered into usefulness.

“On the 27th of August, the *eighth* ambulance left the Palace of Industry, about three o'clock in the afternoon, and took the

train at the Northern station, about ten o'clock in the evening. It was to go by way of Hirson to Mézières, and thence join as it could—*comme elle pourrait*—the corps of General Félix Douai.

"No one had, in fact, any information as to the position occupied by that general; it was only known that he had left Belfort to rejoin Marshal MacMahon, who was himself, probably, on his way to Metz, where Marshal Bazaine had been shut in."¹

And as this ambulance left Paris, so they all left, although they did not all find their way back again, as this one did, a fortnight after, and only to there repeat its first experience.

"September 10th, 11th. After a day of rest at Paris, the ambulance, anxious as it was to be at its post, received the order to go to Lagny. *We were told*, that in the direction of Meaux there was a French corp d'armée, and that there, *certainly*, we should find an occasion for being useful. We arrived rapidly at Lagny by train, and assured ourselves personally that it was impossible that any engagement could have taken place. There was scarcely even a *mobile* or a scout in the country.

"September 12th, 13th. Our Lagny campaign was not a brilliant one; the ambulance, impatient to do something, has received *the order* to go to Villeneuve Saint Georges.

"*It was thought*, that there would be an engagement in that direction. The Lyons road being cut, we took the Orleans road as far as Juvisy. We were able to assure ourselves that the absence of French troops was as complete on this side as on that of Lagny."²

Says M. Le Fort, in his account of the *first* ambulance:—"The 4th of August had been fixed as the day of our departure. Nancy was to be our first halting place; this destination had been indicated to us by an order from the imperial head-quarters. What had passed was substantially this: our situation in the army was very badly defined. The ambulances of the society, as well as the society itself, pretended to be independent, and not to receive their orders from the administration, that is to say from

¹ "8me Ambulance de Campagne de la Société de Secours aux Blessés." Rapport par M. Amédée Tardieu. Paris, 1872; p. 5.

² Ibid. pp. 16-17.

the intendance. This was equivalent to a resolution from the very beginning, never to be seasonably informed of the military movements of the army. To avoid as much as possible such an inconvenience the understanding was, that M. Conneau, the Emperor's surgeon, should be our intermediary at head-quarters, our guide, our counsellor, and if it was necessary our chief and our protector. Doctor Anger, associated with Doctor Conneau, was to transmit to us the opinions and the orders of our eminent confrère. At the time of our leaving Paris, the army was scattered all along the frontier; to what place should the ambulance go, to what corps should it by preference be attached?—this was the problem to be solved. M. Nélaton had gone to Metz, and after having held a conference at head-quarters with M. M. Larrey, Conneau, and Wolf, intendant-general, it was decided that we should go to Nancy and await the army there. . . . Sunday passed and not a single wounded man arrived at Nancy. . . . Our situation became more and more embarrassing. On the 7th of August, in the evening I directed M. Couttolenc to proceed to Metz, and demand instructions from Dr. Conneau. This undertaking was utterly fruitless, I was unable to obtain advice, even that which was unofficial. In fact, it would perhaps have been difficult to have answered my request, for no one then knew, when disasters at every instant were being reported, what direction might be given to the army. I was therefore left to my own initiative as also to my perplexities, and they were great, since I had to divine, in some sort, events from reports which were contradicted at every instant.”¹ M. Le Fort finally concluded to go on to Metz. The society after having sent the ambulance to Nancy, had nothing more to do with it, until after the surrender of Metz, when the ambulance was disbanded.

The *second* ambulance, under the direction of M. Seé, left Paris on the 11th of August with the order to go to Metz; on arriving at Frouard, it was found that the railway was cut; after wandering about in a vain attempt to reach Metz by another route, it strayed within the German lines, where the personnel

¹ “*La Chirurgie Militaire.*” Appendice, p. 33, *et seq.*

were made prisoners, and from whence they were sent back to France, by way of Coblenz and Belgium, ten days later.

The *third* ambulance was also captured a few days after it left Paris. Says the surgeon of the *sixth* ambulance:—"Without instructions, without control, our ambulances whether attached to army corps or free, wandered about at hazard, and the services which they rendered were due principally to the initiative, the talent, and the courage of the chief surgeons who directed them."¹ The story of the Odyssey of each of these ambulances is nearly the same; with the exception of the *sixth* ambulance, which did succeed in finding MacMahon's head-quarters, which it had received orders to join, of the twelve or thirteen ambulances sent out from Paris by the "*Société de Secours aux Blessés*," scarcely one ever reached either the corps or the place to which it was ordered.

By the assumption of this Society to direct the field ambulance service, the regular medical officers of the army were to a great degree not only relieved of their proper responsibilities, but many of them were practically deposed and left either in idleness or to the uneventful office of prescribing for the daily ailments of the troops. There was no uniformity in either the special or general treatment which the sick received—this varied as the opinion of the surgeon-in-chief, and as the liberalities at the disposition of the ambulance. Irregularities of every sort were inevitable in such a hospital organization; neither medical officers nor attendants could be held to any fixed term of service, or punished for any neglect of duty not in itself criminal. The nurses, generally recruited among the most worthless portion of the population, too poorly paid to be controlled by considerations of profit, and outside of civil as well as military discipline, could be depended upon for nothing.

The records of the hospitals thus established so varied in their details as to be quite incomparable; their completeness and even accuracy depending upon the fidelity and scientific habits of thinking, personal to the surgeon in charge. Another evil ex-

¹ "Rapport Général du Dr. Piotrowski." Paris, 1871.

isted, viz., the impossibility of ascertaining the exact number of available beds in any city or department ; frequently, no one knew how many men it would do to send to a certain city or even ambulance. Nor was this the only unfortunate result of not knowing what hospital accommodations might have already been provided ; ambulances (sedentary hospitals) were needlessly multiplied as well as frequently established in places where they could render no service. Indeed, the feverish zeal with which school-houses, convents, and public and private buildings were converted into ambulances, without reference to those already organized, was such, that a ministerial circular, issued for the purpose of moderating this excessive activity, had little effect. "I saw," says a surgeon, "on the 18th of February—that is to say during the armistice and just before the conclusion of peace—a requisition, that had been sent to a convent, which it was proposed to seize for the purpose of converting it into a hospital, and this at a time when, in the town, there were more than 150 vacant beds, and when, in the neighbourhood, there was no accumulation of troops which might lead one to anticipate any new necessities."¹

The number of available beds in a department was moreover constantly liable to be over estimated, from the extent to which the red-cross flag and the word *ambulance* were used for no other purpose than as a protection to property.²

The selfish motives, which prompted the opening of ambulances, were often revealed in places where they were to have been least expected. Says M. Tardieu:—"At the time of our arrival, two Dominicans alone remained in their establishment ; the reception they gave us was most cordial. We were to finally learn that interest counted for much in this reception, and that

¹ "Malades et Blessés de l'Armée de la Loire." Rapport au Ministère par T. Gallard, 1871.

² In accordance with the 5th Article of the Treaty of Geneva:—

"The inhabitants of the country, as well as the members of the volunteer ambulance corps, who shall give aid to the wounded, shall be respected and protected.

"Any wounded soldier received and taken care of in a house shall be for it a safeguard."

very frequently, during this sad war, the international flag has been desired rather as a protection to property than as the mark of a friendly refuge for the unfortunate wounded. . . . We received at the same time the offers of service of the sisters of Cachan. . . . Alas! the relations, which we had at first, with these sisters, were as excellent as those which we had had with the monks. Our ambulance learned to find out later that convents are not entered with impunity.”¹

Few saw during the war a private ambulance opened for the sick, nearly all were for the wounded. For the vast multitude of sick little popular interest was shown. The sick soldier was left by the wayside, while often a crowd of zealous philanthropists, impelled by a love of dramatic effect, gathered around the wounded man, and contended among themselves for his possession. “All Paris remembers . . . the long line of carriages of every form and hue which used to go out as far as the ramparts, or a little farther, and then return in triumph when they had found a wounded man,—for there was a time, when it was *à la mode* in Paris to have *our wounded man*. A sick soldier! No. It must be one wounded, and above all, lightly wounded—in the arm, for example. What a sad sight such an abuse. How much power—how much admirable devotion came to nothing, by reason of pretenders of every sort, coming from no one knew where, who paralyzed everything by their contact?”²

Every little *coterie* was ambitious to have its ambulance, which it could direct and talk about. Hospitals had their “lady managers,” whose sole qualifications were rank, wealth, and the unconquerable determination to keep at the head of fashion, through whatever singular paths it might lead. In these private establishments “the doctor” often played only an inconsiderable rôle. He did what he was told to do; he was obedient and submissive; he was necessary—and so was the scullion.³

¹ “Sme Ambulance,” op. cit. pp. 18, 19.

² Ibid. p. 94.

³ While during the late war the regular medical service, in the German armies, retained in the field a large portion of its just independence in matters of administration, it seems to have exercised very little, if any, control over most of the general hospitals, opened in Germany, for the sick and wounded returned from the front. Large numbers of these hospitals were essentially civil foundations,

The very name which the chief French Volunteer Society assumed—"Société de Secours aux Blessés"—was unfortunate, as it tended to create and direct popular sympathy and charity for the victims of war, almost wholly in the direction where there was really least occasion for it. The sick were forgotten, the prisoners were forgotten, and most of the suffering special to sieges and a war of invasion, except that resulting from wounds, which in comparison was trifling.

The sketch which I have given of the operation of a volunteer ambulance system, is certainly not a pleasing one. For many reasons I wish I could have stated the case differently. To have done so would have been impossible. The evidence of the complete inefficiency of the volunteer system as applied in France, during the late war, is irrefutable, and the most remarkable circumstance is, that this evidence is supported by the statements, and nearly unanimous conclusions of those surgeons who had the direction of volunteer ambulances. If M. Le Fort, of the *first* ambulance says:—"The experiment which has been tried by the international society has proved a complete failure"¹—so M. Championnière of the *fifth* ambulance, concludes as follows:—"I might endeavour to show the improvements of various kinds of which the volunteer ambulance corps are susceptible. I shall, however, not go into these details, as I believe that civil ambulances, so far as battle fields are concerned, have played their rôle, and that this rôle is finished." While M. Piotrowski of the *sixth* ambulance, a member of the Council of the French Society, affirms as the result of his experience, that "the sanitary service of the army should have an organization wholly military, and in no way civil, especially upon the battle-field."²

Indeed, I might multiply almost indefinitely these results and conclusions after a bitter and sad experience.

One inference, from the facts just stated, must be, that the dis-

created, as were the French ambulances, by "Sociétés de Secours," or private individuals; they were very generally directed by committees of ladies, and the doctors and surgeons appear to have been, almost without exception, the most insignificant appendages of the establishments.

¹ "Revue des Deux Mondes." Tome xcvi. (Nov. 1871); p. 132.

² "Rap." cit. p. 23.

order in the administration of the health service of the French army in 1870-71 was complete; such an inference would be just. Another inference may be drawn, that the "Société de Secours aux Blessés" was principally and immediately responsible for this disorder; such an inference would be unjust. The "Société de Secours aux Blessés," I presume, always did as well as it could, and unquestionably quite as much as any similar society could have done, had it assumed the same position. At least, the administration of the society always appeared to be anxious to do what it could, and all it could, to accomplish the overt objects of its mission; and numberless instances of the most heroic devotion on the part of its agents might be mentioned. The real cause of the confusion was the introduction into the administration of the army of an irresponsible agency, whose active functions were wholly undefined; and the responsibility for the consequences which followed, properly belongs to those who first accepted it, and subsequently permitted it.

Whatever the blame, however, which may be attached to those persons, the excuses which may be offered in their justification are many. The inefficiency of the regular *service de santé* was notorious—the principal cause, unfortunately, had not been equally so. Having emasculated this service by depriving it of authority until it was to the last degree impotent, and that by the confessions of the most eminent men in the service,—it was too late, after war had been declared, to discuss reforms in its administration. The horrors of the Crimea, of Magenta, and Solferino, the French people did not care to see repeated—nor did the Government either, if there was a possibility of avoiding them. The proposition made by the representatives of popular charity to take care of the wounded, and provide for all their wants without embarrassment, as also without cost to the Government, was alike too magnificent and too generous to be hastily rejected. Moreover the popular political effects of a general and sympathetic movement on the part of the whole French nation in behalf of the wounded of its armies could not be overlooked. France needed in the struggle into which she had rashly thrown herself all her strength—moral as well as physical—and thus, the proposition of the "Société de Secours aux Blessés" came to be

accepted, although for a long time the action of the society was tolerated rather than officially recognized.

The responsibility, however, for the general confusion in the administration of the health service, which reigned under the Republic as well as under the Empire in the armies of France, must still be assigned to those who, in time of peace, were strong enough to strip of its just prerogatives an essential arm of military service, and who in the presence of war were weak enough to confer them upon the first claimant.

It is quite impossible to maintain the efficiency of any service without a competent and responsible direction. The regular *service de santé* in the French army is competent, but has never been invested with the attributes of direction, and is consequently responsible only for its competence. The "Société de Secours aux Blessés," on the plea of the inefficiency of the regular service—an inefficiency most deplorably manifest—succeeded ultimately in obtaining from the general administration a concession of several important privileges—including a part of the right of direction—which constantly claimed, have been as persistently withheld from the regular service; while at the same time it evaded nearly all administrative responsibility, on the ground of being an extra official organization.

The French army hospital service was established, therefore, during the late war, on substantially the following basis. The regular *service de santé* retained its competence with such responsibility as might be connected therewith, but, conscious of its feebleness, consented to stand aloof. The *Intendance* retained its responsibility (to itself), but transferred to the "Société de Secours aux Blessés" a portion of its authority; as a special qualification for the exercise of this authority, the "Société" combined something of the competence of the *service de santé* with something of the authority of the *intendance*—and both, in about equally small measures. When this triple repartition had been effected, the organization, such as it was, was complete. It will be observed that the "Société" added no strength to it—it gave nothing—it took everything it possessed—it took from the *intendance* its authority, and from the *service de santé* its opportunity to act. The result was inevitable—a more chaotic and wretched state of things

could scarcely be imagined than that which followed this singular division of attributes, the union of which, under one head, was alike indispensable and imperative.

The name which is given to an Army Medical Department is of little consequence; it may be called a "Sanitary Commission," or a "Société de Secours aux Blessés," or a "Service de Santé," or by any other name; it must, however, form an integral part of the machinery of the army, be represented by a single person, and be made directly responsible, through that person, for all its acts to the chief of the War Department.

Made officially responsible for its acts, the "Société de Secours" might have taken the place of the *service de santé*. With something of that liberty of action and administrative independence which was conceded to the "Société de Secours," the regular *service de santé* would have left no place for the "Société de Secours" in any work of administration. Such being the position, the course which should have been pursued is too evident for discussion.

There can be no place in any well regulated army for a volunteer health service. It is as anomalous a creation as would be a volunteer ordnance department, or a volunteer commissariat; and not one of the least remarkable, I might say astounding, facts connected with the late war was the recognition of voluntary ambulance corps as constituent elements of active armies, and that, by a Government presumed to be pre-eminently skilled not only in matters of military art, but in the general science of organization.

The French "Société de Secours aux Blessés" completely mistook its own proper vocation. It misconceived, apparently wilfully, the true province of voluntary effort in behalf of the sick and wounded of armies; and a new field, once opened to it, seemed even, at times, to be led on rather by an inordinate desire of securing to itself official and popular power, and the brilliant insignia of a new order of Hospitallers, than by a desire to fulfil in the most effective manner the conscientious duties of charity and citizenship.

Mr. Stillé, the official historian of the United States' Sanitary Commission, in stating the causes which led to the formation of

that Commission—risks to which the soldier was exposed, the apparent helplessness of the Government to provide adequate remedies, &c., says:—"It was determined by some enlightened men, most of whom had been taught by their profession the value of preventative hygienic measures, to try the experiment of infusing some of the popular enthusiasm and popular sympathy into the cumbrous machinery of Government. This was to be done not irregularly, or in the way of embarrassing intervention, but strictly in aid of the Government plans; as far as possible, through Government means, and wholly in subordination to the great object which the Government had in view in prosecuting the war. This was the germ, the original conception of the functions of a Sanitary Commission . . . They were not disposed to supplant the Government as the proper and most efficient care-taker of the army, but simply so to mould the popular will that it should aid, encourage, and uphold whatever was undertaken by the Government in the direction of humane and careful guardianship of the soldier . . . Into the untried future, with all its fearful dangers, they hesitated to cast what might prove in practice an additional element of confusion and embarrassment to an already sorely pressed Government."¹

It was one of the glories of the United States' Sanitary Commission that it never became a piece of political machinery; nor did it ever propose to do any part of the work which the Government had undertaken to do, better than the Government was doing it. It only proposed to aid the Government—supplement its deficiencies, and encourage it. It never attached to a division or to an army corps a body of surgeons; it directed no hospital, and it never owned even an ambulance waggon. It offered its services whenever and wherever there seemed to be an occasion for them, whether in camp, in the hospitals, or elsewhere; but always in complete subordination to every department of the military hierarchy. Whatever power it or its agents exercised was simply moral power, which was all the more real and conspicuous, free as the Commission was from even the suspicion of seeking

¹ "History of the United States' Sanitary Commission," by Charles J. Stillé. Philadelphia, 1866; pp. 36-37.

to attain objects of personal interest and ambition, by impeaching the competence of any established bureau, or the capacity of any person connected therewith.

In war there may be large and frequent opportunities for the exercise of private charity and benevolence, but an unlimited exercise of these sentiments must often be incompatible with the public welfare, the welfare of the army, and with a wise humanity itself. The army medical service has been created for the sole purpose of giving succour to the sick and wounded ; if composed of the proper personal elements, when clothed with sufficient power, and provided with the necessary means, it would serve the purpose of its creation as perfectly as is possible—certainly much more perfectly than a heterogeneous society of civilians, foreign to the army, slightly acquainted with its necessities, and uncontrolled by its discipline.

So much of the suffering incident to battle-fields as may have been unnecessary, as might have been avoided, is not to be considered conclusive evidence, as superficial observers would have us believe, of the necessity of organizing volunteer hospital corps in time of war. It simply shows that the regular medical service from some cause may have been unable to afford all the relief necessary. This cause should be carefully sought, ascertained, and removed. If it was obviously through some radical defect in the organization of the service, the want of certain authority—correct this defect, and accord the authority necessary;—was it because sufficient material means may never have been furnished by the central administration?—such means should be placed at the disposition of the service;—was it because the service was deficient in personal strength?—increase the number of its agents;—was it because of the personal incompetence of those charged with the service?—replace them by men who are able to discharge its duties.

“Sociétés de Secours aux Blessés” have in principle, no *raison d'être*, while in practice, the “Sociétés de Secours” for which there is the largest need, are *au service de santé*. This service in certain armies needs help, that it may be rehabilitated with the consideration and rights which naturally belong to it, and may be invested with the authority necessary to its effi-


ciency; while the regular medical service in all armies may be aided with advantage by contributions of those material means for taking care of the sick and wounded, which may be deficient in the best equipped armies in great emergencies.

To assist the army medical service in the accomplishment of its arduous and painful duty, to replenish its exhausted depôts, and aid it in the accomplishment of its task, as a servant, and at the same time as a counsellor and a friend, and by so doing, to convey to the wounded encouragement, and that sympathy which the great heart of the nation feels for those who suffer in nobly defending its honour, its soil, and its life—such should be the mission of every volunteer association for the relief of the misery of battle fields.

But there is another way in which a national voluntary association may powerfully contribute to the welfare of the army,—by investigating and stimulating the investigation of sanitary laws, as well as those inquiries which concern the most practical methods of enforcing such laws in camps,—by determining the relations of the soldier's food, clothing, shelter, and general and special surroundings, to health and disease,—by ascertaining the effects of different systems of hospitalization upon those suffering from disease and wounds,—by devising improved systems of transporting the sick,—by advocating such reforms in the general organization of the army health service as may be required to give to it greater efficiency,—by becoming, in short, the educator and organ of that public opinion which, in every state, when taught how to act, strips from individual men their arbitrary personal power, and re-assumes its ancient and divine right of sovereignty and control in every governmental service.

It was not my purpose in writing this report to present any special criticisms concerning the personal and material organization of the French army medical service in its several relations to the regiment, the ambulance, and the hospital. It has seemed desirable, however, that the place held by this service in the military hierarchy should be indicated, as also some of the general causes which have partially paralyzed its force, as well in former campaigns, as in that which has more recently closed.



N the foregoing summary of the leading facts connected with the history of the hospitalization of sick and wounded soldiers, the general insufficiency of the means used to protect armies against the ravages of diseases and the losses consequent upon wounds received in battle is painfully evident, although I have purposely avoided any special references to the frightful results of official neglect, which darken nearly every page of human history. Perhaps the most remarkable fact is the absolute indifference with which the fate of the sick and wounded was generally regarded, for many centuries. When that indifference began to give place to a more humane sentiment, the exercise of this sentiment was for a long time practically obstructed by the conviction, that it was useless to attempt to avoid the perils peculiar to war. This conviction has manifested itself everywhere, in a feeble and inefficiently organized sanitary service. The medical and surgical staff has been numerically insufficient, and has rarely been invested with those official attributes indispensable to an administrative service. Medicines, surgical apparatus, clothing, and even food, have seldom been provided with liberality; barely sufficient, even in the uninstructed opinion of the time, where the necessity for them was the least, when the want has been greatest, many of these supplies have been absolutely unobtainable. Until the middle of the eighteenth century, no organized service for the transport of the wounded had ever been proposed in Europe, and it is only a hundred years earlier that the first references are made to the establishment of hospitals for the wounded. Nearly a hundred years, however, passed away before military hospitals were established on a permanent basis, and we have seen how imperfectly all these hospitals even fulfilled the object for which they were nominally created.

We have seen, nevertheless, that since the importance of making some special provisions for the care of the sick and wounded first began to be recognized, such provisions have been

if slowly, yet steadily increased and perfected. An immense field for improvement is still open; would that governments were not less conscious of this than philanthropic individuals, that all might unite their efforts in order to accomplish those reforms in the sanitary service of armies, which are demanded as well by the social and material changes which have affected the relations of armies to states, as by the more enlightened and humane sentiment of the age!

Whoever would discover the extent to which it may be possible to ameliorate the condition of sick and wounded soldiers, and reduce the mortality rate in armies—whoever would take into serious consideration the practical measures necessary to the accomplishment of this object—must be prepared for an investigation of many difficult and most complex problems. Indeed such a variety of knowledge is required in the investigation of this general subject, that a complete and substantial reform in army sanitation, and in the means of dispensing succour to the sick and wounded, can only be obtained through the joint labours of many. It will be necessary to examine each question from several points of view; the laws of health and disease are not alone to be considered; while a variety of conditions, which may be classed somewhat generally as political and military necessities, will often influence very materially the results of each inquiry.

The best final results, whether special or general, can however only be reached by combining the facts of individual experience. Every serious experiment, made for the purpose of arriving at the truth, upon any one question which intimately concerns the welfare of the sick soldier, has therefore a positive value.

I am acquainted with no subject connected with the service of armies which is more important than that relating to the hospitalization of the sick, and a brief general history of which I have given. I was accordingly greatly gratified to find that the American International Sanitary Committee entertained this opinion also. Formed, as soon as the late Franco-German war had been declared, and with the intention of engaging with similar associations upon a general work of active charity and beneficence, by preparing and sending out to the sick and

wounded the means of immediate relief, wherever the want might be greatest, this committee saw very soon the importance of so directing its work that the facts observed by its agents might be made to contribute in the largest degree possible to the general improvement of the present army sanitary service; and the special question in connection with this service, which presented itself to the committee as the one whose solution was perhaps most immediately important, related to the best practical measures which could be adopted for the hospitalization of troops in the field. The question in its terms was very simple. Do not tents afford the best shelter which can be used in the establishment of field hospitals?—are not the advantages peculiar to such hospitals when established under canvas much greater than have been supposed, and are not the disadvantages peculiar to such hospitals much less than have been supposed? In a word, would not the sanitary service in European armies be more efficient, and the mortality in those armies be greatly reduced, if, when field hospitals were to be created, recourse was less frequently had to public and private buildings, and a use was more frequently made of well constructed portable tents?

Here were questions which the committee was quite at liberty to examine in an experimental way, upon its own ground, and without the possibility of ever finding its work obstructed and its usefulness imperilled,—as must have been the case had it ventured within the uncertain lines of moving armies, where international privileges are unrecognized, and volunteer hospital corps are peculiarly out of place.

The Committee decided to establish a tent-hospital at Paris. The results, as well as the special conditions under which the experiment was subsequently conducted, I shall finally show. The service which the ambulance rendered will be better appreciated, however, after I have exposed more fully certain facts relating to the hospitalization of the sick in modern armies.



MILITARY hospitals may be divided into two classes, viz., the *permanent* and the *temporary*.

Permanent hospitals are established principally in the interest of standing armies in times of peace.

In war, army hospitals are for the most part temporary establishments prepared to receive the sick and wounded, at points more or less remote from the field of active operations, or within the army itself. Those temporarily established at remote points belong usually to a group called *sedentary* hospitals; those existing at the seat of war or within the army itself may be either *sedentary* or *ambulant*.

A sedentary hospital is one which has been created at a particular place, for no long indefinite time, but on such a foundation, that its existence may be continued so long as the circumstances themselves exist which caused it to be created. Sedentary hospitals are established on lines of embarkation, which speedily become what the French term lines of *evacuation*—that is to say, lines of transit for those returning from, as well as for those going to, the seat of war. They are created at those places where supplies, munitions, &c., converge, and which are termed *bases*. They are created also within the lines of armies occupying for a time a fixed position—as in the siege of fortresses, in the military occupation of posts, and in winter quarters.

Ambulant hospitals, *ambulances*,¹ are field hospitals, those

¹ The word *ambulance*, from *ambulare*, to move on, to march, is in several respects an unfortunate one. Introduced into our language, by the celebrity obtained by Larrey's *ambulance volante*—a service organized to afford immediate relief on the battle field, in which a *light waggon* was an original and characteristic instrument—in England and the United States, the word has been applied to a waggon used for the transportation of the sick.

In France, it was first used as a noun substantive in place of *hôpital ambulant*, that is to say, the hospital moving with the army. In this sense the word is still used.

As, however, since the time of Larrey, the essential elements of an ambulant

hospitals which follow the movements of an army. The French divide them into two classes—the *ambulances volantes* (ambulance depôts of the U. S. Reg.), and the *ambulances sédentaires* (general, corps, and division field hospitals). The *ambulance sédentaire* is not, strictly speaking, a sedentary hospital, since it is sedentary only as the army to which it is attached is sedentary, and is always in a condition to move with that army.

Hospitals, whether permanent or temporary, are established partly from reasons of convenience. The duty of extending succour to the disabled and helpless, once recognized, that duty can be discharged most easily as well as most completely, by bringing the infirm together where they may be the constant subjects of care and attention. Some kind of shelter is necessary for men whether well or sick, in peace as well as war. In the establishment of hospitals, use may be made of such shelter as may have been previously constructed, or shelter may be created either because better fitted for the special object in view, or because of the absence of suitable or sufficient shelter.

The primary idea to be attached to the word hospital is that of a *shelter*; a hospital, strictly speaking, is neither a service nor a charity, nor a remedy for disease, nor a place; it is a shelter or asylum—a construction prepared to protect its inmates—*hospites*—from the inclemency of the weather. If men were unaffected by exposure to atmospheric influences, however subject they might be to disease, and however much they might need medical care, there would be at least no occasion for hospitals. This is an important fact, since, if the object of a hospital is to protect those who are to be brought together for medical treatment from atmospheric exposure, it should be built with the immediate purpose in view of accomplishing that object—and nothing more. At

hospital have been surgeons, stretcher bearers, stretchers, waggons, medicines, &c. The word ambulance has been applied to the *service* or organization obtained by the union of these material and personal elements, and in this sense the word was, in fact, generally employed by French medical writers before the late war.

But the enormous number of temporary hospitals, created during the late war, has resulted in an extension of the meaning of the word, which is now popularly and generally applied to every military hospital, called into existence during a campaign.

least, that accomplished, there is little occasion for anything more so far as the general interests of the sick are concerned. It will of course be understood, that, as in the construction of everything to be used, it may be expedient to pay attention to various matters of detail which may make its use more easy, convenient, and agreeable. But it should be observed that all such points of construction are of secondary importance, and that whatever the special advantages to be gained by their embodiment in the work, they are to be objected to in principle, just in proportion as they interfere with the most simple realization of the primitive and more important object.

Briefly stated, the principle involved is this: since a shelter is the object of a hospital, and as buildings and other constructions are used for hospitals because they afford a shelter, the simpler the building, if it affords a sufficient shelter, the better the hospital.

It is unnecessary to attempt to present in this place, in an exhaustive manner, the general principles which should be observed, more or less completely, in the establishment of every hospital, whether permanent or temporary. Although purely military considerations may often determine by a *force majeure*, the spot selected for the establishment of a hospital, and although it may be quite impossible from a want of material means to either organize, furnish, or maintain the hospital in the way theoretically the best, there is at the present time very little, if any, difference of opinion among those competent to give opinions upon sanitary questions, with regard to several of the principal rules to be observed in connection with the creation and management of such establishments. Fortunately, the single principle which underlies all, and is more important than all the others, has lately become an accepted fact of sanitary science, and the chief difference which now exists among those acquainted with it, only concerns the best method of putting it into practice.

It has long since been noticed, in a loose and general way, that where the population was most dense and men were most crowded together, the sickness and mortality rates were highest; the fact was observed, but the cause was unobserved. In hospitals, men are necessarily crowded together, and the mortality in these establishments, was very soon observed to be far in

excess of that obtaining among those who, when attacked with disease, were treated in places distant from each other.

This fact was too evident to be ignored, and finally gave rise to a strong sentiment against these establishments, which found an expression in various ways. Many eminent men towards the close of the last century did not hesitate to declare that hospitals, instead of being institutions of public utility, were productive of more evils than benefits; that the number and size of such establishments should be reduced, and that even their suppression altogether would contribute to the general welfare.

Had it been possible to provide for the treatment of the sick separately, undoubtedly, this would have been done long ago. But this could not conveniently be done; and a high death rate in hospitals was considered as one of the evils incident to, and inseparable from, human society. How heavily it weighed upon the population is shown by a curious fact. Very shortly after the creation of civil hospitals—houses for the sick alone—the mortality rates became so frightfully great in them that the sick poor began to refuse to enter them, and this reluctance speedily grew to be so general, that it was thought expedient in France, to give back again to these establishments the earlier and more euphemistic name of *hospices*. The name was changed; but the conditions remaining the same, the new hospice proved as deadly as the old hospital.

In the early military hospitals, the state of things was no better—if possible, was worse. The enormous number of men, sick, wounded, and worn out by fatigue, who were constantly crowded into these hospitals—crowded into the same room—crowded into the same bed—is almost incredible. Well might a writer of the time despairingly exclaim:—"Military hospitals are an unfathomable gulf; the source of their horrors appears to be inexhaustible."¹ Soldiers could scarcely be induced to go to these establishments, and the repugnance with which they were regarded was universal.

For a long time the principal cause of the great mortality existing in hospitals was not clearly and fully understood. It was be-

¹ "Turpin de Crissé." Op. cit.; tome ii. p. 84, *et passim*.

lied by some, to be attributable largely to the constitutional vices of the sick, occasioned by poverty or by the hardships and fatigues peculiar to camp life. Others, while recognizing these as possible causes, believed that the excessive mortality was more immediately occasioned by a deficiency of medicines, food, and clothing, and a want of care and attention on the part of all those whose duty it was to provide for the sick. In short, faults of special and general administration were made the chief subjects of criticism, by those who during the past century were interested in reforming military and civil hospitals.

One fact could not, however, escape general notice, viz., that the space within hospitals was altogether insufficient for the numbers who were continually brought to their doors. As it was rarely deemed possible to refuse sheltering these homeless applicants for charity,¹ rooms were crowded with beds, into which, that all might share alike, it became necessary to place rarely less than two patients, and these, occasionally, seriously ill or severely wounded. The mere physical discomfort and distress resulting from such a practice can scarcely be imagined.² The atmosphere in these rooms, often close and cell-like, badly lighted, and destitute even of fire-places, speedily became so charged with vitiated emanations of every sort as to be quite insupportable, except to those habituated to it. While the impossibility of cleanliness in such circumstances, or even of an observance of the commonest decencies of life, resulted in abominations which shocked every sense, and, blunting the finer sentiments alike of patients and attendants, converted these places into sinks of moral as well as physical filthiness.

¹ "L'Hôtel Dieu de Paris ne refuse personne; mais l'engorgement qui en résulte dans cette maison fait qu'on ne se détermine à y avoir recours, qu'à la dernière extrémité."—*Idées sur les Secours à donner aux Pauvres Malades dans une Grande Ville, Philadelphie, et se trouve à Paris, chez Moutard*, 1786, p. 18. An anonymous paper written against the project of M. Poyet—the establishment of a new "Hôtel Dieu" on the Isle de Cygnes—and remarkable in many respects.

² So late as 1781, we read in a French ordonnance, that if the affluence of the sick makes it necessary to put two sick into the same bed, this shall be done *successively*, commencing with those who can bear the doubling with the least inconvenience. "Ordonnance du Roi concernant les Hôpitaux Militaires." Du 2 Mai, 1781; titre vi. art. 6.

It is not surprising, therefore, to find over-crowding among the numerous faults specified as peculiar to the hospitals of the past century. But if it was observed that where the over-crowding was greatest the mortality rates were highest, the cause of this relation was not well understood, and the ill consequences were commonly very vaguely spoken of.

In former times there was a great fear of contagious diseases, and it was believed, very justly, that they were likely to prove most destructive where men were brought most closely in contact with each other.¹ Diseases were also believed to assume often a more virulent type in an atmosphere already corrupted by the presence of disease. But that air once respired, whether by a man in health or disease, was unfit for respiration, was an active propagator of disease, was itself a poison, were facts not generally known. One of the earliest statements which I have found in which these facts are clearly recognized is expressed in the form of an aphorism in the preface to a little treatise by Van Swieten. It is as follows:—"The lodging of a number of men in a place wanting in space should be avoided with the greatest care; but should it at any time become necessary, the air must be renewed there as often as possible—whether the men who are lodged together *are well or sick*, for it is from a *want of ventilation* that the most dangerous diseases arise, including even those which are contagious."²

So, Sir John Pringle, referring to outbreaks of "hospital fever" (typhus), says:—"On these occasions it is common to look out for

¹ One of the most remarkable facts, connected with public hygiene, during the eighteenth century, was the prevalence of the *itch*. The disease seemed to be endemic pretty nearly everywhere, and to break out as an epidemic wherever men were long assembled together. According to M. Bailly, in one of the Reports of the Committee of the French Academy appointed in 1786, to investigate the subject of hospitalization:—"The itch is almost universal at the Hôtel Dieu—it is an inexhaustible source from which the disease is spread through Paris." But it was a scourge of armies as well as hospitals. Says Munro (1764):—"In military hospitals, there is no malady so common as the itch;" and it appears to have been, at least in the French army, the occasion for adopting more rigorous measures for securing the isolation of patients than any other malady, whether contagious or infectious.

² "Description abrégée des Maladies qui regnent le plus communément dans les Armées." Paris, 1760; p. xxii.

close and warm houses, and, therefore, to prefer a peasant's house to his barn, but experience has convinced us that air more than warmth is required. It may be received as a maxim that the more fresh air we let into hospitals the less danger there will be of breeding this dangerous distemper."¹ Nor have a larger experience and a rigorous study of the causes which influence health and disease led, in recent times, to conclusions more just than these:—"In fact, as the experience of every time has shown, it is in war and in the midst of camps and great hospitals, that those diseases are seen to spring up, which transported spread like a torrent among mankind. To limit and circumscribe the contagion within a small district, there should be formed in the vicinity of camps a *quartier de santé*, provided with everything needful, but where the sick should be treated *under tents*, or in *barracks* constructed of the branches of trees or of boards. Not only is the danger of infection, so frequent in the wards of hospitals, thus avoided, but the sick are spared the fatigue of transport, and the spread of the contagion is prevented; while if the place is well chosen, the freshness and purity of the air, and the action of the light contribute to the cure, and render convalescence more prompt, relapses less frequent, and the result less disastrous."²

It is very rarely, however, until near the close of the century, that we find allusions to the importance of keeping the air pure and fresh within hospitals. In fact, it was not until in 1786, a committee having been appointed by the French Academy of Sciences, to investigate the means of obviating the effects of overcrowding in hospitals, that the subject of ventilation appears to have received in France, any very serious attention.³ Lavoisier, the celebrated chemist, was a member of this committee,

¹ Pringle, "Observations on the Diseases of the Army." London, 1772; p. 104.

² "Programmes des Cours Révolutionnaires sur l'Art Militaire, faits aux Élèves de l'École de Mars." A Paris, de l'Imprimerie du Comité de Salut Public, an 3 de La République Française. "Des Maladies Contagieuses," p. 6.

³ The committee, in its report of March 12, 1788, upon the conditions essential to a model hospital, proposed an assemblage of separate pavilions; in short, the general plan of construction, therein set forth, was identical with that which was adopted fifty-eight years later in the construction of L'Hôpital Lariboisière.

and to him we owe the first scientific formula of the amount of air consumed by a man, and which consequently it was necessary to replace each hour.¹ During the period which immediately followed, the importance of paying attention to the atmospheric condition of hospitals, was still more clearly revealed by La Rochfoucauld-Liancourt, Pastoret, and other earnest investigators. But singular as it may seem, the efforts of these inquirers appear to have been expended principally in proving the disastrous consequences of over-crowding, rather than in ascertaining the specific causes of the danger, or trying to discover practical expedients whereby they might be avoided ; whatever ameliorations were effected by them were reduced practically to an enlargement of the space—an increase in the number of cubic metres of air—allowed to each patient. With regard to measures having a direct relation to ventilation itself, that is, to the expulsion of foul air and the introduction of fresh air, very little was for a long time accomplished by anyone, and the internal atmospheric conditions of French hospitals remained quite what they had previously been, excepting only as they might have been improved by a reduction of the absolute number of patients shut up in a given space, until as late as 1846, when the first ventilating apparatus which was ever used, in Paris or in France, was introduced as an experiment into one of the pavilions of the hospital Beaujon.²

That no special arrangement should have been made, previously to this date, for the ventilation of hospitals is all the more remarkable, inasmuch as some of the very systems of artificial ventilation now found most effective had long before been suggested, and were by no means unknown during the whole century, which preceded the experiment at the hospital Beaujon. In 1741, Sutton proposed a method of expelling foul air from ships, by means of pipes which were to pass from different parts of the ship to the cooking galley, where the fires were to obtain their air supply through these pipes, so arranged as to open into the fires. This very effective and excellent plan never came into use,

¹ See Husson, *op. cit.* p. 51.

² *Ibid.* p. 55.

although it has been many times strongly commended, and was substantially the one adopted by Dr. Mapleton, for the ventilation of the hospital ships used by the English in the Chinese war of 1860.¹ A modification of Sutton's plan for ventilating ships was recommended a few years later by Munro, as applicable to hospitals. Holes were to be cut in the ceiling, six, eight, or ten inches in diameter, opening into a wooden box or pipe, the extremity of which was to enter into the chimney of the ward, just above the fire. By means of such pipes, the air was renewed—or rather, the foul air was *drawn out* of several of the wards of St. George's Hospital in London in the middle of the last century. About the same time M. de Premenil de St. Malo suggested a method of ventilating rooms, where there were chimneys, by dividing each chimney into two funnel-shaped compartments, one of which was to serve as a conduit for the smoke; and the other for fresh air. Hales, an English contemporary, suggested for obtaining a fresh-air supply, in public buildings and ships, the use of a kind of bellows to be worked by hand. Hales' idea nearly a hundred years later, was modified and improved by Dr. Arnott, and to some extent adopted in England. A plan for obtaining a fresh air supply by mechanical means, which has recently been extensively adopted, was proposed by Desaguliers as early as 1734. Desaguliers proposed to drive the air by means of a fan into a conduit, from which it was to be distributed through branch pipes into the rooms where it might be needed. Yet, notwithstanding a variety of plans for renewing the air in apartments were suggested during the last century, it was only after the observations of Lavoisier and Tenon, and the committee of the Academy of Sciences, that the importance of ventilation began to be recognized, and fifty years more were allowed to pass away in France, and without reference in the meantime to the results of English experience, before any serious attempt was made to improve the interior atmospheric condition of hospitals.

¹ There is a very curious account of Sutton's system in Mead's works—"Recueil des Œuvres Physiques et Médicinales Publiées en Anglois et en Latin," par M. Richard Mead." Traduction Française, par M. Coste. Bouillon, 1774.

Certainly the position of the patient was vastly improved by the additional room given to him, but the idea of remedying the evil results of overcrowding, by a simple increment of the space assigned each patient was false in principle.

"Capacity," says M. Felix Leblanc, "can only retard the moment when ventilation shall become necessary,"¹ and it may be said with quite as much truth, that the special importance which has been ascribed to cubic space, has only served to retard improvements in general ventilation.

The reason why overcrowding is destructive to life, is not because ten men, instead of one, are shut up in a room containing 2,000 cubic feet of air, but because any enclosed space in which men are placed, where the air cannot be renewed, speedily becomes infected and pernicious. Mere space is simply a question of comfort and convenience, while atmospheric purity—the presence of fresh and uncontaminated air—is an essential condition of health.

This point is a very important one, and one which is still not well understood, notwithstanding what has been written and said on the subject of ventilation during the past thirty years. Hygienists still often speak of the danger of placing a large number of men in a small apartment; while even in the English army medical regulations—the indication of the specific means of securing a proper ventilation is limited to the ordering of a certain cubic space for each sick soldier.² Now, a room may be filled with people, without danger from a want of space providing the vitiated air is expelled, and replaced by fresh air with sufficient rapidity and completeness; whereas a single person in a close room, however large it might be, would sooner or later die, poisoned by his own exhalations, as well as from an insufficient supply of oxygen. A man might be boxed up in a packing-case, and yet not suffer in the slightest degree from what is popularly termed overcrowding. Overcrowding is not necessarily connected with an atmosphere soiled by animal exhalations and the products of organic decomposition, and the word

¹ Michel Lévy, "*Traité d'Hygiène*," tome ii. p. 480.

² Parkes, *op. cit.* p. 118.

should not be used to represent such a condition. It came into use when the cause of the occasionally observed insalubrity of apartments, occupied by considerable numbers of people, was not well known; now that we know the cause, we should state it clearly and call it by its right name—a want of ventilation.

The whole subject is practically expressed by the single word ventilation, which signifies the expulsion from an apartment of contaminated impure air, and a corresponding introduction of uncontaminated pure air. General Morin has very well said that the principal object of ventilation, from a hygienic point of view “is to extract vitiated air from the spot where it is produced;”¹ and he even takes occasion to observe, that those persons who have been principally concerned with the means of supplying fresh air in places needing purification, have committed a logical mistake, and have reversed the question; and that, pre-occupied with the means of assuring a supply of fresh air, they have more or less neglected the measures necessary to get rid of the foul air.² Whatever may be the truth of this observation, the principal object of ventilation is, unquestionably, to discharge from the atmosphere of spaces more or less confined, and occupied by men or animals, those exhalations and products of exhalations and of organic decompositions which, remaining in the atmosphere, change its normal character, render it unsuitable for respiration, and impart to it absolute properties prejudicial to health and destructive even to life.

Practically, it is unnecessary to enter into a consideration of the causes why air charged with animal exhalations is prejudicial to health. However interesting such inquiries may be, they are attended with great difficulties, and a solution of many of the questions at issue is remote, if not impossible. It may be useful, however, to remember that if crowded habitations are usually unhealthy, it is not in general because of the presence of a certain proportion of this or that gas, or this or that organic impurity, or from the absence even of a certain proportion of oxygen, but because an atmosphere, in proportion as it is charged

¹ “Études sur la Ventilation,” par Arthur Morin. Paris, 1863; tome i. pp. 109, 110.

² Ibid.


with the products of decomposing matter, sets at work decomposing forces, which attack the structural forms of living as well as dead animal matter; or it may be said, that an atmosphere thus impure, becomes a condition which favours the liberation or increased activity of the germinal principles of disease, whether these principles exist without the body or within it.

With the understanding, therefore, that it is not overcrowding but impure air which is to be feared, and that we are not to measure the degree of impurity present in any given atmosphere simply by the proportion of carbonic acid or some other gas, or the amount of dust or molecular matter existing in it, but by its influence on health, the subject of hospital ventilation so entirely comes within the limits of common observation, as to promise to those who would investigate it immediate and practical results.

Since the introduction of efficient systems of ventilation, the condition of our public hospitals has certainly been greatly improved, and nothing has contributed more powerfully towards this improvement than the constantly reduced death-rate that has followed every successful measure which has been adopted, to increase the purity of the atmosphere within the wards of these establishments. The statistics bearing upon this subject—overwhelming in number—are quite irrefutable; and at the present time no truth of sanitary science is more universally recognized, than that the salubrity of hospitals and their fitness to be used as asylums for the sick, are to be estimated principally by the degree of atmospheric purity which can be and is constantly maintained in them.

It has moreover been observed, that the wounded are particularly subject to be influenced by the condition of the atmosphere around them. A close, ill-ventilated apartment is even more prejudicial to them than to the sick, while the best surgical results which have ever been obtained, have been obtained when the wounded have been treated in separate houses or in places thrown widely open, where the ventilation in fact was most complete and perfect.



HE expediency of constructing and maintaining permanent military hospitals, whether on a large or on a small scale, must be determined entirely by circumstances special to each state. Where large standing armies are supported, such establishments are indispensable as well in times of peace as of war. The plans, which have been adopted in the construction of such hospitals, have usually differed in no essential respect, from those thought best, at the time, in the construction and disposition of the buildings intended for permanent civil hospitals. It is evident that as they are designed to serve—from a sanitary point of view—a nearly or quite identical purpose, the same principles of construction should be observed in each class. The importance of a proper location, of sufficient room, light, ventilation, &c., are all now theoretically recognized, and means of obtaining these conditions are adopted similar to those used in civil hospitals, and with like results.

One of the finest permanent hospitals in Europe, is the French military hospital at Vincennes. This hospital, which was opened in 1858, consists of a central building, occupied by halls, bureaux, &c., and two long pavilions built perpendicularly to the ends of that building.

The central building, which forms the front of the construction, is 68 metres long, about 13 metres deep, and four stories high. It is surmounted, for architectural effect, by a belvedere and gallery. The pavilions or wings are each about 130 metres in length, four stories high, and contain each four large wards, one above the other, besides several small wards, and various bureaux, pharmacies, kitchens, pantries, &c. The constructions enclose three sides of a square open upon the south. The wings are, however, entirely separated from the front building—except as connected on the first floor by a corridor which runs around the three sides of the square, and shut in by glass windows, furnishes a promenade for the convalescent, in rainy as well as

in pleasant weather; the roof of this corridor forms a balcony overhead, which serves as a means of communication between the buildings. The whole establishment is thoroughly well lighted, and the pavilions are ventilated by a system of steam pipes and air shafts, in such a way as to secure 60 cubic metres of fresh air to each bed per hour.

The military hospital at Bayonne is composed of five buildings arranged around a quadrangular court, but separated one from the other. The wards are most of them in one building, 70 metres long, 15 metres wide, and three stories high. Each of the six principal wards contain 116 beds. The space allowed for each bed is 28·67 cubic metres.

Larrey said of this hospital in 1862:—"The military hospital of Bayonne is the most complete model of modern construction of the kind—the best conceived and the best executed—and responds perfectly to all the more essential indications of hygiene. The appearance of the whole, and the harmony of the details, the roominess, and the provisions for securing a ventilation of the wards and a proper distribution of the beds, the arrangement of the subordinate offices, and the working of the service, all have been united to create the very best conditions of salubrity."¹

These two permanent military hospitals are, probably, equal if not superior to any of the kind in Europe, and a study of the details of their plans will indicate very clearly, that if they are in no way inferior to the very best civil hospitals of the same class, it is because they have been constructed upon the same general principles.

It is unnecessary, therefore, that I should occupy your attention long with this special subject. I cannot, however, refrain from making a few observations, as they have a general as well as special application.

The chief fault of nearly all the permanent hospitals that have been constructed, whether in past centuries or more recently, has arisen from an ill-defined idea of the objects to be attained in the construction of hospital buildings, or, at least of the relative importance of these objects.

¹ "Inspection Medicale," 1862.

The principal object to be kept in view should be the construction of the *best permanent shelter for the sick*. Another object, of some importance, is that this shelter should be conveniently disposed—first, for the sick; secondly, for the attendants. Presuming the place selected to be a suitable one, these are the only general objects which should be regarded in the construction of such hospitals, and the hospital plan which most completely realizes them will always be the best.

Unfortunately, however, when any large public building is to be erected, a variety of interests are immediately concerned quite independent of the principal object of the construction itself.

The idea of permanency is commonly brought very prominently forward. A provision is to be made not only for the sick of to-day, but for the sick and needy of all future generations; the buildings should, therefore, be of the most substantial character, and if they are to last for ever, should not only be so constructed as to finally become memorials of ancient beneficence, but should be made monuments as well of the taste of their founders, as of the architectural skill of the age, and of their builders. Nearly every proposition to construct a large building at the public expense, is seized upon as an occasion for the perpetuation of a multitude of human sentiments, more or less honourable, but which might not unfrequently have been better expressed in some other way. So long, however, as sentimental modifications in no way interfere with the usefulness of the building as an instrument for a specific work, we may have no reason to object to them; and this is generally the case. In the construction of most of our public buildings the architect should be free to expend the public money in the production of the noblest forms of his art; with churches, offices of state, and the innumerable buildings created for innumerable purposes, he has a field opened sufficiently wide as well for his special genius as for our gratification. We protest, however, against his attempting to dictate to us the forms of our hospitals. No architect ever yet constructed a permanent hospital which did not prove to be a monstrous failure, and the few redeeming merits which may be found within his piles of stone and brick are but the shattered fragments of systems, which from some cause he was unable to completely crush.

It is the business of sanitary science, and of sanitary science only, to determine the theoretical forms and dispositions most suitable for hospitals, and it is the business of the architect to realize these forms and dispositions literally, so far as he is able to do it. Of architecture as a fine art, sanitary science is ignorant, and if the builders of hospitals were equally ignorant, whatever the external appearance of hospitals, their interior condition would be much less frequently a subject of reproach and opprobrium, while the object sought would be attained with an immense saving in cost—both immediate and remote.

Temporary hospitals are indispensable in time of war; and not only are they indispensable, but most of the sick and wounded during campaigns must, of necessity, be taken care of in such establishments. The sick and wounded must be taken care of either within the army itself, or at places remote from the army. It would be inexpedient to attempt to provide hospital accommodation for all who might be sick, within the lines of an active army; it would be equally inexpedient to attempt to treat the sick only at points very far distant, and consequently difficult of access. The transport of the sick, and particularly of the wounded, over long routes is often highly objectionable; and in principle long transportations are to be avoided, because of their prejudicial effects upon those transported, and because they entail an enormous expense, which increases rapidly with the distance traversed. Hence the expediency of creating in the rear of armies those temporary establishments known as hospitals of the first and second line—general, or sedentary field hospitals. Formerly it was the universal practice to establish these hospitals in such public and private buildings as could be obtained for the purpose; but it has not always been easy to obtain, in the places where it may have been desirable to have such hospitals, buildings which could be readily converted into establishments uniting the essential conditions of a fit and suitable shelter for the sick; and it has been much more difficult in modern times to find such buildings, because our standards of fitness and suitability are more exacting than formerly.

Indeed, this difficulty must be considered as one of the principal reasons for the construction of temporary establishments intended

especially for the sick of armies. Churches, hotels, convents, and private houses, are often badly located, badly lighted, and incapable of being well ventilated. Grave surgical operations rarely succeed in military hospitals established in these buildings, and the common mortality rates from diseases are in such hospitals notoriously in excess of those obtaining either in private dwellings or in public hospitals; rarely in military hospitals has the mortality rate among the sick fallen below ten per cent. The average mortality rate among the sick, for the whole period of the war in the United States, scarcely rose above three per cent. and the most obvious cause for this low rate was the excellent and efficient system of hospital organization adopted by the American Government at the very beginning of the war. The immediate influence of the character of the hospital accommodation upon mortality rates, was even still more remarkable in the Crimea, where, while improperly sheltered, nearly the whole English army perished—the survivors learning that, with proper shelter and care, the mortality in the field might be reduced to a rate scarcely, if at all exceeding, that common to the home service.¹ To these results of recent experience, we are therefore chiefly indebted for the increasing favour with which governments as well as sanitarians have entertained the idea of establishing hospitals in constructions erected with reference to the special use to which they are to be put. Fortunately, it is comparatively easy to secure in such establishments those general conditions, which experience as well as theory has pronounced most essential to the welfare of the sick. The locations can be selected; the buildings, designed only for a temporary use, can be erected almost solely with reference to furnishing a shelter for the sick; an abundant aëration can thus be obtained by the simplest and cheapest mechanical devices; outlets and inlets for the air can be placed wherever they may be needed, in order to obtain the

¹ According to Miss Nightingale, during the first seven months of the Crimean campaign, the mortality among the English troops from disease alone amounted to a yearly death rate of *sixty per cent.* of the present strength of the army, while during the last five months of the campaign the mortality from disease did not exceed a yearly average of *one and one-tenth per cent.* "Report of the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army." 1858, pp. 361, 362.

largest and most constant interchange between the interior and exterior atmospheres; while the very rudeness and imperfection of the construction often serve to fit it, all the more completely, to be used as a shelter for a large number of sick; and it is not a little remarkable that the very earliest wise and practical conclusions, concerning the relative fitness of buildings to serve as hospitals, were the results of the accidental use of constructions generally supposed to be wholly unfit for such a service.¹

Says Richard Brocklesby:—"In October 1758, a greater number of the sick were landed out of the transports on the Isle of Wight, than all the spare out-houses, barns, and empty cottages which could be procured for money or the sake of humanity, at Newport, were capable of containing. In this distress, some gentlemen of the hospital proposed to erect a temporary shed with deal boards upon the open forest, and to have it thatched over with new straw, thick enough to keep out wind and rain, and capacious enough to hold 120 patients or upwards, for doing which and the use of the wards, the country workman who was undertaker exacted forty pounds. Although the hovel was finished in a manner the most slovenly and apparently inadequate to the end proposed, upon trial it was found that, notwithstanding much extraordinary cold as well as moisture which the sick there lodged had suffered, remarkably fewer died of the same diseases, though treated with the same medicines and

¹ MM. Demoget and Brossard ("Étude sur les Construction des Ambulances temporaires," Paris, 1871), state that the idea of barrack hospitals, which has recently been put in practice, has not only been recommended by physicians of our own time, but also by physicians of the middle ages, and they support the statement by passages from the "Opuscule ou Traictés divers et curieux en Médecine," par François Ranchin, Lyon, 1640. Ranchin simply recommended the building of huts for pest patients, from the impossibility of their being received in hospitals and private houses, and as a sort of quarantine for the disinfection of a city. He says, that during the plague at Montpellier, he and his companions constructed a hundred huts outside of the city: "C'était comme une petite ville de bois. Et au plus haut des huttes nous fismes construire une belle chapelle," &c. But it is very evident, from his own statements, that what he commended and did, was done less by reason of the hygienic advantages to be thus secured to the sick, than for the purpose of protecting the well against infection. "L'institution des léproseries . . . semble avoir été moins une œuvre de charité qu'une mesure de police sanitaire."—*Vie Militaire et Religieuse au Moyen Age*, par Paul Lacroix. Paris, 1873, p. 381. A work highly esteemed by—the Society of Jesus.

the same general remedies, than died anywhere else ; and all the convalescent recovered much sooner than they did in any of the warmer and closer huts and barns hired around Newport, where fires, and apparently better accommodations of every sort could be provided for them." "This fact, so remarkable," induced Brocklesby in 1760 to make the experiment himself of treating the sick in temporary huts. The results he then obtained were such as to induce him to say:—"I hope to see due provision in time previously appointed, to have a large ship or two from North America, or elsewhere, with lumber and boards always attending the fleet, and whenever a landing is once made good in any warm climate, occasional huts, such as I have described, may be constructed at proper distances from the fleet and army, instead of being under the necessity of huddling officers and common men, in the same wretched holds of hospital ships hereafter." ¹

Munro says he was told by Dr. Hume, that a malignant fever having broken out on board of some men-of-war, conveying troops to America in 1755, the fever spread rapidly during the voyage, but that on arriving at Halifax, the sick "were lodged in *tents*, or very old *shattered houses* that admitted the air very freely, *which put a sudden and effectual stop* to the disorder."² A number of instances such as these might be cited, in which the beneficial effects upon the sick of occupying buildings open to the air had been observed before the close of the last century. Still, no serious attempt was anywhere made to profit by these observations, and the establishment of sedentary hospitals for the sick, which might realize the special excellencies of the open constructions referred to, scarcely dates farther back than the Crimean war. Wooden barrack hospitals were for the first time made use of on a large scale during that war. The results of the experience then obtained were satisfactory, and moreover, a spirit of inquiry was created, which led to the announcement of many important principles connected with the hospitalization of armies, in reports and writings which appeared a short time before the breaking out of the war of the Rebellion in the United States, in the

¹ "Economic and Medical Observations," by Richard Brocklesby. London, 1764; pp. 66, 67.

² Quoted by Parkes, "Hygiene," p. 329.

spring of 1861. It is therefore not without reason that M. Michel Lévy has said:—"The experiments which we made in the East, in 1854-55, with hospitals in tents and barracks, certainly gave to our *confrères* in the United States the idea of testing the same system upon such an immense scale."¹ So also, in a report issued from the office of the surgeon-general of the United States army, it is said:—"The introduction of these pavilion hospitals was not the work of any one man. Originally suggested by European experience, they were erected in all parts of the country, under the direction of various medical officers, some by order of the surgeon-general, others by the authority of local commanders."² But these statements are incomplete; whatever support the constructors of American barrack hospitals may have derived from the Crimean experience, the real, the principal reason for the construction on a large scale, of special temporary hospitals, in the United States, was the impossibility of finding in many parts of that country buildings available for hospital purposes. This indeed was the original and principal cause of the creation of such establishments in the Crimea.

The unsuitableness of common buildings, churches, hotels, &c., was only thoroughly well understood after it became possible to compare the results obtained in buildings, which had been especially erected to serve as temporary hospitals, with the results obtained in those, which had only provisionally been converted to that use.

In short, the establishment of special constructions, to be used as hospitals in the rear of armies, dates from the time of the Crimean War, and received its largest and completest development in the United States, during the War of the Rebellion. Since that time the system of employing special constructions for the hospitalization of the sick, has been partially adopted in practice by the Austrians and Prussians, and in principle by the English. By the French, the system has not yet been adopted, either in practice or in principle, the administration still relying upon the shelter furnished by the ordinary buildings of the country, in the establishment of its temporary hospitals.

¹ "Traité d'Hygiène;" tome ii. p. 543.

² "Circular No. 6," p. 152.

The general character of the sedentary hospitals, which have been recently especially constructed to receive the sick and wounded of armies, may be summarily stated. Each hospital, of this class, is usually a group of detached pavilions built of wood, a portion of which are erected to furnish bed room for patients, while another portion are intended to serve various purposes in connection with the general administration of the establishment. The unit of the organization is the pavilion, or ward for the sick.

As, however, wooden pavilion or barrack hospitals hold a very important place among the provisions now made for the care of sick soldiers, it may be well to here indicate some of the special characteristics of these establishments, as also some of the modifications in construction which have been at different times either adopted or suggested.

According to a circular-order issued by the United States War Department,¹ the unitary building, or ward-pavilion, should be 187 feet long, 24 feet wide, and 14 feet high, from the floor to the eaves—the pitch of the roof varying according to the materials composing it. At each extremity, two small rooms were to be partitioned off—those at one extremity to be used as a bath-room and water closet, those at the other, as a medicine closet and nurse room. The intermediate space—165 feet long—was to be occupied by beds, 30 being placed on each side of the room. About 1,000 cubic feet of space were thus allowed to each patient. The pavilion was entered by four doors, one at each extremity, and one in the middle of each side; it was lighted by 36 windows, 16 being on each side. The ventilation of the ward was also intended to be partially obtained by means of the doors and windows, especially by the windows, which faced each other, and could be let down at the top. Ventilation was, however, principally effected, in the summer, through an open ridge, protected by

¹ This circular-order, issued as late as July 20th, 1864, is to be considered simply as an official statement and recognition of the principles of hospital construction, previously accepted by the War Department. At the date mentioned, the military hospitals of the United States had received their largest development, and, as a matter of fact, scarcely a hospital was built after the issue of the order.

a false roof or lantern. In the winter, the extraction of air was accomplished by means of four *cheminées d'appel*—shafts—heated each by a stove pipe. Each of the stoves (four in number), surrounded by a perforated metallic jacket, was placed over the opening of an air-box, which was intended to furnish a supply of fresh air. The order directed, that the floor of the ward be at least 18 inches from the ground, with an open and free passage for the air beneath it.

Except as regards the dimensions of length, breadth, and height, the pavilion wards of the American barrack hospitals seldom differed in any essential respect from the description here given. They were built, however, with occasional slight differences in solidity, although the type of the building was a wooden construction with a floor, walls, and roof, made of a single thickness of boards. The joints in the walls were battened on the outside, while the roof was covered with tarred paper, or some other cheap water-proof covering. In the organization of a hospital, from ten to fifty pavilions, similar to those described, were grouped together "*en échelon*" parallel to each other, on two converging lines forming a V; or as radii from the periphery of a circle, ellipse, or rounded oblong. The buildings were to be separated from each other at least 30 feet; and the accessory buildings—in general construction quite like the ward-pavilions—were to be conveniently placed within the lines of the V, or in the centre of the circular plan. The pavilions and principal accessory buildings were commonly united by corridors.

The number of sedentary hospitals constructed in the United States during the war of the Rebellion upon the general plan here indicated was very large. Most of the 202 general hospitals existing in 1864 were of this class, and within them were also placed most of the 136,894 beds for patients, then at the disposition of the Government.¹ Since the reduction of the Federal

¹ Scarcely a French writer on hospital hygiene, who has alluded to the barrack hospitals employed in the United States during the war of the Rebellion, has failed to repeat the ridiculous statement, that after these wooden barracks had served a number of years, more or less, until they were presumed to have become infected, the common custom was to set fire to them and burn them up. I can easily understand, how such a story once told, might become a subject of popular tradition in

army to a peace footing, and its distribution over the country in small garrisons, the United States war department has recommended, for hospital purposes, the construction of small wooden barracks, which are in many respects similar to those now commonly used for military hospitals in the English service. These barracks are warmed by double fireplaces ; but the systems of ventilation, for summer and winter, are in principle the same as that employed in the long pavilions during the war.

The English model hospital-barrack is small as compared with the large American pavilion. Its walls are double ; this is a very considerable advantage, as the barrack is thus warmer in the winter and cooler in the summer. The building is raised above the soil so as to permit a free circulation of air beneath the floor. The inside walls are made of hard material, which can be washed, while the floors are made of planks of dense wood, the joints between which are filled with cement. The floors are to be kept clean by waxing. The wards are warmed by radiant heat from open fireplaces, and are ventilated naturally through outlets and inlets. The pavilions, when grouped together, are to be separated from each other by intervals equal in width to twice the height of the pavilions ; and they are to be connected by corridors. The hospital-barracks now in use in England are frequently two stories high,—a fact of some economical importance in building, but objectionable from a hygienic point of view, as it has been shown pretty conclusively that the mortality rate among the sick increases with the number of the superposed stories.¹

France, but that for a period of years it should be seriously repeated in nearly every new essay or chapter on hospitalization, is more wonderful, than that an account of Mark Twain's *stone man* should have *once* appeared in the columns of the *Lancet*.

If a barrack has become infected by long use, it certainly ought not to serve any longer as a hospital, and when this conclusion has been reached, its history for the sanitarian is finished. Whether it is burned up, or otherwise disposed of, can very rarely be a matter of consequence to him ; but to those who have paid for and own the building, the value of the material entering into its construction, will generally be considered as of more importance than an absurd *coup de théâtre*.

No wooden barrack hospitals were burned up in the United States, except by accident, but at the close of the war, the necessity having entirely ceased which called them into existence, they were all sold to the highest bidder.

¹ "Statistique Médicale des Hôpitaux de Paris," tomes i. ii. iii. Paris, 1867-68

During the Crimean war single-storied pavilions or "huts" were generally used. Most of the "huts," constructed especially for hospital purposes, had double walls, and were provided with a ridge ventilation.¹ They varied considerably in capacity, holding from fourteen to fifty beds, and although essentially the earliest samples of barrack hospital construction, they are doubtless still in some respects the best. They were found to answer well the purpose for which they were intended, and have since been commended for sedentary war hospitals by English hygienists.

Before the Franco-German war, the theory of the barrack system of hospitalization had so far been received into favour in Germany, as to have been in several instances adopted in connec-



FIG. 1.—Side view of the Experimental Barrack erected by Dr. Esse in 1867, as an Annex to the Charity Hospital at Berlin.

tion with the civil hospitals of large cities. One of the earliest and most remarkable of these constructions was erected, as an annex to the Charity Hospital at Berlin, by Dr. Esse in 1867. Constructed confessedly as a result of American military experience, although itself a civil establishment, some account of it may not here be out of place, especially as I am not aware if any description of it has yet appeared in English.²

A good general idea of the appearance and form of the building may be derived from the sketch (Fig. 1), which presents a

¹ "Report of the proceedings of the Sanitary Commission despatched to the seat of war in the East, 1855-56," pp. 134, 135, 142, et passim.

² A similar barrack was also about the same time erected by Dr. Esse, as an annex to the military hospital at Berlin.

lateral view of the barrack, and which exhibits to the eye several of the details of construction I shall have occasion to allude to. The size of the establishment was limited by a want of ground space; it consists therefore of a single barrack, 84 feet long and 29 feet wide, with two covered side galleries, or piazzas, $4\frac{1}{2}$ feet wide, and a verandah at each end, projecting about 10 feet. The total length of the building is thus 104 feet, and its total breadth 38 feet. The lateral walls are $13\frac{1}{2}$ feet high, the height from the floor to the ridge being 19 feet. The roof projects over the side galleries, and also covers the end verandahs. One of these verandahs—that to the right in the sketch—serves as an ante-chamber, and is fitted up with seats and benches; the other contains six beds to be used by patients, whenever the weather permits.

As the barrack was intended for use in the winter as well as in the summer, special precautions were taken to make it a secure shelter against cold and wet. The walls of the barrack were accordingly constructed as follows:—A thin wooden wall having been erected, on each side of this, parallel with and at a certain distance from it, were placed two additional walls of boards set up vertically and battened. There were consequently two free spaces between the middle and the outer and inner walls. The outside space was filled up with small fragments of brick—a substance for certain reasons thought preferable to peat, tan, straw, and other non-conductors. The inner space was left open for a purpose which I shall soon explain, remarking however in this connection, that the roof and floor were formed, as were the walls, so as to enclose two compartments—the outer filled, the inner free. The barrack rests upon dies, which hold it up quite five feet from the ground—much higher than has been usual in erecting such buildings. The roof is covered with slate, but is open along nearly the whole line of the ridge, which is protected by a lantern, called an American roof or Reiterdach. The lantern differs however from those which were generally placed upon American pavilions, in being wider and higher, as also in being furnished on each side with a row of moveable windows. The barrack fronts to the south, and the steps at the entrance are covered by a marquee, or small projecting roof. The

galleries on the sides are closed in by railings, which extend the whole length of the building, while on the lines of these railings posts support and strengthen the roof. Fastened to the top of the railing, and between each pair of posts, is a roll of canvas, which, when *drawn up*, forms a curtain. By means of these curtains the sun and rain can be quite shut out of the galleries when desired. The barrack is lighted on each side by twelve windows, opening outward. The ward-room within the walls of the barrack contains twenty beds, each placed three feet from the walls, a free space of ten feet remaining between each bed. At the north end of this room, two small chambers, nine feet square, were partitioned off—one, serving for the watcher, the other, for a wash-room and water-closet. The wash-room is supplied with hot and cold water delivered from the reservoirs of the hospital; a gas stove is also placed here as a matter of convenience in the preparation of dressings, &c. The verandah fronting on the south, furnished with chairs and benches, was intended as a place where the sick might sit in the open air, or repose after having walked or taken exercise within the side galleries. The side galleries were intended to be used by the patients in pleasant weather as a promenade, and also at the same time to furnish a place for beds, where certain sick or wounded could take the air in pleasant weather. The north verandah, capable of being enclosed on the sides with curtains, is occupied by six beds, and is used in the summer as a tent-barrack. The ventilation in the summer is maintained by the doors and windows, but more particularly through the opened windows of the lantern. In the winter, the building is warmed and ventilated as follows:—Two stoves are placed on the long axis of the floor of the ward, about equidistant from each other and the ends of the ward. These stoves are each enclosed in a porcelain envelope, that also includes a portion of the smoke pipe; this is coiled, to increase the evolution of heat from it, before it ascends vertically through the roof. The porcelain envelope also contains another pipe, which ascends parallel with the smoke pipe, and the function of which we shall presently see. The hot air enters the barrack, through registers inserted in the porcelain envelope, and is distributed through the

ward. But it will be remembered that between the walls, and the floors also, there is a space that envelopes as it were the entire ward. Now an arrangement has been made by which the warm and vitiated air of the ward shall escape into this space through openings which communicate with it near the floor, and the circulation is forced or drawn in this direction by the second pipe, which I have spoken of as enclosed in the porcelain envelope, and which, communicating with the space beneath the floor, constantly acts as a *cheminée d'appel*. This system of heating and ventilating has the advantage of being not only efficient, but of being exceedingly economical. The floor of the ward is surrounded with warm air, and very little heat fails to be utilized.

This experimental barrack has proved most successful, and has yielded surgical results highly satisfactory to those who created it, and which have strongly tended to commend and make popular, in Germany, the treatment of the sick in barracks. During the late war, barracks on this plan were constructed in considerable numbers, at Berlin and other cities of Germany.

The Friedrich's Hospital at Carlsruhe, which was considered second to none in Germany, consisted of six wooden ward-barracks, each 151 feet (German) long, 29 feet broad, and 23 feet high; they contained each 32 beds. The six barracks complete cost 71,000 florins, and were very handsomely finished and furnished. They were heated and ventilated, as were also the barracks erected at Heidelberg, almost precisely as were the American pavilions.¹ Still most of the German sedentary war hospitals were built on a simpler plan—were reproductions in all their essential details of the Crimean hut or the American pavilion. In fact, the chief differences between the German and American systems were these: the German barracks were smaller, contained fewer beds than the American, were grouped together in smaller numbers, and were usually even more hastily constructed. The barrack hospital at Tempelhofer, near Berlin, contained 1,500 beds; but this was almost the only instance in which a very large general hospital was created

¹ "Die Freiwillige Hülfsthätigkeit im Grossherzogthum Baden im Kriege 1870-71." Karlsruhe, 1872; pp. 109, 110, 111.

during the war. And yet the fifty barracks which formed this hospital were arranged in three separate groups, and directed by three distinct administrations—the War Department, the City Government, and the “*Société de Secours*”—each having its own model barracks and plan of grouping the same.

The ward-barrack of the Prussian service for thirty patients is thus described by a regulation of 1867:—

The barrack should be so placed as that one of its sides may face the south or south-east. A dry location should be selected where the air is free to circulate. The sward, should there be any, should be removed from the spot the barrack is to stand upon, and be replaced by a covering of gravel or coal-cinders six inches deep. Three lines of dies are to be set up in masonry. These dies should be a foot wide and a foot high, and four feet apart on the lines corresponding with the length of the building, and ten feet apart on the lines of its breadth; so that the building shall be eighty-eight feet long, and twenty-one feet wide, and be supported by sixty-nine dies. Upon these dies, or columns of support, the traverses are to be laid for the floor, as also, the plates upon which rest the lateral walls. These walls shall be ten feet in height. The outside walls of the barrack are to be formed of a frame-work of posts and plates, to which the covering-boards are to be nailed vertically. The roof shall be fifteen feet above the floor, and three openings shall be left in the ridge for ventilation. The roof is to be covered with a lathing of pine boards an inch thick, upon which is laid a course of bituminous paper, to be whitewashed in hot weather. The roof is to project over the walls, everywhere, from a foot to a foot and a half. In the west end, there is to be a door seven feet high and four feet wide; in the east end, a door ten feet high and ten feet wide. On each side, there are to be ten windows, four feet by six, and four feet above the ground. On the south side, six of the windows are to be closed with sashes and curtains; the remaining four are to be closed simply by means of canvas curtains. On the north side, all the windows are to be furnished with sashes and glass. The windows and doors are all to open outward. On the inside of each door there shall be a canvas screen to prevent draughts. At the western end, two

small rooms shall be made—one for the linen, the other for the nurses and the preparation of the medicines; these rooms are to be covered over, seven feet from the floor, so as to form a sort of loft, where various articles may be stored. The latrines shall be in a special cabinet built outside, and shall be placed in communication with the ward by means of a corridor closed by a double door. The faecal matters are to be received in a trough tarred on the inside, and mounted on wheels, so that it may be easily drawn

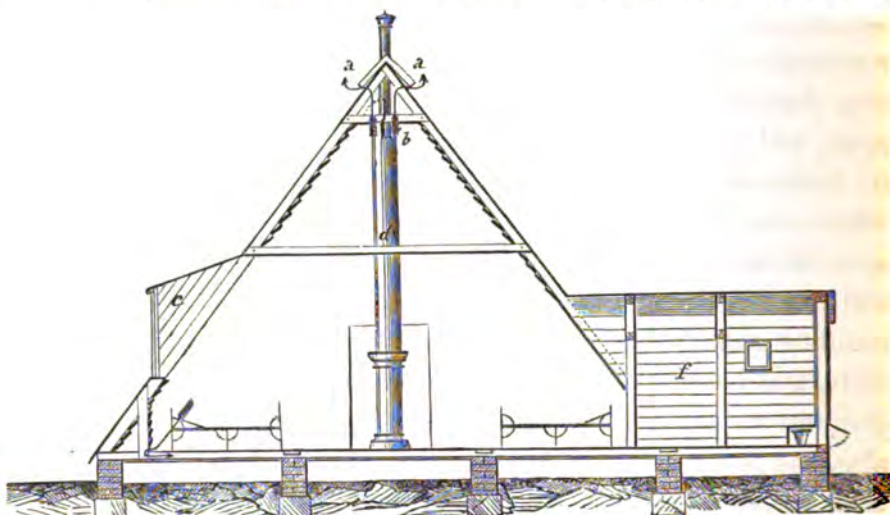


FIG. 2.—Transverse section of a Minden Prussian barrack — *a a*. False roof covering the ridge; *b*. Openings in the ridge; *c*. Window; *d*. Ventilating shaft, enclosing the stove pipe; *f*. Water-closet.

out from its place, after having been disinfected and closed by means of a tarred cover. Before putting back this receptacle after it has been emptied, it is to be one-fourth filled with the *Süvern* mixture.¹

The barrack may be built directly upon the ground if either

¹ *Süvern's* mixture, which is used in Germany, principally for the disinfection of latrines, night utensils, &c., is prepared as follows:—

Quick lime	100 lbs.
Coal-tar	15 „
Chloride of magnesium	15 „

The lime is slacked with hot water, and the tar at the same time poured into the mass, which it is necessary to stir continually while pouring on the water. The chloride of magnesium is added afterwards, having been previously dissolved in a closed vessel. The quantity of water used is about five times the weight of the materials; and would be for the quantities given about eighty gallons, giving to the mass “just sufficient liquidity to drop slowly from a stick inserted in it and then pulled out.”

time or the materials are wanting to construct the dies, but in this case, the ground should be covered with a thick layer of gravel or slag. The kitchen should be in a separate building. If water-colours are at hand, the barrack should receive a coating of wash.

A very ingenious system of barrack construction was employed at Minden (Prussia) to furnish hospital accommodation for the French prisoners quartered in that fortress. (See Fig. 2.)

The buildings were wedge-shaped, the roof forming at the same time the walls; a barrack thus resembled a long prism resting on one of its faces.

Each barrack was slightly elevated from the ground; it had two doors, one at each end, and was lighted by dormer windows. The ridge was open, and covered by a false roof or lantern. The ventilation was, however, effected principally by a modification of the system which I have already described, when speaking of the barrack at the Charity Hospital, in Berlin. The walls and floors of these wedge-shaped barracks were double; the exterior covering of the wall was made

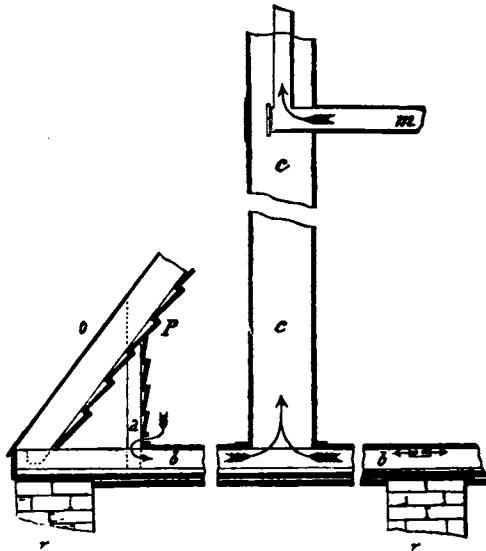


FIG. 3.—Diagram, showing the system of ventilation as applied to the Minden barracks—*a*. Open seam for the escape of foul air; *b*. Air chamber beneath the floor; *c*. Ventilating shaft; *m*. Stove pipe; *r*. Dies of bricks supporting the barrack.

of plain boards, covered with tarred paper; the interior was formed by a wainscoting of clap-boards. The ward was thus enveloped by an air-chamber, which communicated with the ward by an open seam, on each side, along the line of the floor. The barrack was heated by four stoves, the smoke pipes from which entered shafts communicating with the air space beneath the double floor. The character of the construction, and the system of ventilation, will be made evident by a reference to the accompanying diagram. (Fig. 3.)

At the front entrance of the barrack were two rooms for the service. The water-closet was a separate room, built out in the middle of the barrack, and at right angles to its long axis. (See Fig. 2.)

Several large barrack (sedentary) hospitals were erected in France during the war of 1870-71.

The first of these owed its existence to the personal efforts of M. Michel Lévy, who had the honour of being the earliest and at the same time the ablest French advocate of the open-air system of hospitalization. This hospital was established by the War Department in the garden of the Luxembourg, and was designed to contain thirty-two pavilion wards, with the accessory buildings; but twenty-two of these pavilions were erected, and as each contained but twenty beds, the capacity of the hospital was thus limited to 440 patients.

The wards were simple wooden pavilions $124\frac{1}{2}$ feet long, from 30 to 32 feet wide, with side walls 13 feet high; the height, from the centre of the floor to the top of the lantern, was 26 feet. The lantern formed a bay in the centre of the roof, along about one-third the length of the ridge, nearly ten feet wide, and five feet high or deep. About thirteen feet was reserved at each end of the pavilion, for a bath-room and water-closet at one end, and for attendants' rooms at the other. But twenty beds having been placed in such a ward, nearly 3,600 cubic feet of space were given to each, or almost *four* times as much space as was given to a patient in an American pavilion. The Luxembourg barracks were elevated above the soil about eighteen inches, and consisted of frame-works covered with a single thickness of pine boards, battened both outside and inside. The roof was boarded over, and covered with tarred paper. As after the erection of these buildings they proved to be neither air nor water tight, the roofing was doubled in certain places, and the walls lined on the inside with coarse canvas and paper, as also partially wainscoted. The ventilation was intended to be maintained during the summer by the doors and windows. Ten large windows were placed on each side of a pavilion, and the sides of the lantern were fitted with windows, balanced upon horizontal pivots, so as to open by their own weight.

The barracks were heated by stoves, covered with envelopes and furnished with an air supply from without. But no shafts were used for the discharge of the vitiated air, the only outlets in a ward, constantly open for the escape of air, being two longitudinal crevices, each about one and a half inches wide, left open at the base of the lantern.

The water-closets and bath-rooms were all fitted in a very complete and admirable manner.

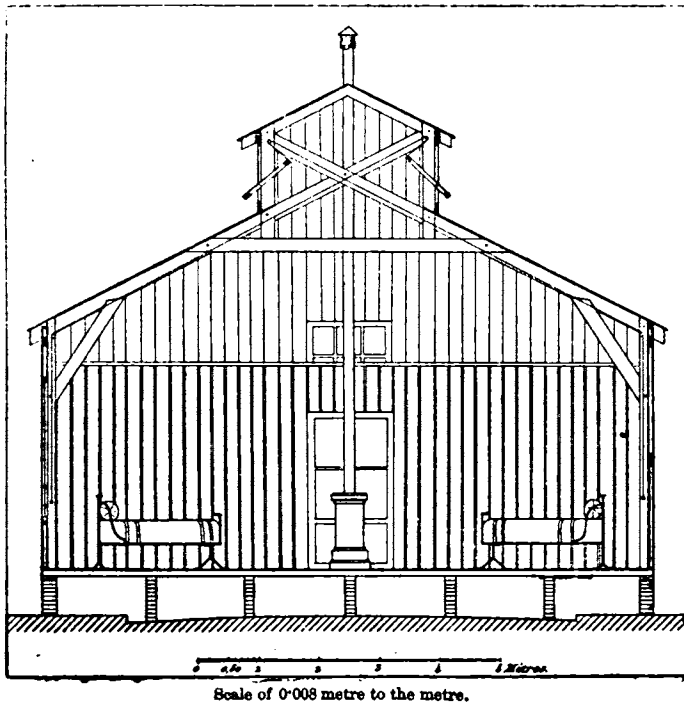


FIG. 4.—Section through one of the Luxembourg ward barracks.

Practically the only differences between these barracks and the American pavilions were : 1st. The Luxembourg barracks were much more spacious; everything pertaining to them was on a larger scale, the doors were larger, the windows were larger, the walls higher ; the beds were also at the same time much larger and much farther apart. 2nd. The barracks were unprovided with ventilating shafts.

The barracks were badly grouped at the Luxembourg; the kitchen and pharmacy were quite at one side of the grounds, and far distant from several of the wards. Certain

points in the construction, as well as in the general interior arrangement of these barracks, are shown in the accompanying sketches.

The plan adopted for the Luxembourg hospital, served also for one, containing nearly the same number of pavilions, which was erected—also by the War Department and at the suggestion of M. Lévy—in the Jardin des Plantes, and was opened for use at about the same time.

During the winter of 1870-1, the Direction of the “Ambulances of the Press” constructed a barrack hospital at Passy, similar in all essential respects to those previously organized by M. Lévy at the Luxembourg and the Jardin des Plantes.

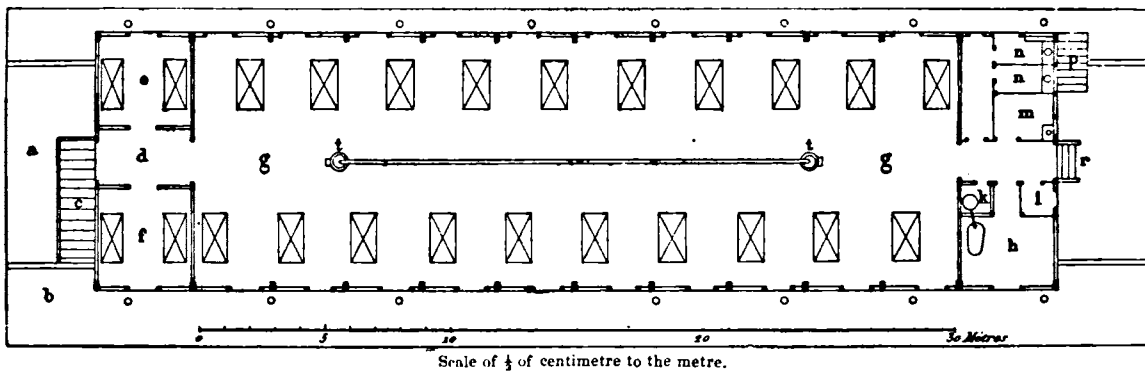


FIG. 5.—Ground plan of a Luxembourg ward barrack—*a*. Road way; *b*. Side walk; *c*. Moveable bridge; *d*. Vestibule; *e, f*. Rooms for the sisters of charity and the nurses; *g g*. Ward for the sick; *h*. Bath-room; *k*. Heating apparatus; *l*. Dirty linen room; *m*. Wash-room; *n n*. Water-closets; *p*. Vault; *r*. Steps; *t t*. Stoves.

The “Société de Secours aux Blessés” also began to construct during the siege—and to finish only after its close—a hospital in Paris, near the Palais de l’Industrie, which although closely resembling those at the Luxembourg and at Passy, yet differed in some respects from them. The walls of the ward-pavilions were double, and special inlets and outlets were arranged in them, to better serve the purpose of obtaining a constant and natural ventilation.

One of the largest barrack hospitals constructed by the French during the war, was that at Metz. This hospital was designed to be an almost exact copy of the Lincoln hospital at Washington, both as regards its unitary ward-pavilion, and the disposition of the pavilions upon two converging lines. The pavilions at

Metz, however, instead of being placed parallelly to a line bisecting the angle enclosed by two converging lines, were slightly inclined outward, a disposition which was supposed to facilitate the circulation of air between the buildings, and at the same time adapt them better to the covered corridor. The hospital was composed of thirty pavilions, each containing fifty beds. The unitary pavilion was very lightly and imperfectly constructed, even the frame-work being to a considerable extent made of boards, while both the walls and roof were covered with but a single thickness of overlapping boards. The pavilion was open at the ridge, and was ventilated also by an opening under the eaves on each side, about a foot-and-a-half wide, extending the whole length of the building. This opening was partially closed by the windows which were inserted in it, and could be entirely shut up by a series of trap-doors, which when closed, formed the piers between the windows. It was intended that, during pleasant weather, the side opposite the wind should always remain open beneath the eaves, the windows and piers being hoisted up by cords arranged for the purpose.

This hospital was constructed in a great hurry, was filled up with patients before it was finished, and gave proof, frequently during the winter, by leaking, &c., of its imperfections. It was chiefly remarkable from having been the occasion of an excellent treatise on the construction of temporary hospitals, by the architect M. Demoget, as also from its having been the only temporary hospital constructed, during the war, in France, of which we have as yet a detailed statement of the cost of construction. M. Demoget reports the total cost of the hospital, as having been for material and work of all kinds, 163,000 francs. The location of each bed having thus incurred an outlay of 108 francs. But at the close of the war, the material was sold for 80,000 francs; thus reducing the actual cost incurred for the location of a bed to fifty francs, a sum astonishingly small.

If any advance has recently been made in the theory and practice of barrack hospital construction, we are certainly indebted to the Germans for it. In constructing the German barracks, means have never been neglected to secure a constant ventilation in summer, and also in winter, when a winter use

may have been anticipated.¹ The open ridge, numerous doors and windows, outlets and inlets, and the employment of shafts, and the use of heat as an air-extracting force—these means, have all commonly been combined in each barrack, for the more certain attainment of the object in view, a constant and sufficient pure air supply. But this is not all, the German barracks have been generally so built, that they could be thrown widely open on every side, during pleasant weather. The windows of the Prussian regulation barracks were, on the south side, only closed with canvas curtains, and in fact, frequently the sides of these barracks were only built with a fixed covering, up to the line of the window sills; the section remaining between this line and the eaves, being occupied by moveable windows, curtains, or hinged sections of wall. This arrangement made it possible to thoroughly aerate the wards, as also to bring the fresh outdoor air to the beds of those who needed most its health-restoring influence, but who were too feeble to have obtained it otherwise. Not only were the German barracks so constructed as to be opened freely on one or more sides, but the well-being of the patients was often still more completely provided for, by the erection of side galleries, and projecting verandahs, protected and screened by canvas curtains, where the convalescent might take exercise or repose, and even the sick not unfrequently be treated with the very best results.

The system of winter ventilation employed in the Minden and also in some of the Berlin barracks, was simple and excellent. It seems to possess the great advantage over the American

¹ It is to be regretted that so many of the German barracks, erected during the late war, were not designed to be used as winter hospitals. This was the case even with the Tempelhofer Barracks at Berlin. Everybody at first supposed the war could not last later than October, and the buildings were constructed accordingly. But when cold weather came, the means found so excellent for securing a summer ventilation—the open roof, windows, &c., had to be closed up, and even then, it was often found difficult to keep the wards sufficiently warm. The patients consequently suffered from both cold and bad air, and I am not surprised to learn that a number of cases of gangrene, &c. were reported during the winter in these Berlin barracks. It is questionable if any advantage was derived from lifting the buildings so high—many of them standing on piles quite eight feet above the ground. The sharp winter wind blowing all around them, they were cold without necessarily being well ventilated.

system, whether as formerly applied or more recently modified,¹ of maintaining a better distribution of warm and fresh air in the ward.

One of the chief faults of the typical American pavilion, results from its having walls of only a single thickness; it is consequently liable to be excessively hot in the summer and excessively cold in the winter. The walls of the German barracks, of the best class, were generally formed of two or more coverings of boards, enclosing one or two air-chambers; they were thus less likely to leak, and the buildings were much more comfortable both in winter and in summer. Perhaps the most formidable objection urged against the use of wooden barracks, as well as tents, is the imperfect protection they offer against the direct heat of the sun. Barracks built of a single thickness of boards are certainly, during the summer months, often intolerably hot. Partial relief may be obtained by a free ridge ventilation, but the most effective remedy for this special evil, is the addition of another wall, in such a way as to envelope the ward with a thin cushion of air; and it is not even necessary that the inner wall should form a solid partition; if constructed of coarse oil-cloth, or even strong paper, it often serves its purpose very satisfactorily. Paper is quite impermeable to air, is one of the best non-conductors of heat known, is cheap, and easily applied as well as removed, and, for these as well as other reasons, is perhaps the material best suited for the doubling of walls in temporary barrack-hospitals. Indeed, paper was extensively used for this purpose in the German barracks, and particularly in order to prevent the entrance of currents of air, and to increase their warmth during the winter. This use of paper had previously been made, with the very best results, at St. Petersburg, in converting summer barracks into winter hospitals. Indeed, a knowledge of the use of paper, and of cloth sized and painted, in the construction of inner walls and ceilings, is one of the chief acquisitions relating to temporary hospital construction, to which we are almost wholly indebted to recent, and more particularly German experience.

¹ See "Circular, No. 4," War Department, Surgeon-General's Office, Washington, 1870; p. xiii.



WHILE it must be confessed, not only that the general provisions now made for the care of the sick and wounded of armies are greatly superior to those which were formerly made, but that army hospital accommodations have been increased and improved as well, the increase and improvement have been almost entirely limited to those military hospitals called in English "general hospitals," and which, if temporary, are at least at the same time immovable or "fixed." It is evident that such establishments can respond only partially to the necessities of an active army. It is difficult to determine where to establish them. It requires time to create them, often so much that the necessity for such hospitals ceases before they are in a condition to render any service. Armies often move away from these hospitals such distances, as to make it only possible to profit by them, by the transportation of the sick over long lines of transit, at great cost and embarrassment to the administration, and with fatigue and loss of life to the sick. Whatever advantages may be derived from the organization of special hospitals for the sick and disabled of armies in time of war, it is perfectly evident, that so long as these establishments are fixed, they can only meet in a partial way those needs for which they are nominally created. To complete the hospital organization of an army, something more is therefore required. It is necessary that the means should exist for creating, within the lines of the army itself, rapidly and whenever the occasion may demand it, hospital accommodation for a large number of men. The need for such accommodation is especially felt after engagements, which it is often quite impossible to foresee, at least in so far as their locality and importance are concerned. After great battles thousands of wounded often become the subjects of our care; to transport all these unfortunates back to the general hospitals in the rear is commonly a physical impossibility. The consequence is that large numbers of wounded must receive what care may

be given to them, at least for a time, in the immediate vicinity of the spot where they may have been wounded.

This fact has been, as we have seen, so far recognized as to have resulted in the establishment in all modern armies of a service corresponding more or less completely with that known in the French army as the ambulance service, and which has in charge the organization and direction of the ambulant or field hospitals.

While, however, military hospitals, both permanent and sedentary, have been all the while steadily improving—indeed, have been so far perfected in their material organization, as to fairly represent at the present time the most enlightened opinions which have been advanced concerning the general subject of hospitalization,—this can scarcely be said of the service which has been created for the more immediate care of the wounded upon the field. Its personal organization has generally been sadly defective and insufficient for its office. Created to respond to no well-defined idea of the true mission of such a service, it has rarely exhibited any plan other than one which may have had its origin in reasons of temporary and immediate expediency; remote and contingent needs have seldom been considered, or if once felt have been speedily forgotten. The consequence has been, that those upon whom it has fallen to discharge the functions of this service have too frequently been few in number, in proportion to the work to be done, as well as feeble in authority in view of its importance. There has been a want alike of men, authority, and material; and this want still exists. The surgeons, assistants, and stretcher-bearers for field duty, are not more numerous or better disciplined in the French army to-day than they were a hundred years ago; and the material at the disposition of a French ambulance corps is now scarcely greater than it then was; nor have the resources of the field sanitary service attached to any European army been in many important respects perceptibly increased since a date equally remote. These defects, however, are general, in so far as they are the results of a constitution radically vicious; and I wish in this place to direct your attention more particularly to a want which has been especially felt by all—the want of shelter sufficient for the

sick and wounded—who cannot, or ought not, to be transported a long distance—and so established, as to realize the conditions which experience has taught us were most favourable to health, as well as recovery from disease or wounds.

Not only have few attempts been made to improve the constructions occupied by the field hospitals attached to European armies, but few attempts have ever been made even to provide special constructions suitable and sufficient for the requirements of these most important establishments. We have seen what the practice was in France, in the reign of Louis XIV., and how according to the “Instruction” of D’Argenson “one was almost always obliged to have recourse to barns.” The methods adopted in those days for hospitalizing the sick in the immediate vicinity of armies, are those still most frequently practised.

Sick and wounded soldiers have been almost always crowded together in such buildings as chance might offer in the immediate vicinity of the camp or of the field of battle—in buildings not only generally insusceptible of proper ventilation, but often located in places unsuitable, as well from the presence of innumerable morbid agencies, as from the absence of the first conditions of salubrity. Wounded soldiers who fall upon a European battle-field are treated to-day almost precisely as they were a hundred years ago—excepting only certain details of medical and surgical treatment; and I am sorry to say that they are not only treated in the same way, but that they die in the same way, in nearly the same proportion, from the same causes—typhus, gangrene, and purulent infection.

If the statistics of modern European field-surgery show results somewhat better than those obtained during the seventeenth and eighteenth centuries, it must be attributed principally to the fact, that both private and public buildings are better constructed than formerly, as well as more carefully kept, while at the same time the soldier himself is better clothed and fed; in a word, to the generally improved conditions of living among all classes of people at the present day.

Perhaps the most conclusive proof I could offer, that up to the present time no systematic effort has been made to procure suitable shelter for the sick and wounded of active armies in the

field, is the fact that the word *ambulance* itself, now so well known to all the world, does not suggest to those who most frequently use it a *building* or even a *shelter*. It is a term which has been generally employed to indicate a *service*. On consulting the classical "Medical Dictionary" of Littré and Robin, we find that an ambulance is "a temporary hospital establishment (*établissement hospitalier*) near an army corps"—that its *personnel* numbers thirty-four surgeons, assistants, and nurses, and that its *matériel* is carried upon *five* waggons. What this *matériel* is, we are not informed, although told that it is generally placed in "*dépôt*" in a sheltered spot, and "in the neighbourhood of water." Legouest, however, in his "*Traité de Chirurgie d'Armée*," informs us what this *matériel* may be, which "is necessary to the service of the sick and wounded. In the first place: the medicines, material for dressings, surgical instruments, and various utensils; in the next place: the means of transport." In sixty pages, of the twenty-second chapter of this book, entitled "On the Medical Service in the Field," the medicines, and the bandages, and the surgical instruments, and the utensils, are enumerated with a detail that is almost painful; but scarcely a word is to be found there which throws any light upon the character of the installation of the ambulance itself. So, in the voluminous reports of Chenu, upon the ambulances and military hospitals established by the French during the Crimean War, and in Italy, during the war of 1859, while the movements of the armies, and the personal organization of the *service de santé*, and the statistical results of wounds, are given in many respects with the most satisfactory minuteness, I am unable to find any detailed account of the dispositions which may have been taken to secure for the sick and wounded the shelter they must have required at the field ambulances, *volantes* and *sédentaires*.

The failure to allude to a subject of such importance in the works I have referred to, would certainly seem very singular, except it be presumed that the kind of shelter generally employed for the ambulance was too well known to make any description of it necessary. This presumption was undoubtedly entertained by these writers, as—in my belief—it had been previously by nearly all their predecessors. The fact is simply

this—from the earliest times down to the present time, rarely, if ever, have systematic measures been taken to provide a special and sufficient shelter for the wounded, in the immediate neighbourhood of armies, engaged in active hostilities—the wounded have nearly always been carried from the field to such convents, churches, private houses, or huts as may have been nearest or most easy of access; and under such cover as these constructions may have afforded, the ambulances, both *volantes* and *sédentaires*, have generally been established. Such having been the conventional method among all armies of obtaining a *locale* for the ambulance, and a shelter for the wounded, it has been evidently impossible to give the details of an installation, the peculiarities of which must always have been determined by the circumstances of time and place.

This method of obtaining shelter for the wounded possesses, at least in Europe, certain advantages which are unfortunately so evident as to conceal to a great extent the disadvantages inherent to the system. Armies in Europe are seldom far distant from cities and villages, where public and private buildings may not be obtained to give shelter to considerable numbers of wounded. The employment of such buildings for hospital purposes saves to the State, not only the cost of constructions for the ambulances, but also the cost and *encombrement* which their transportation in the train of the army would inevitably occasion. The immediate advantages to be derived by adopting the custom of relying upon the country itself in which the war may be conducted, for the shelter necessary for the wounded, are therefore obvious; so much so, that unless we could show that the system was attended by disadvantages, so serious as to be more than commensurate, we should be ready to give it our sanction as the best which could be adopted—one which, if it did not entirely respond to the necessities of the individual soldier, at least most completely protected the larger and more general interests of the State.

A careful investigation of this system, however, will make evident its many and great disadvantages. In the first place: it subjects the medical department in the army to various conditions which it alone should always be able to control. Such conditions

as the absence of dampness, cleanliness, isolation from places which may prove centres of infection, the supply of water, of light, and, more than all, of air in proper quantities, are of altogether too much consequence in the installation of an ambulance to be determined by mere chance—the chance of their presence in the constructions which may be found near the field of battle. Indeed, it is very seldom that the surgeon is so fortunate as to secure a building in which he can establish his ambulance, so located and so arranged as to be entirely unobjectionable. In the next place: such buildings are generally small and deficient in number. It becomes as difficult to adapt them to meet the requirements of sanitary science, as it does finally and almost inevitably to prevent their becoming overcrowded and infected.

The inconvenience, the suffering, and the loss of life, which have been sustained by armies from the insufficiency of the shelter provided for the wounded are almost incredible. Larrey, speaking of the condition of the wounded after the battle of Eylau, says:—"I had in the morning established an ambulance in some barns on the left side of the road entering the town, but unfortunately they were open on all sides, the straw which had covered them having been taken off for the horses. We were forced to lay our wounded upon what was left of this straw sprinkled with snow, and a large number both from the guard and the line were brought together under this miserable cover. . . . The cold was so intense that the instruments dropped frequently from the hands of my aides. . . . A great part of the soldiers of the army had been operated upon, and had had their wounds dressed within the first twelve hours; it was only then that we were able to take a little repose. We passed the rest of the night upon the frozen snow around the bivouac fire of the ambulance. Never had I passed so painful a day—never had my soul been so deeply moved. I had been unable to repress my tears at moments when I sought to sustain the courage of my wounded. I was unhappily compelled to see a number of these unfortunates die because of the pitiful circumstances of our position—the excessive cold and the want of a *locale*. The impossibility of bringing together all the wounded

French, as well as those of the enemy, in that little town (Eylau), where the whole *état-major* of the army and of the imperial guard were lodged; the danger of witnessing the outbreak of an epidemic, from the piling together of these unfortunates, and the abundant suppuration which must take place after the third day; and, finally, our extreme penury, in an open country covered with snow, abandoned by its inhabitants, and stripped of every resource,—these were so many reasons which imperatively demanded an evacuation.”¹

According to Gama:—“Six days after the battle of Eylau the wounded who had gone themselves or been carried to Thorn, five leagues distant, were in a condition as deplorable as during the first hours after the battle. I had assigned me, as chief of service, nearly eight hundred of these people, whom I found in a great house, lying on dung rather than straw, crowded together one against the other, shrieking, weeping, and complaining of having been abandoned—asking for death even; for in the midst of these tortures existence was no longer a benefit. I succeeded after a few days, assisted only by two or three sub-aides, in giving to this place an aspect somewhat less disgusting—in alleviating in a measure these great sufferings—in creating an atmosphere less corrupt than that, which had been infected by the emanations arising from purulent matter and the ordure in which those poor soldiers who were unable to move were lying. Without the assistance of the *économe*, who had been replaced by a clerk, only charged, as it appeared, with the accounts—with but two or three *infirmiers*, unacquainted with their duties—not a place where broth could be made, for more than twenty-five men—without boilers, which could be used out of doors—without vessels, in which drinks might be served to the men, tormented by an inextinguishable thirst from the fever of their wounds—destitute of assistance, destitute of means—unable to find a person with whom I might concert some plan for getting out of the difficulty—forced to make use of the fragments of ambulance caissons for dressings, and even these insufficient,—such

¹ “Mémoires de Chirurgie Militaire,” de D. J. Larrey. Paris, 1812; tome iii. pp. 38, 39, 42, 43.

were the arrangements made for the care of the soldiers of Napoleon!"¹

In speaking of the Russian campaign, the same writer says:—"As for the help which is demanded after battles, and which the overwhelming fatigues of long marches render equally necessary, where were the hospitals which the administration took care to establish—even to trace out at long distances the line of evacuation, which was so necessary, up to the Prussian frontier? There was not one. The hospital at Wilna, and those of Moscow, where the sick and wounded French were received, did not belong to the army; and, although M. Larrey may call '*hospitals*,' the houses and barracks where he left sick men and surgeons, when going as well as returning, this name cannot be applied to them. A place where everything is wanting, sometimes even water, where surgeons, after having used their own under-clothing, are obliged to take that of the wounded for dressings; where one is compelled to think himself fortunate in being able to procure old paper, pieces of parchment, and carpeting, to be used for compresses and fracture bandages, is not a hospital, it is only a miserable sink in which the wounded are heaped up to die. The administration was unmoved by these pressing necessities; it did not even occupy itself with them, except, perhaps, when everything was quiet and its aid came too late. On the retreat it left behind the surgeons, among soldiers overwhelmed with grief; and it left them to console their patients as best they might, without means and without other resources than those which their ingenuity might discover in the most indescribable things which fell into their hands, as also, exhausted—worn out with fatigue, and pushing to the end what was left of presence of mind, of activity, and courage—to die in their turn."²

Indeed, scarcely a great battle occurred during the history of the Consulate and the First Empire which was not followed by scenes of wretchedness, arising from the complete inadequacy of the available shelter, in no respect less painful than those which furnished the occasion for these graphic sketches.

¹ Gama, op. cit. p. 434.

² Ibid. pp. 524, 525.

The only possible remedy was an evacuation of the wounded upon the towns and cities most accessible, but often quite distant, and which never could be effected without seriously compromising the chances of recovery in every case where a severe wound had been received. A decree¹ regulating the French ambulance service had directed the immediate transfer of the wounded from the place of first dressing ("ambulance volante"), to the "dépôt d'ambulance" (head-quarters of the "ambulance volante"), established just behind the centre of the army; from this place they were to be sent on as rapidly as possible to the first "hôpital sédentaire;" from which, to prevent overcrowding, a sufficient number were to be evacuated on to the sedentary hospital next farthest removed, and so on back, if necessary, to the first permanent military hospital. The wounded were therefore theoretically constantly *en route*. From the enormous burdens of such a service upon the transportation of an army, it is evident that it must have been, generally, most inefficiently accomplished. These evacuations of the wounded from the immediate neighbourhood of the field of battle, accordingly, seldom failed to occasion their accumulation in such numbers, at what were considered the most favourable points, as to produce the outbreak of pyohemic epidemics, often of a formidable character; as, for example, at Brünn, a city upon which the wounded at Austerlitz were evacuated, where the epidemic assumed such violence as to extend to the civil population of the city, and finally to invade the whole line of evacuation quite back to France.

The cruel results of over-crowding and long transportation—typhus and hospital gangrene—induced Vaidy, a surgeon of the First Empire, to propose the treatment of the wounded in provisional barracks established in the open air. In an article published in 1818 in the "Dictionnaire des Sciences Médicales," he says:—"Since in those large gatherings of men, such as armies occasion, it is physically impossible to respect all the rules of hygiene, it is the duty of those charged to watch over the health of their

¹ Arrêté du 24 thermidor, an viii. titre 1^{er}, 6^{me} sec. See "Législation Militaire," par H. Berriat. Alexandrie, 1812; tome iv. pp. 2, 3, *et seq.*

fellow-citizens, to remedy the evils which necessarily result from these dangerous gatherings. Inasmuch, therefore, as they are productive of a great deal of sickness, instead of crowding the sick together in the hospitals of towns, where they may carry with them the germs of a fatal contagion, it would be expedient to create establishments large and well aired in the open country. These buildings should be constructed of wood, boarded up on the outside, and lined on the inside with fresh straw—to be frequently renewed. Such barracks would serve very advantageously as asylums for the sick coming from the army, while they would be for the people upon whom the scourge of the war might fall, a happy guarantee that they should not see typhus, one of the most deadly diseases which men have to fear, developed among them.”

Vaidy was induced to make this suggestion principally by a desire to avoid, or at least mitigate, the several evils incident to long transportations. By the establishment of special hospitals in the rear of the army, not far removed from it, these objects could be in a certain measure secured. But, at the time he wrote, the importance of making any special provision for the shelter of either sick or wounded was rarely entertained, and thus, the wise and humane suggestions of Vaidy were for a long time unheeded.

At the outbreak of the Crimean War, one of the first military movements being into the Dobrudscha, a country of arid plains, steppes, and marshes, inhabited only by a few shepherds, and destitute of all resources, the Russian and Turkish armies suffered severely from a mortality among their sick, occasioned as much from the absence of cover as from a want of food. And the French themselves very shortly after suffered even more severely from a similar cause.

“We established,” says Chenu, “at Gallipoli (April 5, 1854) a provisional hospital in some Turkish houses—no better place could be found—although the hospitalization was so bad as to render it necessary to abandon the place as the weather grew warm.”¹ The cholera broke out here early in July:—“That infected mass of

¹ Chenu, “Rapport au Conseil de Santé des Armées.” Paris, 1865; p. 14.

houses in the midst of filth of every kind, which the indolence of the people of the country had left to fester at the corners of the streets, and on the door-sills of the dwellings, seemed an audacious defiance thrown at the epidemic. The hospitals filled up, and graves were dug in silence around the camps. The living of to-day were the dead of to-morrow.”¹

The disastrous consequences to the allied armies during the Crimean campaign, from having neglected to procure suitable and sufficient shelter for the sick, independent of such as might be found in the country in which they were to operate, were not limited to the period of the cholera epidemic at Gallipoli and at Varna. On landing at Eupatoria in September, the English troops bivouacked without cover and without fire; and, exposed the first night to a rain which poured in torrents, were compelled to re-embark immediately, on shipboard, fifteen hundred of their sick.² At the Alma the same want was severely felt, as it was, perhaps, even still more severely during the whole of the terrible first winter before Sebastopol. For quite two months after a landing in the Crimea had been effected, the only means possessed by a large number of regiments for sheltering their sick and wounded were those afforded by “a single bell-tent.” It has rarely happened that an army has entered upon an autumnal campaign so completely destitute of suitable shelter, and if the complaints of those upon whom the responsibility of caring for the sick principally fell were frequent and bitter, the suffering from cold, rain, and exposure, as the season advanced, was almost incredible. On the 1st of January, 1855, Chenu said of the English army:—“It numbered at the commencement of this campaign 54,000 men, its strength to-day is but 27,000, and half this number are on the sick list.”³ The mortality in the English army was, indeed, so fearful at this time as not only to profoundly impress public opinion in Great Britain, but to cause the government at once to resolve upon energetic and effective measures of relief. A few months after, the English army was well supplied with clothing

¹ Bazancourt, “*L'Expédition de Crimée.*” Paris, 1857; tome i. p. 98.

² Shrimpton, “*La Guerre d'Orient.*” Paris, 1864; pp. 5-20.

³ Chenu, *op. cit.* p. 75.

and food, while the sick were sheltered in comfortable framed barracks, which had been sent out from England, instead of half buried in the earth in the *taupinières* which the country alone furnished.

But if the English field hospitals were well established and maintained, during the middle and latter periods of the siege, the same could hardly be said of many of the French ambulances. Whoever may have been at Sebastopol, can hardly fail to remember the troglodytic caves everywhere to be seen along the line of the naked rocky hills which shut in that city. These afforded during the siege a convenient cover to the Russian and allied *tirailleurs*; they were used, however, for other purposes. "Two of these grottoes," says Baudens, "taken from the Russians in the ravine of the Carénage, and the Karabelnaïa, served as ambulances for the trenches on the right. They were out of the reach of shot fired in a direct line, but more than one bomb came rolling into the ravine, to burst and make victims at the entrances of these pitiful retreats of misery. The uncertain light, which entered by the crooked galleries, rendered surgical operations difficult. During the night, that the enemy's attention might not be drawn to us, we were contented with one little lamp suspended overhead. The continual dull roar of the cannonade was, at intervals, dominated by screams of birds of prey, who, disturbed in their peaceful haunts, sailed down from the rocks above to carry back with them shreds of human flesh. After the fall of Sebastopol, it was a pious custom to visit these grottoes, full of sad souvenirs; there was shown the straw bedding, still bloody, where the surgeon had kneeled down to extract a ball or stop a hemorrhage. Who shall ever tell all the sad and touching scenes which passed there? In these ambulances the open wounds, and broken limbs, received the first dressing; the blood which flowed in abundance was checked by hasty expedients; many entered only to die after cruel suffering with heroic courage; the others were carried into the division ambulances."¹ The division ambulance which received most of the wounded from the place just described, was established at the

¹ Baudens, "Souvenir d'une Mission Médicale en Crimée." Paris, 1857; pp. 36, 37.

entry of the ravine of the Carénage, under the shelter of some barracks and tents; but the barracks were by no means well constructed, while the tents, made of loosely woven stuff, permitted the rain to sift through, and unprovided with any suitable heating apparatus, became so thoroughly uncomfortable, when the weather grew cold, as to be abandoned as fast as it was possible to replace them with barracks.

We find, moreover, that recourse was constantly had, in the Crimea, to those forced evacuations of the wounded, from both ambulances and hospitals, to which I have already alluded, and which have been one of the curses of the French ambulance system, since the time of its adoption—what they always have been, and always will be, to every system which abandons the sheltering of those who may fall wounded upon the field to the caprice of chance. Says Chenu:—"Even after the establishment of these hospitals, (at Constantinople and in its vicinity, in 1855-6,) it was necessary to have recourse to an extreme measure, but one demanded by the circumstances, that of evacuating the inmates of these hospitals, from one to the other, back to France. The result was—our hospitals served scarcely any other purpose than that of *hotels*, where the sick stopped for a few days, more or less, before a similar repose at Gallipoli, and afterwards at Nagara, and so on to France. This measure, considered indispensable, had its good side, but it is suggestive of many serious reflections. If it may be employed in the case of certain diseases, in a word, for the sick who are really transportable, it is not the same for most of the wounded, the recently amputated, and those exhausted by the incessant calls of diarrhoea and dysentery. Nevertheless, it was necessary to face these necessities, and if I must say it, we did all we could, although we did very badly."¹

M. Dunant informs us that at Solferino, in 1859, just before the commencement of the battle, "the *ambulances volantes* had been established in the private houses, granges, churches, and convents in the neighbourhood, or even under the trees in the open air. From these places the wounded were sent to the

¹ Chenu, "Rapport au Conseil de Santé des Armées." Paris, 1865; p. 708.

nearest villages or hamlets. In these little country towns, churches, convents, houses, public places, courts, streets, and promenades—all, were occupied as provisional ambulances. . . . At Castiglione, the hospital, the cloister, the caserne San Luigi, the caserne of the gendarmes, as well as the churches Maggiore, San Giuseppe, and Santa Rosalia were filled with the wounded, crowded together and lying only on straw. Straw had also been put in the streets, courts, and squares, wherever, here and there, under boards or awnings, a cover had been set up to protect against the sun the wounded who were coming in, all at once, from every side. The private houses even were soon filled up. What were the agonies and sufferings of those days—the 25th, 26th, and 27th of June? The wounds inflamed by the heat, dust, and the want of water, as well as of care, became more painful, and the air grew corrupt from mephitic exhalations, in spite of the praiseworthy efforts of the intendance to maintain proper sanitary conditions, in the places which had been transformed into ambulances. Upon the flagstones of the churches and hospitals of Castiglione, had been placed side by side men of all nations, French, Arabs, Germans, and Slaves. Some, who had been provisionally pushed down to the lower ends of the chapels, had lost all power of moving, or were unable to move, on account of the narrowness of the place they occupied. The vaults of these sanctuaries rang with oaths, blasphemies, and cries, which no words can express. Certain soldiers, imagining that the cold water which was poured upon their wounds, already purulent, caused maggots, refused to have their bandages moistened, others, who had been fortunate enough to have had their wounds dressed upon the field, were not cared for, during their forced detention at Castiglione, and the dressings tightened by the jolting of transportation, neither removed nor loosened even, were productive of veritable tortures At one of these churches more than 500 soldiers lay in heaps, and there were at least quite 100, in addition, stretched upon the straw in front of the church, and under some awnings which had been set up to keep the sun off.”¹

¹ “Un Souvenir de Solferino.” Genève, 1863; pp. 44, 66, 68, 69, 74, 75, 78.

At Langensalza in 1866, "no one was prepared," says Dr. Evans, "for so terrible a carnage ; the hospital service was wanting not only in nurses, but, strange to say, it did not even possess the necessary material for arranging a single ambulant hospital ; so the wounded Hanoverians and Prussians were placed upon such straw as could be hastily procured ; some even were laying upon the ground ; few were they to whom a bed furnished with a straw mattress had been given."¹

The sufferings of the wounded during the recent war, at Sédan and at Metz, and on the Loire, are almost too well known to make them the occasion for a special notice. The French army was in no way prepared to take the field when war was declared in July, 1870. The intendance was consequently at once overwhelmed with multitudinous orders, which concerned rather the equipment of the troops and their maintenance in the field, than an enlargement of the resources to be placed at the disposition of the *service de santé*. Time, moreover, was wanting, as the work of weeks and months had to be crowded into days. Something also was expected from the different associations which had been organized since several years, with a view to co-operate with the *service de santé* in the work of battle-field relief. To what extent these circumstances may have led to the insufficiency of the material and the means of caring for the sick and wounded in the French army, during the late war, it is not necessary here to inquire. The only fact which now concerns us is this : wherever a large number of wounded had to be taken care of, they had to be taken care of in the old way, under such cover as was most available. An English surgeon, writing from Sédan, Sept. 5, says :—" Here in the hospital, within one hundred yards of the battle-field, we are in a bad way ; what we want are *tents* and *beds*." An agent of the English Aid Society, writing from Arlon on the 6th of the same month, says :—" The condition of things at the front is very bad, not only are there wounded in enormous numbers without bedding, but without even sufficient nourishment, there is also dysentery, diarrhœa, and fever."

¹ "Sanitary Institutions." Thomas W. Evans. Paris, 1868 ; pp. 55, 56.

another writer says:—"The villages of Rémilly and Douzy are crammed with wounded, one small château outside the latter village has 900 wounded in it, and all the other houses are proportionally full. It is sad to think of the hundreds who might be saved with a little care."

Is it surprising that under such circumstances, pyæmia and typhus should have soon broken out, in almost all these villages, with a violence such as has seldom been witnessed except in the records of ancient surgery? At Metz the state of things was, if possible, even worse. The whole city became a vast ambulance after the battles of the 14th, 16th, 17th and 18th of August. Notwithstanding almost every building, public and private, had been filled with the sick and wounded, places for them were still wanting, and hundreds of these unfortunates were finally crowded into the cars of cattle trains, which were brought into the "Place Royale" to be organized into an ambulance. The sanitary condition of the city was most deplorable, long before it had suffered from the privations incident to the siege.

M. Gallard, inspector of the transportation service for the sick and wounded of the army of the Loire, says:—"The morning after the first occupation of Orleans by the Prussians . . . I went with three of my assistants to Vierzon, where I thought of organizing a system of caring for the wounded, in anticipation of the military events which seemed imminent in Sologne. As the resources of the city were very limited, it seemed to me quite natural to ask the intendance to assist me in establishing a fixed ambulance or temporary hospital, the creation of which appeared to me indispensable. Feeling authorized as I did to make this demand, from the instructions I had received from the International Society and the intendant-en-chef of the army of the Loire, the short and categorical refusal which I received surprised me very much, I must confess; but what surprised me more, were the reasons assigned for the refusal. The principal one was, that there was no need of thinking about preparing ambulances in view of eventualities which might never occur; that even should there be a great battle, such ambulances would be much less useful than I supposed, for it would only be necessary to take one of the car houses at the railway station,

and throw 200 bundles of straw on the ground, to be able to receive all the wounded, *who would there find themselves perfectly well provided for.*" M. Gallard was naturally very indignant, that anyone should coolly propose such a system for treating those who might fall wounded in defending their country; and obtaining the aid of a citizen of the town, he established there a small ambulance of thirty beds:—"But this was indeed very little, for the hospital being filled up and the private houses invaded, we found, according to the wish of my interlocutor, more than 200 sick lying upon the straw. This crowding together had been occasioned, not by the wounded, for there had been no serious fighting in the neighbourhood, but by the sick, of whom we never think enough, although experience has shown that in all long campaigns, there are at least nine times as many sick as wounded. There were in this place unfortunates down with small-pox in the suppurative stage, those sick with typhoid and dysentery in its worst forms, and who could not be undressed from a want of sheets and blankets. How many died in the midst of this rottenness, I do not wish to find out; I will only say that if the ambulances, which were refused me, had been organized, if the transport service had worked regularly and orderly, all these sick would have received in season the care which they failed to get, and which, in spite of the devotion of the inhabitants of Vierzon, it was impossible to give them, from the want of sufficient material resources."¹ And during this same campaign some English gentlemen attached to the *fifth* ambulance (of the "*Société de Secours aux Blessés*") speak of the wounded having been lodged in school houses, the outbuildings of farms, and private houses:—"At L'Echelles many were in barns, where at night *sheep or cattle were driven in to the adjoining sheds, to keep the patients as warm as we could.* They almost buried themselves in the straw during the very cold weather. We had great difficulty in keeping good ventilation," &c.²

¹ "*Malades et Blessés de l'Armée de la Loire. Rapport au Ministre par T. Gallard.*" Paris, 1871; pp. 14, 15.

² See the "*Report of the Operations of the British National Society for Aid to the Sick and Wounded in War,*" London, 1871; p. 68.

It is not surprising that there should have been some difficulty in keeping good

If I have been induced to make these citations it has been for the purpose of furnishing you with the unequivocal evidence of the truth of my assertion—that since a century there has been on the part of the principal European States, no augmentation of the means wherewith to furnish shelter to the sick and wounded, within the lines of their armies—that as formerly, so now, armies are sent into the field unprovided with the material necessary for the establishment of ambulances, although such an establishment may be imperatively required, either from the absence of buildings near the field of battle, or their unsuitableness, or complete insufficiency, for the shelter of the multitudes who may have been suddenly stricken down in the fearful collisions of a great battle. I have also wished to represent to you, in the words of those who themselves have witnessed the scenes they have described, the pitiful and often heartrending consequences of this secular official improvidence.

Few are the persons who, familiar with the hardships the soldier has to face, and with the death-rate in the ambulances, far exceeding that common in our civil hospitals,¹ although the soldier has in his favour the vigour of his age, may not have often asked if there was no remedy for this scourge—if it was not possible to modify and improve the hospitalization of active armies? These questions, as we have seen, have been almost always answered practically in the negative. Public and private

ventilation under the circumstances mentioned, but it is certainly surprising that any one should have had recourse, as late as 1870-71, to the system of warming the wards of hospitals alluded to—the system of overcrowding simple, if not *pure*—inasmuch as animals (cattle), when present in an apartment, vitiate the atmosphere and render it unfit for respiration, even more rapidly than would the same number of men.

“ Les animaux qu’on a la funeste habitude de laisser dans les chambres à coucher, même dans les chambres des malades pendant la nuit aussi bien que pendant le jour, ne contribuent pas moins que l’homme à vicier l’atmosphère. Le chien, par exemple, comme M. Béclard en fait la remarque, d’après les expériences de MM. Regnault et Reiset, exhale, *en égard à son poids*, une quantité d’acide carbonique plus considérable que l’homme; par conséquent il absorbe une plus grande quantité d’oxygène; il en est de même pour le chat.”—Introduction of M. Daremberg to the French translation of Miss Nightingale’s “Notes on Nursing; what it is and what it is not.”

¹ The annual mortality from disease in the British army in the Crimea was 23·2 per cent. of its whole strength, while the annual mortality in the French army during the same campaign was over 30 per cent. of its strength.

buildings have not only been constantly used for the shelter of the sick, but they have almost universally been considered as the best places in which to establish ambulances or temporary hospitals, whenever or wherever they could be obtained. If at any time provisions may have been made to provide the *service de santé* with shelter for the wounded, other than this, it has been for the purpose of meeting the possible contingency of the absence of buildings at the seat of war, rather than for the purpose of establishing a hospitalization which might respond more completely to the requirements of modern hygiene; and such provisional shelter has generally not only been considered inferior to that furnished by permanent constructions, but its transportation has always been regarded as a heavy burden, to be abandoned, either wholly or partially, on every possible occasion. Although, since the beginning of this century, the common roads of Europe have been replaced by McAdam highways—uniting all the important strategic points—which have more recently been superseded by lines of railway, along which armies may be transported in a few days such distances as, formerly, could only be traversed in weeks or even months, the word *impedimenta* still disturbs the repose of a European quartermaster, as much as it did in ancient times that of a Roman quæstor making ready for a campaign into Germany or Africa. I know that it is almost useless to represent the advantages to be derived by supplying an army with any system of portable hospitals, as we are very sure to be informed that the system is impracticable, that the baggage of an army is already an excessive burden upon it, and that any increase in its means of transportation would be most prejudicial. But whatever may be the inconveniences of transporting the material necessary for the construction of field hospitals, it is perfectly evident that they are much less than those resulting from the constant decimation of armies insufficiently provisioned in this respect. For example, one *third* of the whole French army in the Crimea was destroyed each year by disease alone; to maintain its full strength, nearly seventy thousand men had to be taken annually from France, each man representing a portion of the wealth of the country, each drawing upon the public treasury for his support, and each one to be transported to the

seat of war, at a cost of not less than — francs. Suppose a proper outfit for the hospital department at the opening of the campaign had enabled it to reduce the mortality twenty-five per cent, which is a very modest supposition, would the cost and *impediment* of such an outfit have been an equivalent for the expense and loss to the State occasioned by the annual expedition of a new force of nearly twenty thousand men? The humanitarian arguments in favour of my proposition I leave purposely out of view, as it is generally useless to bring before the tribunal of sentiment those questions which always have been, and always will be, settled in such a way as may seem to accord best with the interests of the administration, rather than with those of the individual.

It is certainly remarkable that the impracticability of reforming the hospitalization of active armies should still be entertained, at a time when the value of human life was never more highly estimated, and when the laws of sanitary science as applied to the health of civil populations, were never more carefully considered or more universally respected. Moreover, the civil population is only occasionally or partially subjected to the evils arising from an insufficient shelter, or the imperfect ventilation of hospitals—dangers to which armies are constantly exposed; dangers which, if alike in kind to each class of the population, are certainly not alike in degree; while the claims of the soldier to profit by all the ameliorations which science or humanity may discover, to prevent disease and death, are as much greater than those which can be presented in behalf of the civilian, as the peril he must meet is greater and the cause he serves more sacred.

Unfortunately, certain facts valuable in their relations to science, to humanity—in the broadest sense of that word—seem destined to remain for ever sterile. They appear never to have known the fertile touch of some strong conviction of their worth and excellence, which might quicken the life within them, and force it to contribute to the general movement and the welfare of the world. How important it is to do this or that thing—to avoid this or that peril, may even be admitted; but the thing is neither done nor the peril avoided. If it be asked why, no one is able to give a satisfactory answer,

The dangers which an army, entering upon a campaign, incurs by being imperfectly equipped and provisioned, have often been pointed out. It was a maxim, even among the Romans, that a want often wastes an army more than fighting—"Sæpius enim penuria quam pugna consumit exercitum."¹ And in modern times scarcely a campaign has been lost, rarely has a great military disaster occurred, which could not be attributed in a measure to the inadequacy of the supplies, or which may not have been greatly aggravated by the insufficiency of the means for preserving the health of the soldier. Indeed, of all the wants which ever may have imperilled the force of an army, the most frequently occurring, as well as the greatest one, has been the want of suitable means of shelter, and more particularly for those who have been worn and exhausted by the fatigues of active service.

If such have been the uniformly fatal consequences of an insufficient provision for the organization of field hospitals, the question must continually recur—Is it not possible to make a larger and more complete provision? The answer which I should most unhesitatingly now give is—Yes. An arrangement should and could be made, in every army, for the establishment of a certain number of field tent-hospitals, and the number should be sufficient for the treatment of all the sick and severely wounded, who cannot safely be transported long distances. Whatever may be the good qualities of barracks, even those most hastily constructed often require too much time for their construction to be of service, and finally, and principally, they are non-portable. If armies are to be followed by hospitals, such hospitals must be established under tents. Tents are portable, are neither heavy nor bulky, and can be carried in the train of an army without encumbering it. A single waggon can easily carry the shelter required for a tent-hospital of eighty or a hundred beds. Such a hospital can be put up in an hour, in the most suitable and best place, and exactly when as well as where it is needed. Tent shelter costs less than most kinds of special shelter for the sick. In short, it is not more expensive than other kinds of shelter, while it is the only special shelter which can be employed for ambulant

¹ Vegetius "De Re Militari;" lib. iii. c. 3.

hospitals. Fortunately it happens that it is precisely that kind of shelter, which experience has proved to be better than any other for the organization of temporary hospitals, from a strictly sanitary point of view; it exposes the smallest amount of material to infection, and is capable of the completest and most constant ventilation.

I have elsewhere spoken at length of the great importance of pure air in the treatment of the sick, and have endeavoured to show how necessary it is, that measures be taken that the air of apartments occupied by the sick may be kept fresh by an ample ventilation. I have also spoken of some of the special means which at different times have been taken to maintain a fair degree of atmospheric purity within hospitals. I then had occasion to state, that one of the great advantages which temporary constructions possess over permanent constructions, is the facility with which systems of natural ventilation can be applied to them. If they afford a less perfect shelter against the inclemency of the weather—rain and frost, this apparent defect is usually more than compensated for, by the advantage here alluded to. Pure air is even of more consequence than shelter itself, so that by exchanging a certain amount of shelter for a certain amount of fresh air, oftentimes a most profitable exchange can be made. Indeed, the amount of shelter which can often be dispensed with, advantageously, is vastly greater than is even now generally supposed. I have already mentioned certain instances in which the sick have been forced to occupy quarters which were supposed at the time to be quite unfit to receive them, on account of their imperfect and shattered condition, but where it was found that the proportion of recoveries was much greater, than among those treated within the shelter of substantial walls. Occasionally, the sick have been compelled to pass a considerable portion of the day quite unprotected by any shelter, and yet so far from having suffered, in mild seasons and climates, they appear to have been almost uniformly benefited by the seeming exposure. Thus, it is said that:—"In 1782, early in the summer following the surrender of Yorktown, the French army left Southern Virginia, where the heat had become insupportable. The sick conveyed upon the waggon of

the ambulance train, continuing on the march and halting with the army, had nearly all got well on their arrival in Pennsylvania, a few only remained, and these were convalescents. And this experience," the writer intelligently observes, "was not at that time sufficiently taken into consideration, but was soon forgotten."¹

At a meeting of the Académie des Sciences, held in June, 1871, General Morin read an extract from a letter which he had received a few days before from General L'Hérillier, in which that officer referred to a remarkable instance, which came within his own knowledge, of the good effects of the open air upon the sick.

During the Mexican expedition, twelve soldiers fell sick with typhus contracted by occupying a house just abandoned by the Liberals, who were being decimated by that disease; as it was impossible to leave these soldiers behind, they were placed on litters and put on the backs of mules, and thus followed the movements of the command. *Au bivouac*, they were put under tents, quite in the open air. Instead of growing more ill, every one of these patients recovered, and not a new case was declared. And General L'Hérillier very justly concludes as follows:—"In my opinion the only way to avoid typhus in hospitals, and in large armies, is to make use of provisional hospitals alone. . . . I may add, in support of what I have just said, that in the Crimea we were obliged, from the number who fell sick with typhus, to put them under tents. These tents were almost constantly open. The rain, snow, and frost, penetrated within them; the men lay on rugs in their clothes. Well! in spite of these conditions, certainly to be deplored, we lost proportionally less sick thus sheltered, than in the wooden barracks, which were literally infected, I might almost say injected, with putrid miasms."²

But were I to introduce here the results of recent experience, I might multiply these observations almost indefinitely.

¹ "Instruction sur la Santé des Troupes de la Grande Armée." Quoted in "Dictionnaire Encyclopédique des Sciences Médicales;" art. Camp.

² "Comptes-rendus;" tome lxii. p. 749.

If there is a principle of sanitary science well established at the present time, it is that no shelter can be considered as suitable for the sick, which, while affording a sufficient protection against the inclemency of the weather, is not susceptible of a constant and abundant aëration. Facts which I shall present in another part of this Report have proved, I think, quite beyond question, that tents afford to the sick all the protection against unfavourable atmospheric influences which is necessary, not only in the summer, but also in the winter in temperate climates. Facts, no less conclusive, have shown that it is much easier to assure a sufficient and unfailing supply of fresh air to the inmates of tents than to those dwelling in ordinary constructions.

In the hospitalization of the sick of armies, we have certainly made great progress, we have improved our permanent military hospitals; we have multiplied and improved our sedentary temporary hospitals. We have still, however, a great evil for which to find a remedy, the suffering and waste of life occasioned by the enormous accumulations of sick and wounded in camps, and on fields of battle—in houses and hovels, and buildings totally unfit to serve as hospitals—with the alternative and consequence of a hurried evacuation or transportation to far distant hospitals of men seriously ill with painful diseases, or who may have been grievously wounded. And these transportations are often absolutely forced by the absence of all means of hospitalization within the army itself.

Says Dr. Sutherland:—"But while admitting that large buildings may be improved if there be time for doing so, it must be stated that no more disastrous idea can take possession of men's minds than that sick and maimed people ought, on grounds of humanity, to be packed into churches, barracks, and other unprepared buildings, with as little delay as possible. This error has slain its tens of thousands in all wars. Even in specially constructed and well managed civil surgical hospitals, every surgeon knows how difficult it is, with all his care, to prevent the invasion of hospital diseases. In extemporized war hospitals they have been too often invited to enter.

"It is time that more rational ideas on subjects of this importance should prevail, and it *would well become aid societies to turn*

their attention not only to improved ambulances (waggon), but to simpler methods of obtaining wholesome shelter for wounded men, at a safe and convenient distance from battle-fields, until their wounds have progressed so far as to admit of the sufferers being removed into properly appointed hospitals at a distance. . . .

"There is evidence that during the late war agglomerations of wounded into what is called 'a hospital' have been as destructive of life as ever. It would be far better and safer to place wounded men, as a rule, in detached dwelling houses, or under a canvas roof, or any similar shelter, sloping from a barrack or church wall, rather than to take them inside."¹

Baron Larrey has recently observed:—"The question of employing tents and tent-barracks is of much importance, and it seems to have been judged to-day, by an experimental trial, the most complete as well as the most favourable. We have seen, especially in these recent times of disaster, what services have been rendered by the numerous ambulances attached to the hospitals, and we have seen how important it was, in the presence of a constantly increasing affluence of sick and wounded, to prevent over-crowding and infection, by dissemination and increasing the number of our provisional asylums."²

Would that these opinions might have their just weight among those who have the power to organize reform!

Says Dr. Sutherland:—"What appears to be most required now-a-days in field work, is ingenuity in turning everything to account for affording shelter and comfort to wounded men at a safe distance from (near) the battle-field. Sufficient has been stated to show an absolute necessity for some understanding being come to regarding improvements in the hygiene of belligerent military hospitals."³

I have frequently had occasion to allude to the evil consequences of an indiscriminate evacuation of the sick and wounded upon remote hospitals, but the evacuation of the sick is often a

¹ "Report of the Operations of the British National Society for Aid to the Sick and Wounded in War;" p. 172, et passim.

² "Comptes-rendus de l'Académie des Sciences;" tome lxii. p. 750.

³ "Report of the Operations of the British National Society," &c.; pp. 176, 177.

salutary measure, and one so immediately connected with every system of army hospital organization as to demand a more serious consideration in this connection.

It is generally believed, and the belief is a result of experience, that most of the seriously sick as well as a large proportion of the wounded, can with safety, and perhaps even with advantage to themselves, be conveyed to hospitals situated far in the rear of the army. It is well known, that one of the most powerful and effective restorative agencies, when disease exists, is found in a complete change of air, climate, and surroundings. And among the sick of armies, in a vast multitude of cases, the benefits to be derived from such a change have been found to more than counterbalance the evils incident to the transport. By the dispersion of the sick, foci of pestilence and death are often broken up; while the sick, disseminated through the country, are thereby less exposed to invasions of hospitalism in any of its forms. Moreover, at points distant from the army, the hospital service, as a whole, can always be established on a more perfect footing than within the army itself. The sick can be made more comfortable in a material point of view, can be better supplied with general and special food, and become the subjects of more direct personal attention. These facts are well known, and when conjoined with the advantages to be derived from disencumbering the army of its sick and disabled, we are led to affirm that, as a rule, whether a greater or a lesser number of sick are transported, or are transported a longer or a shorter distance, will depend largely upon the material means of transportation possessed by the administration, as also conversely, that the transport material will usually be increased quite in proportion as the advantages to be derived from transporting and evacuating the sick, appear to be real and important.

If the medical history of the American War of the Rebellion is valuable from the confirmation which it has given to certain principles of hospital construction, it is certainly scarcely less so, from having shown what immense services might be rendered by a large dispersion of the sick through the country, and by a transport service organized upon a scale wholly unprecedented

in the military history of any State. Convoys of sick were constantly being sent from every military department, by steamboats and railways, to be disseminated amongst the general hospitals of the Northern States, from which, after a few weeks, the majority of the sick were returned to their regiments "fit for duty." The total number of those thus sent back and returned to the army, during the war, was enormous; and no fact is more universally believed by army medical officers in the United States, than that had the sick not thus been sent out of the "field," "post," and "departmental" general hospitals, at times almost *en masse*, the mortality rates in those hospitals would have often attained proportions as formidable as any which have existed in military hospitals during this century.

A large proportion, nearly all, of the seriously sick bear transportations very well when properly conducted; and so also do a majority of the wounded. Provisions should accordingly be made for the treatment of most of the seriously sick, and many of the wounded, neither in the camp nor on the battle-field, but at points more or less remote, yet easy of access from the army by direct lines of communication. Such transportation as is necessary to convey the soldier to these points is a transportation of expediency, it is the best service which can be rendered to the disabled soldier himself, and at the same time it is a service to the army.

Still these general evacuations of the sick have their disadvantages; they involve a heavy loss of time, a large outlay of money and material, and often result in encumbering the approaches to an army, to a degree which may prove disastrous. Moreover, "nothing," says Dr. Letterman, "so disheartens troops and causes home sickness among those who are well, as sending the sick to the hospitals outside the army to which they belong; such was the experience of the armies in the Crimea, and it is that of all armies."¹ Whatever the good results finally secured, by sending the sick from an army, the immediate moral effect of such evacuations upon the army itself is unquestionably bad.

A large number of soldiers must always be treated within the

¹ "Medical Recollections of the Army of the Potomac," by Jonathan Letterman. New York, 1866; p. 15.

army to which they belong; and I will mention first, those who are not seriously ill, but need care, attention, and nursing, to prevent their becoming so. The number of this class is always large, as it is almost certain to include for a time nearly all the seriously sick. To make no special provision in the field for the proper treatment of this class, would result in the transference to remote hospitals of large numbers of soldiers, who would have been saved to the army by a few days' treatment near by, and whose transportation in any event might have been needless, had suitable provisional regimental and corps hospitals been provided.

But there are special classes of sick and wounded; there are those who have been stricken with sharp attacks of acute and painful diseases, and those who have been severely wounded—by missiles or thrusts, which have penetrated the cavities of the head, chest, and abdomen—wounding and compromising the integrity of organs essential to life—by the fracture of the joints and great bones of the limbs—including nearly all those cases of wounds, in which so-called capital operations are required, or are dispensed with only in the hope that conservative surgery may record a new triumph. These classes—those sick with short and violent diseases, and those severely wounded—and the number of the latter is large after every great battle—are *not transportable*, in the sense of being able to sustain an evacuation on to a distant hospital. As a rule the least transportation is an injury to them, and they should be conveyed as quickly and as gently as possible to the nearest hospital, and that hospital should be in the camp or on or near the field of battle. To attempt to send such people in horse litters and ambulance waggons over miles of road, to be transferred to railway carriages, to be re-transferred from carriage to carriage, during perhaps two or three days, is a barbarism—is little less than a homicide. I know of no circumstance which can serve as a pretext even for such a procedure, except it be the retreat and defeat of an army, and even then it would be a hundred times better, except perhaps in a war with savages, to leave the unfortunate sufferers to the mercy of the enemy, than to thus torture them and destroy pretty nearly every chance of life by a cruel kindness.

During the late war the Germans made in some respects a greater use of railway transportation than did the Americans during the War of the Rebellion. Throughout the whole war incessant streams of sick and wounded, coming from every army operating in France, were pouring into the interior of Germany. Had these sick and wounded belonged exclusively to the classes able to bear transportation and evacuation, the course pursued might have been praiseworthy; but so far from this having been the case, the number of untransportable soldiers who were hurried off by rail, to be tortured on the way, and finally to die in distant hospitals, was immense. I know there are persons who admire this German wholesale system of evacuating battle-fields and hospitals. I must confess I do not. It is useless to commend to me the excellence of plaster-of-paris and straw splints, as instruments for holding in their places the fragments of a shattered femur, and it would be equally useless to tell me how comfortably a man with a bullet in his lungs can be borne in a suspended litter in a railway-carriage. The torture incident to these transportations is alone a sufficient cause for condemning them altogether; but the accidents of every kind to which they give rise, and the diminished chances of recovery which they entail, involve those who direct them, governments as well as surgeons, in the gravest responsibilities.

Where these hurried evacuations are resorted to, conservative surgery has but a poor chance; by the joltings in vehicles, and the disturbance incident to removals from beds to stretchers and from stretchers to beds, the positions of the fragments of the shattered bone are changed—these are detached from their connections, and thrust into the surrounding flesh; inflammation results, the periosteum is destroyed, the bone dies, and immense suppurations follow, with burrowing abscesses; the patient begins to sink; the limb is amputated, and shortly after the patient dies—and the *conclusion is*, that it would have been better to have amputated the limb at first, and that the attempt to save it was a mistake. No! the mistake—a mistake in such a case nothing less than a crime—was the sending of the wounded man to a distant hospital; he should have been treated in a provisional hospital on the field.

Says Dr. John A. Lidell, in an able paper on the "Traumatic Lesions of Bone:"—"Again, clinical observation and reflection have convinced me that *the transportation of our wounded during the late war exerted an important influence in the production of osteo-myelitis.*¹ My attention was first directed to this subject about the middle of June, 1863, when a considerable number of patients who had sustained gunshot fractures of the lower extremities were brought to the Stanton United States Army General Hospital, from the Depot Field Hospital of the army of the Potomac at Potomac Creek, where they had been under treatment since the battle of Chancellorsville—a period of about six weeks, and progressing favourably up to the time of their removal from that place. Now, all these patients were rendered very much worse by the transportation; those having fractured thighs suffered most. Several of these patients died of what I now know was osteo-myelitis; and there was good reason for believing that most of these fatal cases would have recovered if the exigencies of the military service had not rendered the evacuation of Potomac Creek a matter of necessity. . . . My attention was again called to the same subject in the summer of 1864. It was observed in some of the Army General Hospitals at Washington, and, I believe, in all of them, that osteo-myelitis and *kindred* disorders were met with much more frequently among the wounded brought directly from the army of the Potomac in the campaign of 1864, which extended from the Rapidan to the James River, than in the campaign of 1862 and 1863 upon the Rapidan and the Rappahannock." At first Dr. Lidell thought the difference might have arisen from other causes, but, after a careful inquiry into the antecedent history of the cases, the comparatively long transportation in ambulances and army waggon over rough roads, to which great numbers of those wounded in the battles between the Wilderness and Cold Harbour inclusive, in 1864, had been subjected, "stood out in bold relief; and I am thoroughly satisfied," says he, "that this affords the true explanation of the prevalence of osteo-myelitis among the wounded brought from those battles. . . . And I am

¹ The *italics* are reproduced from Dr. Lidell's paper.

strengthened in that opinion by the statement of Dr. Moses, that osteo-myelitis was more frequently seen in the Confederate hospital at Charlottesville, among the wounded in the Maryland and Pennsylvania campaigns, than among those wounded at nearer and more accessible places; and also by the statement of Surgeon Henry Janes, U. S. Vols., that but comparatively few cases of this disease occurred among the wounded at Gettysburg, who were treated near the field of conflict."¹

But I will not dwell longer on this subject; enough has been said to point out the disastrous consequences which may follow an indiscriminate transportation of the wounded. The only remedy is to be found in the establishment of field hospitals or ambulances, in sufficient number for the treatment of all the *non-transportable* wounded who may fall in battle.

Indeed, I can hardly believe that any one well acquainted with the radical defects, and with the inevitably disastrous consequences, of the traditional method of hospitalizing armies in the field, can be unwilling to admit that the necessity for a reform is most urgent—or in brief, that each army or expeditionary corps should be furnished with shelter for its sick and wounded, sufficient to render it independent of such resources as may be furnished by the country within which it is to operate, or so far independent as to enable it to organize all its field hospitals—its *ambulances*—in such a manner as that the evils of exposure, bad ventilation, and a pernicious and unnecessary transportation may be avoided; nor do I believe that any one can contend that such provisional shelter should not realize in the largest degree possible all those special hygienic conditions now considered as essential in the establishment of hospitals for the civil population.

If the American ambulance was established at Paris, it was for the purpose of showing by a practical example how these objects might be accomplished.

¹ "Surgical Memoirs of the War of the Rebellion," collected and published by the United States' Sanitary Commission. New York, 1870; vol. i. pp. 341-343.



PART II.

ON TENTS AND TENT-BARRACKS.

“ Quam pulchra tabernacula tua, Jacob, et tentoria tua, Israel! ut valles nemorosæ, ut horti juxta fluvios irrigui, ut tabernacula quæ fixit Dominus quasi cedri prope aquas.”—*Liber Numerorum*, cap. xxiv.





ON TENTS AND TENT-BARRACKS.




S I wish to direct your attention particularly to the material means employed at the American ambulance, for the purpose of accomplishing the object had in view—the establishment of a hospital under canvas, which might equal in sanitary excellence the best permanent hospital,—in taking up, in the order of their importance, the several subjects which I propose to discuss, I am naturally led to speak first of tents. As what signally characterized the American ambulance was the use there made of tents and tent-barracks, and as the employment of such shelter, for many purposes at least, has been known since a very remote time, it has seemed to me preferable to present in a general way the history and characteristics of these constructions; and I am also encouraged to do this, from the fact that very little exact information is to be found in any work, with which I am acquainted, as regards either the tents now in use or those formerly employed.¹ But while it has seemed to be highly desirable that a Report upon a special tent-service, should contain at least a fair summary of our present knowledge of

¹ I perhaps ought to except "Tents and Tent Life," by Major Godfrey Rhodes. London, 1859—the only book ever published in English upon this special subject. The subject holds even a smaller place in French literature, represented as it is by a single brief "Dissertation sur les Tentes ou Pavillons de Guerre," par M. Beneton de Perrin. Paris, 1735. But, aside from a few short articles in encyclopædias and dictionaries, the two works cited complete the bibliography of tents, so far as I am acquainted with it.

tent architecture, such a dissertation would have appeared disproportionately voluminous, had it found a place under any title, in an account of the material organization special to the American ambulance itself; I have therefore preferred to introduce it as a separate part, preliminary to a detailed account of the principal material characteristics of the ambulance.

I shall, in this part of my Report, present the conclusions to which I have arrived concerning the forms or models of tents best adapted for the construction of temporary hospitals; I shall also consider the advantages to be derived from the use of tent-barracks in the hospitalization of troops, and finally shall describe at length several of the forms recently proposed for such constructions.



 F the word tent is used to signify a portable shelter, the use of tents is probably nearly coeval with the origin of man. In Genesis iv. 20, we are told that Jabal was the father of such as dwell in tents.¹ Noah, Lot and Abraham are said to have been dwellers in tents. Indeed, from early Bible history we may infer that for many centuries nearly all the inhabitants of Palestine and Syria dwelt in tents.² As in the earliest ages, so among the primitive and uncivilized tribes which now inhabit the earth, provisional or temporary shelter is chiefly made use of; but in the earliest ages, as among the savage races of to-day, a tent was an establishment, often very different from that which the word now generally suggests to us. Derived from the Latin verb *tendo*, a *tentorium*; tent, conveys to our minds the idea of a

¹ According to the Biblical account, the use of permanent houses preceded that of tents (see Gen. iv. 17); but it is more than probable, that when the Judaical Genesis begins to speak of men and their social habits, the human race had already exhibited itself in a variety of phases, and had shown its power as well to build and dwell in cities, as to subsist in ways more primitive.

² "And Laban went into Jacob's tent, and into Leah's tent, and into the two maidservants' tents, but he found them not. Then went he out of Leah's tent into Rachel's tent."—*Genesis xxxi. 33, &c.*

shelter *stretched out*, or of one afforded by some material which is capable of being stretched out at will. It also, almost invariably, suggests to us a construction made of canvas or some woven stuff. Among all primitive people, however, the "tent" only represents that provisional and more or less portable shelter which they may have the habit of constructing to protect themselves against the heat of the sun, or the vicissitudes of the weather. In the East, where time has wrought few changes in the customs of the people who inhabit those countries whence come our earliest traditions, the tents of Jabal and of Abraham may still be seen. The writer of this report has a most unpleasant remembrance of a compulsory study of the architecture and merits of one of these constructions among the Bedouins of the Jordan. The *tent*—the subject of his painful inspection—was about ten feet square, and six or seven feet high, and was formed entirely of sticks and the branches of trees; with the latter it was thatched overhead, and covered on three sides—the fourth served most conveniently as a doorway, being always wide open; on the ground within was a bit of dirty carpet. It was a rude hut *en bivouac*, that only served to keep the sun out by day and the dew by night; and although the hospitality of its proprietor left nothing to be desired, except perhaps a less avaricious thirst for *backsheesh*, a day passed within it, pretty effectually destroyed all the associations of romance, which he may ever have entertained in connection with tent life, whether among modern or patriarchal Bedouins.¹ The "booth" which

¹ I do not wish to convey the impression, that the Bedouins make use of no other kind of temporary shelter than that which I have described; they often shelter themselves under constructions covered with coarse hair-cloth or skins. Says old Sir John Maundeville:—"In that Syrian desert dwell many of the Arabians who are called Bedouins and Ascopardes, who are people full of all evil conditions, having no houses but tents, which they make of the skins of camels and other beasts which they eat, and under these they sleep and dwell in places where they can find water." Strabo called these Arabs "tent dwellers," *σκηνῖται* (Strabo, book xvi.); and Pliny gives the same name to them—"scenitæ"—because they were in the habit of living in tents (N. H., book vi.). Still, these names are not incompatible with their having dwelt, two thousand years ago, in constructions such as I have described, "booths," which are now much used by the Bedouins, as they also are, and there is every reason to believe have been, used by other Syrian tribes, both ancient and modern.

the prophet Jonah is said to have made and sat under, on the east side of Nineveh, was probably a construction of this sort.

The branches and bark of trees, reeds, and grass, have always been largely used by the constructors of temporary shelter. Many of the nomadic tribes of Siberia still make their huts or tents of the bark of trees; among these, may be mentioned the Kalmucks, the Tungoosians and the Buraets, who employ birch bark for this special purpose. This bark being very flexible, is sewed together piece by piece, and is often very handsomely embroidered.¹ Many of our American Indians were also in the habit of using bark as a covering for their "wigwams;" they also occasionally used reeds and grass for this purpose, as do the Hottentots of this day, who, weaving these materials into mats, make of them a shelter, somewhat as Cæsar informs us the soldiers of his legions, whom he had embarked into Africa, constructed for themselves tents *arundinibus scopisque contextis*.² Achilles' tent, if more imposing, was only a slight improvement upon the same style of architecture.³

Herodotus mentions a peculiar people living on the confines of Scythia, "who dwell all the year round under trees. During the winter they cover these trees with a sort of felt, made of white wool; this covering is taken off as the season becomes warm."⁴ During the Peninsular campaign (1811-14), the English troops, when unprovided with canvas tents, were in the habit of constructing for themselves a kind of shelter, which is thus described by Luscombe:—"The plan pursued was to select

¹ "Oriental and Western Siberia," by Thomas Witlam Atkinson. Philadelphia, 1865; p. 157.

² "De Bello Africano," c. xlvii. Cæsar also here says, that his soldiers made for themselves little tents out of their clothing—"ex vestimentis tentoriolis factis;" and more than all, that these makeshifts were quite useless,—that the rain beat through them, that the fires were put out and the provisions spoiled, and the soldiers at length forced to protect themselves, as best they could, *under their shields*.

³ "Unseen, through all the hostile camp they went,
And now approach'd Pelides' lofty tent;
Of fir the roof was raised, and covered o'er
With reeds, collected from the marshy shore."

POPE, *Iliad*, xxiv. 551-554.

⁴ Herodotus, book iv. c. 23.

a tree (generally a cork tree or an evergreen oak) which had wide-spreading branches; a lower branch was then nearly cut through, so as to allow the extreme points to drop to the ground; other branches were then cut from adjoining trees, and fixed in the ground, so as to form nearly a circle of sufficient dimensions, placed nearly upright, and with the upper branches resting on that branch of the tree under which the hut was to be constructed, and which had been dropped towards the ground. Smaller branches were then interwoven to thicken the walls of the hut, which was afterwards lined on the inside with the broom plant, in the manner of thatching. Care being taken that the door of the hut should have an aspect of nearly due east (so that the sun might pass over it before reaching the horizon), a very agreeable residence was thus provided during the day.”¹ It is described, however, as cold at night, and as probably prejudicial to health.

The first real *improvement* in the construction of temporary shelter, dates from the time when skins began to take the place of the branches and the bark of trees, reeds, and grass. Constructions made of the latter materials are scarcely portable; and although “leafy bowers” may furnish a shelter better than none, it is not to be compared with that obtained by the use of skins, of which material probably was made the first construction that could with accuracy be called a *tent*. The first instance on record in which skins were used to furnish a shelter, is in Exodus xxvii. 14:—“And thou shalt make a covering for the tent of rams’ skins dyed red, and a covering above of badgers’ skins.” The tent here alluded to was none other than the *Tabernacle*.² Indeed, the Israelites, immediately they escaped

¹ “Practical Observations on the Means of Preserving the Health of Soldiers.” Edward Thornhill Luscombe, M.D. Edinburgh, 1820; p. 106.

² From the Bible description of the Tabernacle, as also from the description given by Josephus (book iii. c. 5, “History of the Jews”), it is quite evident that this construction was a tent-barrack, covered almost entirely with tissues of “fine twined linen,” and with “hangings of blue, and purple, and scarlet,” and only provided with double roofs of coarse goats’ hair cloth and skins, to secure its more complete protection from the destructive action of the weather—from rain and sunlight.

from their Egyptian servitude (B. C. 1531), reverted to their ancestral habits of living, and adopted the general customs of the neighbouring nomadic races. "The children of Israel journeyed from Rameses to *Succoth*."¹ The meaning of the word *Succoth* is *The Tents*.² Their tents were probably made of skins, as also of coarse tissues of goats' hair, camels' hair, wool, and linen. Whether skins or woven fabrics were most commonly employed by them for tent coverings, it is difficult to say, although probably, as is now the case in the East, coarse fabrics were generally employed in the construction of their temporary shelter.

The tents now most common among the Arab sheiks are made of camels' hair or goats' hair cloth, and are of a dark grey colour ; they are sometimes even quite black.³ They are oblong in form, from twenty to forty feet in length, from ten to twenty feet in depth, from eight to twelve feet in height, and are supported by numerous poles within, and pickets and cords without. The walls are tied on to the roof, which generally slopes one way—back from the front, which is almost constantly open.⁴ The tent is usually divided into apartments by means of curtains. The inside lining of the tent is generally of some bright-coloured cloth, and the floor is often richly carpeted. These tents have frequently been said to resemble the hulls of ships upside down ; but the similitude was probably first suggested rather by a remembrance of Sallust's description of the Numidian "*mapalia*"—

¹ Exodus xii. 37.

² "Et Jacob venit in Socoth; ubi ædificatâ domo et fixis tentoriis, appellavit nomen loci illius Socoth, id est tabernacula."—*Gen. xxxiii. 17*, "Biblia Sacra Vulgatæ editionis Sexti V. et Clem. VIII." In the English version, "booths" is used as the equivalent of *Succoth*, as well as for the word rendered in the Vulgate by *tentoriis*.

³ "Solomon's Song," i. 5. Volney, vol. i. p. 279. The tents of Kedar are said to have been made of goats' hair mixed with camels' hair. The Arabs still call their tents *beet el shaar*—"houses of hair," and the colour of the covering was determined by the natural colour of the hair used in weaving it. It has been said, (D'Arvieux, "*Voyage dans la Palestine*") that hair-cloth was chosen for the purpose of excluding the rain and dew ; if hair-cloth was used instead of other cloths, it was for the simple reason that among the nomads of Arabia, goats' hair and camels' hair were the principal textile materials known.

⁴ "And Abraham sat in the tent door in the heat of the day."—*Genesis xviii. 1*.

"quasi navium carinæ sunt"¹—than by the appearance of the tents. The Arab tent can at any time be easily increased in size by stretching out the main coverings, and attaching, if necessary, curtains, at the same time replanting the pins and lengthening the cords. It is in allusion to this very ancient practice that the prophet Isaiah exclaims:—"Enlarge the place of thy tent; and let them stretch forth the curtains of thine habitations; spare not, lengthen thy cords, and strengthen thy stakes."² These tents, however, vary very much in size, quality, and elegance; conditions usually dependent upon the wealth of their owners; but the more imposing examples of Arab tent architecture are so far suggestive of the construction described in Exodus, as to render it highly probable, that they represent similar phases of life in the history of civilization. Not only were tents used by the nomadic tribes dwelling in Syria during the earlier periods of Jewish history, but there is reason to believe that they were subsequently, to some extent, used even within the walls of cities, or, as has been suggested, it is not unlikely that the dwellers in cities, at certain seasons of the year, were in the habit of resorting to tents. This at least was a Jewish custom,³ and one which, from the general life of the surrounding population, could hardly have been peculiar. The Egyptians are said not only to have used tents in war, but to have pitched them upon their house tops. So representations of tents are to be seen on some of the sculptures found at Nineveh, together with articles of tent furniture, many of which are quite similar to those still thought most essential to common life in the East.⁴

Harmer informs us that Tamasp, a Persian monarch, passed his winters at Cashbin, and his summers in tents, at the foot of

¹ "Bell. Jugurth." c. xviii.

² Isaiah liv. 2.

³ Leviticus xxiii. 42. It may be observed, however, that the "feast of tabernacles" was not peculiar to the Jews. The Egyptians, Greeks, and Romans had also their *skenopegia*. These feasts were held in the spring or early summer: by the Egyptians, in honour of the god Thammus (Osiris); by the Greeks, in honour of Bacchus; and by the Romans, as a thank-offering to Nature, under the name of Anna Perenna.

⁴ "Nineveh and its Remains." By Austen Henry Layard, D.C.L. Paris, 1850; p. 206.

Mount Alouvent, a place celebrated for its coolness and its delightful scenery; and he states that the custom of this monarch was maintained in Persia until the time of Abbas the Great, who established his court permanently at Ispahan.¹ Paxton supposes that "the curtains of Solomon" were tents to which that great king retired in the heats of summer,² and Pococke and other travellers³ have mentioned the summer villages of canvas, or of reeds and boughs, still to be met with in the East, occupied by people whose winter houses stand empty for the time in the neighbourhood.

Long after a certain civilization had been attained, many of the races of Central Asia cared very little for permanent shelter, as may be inferred, from the statements of several ancient writers who have spoken of tents mounted upon wheels, to be drawn by horses or cattle, as among the peculiar institutions of some of the more wealthy and prosperous of these races.⁴ Such statements are, however, evidently exaggerations resulting from the fact that these nomads have occasionally dispensed with all shelter, except that afforded by carts or waggons covered with bark, felt, or stuffs of wool or goats' hair.⁵ A very good idea of the construction of the dwellings used by vast numbers of

¹ "Observ." vol. i. p. 219.

² "Illustrations of Scripture Manners and Customs," vol. i. p. 78.

³ "The Land and the Book," by W. M. Thomson, p. 296. Layard in op. cit.

⁴ As tents have long been so indispensable to those living in the East, it is quite natural that we should occasionally meet with Oriental allusions to their use by houseless spirits after death. One of the most curious of these allusions occurs in connection with this story. After the establishment of Mahometanism, on a certain occasion, a theological dispute arose between some doctors of that religion and some Jewish rabbis. These last, it is said, positively denying that the others would ever find a place in Paradise, the Mahometans replied,—“Since you pretend that we shall never enter there, and as it seems to be your wish that we remain outside of the gate, it will be necessary for you to provide us with the means of obtaining tents” (*papiliones*). And on this pretext the Jews were immediately charged with a tax, which the Turks have continued to levy, in the language of the narrator, “even to this day.”

⁵ Strabo, book iv. c. 2, 7. Herodotus also mentions these tents on wheels; and Horace has given them notoriety, by referring to the Scythians:—

“Quorum plaustra vagas rite trahunt domos.”—*Od.* iii. 24, 10.

⁶ “Cum carpentis, in quibus habitant.”—*Ammianus Marcellinus*, lib. xxxi. c. 2.


Asiatics, whether in ancient or modern times, may be derived from Atkinson's description of a Kirgis *yourt*. "The *yourt* was formed of willow trellis-work, put together with untanned strips of skin, made into compartments which fold up. It was a circle of thirty-four feet in diameter, five feet high to the springing of the dome, and twelve feet in the centre. This dome is formed of bent rods of willow, one and a quarter inches in diameter, put into the mortise-holes of a ring about four feet across, which secures the top of the dome, admits light, and lets out the smoke. The lower ends of the willow rods are tied with leathern thongs to the top of the trellis-work at the sides, which renders it quite strong and secure. The whole is then covered with large sheets of *voilock*, made of wool and camels' hair, fitting close, making it water-tight and warm. A small aperture in the trellis-work forms a doorway, over which a piece of *voilock* hangs down and closes it; but in the day time this is rolled up and secured on the top of the *yourt*. Such is the dwelling of a great and wealthy chief in the steppe."¹

In general, it may be stated that tents of various kinds have been extensively employed as domiciles, by a considerable portion of the whole population of Western and Central Asia, since a time almost immemorial.

Nor has the habit of dwelling in tents or temporary domiciles been limited to that quarter of the globe. A large part of the human family has been reared in tents, and is still acquainted with no other kind of shelter. In construction, these temporary habitations have varied with the climate and products of the country, and with the necessities and special tastes of the races using them. An almost endless variety may be found described in books of travel. But whatever interest may be connected with many of these descriptions, my present object is rather to consider the use which has been made of tents in war.

¹ "Oriental and Western Siberia," by Thomas Witlam Atkinson. Philadelphia, 1865; p. 225.



HE Greeks are said to have encamped in tents at the siege of Troy; and they were at that time undoubtedly acquainted with the use of tents of skins or woven fabrics. The large fleets, which seem to have been constantly lying before the Greek camps during that memorable siege, sufficiently show, that there was no lack of those materials from which tents as well as sails are made. But, curiously enough, although Homer alludes frequently to the camp quarters of the Greeks, he never mentions the use of tents of canvas, or skins. The word *κλισίη*, which he almost uniformly employs,¹ when speaking of the lodgings of the chiefs, as well as of the common soldiers, signifies a hut or a cabin, rather than a tent. Thus, as we have already seen, the *tent* of Achilles was a sturdy framework, thatched with grass; and Homer speaks of it even, as if it were divided into separate apartments.² Indeed, early Greek writers have perhaps spoken less frequently of portable shelter than would have been the case, had the employment of such shelter been considered by them, at any time, as indispensable to an army.

Herodotus does not allude to the existence of tents in the Greek armies, and refers but twice to their use in war by the Persians; from one of these references, however, we may infer that they were not only numerous, at the time of his writing, in Persian camps, but that they were not wanting in any of the adjuncts and appurtenances of barbaric splendour. After the battle of Platae, Pausanias forbade, in a proclamation, any soldier to touch the plunder which had been captured from the Persians, and at the same time, ordered the Helots to bring it all together into one place:—"And they went through the camp finding *tents*,

¹ "Iliad," book i. ll. 189, 325, 346, 391, 485; book ix. ll. 71, 107, 178, 185, 226, 263, 622, 652, 663, 669, and in many other places.

² Αὐτὰρ Ἀχιλλεὺς εὐδε μυχῷ κλισίης εὐπύκτου.—*Iliad*, ix. 663.

But Achilles slept in the *mucho* of his hut solidly built; that is, the part, or *room*, furthest removed from the entrance.

resplendent with gold and silver;¹ beds, covered with gold and silver ornaments, vases, goblets, and other drinking vessels of gold; and in sacks, loaded upon waggons, gold and silver kettles."² The magnificence of the Persian camp equipage at this period is confirmed by the statements of other writers. Thus Plutarch says, that Aristides did not disappoint those who held him in estimation, on being left at Marathon to guard the prisoners and the booty captured from the Persians:—"For although gold and silver were scattered here and there in the tents (ἐν ταῖς σκηναῖς), and the ships that had been taken were full of magnificent articles of clothing and countless riches, he not only did not appropriate any of these things to himself, but kept others from so doing."³ Xenophon mentions the capture of the tent (ἡ σκηνή) of Teribasus, in which were found beds with silver feet, and drinking cups, as also servants, who reported themselves to be his bakers and cup-bearers.⁴ Xenophon also speaks several times, in his account of the expedition

¹ σκηνὰς κατεσκευασμένας χρυσοῦ καὶ ἀργύρου. The Greek word σκηνή, which is generally considered as synonymous with *tentorium*, tent, tente, &c., is derived from the verb σκῆω, to cover—from which σκιά, a shade—and signifies a temporary domicile, "made," says Stephanus, "of the branches of trees, straw, boards, skins, linen or woollen cloth, or similar material, commonly erected in camps and gardens to make a shade, or as a protection against the rain." The word σκηνή cannot, therefore, be regarded as the equivalent of the English word tent; as for example, in the passage, σκηναὶ λευκοῦ κίττου καὶ ἀμπέλων, tents of white ivy and vines—arbours—which has caused Stephanus to observe: "Nec enim hic reddere queas tabernaculum, quod ex tabulis potius construitur; nec tentorium quod ex pannis lineis laneisve aut pellibus tensis, sed umbracula." (Stephanus, "Thesaurus Græcæ Linguae;" see also Casaubon, "Animadversio in Athenæum," l. iv. c. 21.) So the word σκηνάω—tentorium pono, I pitch a tent—the several inflected forms of which are frequently found in Greek authors, indicates the establishment of a camp under no specific kind of shelter, and oftentimes simply relates to the halting of the army for the night. Still the words σκηνή, σκῆνος, and their derivatives, were used by Greek writers to indicate those specific constructions called in English, tents.

² Herodotus, book ix. c. 80.

³ Plutarch, "Life of Aristides." In the "Life of Aristides," Plutarch makes three other allusions to tents:—τὴν σκηνὴν τοῦ Θεμιστοκλέους—τὴν σκηνὴν τοῦ Πausanίου—καὶ κατασκηνοῦντων ἀτάκτως. Two, inform us that Themistocles and Pausanias, Greek generals, had tents; from the third, we may infer that the Greek troops also had their tents.

⁴ "Anabasis," book iv. c. 4.

of Cyrus, of the Greek "soldier's tent;" and he moreover says they were made of skins. Coming to the Euphrates, the soldiers crossed over it in the following manner:—"They filled the skins, which they made use of for tents, with dried hay, then joined and sewed them together so close, that the water could not get at the hay; upon these they passed the river."¹ Arrian also informs us that Alexander crossed the Oxus, by making use in a similar way of the *skins* of the soldiers' tents.²

That the Greek soldiers who set out upon the expedition of Cyrus, were well supplied with tents, may be inferred from a circumstance which took place after the death of Cyrus, and when, Xenophon having been chosen to command the Greeks, it was resolved to return to Greece. In a speech made to his soldiers, Xenophon said:—"In the first place I think we ought to burn all the carriages, that the care of them may not influence our march, but that we may be directed in it by the advantage of the army. After that, we ought to burn our *tents*³ also, for they are troublesome to carry, and of no use either in fighting or supplying ourselves with provisions. . . . And after he had said this, they all rose up, and departing, burnt their carriages and tents."⁴

With regard to the size of the Greek tents, and their forms and qualities, we are quite ignorant, as we also are of the whole art of castrametation, as practised by the ancient Greeks and Macedonians. To what extent the use of tents among the Greeks may have been adopted from the Persians, it is difficult to determine; it is very certain, however, that the use of splendid tents came as one of the results of the Asiatic

¹ Διφθέρας, ἃς εἶχον στεγάσματα, ἐπίμπλασαν χόρτου κούφου. Literally, The skins which they had as coverings they filled with light grass. "Anabasis," book i. c. 5.

² Arrian, "Life of Alexander;" book iii. c. 10. Indeed, Arrian's words are quite unmistakable in their meaning:—τὰς διφθέρας ὑφ' αἷς ἐσκήνου οἱ στρατιῶται. The skins under which camped the soldiers. Arrian also speaks, in the same work, of the passage of the Danube, of the Hydaspes, and the Acesines, and in each instance, the construction of the rafts used, is described in almost exactly the same terms (see book i. c. 1; book v. c. 3; book v. c. 5).

³ ἔπειτα καὶ τὰς σκηνὰς συγκατακαῦσαι.—*Anabasis*, b. iii. c. 2.

⁴ καὶ ἀπελθόντες κατέκαιον τὰς ἀμάξας καὶ τὰς σκηνάς.—*Ibid.* b. iii. c. 3.

conquest of the Greeks. We first hear of them in the Greek cities of Asia Minor, and Plutarch particularly notices the magnificent tent, which the Ephesians erected in honour of Alcibiades.¹ I have already alluded to the wealth found in the captured camps of Xerxes' armies. His successor, Darius, was not less prodigal in the equipment of his troops, and his own royal pavilion is spoken of as a wonder, full of everything which luxury could suggest or wealth obtain, while above the pavilion, where all could see it, "flamed an image of the sun set in crystal."² Alexander seems at times, if we can credit the accounts which have reached us, to have even surpassed Darius in the magnificence of his pavilions. At least, the splendours of Alexander's tent, "tabernaculo adornato quod centum lectos caperet,"³ held their place, even among the legends of popular mediæval romance.⁴

In the second book of the "Deipnosophistæ" of Athenæus, is an account taken from Masurius or Callixenus Rhodius, of the splendid fêtes given by Ptolemy Philadelphus, in celebration of the apotheosis of the first Ptolemy (Soter). A tent (σκηνήν) of marvellous beauty was erected within the citadel of Alexandria; it was fifty cubits high, and supported by wooden columns, some of them so carved as to represent the foliage of palm-trees, while others imitated the thyrsus. The ceiling of the tent was of purple cloth, embroidered with white, while all around hung draperies festooning the supports, the spaces between which were filled with various emblematical pictures. The ground was covered with Persian carpets, inwoven with the figures of

¹ Plutarch, "Life of Alcibiades," c. xii.

² Quintus Curtius, lib. iii. c. 3.

³ *Ibid.* lib. ii. c. 2; also Diodorus Siculus, Σκηνήν δὲ κατασκευασάμενος ἑκατοντάκλινον, book xvii. c. 16; and Athenæus, Deipnosophistæ." Lugduni, apud viduam Antonii de Harsy, 1612; p. 539 (lib. xii. c. 54, 538 c).

⁴ "Del tref roi Alixandre voel dire la faiture :

Il est et grans et lés et haus à de mesure ;

L'estace en fu d'ivore, à rice entableure ;

Quant ele estoit drecie, il n'i paroît jointure.

Li cies en estoit d'or, tous à noeleure ;

De fin or espagnois estoient li paisçon

Et les cordes de soie, qui tendent environ," &c.

Li Romans d'Alixandre.

animals. In one of these tents were one hundred golden beds, with sphinxes' feet, arranged in a circle on the sides, and overhung with purple tapestry of velvet. And here also were placed two hundred tables, fitted with silver shelves. At the end of the tent, below the beds, were one hundred silver basins and ewers, and farther down, upon a superb sideboard, were vases and goblets and the splendid service of the feast, of wonderful workmanship, in gems and gold.

Athenæus estimates at ten thousand silver talents, (over 7,500,000 dollars,) the value of the vases and goblets alone, used upon these tables; and this without counting either the cost of the workmanship, or the precious stones which might have been set in them.¹

But I have perhaps dwelt sufficiently upon constructions which rather illustrate the ancient wealth and prodigality of the East, than the common life of the armies which have become famous in its history.

From a passage in Livy, it has been inferred that tents were adopted in the Roman army during the second year of the siege of Veii, in the 349th year after the foundation of Rome. These tents were said to have been made of skins or leather. There are reasons for believing, however, that tents were used by the Romans before this time. If we can trust the statement of Dionysius of Halicarnassus, the cities of Latium, which were engaged in almost perpetual wars with the Romans, after the expulsion of the kings, were rich and even highly civilized. Dionysius frequently alludes to the presence of tents in the armies sent by these cities against Rome.² In the 300th year of Rome, in the campaign which Siccus conducted against the Æques, Siccus having captured the enemy's camp, "set fire to the tents, (τὰς σκηνάς,) which were full of arms, and corn, and goods, and munitions of war, and burnt up all the plunder and wealth which had been stripped from the Tusculans."³ In the first year of the 83rd Olympiad (306th year of Rome), the Romans again declared war against the Æques, and were in turn defeated. In narrating

¹ Op. cit. p. 196.

² Dionysius of Halicarnassus, book ii. c. 2; book viii. c. 6; book ix. c. 4, &c.

³ *Ibid.* book x. chap. 8.

this defeat, Dionysius for the first time speaks of Roman tents:—
“The enemy plundered their tents, carried off their beasts of burden, their silver, their slaves, and all their munitions and apparatus of war.”¹

Moreover, Livy does not say that tents were first used by the Romans at the siege of Veii; he says, the Roman generals then first caused *winter quarters* to be built—*hibernacula etiam ædificari cœpta, res nova militi Romano*.² The words *hibernacula* and *ædificari* would hardly have been used had it been proposed to provide only tents. It is true that the demagogical tribunes made the continuance of the campaign a pretext for complaining that the whole army was thus forced to pass the winter in tents—*sub pellibus durare*; ³ but this expression, even, implies that the army had long been more or less accustomed to be *sub pellibus* in summer encampments; and the inference is confirmed by the statement of Florus, that at this siege of Veii, the Roman army first *passed the winter* under tents made of skin—*tunc primum hiematum sub pellibus*.⁴

Of the form and qualities of the tents used in encampments, in the earlier periods of Roman history, as also of the proportion of the tents to the troops in the field, we know almost nothing. There were times when their use is said to have been forbidden even in the winter,⁵ and the Roman military authorities seem always to have considered tents as an impediment, and to have not unfrequently dispensed with them altogether. Probably Ovid's lines very accurately represent Roman encampments, as they existed for a long time after tents first began to be used:—

“Sub Jove pars durat; pauci tentoria ponunt;
Sunt quibus è ramis frondea facta casa est.”⁶

Camped a few in tents, some in the open air,
While bowers and booths were well-nigh everywhere.

It is evident, however, that as the Roman armies became

¹ Dionysius of Halicarnassus, book xi. chap. 4—*σκηναὶ καὶ ὑπολύγια καὶ χεῖματα*, κ. τ. λ.

² Livy, lib. v. c. 2.

³ Id. in loco citato.

⁴ Florus, lib. i. c. 12.

⁵ Bardin, art. “Tente.”

⁶ Ovid, “Fast.” iii. 527.

larger and better organized, and were sent upon more distant and longer campaigns, the necessity of sheltering the troops becoming more and more apparent, tents began to be regarded as an indispensable part of a soldier's equipment.

Livy, in his "History of Rome," speaks of tents or huts—*tentoria, tabernacula*—perhaps twenty times; but the words, unfortunately, generally occur quite unaccompanied by any account, either direct or indirect, of their forms, construction, or qualities.¹ After the defeat of the Romans by the Etruscans (300 B. C.), Valerius Maximus is said to have found, on visiting the Roman camp, the cohorts which had lost their standards, outside of the stockade and *destitute* of tents.² The obvious inference from this statement is, that the cohorts at the time mentioned were habitually provided with tents; and we are told that when Pyrrhus, about twenty years later, during the war of Tarentum, having taken a considerable number of Roman prisoners, gave these up without ransom, the Roman general, wishing to punish these troops for having been taken prisoners, degraded them all, and among other punishments, refused to the foot soldiers the use of their tents.³

Livy also informs us, that less than a hundred years after, the regularity and order observed in laying out a Roman camp were

¹ I may here remark that the word *tabernaculum*, although sometimes used by Latin writers as a synonym of *tentorium*, generally signifies a hut or booth, and not a *tent*. Thus Cæsar, in speaking of the luxury in Pompey's camp, says, there were tables and sideboards loaded with silver plate, "and booths covered with fresh turf, and some even, as that of L. Lentulus, overhung with ivy"—*recentibus cespitibus tabernacula constrata, L. etiam Lentuli et nonnullorum tabernacula protecta ederat*. ("De Bello Civili," lib. iii. c. 96.) Although the word *tabernacula* in this connection has frequently been translated by the words *tents, tentes*, such translations are inexact. The improbability of laying courses of sods, or training vines upon awnings of skin or canvas, is quite evident. Lucan, in speaking of the same booths, says:

"Capit impia plebes

Cespite patricio somnos."

LUCAN, *Pharsalia*, lib. vii.

² "Extra vallum sine tentoriis destitutas invenit."—Livy, book x. c. 3.

³ "Decreverunt, ut ex iis, qui equo meruerant, peditum numero militarent, qui pedites fuerant in funditorum auxilia transcriberentur; neve quis eorum intra castra tenderet, neve locum extra assignatum vallo aut fossa cingeret, neve tentorium ex pellibus haberet."—VALERIUS MAXIMUS *De Disciplinâ Militari*, lib. ii. c. 7.

such, as to particularly excite the admiration of those who were then first made acquainted with the Roman system of castrametation. Thus Philip of Macedonia, when he first saw a Roman camp, and observed the regularity with which the tents were pitched, and the width of the streets, said :—"Such a camp cannot be the camp of barbarians."¹ In the war which followed against Perseus, each soldier had his tent;² and Scipio Asiaticus, when carrying on war against Antiochus, informed his soldiers, that unless the campaign was brought to a speedy close, they would be compelled to winter in their tents—*aut sub pellibus habendos milites fore.*³ It is certainly a little surprising that Polybius, who, in a work written about 150 years before the Christian era, devotes a chapter to the description of the Roman system of castrametation, should enter into no details relating either to the form of the tents used, or the materials of which they were made. His description, however, of the *position* of the tents occupied by the generals, the tribunes, and the troops of each class, makes it perfectly certain that portable tents had been regarded as essential to well organized camps long before his time.

Cæsar gives us to understand, that his troops were generally well provided with shelter *in tabernaculis*,⁴ as also, that even the sutlers who followed his armies had their tents, on the borders of the camp—*sub vallo tenderent mercatores.*⁵

Cæsar also tells us, that the tents were sometimes used as a roofing to other constructions. Thus, on one occasion, his men were quartered partly in houses and partly in constructions covered over with skins and thatch—*atque in tecta partim Gallorum, partim quæ, conjectis celeriter stramentis tentoriorum integendorum gratiâ, erant inædificata, milites contegit.*⁶

¹ "Tum tendentium ordine, tum itinerum intervallis, et negasse barbarorum ea castra ulli videri posse."—*Livy*, lib. xxxi. c. 34.

² "Miles ad sua quisque tentoria discurrit."—*Ibid.* lib. xlii. c. 58.

³ *Ibid.* lib. xxxvii. c. 39.

⁴ "De Bello Gallico," lib. i. c. 39.

⁵ *Ibid.* lib. vi. c. 37.

⁶ *Ibid.* lib. viii. c. 5. May we not infer, from a passage in Cæsar, that tents were sometimes similarly used to protect the soldiers on transport ships? The troops on a certain expedition, are said to have been so short of water, as to have been compelled to gather the dew which fell during the night upon the skins which covered the ships—*ex pellibus, quibus erant tectæ naves.* ("De Bello Civili," lib. iii. c. 15.)

And finally, at a later period, we find Vegetius laying down the rule, that, if the health of the army is to be considered, not even in the summer should the soldier be without a tent—*ne sine tentoriis æstate milites commorentur*.¹ Indeed, mere allusions to the presence of tents in Roman armies, may be found as frequently in contemporaneous writers, as allusions to a similar means of encampment, are to be found in the literature of our own time, for they are by no means confined to the purely historical writers. Thus Lucan speaks particularly of Cæsar's tents,—

“Deseruere cavo tentoria fixa Lemanno,
Castraque quæ Vogesi curvam super ardua rupem.”²

And again,—

“Et subitus rapti munimine cespitis agger
Præbet securos intra tentoria somnos.”³

But to multiply these citations is needless; what is principally to be regretted is, that with all the abundant and even inexhaustible evidence of the almost constant presence of tents in Roman encampments, at this time (that of Cæsar), scarcely a word is to be found descriptive of them, while even the bas-reliefs and medals, in which their outward forms may have been repeated, have probably disappeared for ever.

Reticent as have been Roman historians on nearly every subject, which directly concerned the administration of their own military service, we can hardly expect from them much information concerning the measures adopted by foreign states for maintaining and supplying active armies.

Cæsar gives no account of the manner in which the Gauls, Germans, or Britons, were in the habit of sheltering themselves during their campaigns; except, perhaps, when speaking of a certain Roman camp, he says the cabins of the troops were covered with straw, *in the Gallic fashion*.⁴ In but a single instance, however, does he refer to a Gallic *tabernaculum*, that of Teutomatus;⁴ and as for the Germans, he only says, in speaking

¹ Vegetius, lib. iii. c. 2.

² Lucan, “Pharsalia,” lib. i.

³ “Quæ more Gallico stramentis erant tectæ.”—*Bello Gallico*, lib. v. c. 43.

⁴ *Ibid.* lib. vii. c. 46.

of the Suevi, that they were a nomadic people, who never remained longer than a year in one place.¹ There can be little doubt, however, that both the Germans and the Gauls, accustomed as they were to the use of various kinds of temporary shelter, were acquainted with that furnished by light and portable coverings. It is scarcely necessary to refer to the well-known readiness of the Gauls, in particular, to imitate their enemies in the use of everything which promised to be of the least service in war;² the immense amount of baggage which constantly followed their armies, and the frequent presence in their camps of the women and children of the whole tribe which might be at war, are the indirect but sufficient proofs that such coverings were used by them.³ Plutarch, moreover, distinctly asserts that the Gauls used tents, during their wars with Cæsar; and that their tents were true tents of skin, or some kind of cloth, is evident from the fact, that at least on one occasion, they formed no inconsiderable part of the plunder brought into the Roman camp.⁴

Two or three passages in Livy have fortunately preserved for us the fact that the expeditionary armies of Carthage were provided with portable tents. We are told that when Hannibal crossed the Alps into Italy, the weather was severely cold, and that his troops were in the habit of building up fires before their tents—*ignibus*

¹ Cæsar, "Bello Gallico," lib. iv. c. 1. Tacitus says, everybody knows the Germans do not live in cities; that the art of building seemed to be unknown among them; that they constructed their huts of the rudest materials; and that they very commonly passed the winter in holes dug in the ground—*Solent et subterraneos specus aperire,—suffugium hiemi et receptaculum frugibus* ("Germania," c. 16); and this practice seems to have long prevailed, among the rude races who inhabited northern Europe. So late as the tenth century, a large portion of the Scandinavian peasantry passed the winter in trenches in the ground; while their chiefs lived in huts built of timber, but so covered over with earth and turf as to resemble natural hillocks, especially when crowned with the rank vegetation, which sprung up upon them, during the spring and summer months. ("Les Scandénaves." Paris, 1801; tome i. Notes de M. de Montbron.)

² Cæsar, "Bello Gallico," lib. vii. c. 22.

³ *Ibid.* lib. i. cc. 5, 26; and Tacitus: "Unde feminarum ululatus audire, unde vagitus infantium; hi cuique sanctissimi testes, hi maximi laudatores."—*Germania*, c. 7.

⁴ καὶ σκητὰς Γαλατικὰς ὑπὸ τῶν Ῥωμαίων εἰς τὸ στρατόπεδον κομιζομένας.—PLUTARCH, *Life of Cæsar*, c. 27.

ante tentoria factis.¹ But this statement is followed by another even more explicit; it substantially proves that the *tentoria* above mentioned were carried on the march, and that they were moreover made of skins or some kind of cloth. Shortly after Hannibal had broken up his winter camp, his troops, while crossing the Apennines, were overtaken by a great storm followed by cold and windy weather, which occasioned sufferings, if possible, severer even than those which had been endured in crossing the Alps; and the principal or direct cause of these sufferings, is said to have arisen from the circumstance that the tents, soaked by the rain, became so stiff when it grew cold as to make it nearly or quite impossible to *unroll* them, while a violent wind blew down everything which was set up.² Hannibal also is said to have occasionally deceived the Romans by leaving some of his tents standing on moving out of his camps.³

Again, Asdrubal's army in Spain is represented as encamped in tents, in which the soldiers quietly reposed—*quietos in tentoriis suis*.⁴

But the most remarkable account which Livy gives of a Carthaginian encampment, relates to certain winter quarters occupied by Asdrubal, after Scipio had carried the war into Africa. These winter quarters were made for the most part of light and unsubstantial wood, the materials having been brought in very hurriedly from the surrounding country; those of the Numidians, especially, were made almost entirely of reeds and coarse matting, and were scattered about without order.⁵ The camp being thus composed of frail cabins, Scipio burned it up—*proximis casis injectus ignis hæsit*.⁶ A similar encampment is said to have been formed by Nabis, King of Lacedæmonia, during his war

¹ Livy, lib. xxi. c. 55.

² "Nam nec explicare quidquam, nec statuere poterant: nec, quod statutum esset, manebat . . . ut, omnibus omissis, procumberent homines, tegminibus suis magis obruti, quam tecti."—Livy, book xxi. c. 58.

³ *Ibid.* xxii. c. 43.

⁴ *Ibid.* xxii. c. 19.

⁵ "Hibernacula Carthaginiensium, congesta temere ex agris materia exædificata, lignea ferme tota erant. Numidæ præcipue arundine textis, storeaque pars maxima tectis, passim nullo ordine," &c.—Livy, book xxx. c. 3.

⁶ *Ibid.* book xxx. c. 5.

with the Romans (192 B. C.)¹ As this camp was likewise destroyed by fire, we may well doubt if constructions of the sort described, were much resorted to by the Romans after, engaging upon wars of conquest, they had established their armies upon a permanent footing. It is true that Tacitus speaks of Corbulo's army wintering in Cappadocia *raptim erectis tuguriis*;² but the Romans unquestionably preferred, as well for strategic reasons as from considerations of convenience, small solidly constructed huts, *tabernacula*, for their stationary or winter camps; and for their flying or summer camps, *tentoria*, tents made of skins.

Bardin says that "when campaigns were inevitably prolonged, the huts and barracks, which were called *tabernacula*, were replaced by tents made of skins."³ This would seem to be an inversion of modern practice in the method of sheltering troops. It will be understood, however, that as these huts, or booths, were constructed of boards, the branches of trees, or even turf, they were seldom transportable, and that in consequence, tents of skin were greatly to be preferred for active campaigning.

The Romans rarely carried on war in the winter, but were accustomed to take up their quarters, as soon as the season became inclement, *in hibernis*. The character of the constructions within which the troops dwelt, in these winter quarters, is very rarely indicated in Latin authors. It is occasionally evident, however, from the context, that the troops were then often quartered upon the inhabitants of the towns and cities at or near the seat of the war.⁴ Probably, in most cases, the army passed the winter in huts, *tabernacula*, while occasionally, as we have seen, they continued to remain, notwithstanding the inclemency of the season, *sub pellibus*.

It is very certain that the Romans in their winter camps, *stativa hiberna*, generally hutted their troops, and that the use of tents of skin in the winter, was always considered a hardship. Thus Tacitus, referring to the strict discipline of Corbulo, says:—

¹ "Pauci tabernacula haberent, multitudo alia casas ex arundine textas fronde, quæ umbram modo præberet, texissent," &c.—*Livy*, book xxxv. c. 27.

² Tacitus, "Annales," lib. xv. c. 6.

³ Bardin, art. "Tente."

⁴ *Livy*, lib. xxvii. c. 40; lib. xxxii. c. 39; lib. xxxiv. c. 48; lib. xli. cc. 10-14; lib. xliii. cc. 7-10, &c.

"The whole army was kept in tents, *sub pellibus*, although the rigour of the winter was such, that the earth, covered with ice, would not without digging afford a place for the tents."¹ And Frontinus, among the numerous examples which he gives of the exercise of a strict and even severe military discipline, states that:—"The Senate ordered the consul Valerius to lead his defeated army to Serinum, and there establish his camp, and pass the winter under tents."²

The only details we possess, concerning the form and size of Roman tents, date from the time of Trajan.

On the column erected to commemorate the Dacian campaign of this Emperor, are representations of the equipage used by the troops engaged in that expedition. Among these, are the figures of huts and tents. If the bas-reliefs on this column faithfully represent the several kinds of shelter used by Roman armies, at the beginning of the second century, it would seem as if small framed houses were then more employed as a shelter than tents, while even of the tents, most appear to have had wooden frames



FIG. 6.—A Roman soldier's hut, *tabernaculum*.
From the column of Trajan.

and roofs, the walls alone being made of skins or canvas; but as Montfaucon has observed, the relative size of these constructions was evidently not regarded in the designs, and it is equally probable, that the forms the artist most

frequently chose to delineate were not those most common in Roman camps.

The first figure to which I may call attention (Fig. 6) is that of a small wooden building, which was very likely intended

¹ "Retentusque omnis exercitus sub pellibus, quamvis hieme sævâ adeo ut, obductâ glacie, nisi effossa, humus tentoriis locum non præberet."—TACITUS, *Ann.* lib. xiii. c. 35.

² "P. Valerio consuli senatus præcepit exercitum ad Sirim victum ducere Serinum, ibique castra munire, et hyemem sub tentoriis exigere."—SECT. JUL. FRONTINI *Strategemata*, lib. iii. c. 1.

to represent a well-constructed *tabernaculum*, or soldier's hut. It will hardly do, however, to infer from the sketch that the Roman troops were habitually quartered, even in permanent camps, in such well-built barracks; it is by no means improbable that these strong wooden buildings were used chiefly for store-houses; whatever may have been the uses to which they were put, there is an artistic finish about the relief which was probably absent in the model.

Fig. 7 represents also a *tabernaculum*, but one made on a different principle. A frame-work of wood, surmounted by a roof covered with shingles or boards, is enclosed on all sides by curtains of some flexible material impermeable to rain. These are so arranged as to be opened, or even rolled up and attached to the roof, the weather permitting. This *tabernaculum* is in principle a very excellent example of the constructions now known as tent-barracks.

Vopiscus may have referred to such constructions when, in his "Life of Aurelian," he speaks of the skins prepared for the *tabernacula* and tents—*pelles ad tabernacula et tentoria paratæ*.

Sometimes the frame-work was made lighter, the roof as well



FIG. 7.—A Roman tent-barrack, *tabernaculum*.
From the column of Trajan.

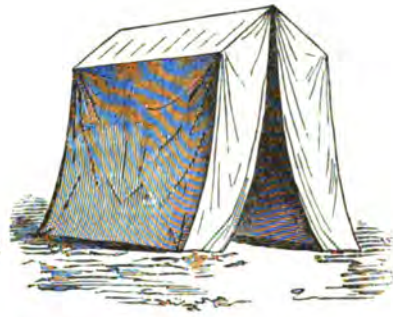


FIG. 8.—A Roman tent or *tabernaculum*. From the column of Trajan.

as the walls being covered with skins or canvas, as was probably the case in a tent represented on the column of Trajan, and of which a sketch is shown in Fig. 8. To that construction, Livy's words might be applicable—*nautici tabernacula detendunt*.¹

The characteristic peculiarity of the *tabernaculum* seems to

¹ Livy, lib. xli. c. 3, 7.

have been its *frame-work*; it might be covered with boards, or turf, or skins, or canvas, and have various sizes and shapes, but it would appear always to have been supported by a skeleton of posts and rafters, and often, in this respect only to have differed from the *tentorium*.

Isidorus says, the *tabernacula* were so called, because the coverings stretched out with cords rested upon a frame-work, which sustained the tent—*Dicta tabernacula, quod cortinæ funibus distentæ tabulis interstantibus, appenderentur, quæ tentoria sustinerent*.¹

Among the designs on the column of Antonine, is one shown in Fig. 9, which was evidently intended to represent an

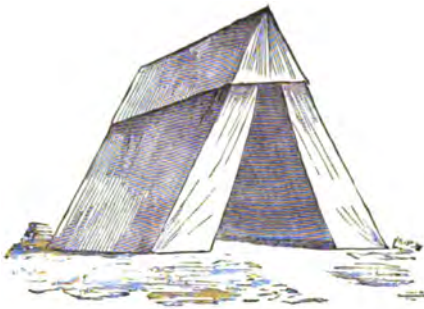


FIG. 9.—A Roman tent, *tentorium*. From the column of Antonine.



FIG. 10.—A Roman tent, *papilio*. From the column of Trajan.

ordinary soldier's tent; its primitive form is proof sufficient of this. Doubtless, the form and size of the common soldiers' *tentorium* varied more or less at different periods of Roman history, and according to special circumstances, but it is almost certain that the sketch in the figure, representing, as it does, one of the types of tent construction most common to all ages and to all countries, also shows one of the forms most used by the Romans, not only of Trajan's time, but during many preceding centuries, and conveys to us the best idea it is possible now to obtain of the character of the shelter Roman troops were provided with, when they were said to be *sub pellibus*.

This *tentorium* very closely resembles the so-called "wedge-

¹ Isidorus, quoted by Justus Lipsius "*De Militiâ Romanâ*." Antverpiæ, 1596; book v. p. 57.

tent" of the present time; it was probably supported by two upright standards and a ridge pole, while the covering stretched out at the sides, and perhaps also at the bottom or rear of the tent, was pegged directly to the ground, along the line of its lower border. As from the shape of the tent, but a small surface was exposed to the direct force of the wind, stay ropes were not needed, a great advantage from many points of view. Indeed, the tent would appear to have been chiefly commendable for general usage, by reason of the simplicity of its construction. It may seem as if a tent which requires three poles to sustain it, is less simple than a tent supported by a single pole; but this is not the case. No tent can be supported by a single mast, the covering for which has not been previously prepared with reference to such a support; while wedge tents may be made by throwing almost any kind of covering over a bar, lifted at one or both ends from the ground, and drawing out and fastening to the ground its dependent borders.

It would appear from the sketch, that the ridge of the Roman *tentorium* was protected by a special covering of some sort. What may have been the particular object of such an arrangement, I am by no means ready to affirm. I may observe, however, that although the dimensions of this tent are unknown, it was probably intended to be occupied by eight, perhaps ten soldiers; it must therefore have had a width and depth of at least ten feet, with a corresponding height.¹ Now, if this tent had such dimensions, it is very evident, that covered as it was with skins, no single breadth of these would reach from the ground to the ridge-pole. It is by no means improbable, therefore, that this kind of tent was made in two or three sections—side pieces, reaching up from the ground to within a foot or two of the ridge-pole, laced together at the rear of the tent, and fastened to the ridge-pole above by slings, and a roof piece, which serving as a hood, completed the covering. Such an arrangement would have greatly facilitated the transportation of the tent coverings, which, had they been made in a single piece,

¹ "Papilio tegit homines octo."—HYGINUS GROMATICUS *De Castrametatione*. "Ut decem militibus sub uno papilione degentibus."—*Vegetius*, lib. ii. c. 13.

as are our modern canvas tents, must have been very heavy and cumbersome. Moreover, as these tents were made of a material absolutely impermeable to air, it would have been quite impossible to have placed a number of soldiers within one, had no measures been taken to ensure a natural and permanent place of exit for the air, heated and vitiated by such an assemblage of men. Supposing the upper part of the tent to have been covered only by a loosely fitting hood, it will be easy to understand how greatly such an arrangement must have contributed to the comfort as well as the health of the occupants of the *tentorium*.

On the arch of Constantine may be seen, in outline, two conical tents which in form, as well as by reason of hood-like coverings at the summits, strikingly resemble some of our modern tents.

Another Roman tent has been pictured upon ancient monuments ; it was round in form, and covered with a sort of dome, from which the walls fell almost perpendicularly to the ground, while an ornamental border frequently concealed the line upon which the roof and curtains met. (See Fig. 10.) This tent would appear to have had a special name, and to have been perhaps the most important and considerable of all the tents used in the later Roman encampments.

Tabernaculum and *tentorium* are the only words used by the purest Latin writers, when they may have wished to specify the kind of shelter employed in encampments.¹ Even Frontinus, who wrote on the "Stratagems of War" (A. D. 86), when speaking of tents, employed only the word *tentorium*. Some time, however, within the thirty years which followed the work of this

¹ The word *prætorium* is often translated *tente*, *tent*, &c. ; but it has a much broader meaning than such a translation would indicate, and would be much better rendered, as Mazeroy has suggested, by *quartier-général*—*head-quarters*, or even by the words *general's quarters*, as Gibbon translates it (see "Decline and Fall of the Roman Empire," book i. c. i.). So, also, it would be improper to render Cæsar's words, *depositis in contubernio armis*—leaving their arms in their tents. The *contubernium* was the soldiers' quarters, or rather, perhaps, the *squad* occupying those quarters. The soldier's hut was rarely, if ever, called a *taberna* ; this word belonged essentially to civil life:—

"Pallida mors æquo pulsat pede pauperum tabernas
Regumque turres."—*Horace*, lib. i. ode 4.

"Tabernæ dicuntur ædificia qualiacunque popularis usus."—BARTHOLOMÆUS, *Romanæ Antiquitates*.

writer, the word *papilio* seems to have come into very general use, either as a name for a special kind of tent, or as a term applicable to tents in general. The origin of the use of this word, whether as the name of a special tent, or as a generic term for tents, is very uncertain. Pliny, I believe, is the first author who uses the word *papilio*, but neither he nor those writers on military subjects—Hyginus, Modestius, Vegetius—who gave this new word currency, have taken the trouble to describe the *papilio*, and singularly enough, they have not even employed a chance expression suggestive, in any respect, with regard either to its origin or its essential and distinctive characteristics. The statement of Isidorus, a writer of the seventh century, that tents were called *papiliones* from their resemblance to butterflies,¹ has generally been repeated in subsequent explanations of the meaning of the word *papilio*, generally with the additional observation, however, that the resemblance existed particularly when the walls of the tent were drawn out on the sides at the doorway, in a wing-like fashion, as shown ante, Fig. 10.²

¹ "Papiliones tentoria dicuntur a similitudine parvi animalis volantis, hæc sunt aviculæ."—ISIDORUS, in *Calepinus*.

² "Quia expansa vela habet ad similitudinem alarum papilionis" (see *Papilio*, "Lexicon" Jacobi Facciolati; Rich, "Roman Antiquities;" Bardin, art. *tente*). "Papiliones, pavillons, sont aussi dictz tentes, a la semblance d'un oysillon qui vol." (Robert Valturin, translatez de langue Latine en Francoyse, par Loys Meigret, Lyonnois. Paris, 1555; p. 120.) Schelius gives a reason for the lifting up of the walls of the *papilio*. He infers that, as the arms, &c., must have been placed behind the tents, it would have been very convenient to have had a ready access to them. "Hence," he thinks, "*tentoria* took in camps the name of *papiliones*, because covered with skins, opened both in front and behind, to furnish a passage-way, the four flaps or wings of these, when raised up a little, might have had a certain resemblance to flying butterflies." "Ac inde, opinor, castrense hoc nomen tentoria traxerunt, quod binis à fronte et à tergo pellibus in medio ad exitum apertis et divisis, in modum quatuor alarum tegerentur, quibus hinc paulum allevatis inde papilionum volantium similitudinem quandam exhiberent." ("Hygini Gromatici de castris Romanis quæ exstant," &c. Amstelodami, 1660. Notæ Schelii, p. 2.) Wedgewood suggests that this name was given to tents because their sides, when *flapping*, were like the moving wings of butterflies. Ferrari, however, explains the origin of the word in another way. He says tents are called *papiliones*, not because the butterfly spreads out its wings like a tent, but because *papiliones* was the generic word for winged insects, as a protection against the annoyance of which, canopies were attached to beds; and that from their resemblance to these canopies, military tents obtained

It is by no means certain that this presumed resemblance was one wholly of form. That the *papiliones* were sometimes highly ornamented, is evident from an expression—*aurati papiliones*—used by Trebellius Pollio;¹ it is therefore not improbable that certain tents may have been first called *papiliones*, from their resemblance to butterflies, as well in the richness and variety of their colours, as in the form sometimes given to them. But it has been more than intimated that the *papilio* possessed a quality in some respects even more distinctive than those of form and colour. If Pliny's statement, *Numidæ vero nomades, a permutandis papilionibus*,² is suggestive of lightness,—of the facility with which these constructions were moved, or rather flew, like butterflies, from place to place,—a passage in Tertullian attributes this quality to the *papilio* quite explicitly. "In time of war, no soldier," says that writer, "is surrounded with luxuries, nor does he go forth to battle from his couch, but from the snug and *swiftly moved papilio*"—*sed de papilionibus expeditis substrictis*.³

Papilio and *tentorium*, and even *tabernaculum*, having been apparently used as synonymous by Latin writers of the brazen age, it has been inferred that there was really no difference in the objects represented by these words. Hyginus does not certainly indicate any distinction between them, and this has led Schelius to say, that *papilio* was but a common camp name for both the *tentorium* and the *tabernaculum*.⁴ Now, with all due deference to the authority

their new name. "Tentoria dicta sunt papiliones; non quod id animal, dum flores delibat, alas instar tentorii extendit; sed quod genericâ voce culices papiliones dicti sunt: adversus quorum tædium conopœa lectis abtenta, a quorum similitudine tentoria militaria, pariter padiglioni, sunt appellata." Ménage ("Dictionnaire Étymologique de la Langue Française") considers this explanation as satisfactory as any which can be given.

¹ In "Tyrann. Herod." c. 15.

² Pliny, lib. iii. c. 5. It is only proper that I should say that there is a variation in the reading of this passage, and that in certain texts *pabulis* is used instead of *papilionibus*.

³ Tertullianus "Adversus Marcionem," lib. iii.

⁴ "Vidi, qui vellet tabernacula principum, gregarii militis papiliones esse, . . . Sed Romani tam his quam illis tentoria ex pellibus attribuebant quæ castrensi vocabulo papiliones vocabantur" (Rathbodi Hermanni Schelii, "Thesau. Antiq. Rom." Notæ in Hyginum); and this opinion was repeated by Schwebelius, one of

of that learned but somewhat heavy German commentator, when we remember that the word *papilio* suddenly came into use, and within a period not exceeding fifty years, nearly excluded for a time from the Latin speech those common words previously used to indicate tents or the portable shelter employed by troops, it becomes quite impossible to entertain the opinion he has expressed. If *papilio* is simply a synonym of *tentorium* and *tabernaculum*, it is not probable that its introduction into the vocabulary of the language would have resulted in a temporary suppression of words previously used to indicate the same object; this, at least, would have been an exceptional case in the history of any language. If *papilio*, shortly after its introduction into the Latin vocabulary, was used as a synonym for *tentorium* and *tabernaculum*, it was most probably because it first represented a peculiar kind of tent, and because the new word representing the new tent was popularly accepted as the symbol for a class of objects of which it primitively represented but a single type.

If two thousand years hence, most of our literature being lost, a discussion should arise as to the meaning of the French word *chassepot*, it is not unlikely that the weight of written evidence would incline to the opinion that it was a synonym of the word *fusil*. The two words, certainly, as now popularly used, are nearly or quite synonymous, but the essential difference between these words is as well understood to-day, as are the special circumstances which have given to a specific name a signification, in France, broad enough to include all the *fusils* with which modern troops are armed.

Whoever has studied carefully the processes by which languages are formed—whoever will reflect upon the circumstances attending the introduction of many of the words newly placed in the vocabularies of living tongues, will understand how

the commentators of Vegetius. Of the *papiliones*, he says they were “*tentoria ex pellibus confecta, quibus non gregarii solum milites, sed principes quoque uti fuerunt.*” Lipsius speaks vaguely of the distinction to be made between the words in question; but incidentally quotes, from Procopius, perhaps the strongest passage which could be offered to show that there was really, at least in the time of that writer, no difference in the signification of the words: *Ipsæ subito tugurio ex crassissimis assensibus compacto, quod papilionem vocant*—A hut solidly built of large joists, which they call a *papilio*. (“*De Militiâ Romanâ*,” lib. v. p. 58.)

readily and naturally even the name *papilio*, given to a new kind of tent, may have been used in the course of a few years to indicate a tent, without reference to its special form or qualities. To suppose that a new name was given to an old object, is highly improbable—as improbable as that a resemblance to a “butterfly,” so striking as to cause that name to be given to the tent, and to be immediately and universally adopted, had never been observed by any one, during the three or four hundred years preceding, during which Roman armies had habitually encamped in *tentoriis*.

Moreover, during the middle ages, the words *padiglione*, *pavillon*, and *pavilion*, which are the Italian, French, and English derivatives of *papilio*, were always used by the chroniclers of those times, when speaking of the tents of the nobles—tents alike remarkable for their size and elegance; but were never used to indicate the tents of the common soldiers. This fact is important, as it is hardly probable, had *papilio* never signified anything more than the tent used for several centuries by common soldiers, in the Roman and Gallo-Roman armies, that its immediate derivatives would have been employed only when a reference was made to the large and richly-furnished tents of officers.¹

As for the kind of covering employed in making the tents first called *papiliones*, no information has reached us. All we may say is, that from the time of Hyginus (A. D. 120), until after the fall of the Empire, Roman armies, when encamped, were

¹ The only explanation of the distinction to be made between the *papilio* and the *tentorium*, which I have met with, may be found in Calepinus and Facciolatus. Says the first authority:—“Inter tentorium et papilionem hoc est discriminis, quod tentorium proprie dicitur, quod ad brevem moram figitur, papilio vero est ad diu morandum aptum tabernaculum.” Between a *tentorium* and a *papilio* there is this difference, that the *tentorium*, properly speaking, was a shelter established as a temporary expedient, while the *papilio* was a sort of *tabernaculum*, fit for a much longer and more permanent service. Says Facciolatus:—“Si discrimen est inter papiliones et tentoria, fortasse est, quod illi minoris molis et apparatus sint.” If any distinction is to be made between the two words, it is, perhaps, because the *papiliones* may have been smaller, and fitted up with less gearing. It will be noticed that these attempts to establish a difference in the signification of the words are founded upon quite different, if not absolutely contradictory, ideas as regards the essential character of the *papilio*.

said to have been *sub papilionibus*, perhaps more frequently than they were said to have been *in tentoriis*, or even *sub pellibus*. It does not necessarily follow that skins were no longer used in the construction of tents; but if the term *papilio* was first suggested by the peculiar form, or colour, or lightness, of a certain class of tents, it is also highly probable that the material of which the coverings of these tents were made, was unlike that used in the construction of the common *tentorium*. It would have certainly been difficult with a covering of skins, to have obtained these graceful effects of drapery, presumed to characterize the *papilio*; nor would it have been easy to have given to skins, that diversity of colour which might readily have been obtained by the employment of woven fabrics; and above all, it would have been impossible to have secured that lightness so indispensable to their easy and rapid transportation.

Now, it is a very remarkable fact, that no writer, who may have written previously to the period in which the word *papilio* began to be used, has spoken of Roman tents made of any woven material. It is true that Cicero, in his second oration against Verres, accuses Verres, among other corrupt practices, of having, late in the season, and as a matter of mere luxury, "commanded *tabernacula* of fine linen to be pitched along the shore, just as he was accustomed to do in the summer."¹ But it would be forcing the translation to say that he commanded *linen tents* to be pitched. As the *tabernacula* were not erected for military purposes, but simply for the pleasure of Verres and his associates, Cicero may have only referred to a kind of summer-house provided with linen awnings.

Nor are Virgil's lines—

"Nec procul hinc Rhesi niveis tentoria velis
Agnoscit lachrymans"²—

("The tents of Rhesus next his grief renew,
By their white sails betrayed to nightly view."—*Dryden*.)—

¹ "Tabernacula, quemadmodum consueverat temporibus æstivis, carbaseis intenta velis, collocari jussit in littore."—CICERO, *Second Oration against Verres*, c. xxxi.

² "Æneid," lib. i. 469-70.

to be accepted as authority for stating that the camp of the Rhetians, before Troy, was composed of linen tents. *Niveis tentoria velis* is only a poetical expression, although the tents might well have had "white sails," without being of canvas.

Again, in the third Georgic these lines occur:—

"Cinyphii tondent hirci, setasque comantes;
Usum in castrorum et miseris velamina nautis."¹

("Meantime the pastor shears their hoary beards;
And eases of their hair the loaded herds.
Their camelots, warm in tents, the soldier hold,
And shield the shivering mariner from cold."—DRYDEN.)

Dryden has, doubtless, perfectly rendered the meaning of *usum in castrorum*, although the expression has been supposed to refer to the employment of goats'-hair cloth in the construction of tents. Indeed, De Perrin seems to have felt, so confidently, that such was its meaning, that he makes it the text for quite a dissertation on the "two kinds of coarse cloth used by the ancients in the construction of tents," *felt*, and the *pannus cymatilis*, and concludes that it was customary to employ tents of woven stuffs in camps established in the summer, while tents of skins were employed in the construction of winter encampments.² But the three citations which I have here given, are the only ones which I have been able to make from the whole body of classic Latin literature, in which *cloth* is stated, either directly or indirectly, to have been used by the Romans in the construction of tents.³

¹ Georgics, lib. iii. 312-13.

² De Perrin, "Dissertation sur les Tentés," pp. 23-27.

³ Several writers, among others M. Michel Lévy, have included the *conopeum* among Roman tents. This is a mistake. The *conopeum* was a bed canopy, or a mosquito netting, rather than a tent. It had an Eastern or Egyptian origin, and its use at Rome was always considered a foreign practice, and thus a subject for satire:—

"Interque signa turpe militaria
Sol aspicit conopeum."—HOR. *Epod.* ix.

"Fœdaque Tarpeio conopea tendere saxo."

PROPER. lib. iii. *El.* 9.

The distinction to be made between a *tabernaculum*—tent, and a *conopeum*—bed canopy, is clearly recognized in the Vulgate Bible. "Duxeruntque illam ad *tabernaculum*

The Roman soldier's tent in the armies of the Consuls and of Cæsar was made of skins or leather, whether for summer or winter use; and it should be observed that this tent was never spoken of except as a *tabernaculum* or *tentorium*.

There is every reason to believe, as I have elsewhere remarked, that tents of woven stuffs were in general use among the populations of western Asia, during many centuries before the Christian era; at least, the art of weaving not only originated in the East, but had there been extensively practised from a very remote period; while among the Romans, at no time, does it appear to have held any considerable place among the industries of common life. It was only after their Asiatic conquests that the various fabrics, for which the East had long been famous, became among them articles of use and common traffic.

The vast magnitude which this commerce assumed under the Empire, is well known to those acquainted with Roman history.¹ It becomes highly probable, therefore, that one of the results of the increased distribution, at this time, of the products of Eastern workmanship, was the employment of certain kinds of woven stuffs in the construction of tents, which, lighter, more graceful in

Holofernus . . . videns itaque Judith Holofernem sedentem in conopæo, quod erat ex purpura, et auro, et smaragdo, et lapidibus pretiosis intextum " . . . And after Judith had cut off the head of Holofernes she exhibited it to her people, together with a piece of this canopy, saying:—"Ecce caput Holofernæ, principis militiæ Assyriorum, et ecce conopæum illius, in quo recumbat in ebrietate sua."—*Judith* c. x.-xiii.

¹ For an account of the extensive use of splendid tissues made by the Ephesians, see Athenæus, op. cit. p. 525. Says M. Renan:—"Ionia, in the first century, was densely populated, and covered with cities and villages. Powerful associations of workmen, similar to those of Italy and Flanders in the middle ages, elected their chiefs, raised public monuments, erected statues, created works of public utility, founded institutions of charity, and exhibited all the signs of prosperity, welfare, and moral activity. Around the manufacturing cities, such as Thyatira, Philadelphia, and Hierapolis, devoted to the great industries of Asia, the fabrication of tapestries, of woollens, and of leather, and the dyeing of stuffs, a rich agriculture was developed," &c. ("Saint Paul," Paris, 1869; pp. 354, 355); and on p. 341 of the same work this writer says: "Ephesus was justly celebrated for its tents." Certain facts relating to Roman commerce with Asia, early in the Christian era, may be found in Gibbon's "Decline and Fall of the Roman Empire," book i. c. 2; but for a full and complete exposition, consult Heeren, "De la Politique et du Commerce des Peuples de l'Antiquité;" trad. de l'all. par W. Suckau. Paris, Didot, 1830-34.

form, and richer in colour than the old tents of skins, may have received the new name of *papiliones*. Such tents may have been first used by officers; doubtless the largest and richest models were always employed by them alone; but it is probable that, very soon after the introduction of the officers' *papilio*, tents similar to that construction, in many general respects, began to be issued to the troops, and that, as a consequence, and almost immediately, the words *tabernaculum* and *tentorium* fell into disuse, and the new word *papilio* became a generic name for *tent* in the written as well as spoken Roman language.¹

In speaking of the form of the *papilio* I have elsewhere referred to fig. 10, on page 276. It is very probable, for the reasons already given, that this figure may represent its primitive form. And tents of this form have even been supposed to be those most common in Roman camps;² but the tent represented in the

¹ I do not wish to convey the idea that the words *tabernaculum*, *tentorium* and *sub pellibus* were at any time obsolete; they may be found not unfrequently in writers who wrote long after Hyginus. Some of these, even, do not employ the word *papilio*. Thus Ammianus Marcellinus, who wrote at the close of the fourth century, speaks often of *tentoria*, and even of encampments *sub pellibus*, but never once of the *papilio*; and yet he was a contemporary of Vegetius, who, in his treatise "*De Re Militari*," scarcely uses any other word than *papilio*, when he has occasion to indicate a tent. Indeed, there is reason to believe that *sub pellibus* may have been in use, as an archaic or poetic form of expression, long after it had ceased to be descriptive of the material of which tents were commonly made. One can easily understand why Pacatus, in praise of Theodosius, should have alluded to the "*hyemes actas sub pellibus*;" and why Claudian, in his adulatory verses, written as late as the fifth century, should have credited the Vandal Stilicon with having inured his legions to a discipline even more rigorous than was practised in the days of Brutus and Valerius:—

" Quoties sub pellibus egit
Edonas hyemes, et tardi flabra Bootæ
Sub dio Rhipæa tulit," &c.

Still the word *papilio* grew into such general use, as to find its way into the Greek language, and to be able to hold its place, in the vocabularies of the monkish chroniclers. Du Cange closes a long list of references to the use of this word by such writers by, "*et alii sine numero*." The word also occurs in the Vulgate:—"Datham et Abiron egressi stabant in introitu papilionum suorum," &c.

² "*La Militia Romana di Polibio, di Tito Livio, e di Dionigi Alicarnaseo*," da Francesco Patricii. Ferrara, 1583. See also the engravings in the magnificent edition of Clarke's "*Cæsar*," published in London, in 1712, by Tonson. These round, highly-ornamented tents are very frequently to be seen in the sketches of Greek and Roman encampments, which may be found in military works of the sixteenth

figure would seem to be less fitted for common service than for the use of officers of rank; even its form would indicate such a usage, for we have it on the authority of Josephus, that "the tent of the general was like a little temple,"¹ a vague description, certainly, but we know that Roman temples were commonly round and surmounted by dome-shaped roofs. Indeed, it is by no means certain that fig. 9 on page 276 does not show the form of the *papilio* in most common use among the troops of the Empire, or at least the one to which Hyginus refers when he says:—"It is ten feet wide and ten feet deep, each shelters eight men; ten must be allowed to a *centuria* of eighty soldiers."²

and seventeenth centuries; they have, however, no historical value except as representations of the tents in use at the period when the sketches were made.

It is a remarkable fact that historical accuracy in composition rarely seems to have been observed by the most eminent designers of the sixteenth and even seventeenth centuries; it was then, those splendidly illustrated Dutch Bibles were appearing, in which the antediluvians are represented as living in Flemish houses, and Moses as having been taken out of the Nile, at a point where the narrow tortuous stream winds among wild, rocky hills, whose flanks are covered with pines and birches, and whose summits are picturesquely crowned with Rhenish castles and watch-towers. Rhodes has been careless enough to suppose, that the representations of encampments and tents in Clarke's "Cæsar" were historically accurate. Accordingly, he tells us that "the army of Ariovistus, a king of the Germans, used huts and tents similar to those represented in Froissart," &c.; as also, that among "various other tents used in Cæsar's wars, are shown *three* tents of the *exact form* now used in England—the *old pattern* round tents, without the improved short wall." This surprising similarity in the forms of ancient and comparatively modern tents, is explained by the almost universal custom among the artists, at the time referred to, of representing the subjects of ancient history, by modern and familiar symbols. Thus, the most common form of the Roman soldier's tent, shown in Clarke's engravings, is a long wedge-tent capable of sheltering a whole company; such a tent is neither described by any Roman writer, nor exhibited on any Roman monument, but was well known in Italy and Germany during the seventeenth and eighteenth centuries.

¹ Josephus, "Wars of the Jews against the Romans," book iii. c. 6.

² The work of Hyginus Gromaticus "De Castrametatione" commences, rather abruptly, with these words: "Nunc papilionum tensionem cohortium superscriptarum ostendimus. Papilio unus occupat pedes decem, *accepit* incrementum tensuræ pedes duos, tegit homines octo; plena centuria habet milites octoginta, *erunt* papiliones decem."

It is remarkable that Schelius, in his plan of a section of a Roman camp, should have given to the *papilio* the form shown in fig. 8, p. 275. Hyginus says there were

It is a curious fact that the Romans seem never to have imitated, either the people of the East or the Greeks, in the use of magnificent tents. A passage in Suetonius has been referred to,¹ in which Julius Cæsar is said to have taken with him, on certain expeditions, mosaic floorings, as if these were to be used to embellish his *prætoria* or pavilions;² but I remember no instance, in the course of my own reading, in which classic writers have mentioned the use of such tents by Roman generals. Even Claudian refers to the painted and begemmed tents of the East with a sort of contempt,³ and tells us, that Honorius did not use gilded awnings in his camp to keep the sun off.⁴

We have descriptions of the splendid tents of Herod, King of Palmyra, and of Antiochus, and of other kings, at war with Rome; but Roman tent architecture would appear to have always been very strictly limited to a realization of the forms most useful and serviceable in the field.

but two feet between the tents as they stood together side by side in line—*accepit incrementum tensusæ pedes duos*; they could not, therefore, have been supported by side stay ropes; but we are told that they covered an area of ten square feet—*scrupulum itaque terræ occupat*. (Schelius, not. in Hyg.) Now no tents covering a square area can be made secure without stay ropes at the sides, except those having a wedge or pyramidal form, unless sustained on the inside by a strong framework; and such tents, as we have elsewhere stated, were called *tabernacula*. The *papiliones* mentioned by Hyginus must, therefore, have been either wedge-shaped or pyramidal tents, or a sort of tent-barracks. That Roman camps in the time of Hyginus were generally laid out in view of the employment of a comparatively non-portable shelter, is scarcely probable. If *papilio* was at any time a common camp-name for a tent, there is reason for believing, from the indications of Hyginus, that he refers simply to a *tentorium*, the form of which may be seen in fig. 9.

¹ Masquelez, "Étude sur la Castramétation des Romains." Paris, 1864; p. 53.

² "In expeditionibus tessellata et sectilia pavimenta circumtulisse." (Suetonius, "Life of Cæsar," c. xlv.) Admitting this statement to be true, there can be very little reason for supposing the *pavimenta* were to be employed in tents. It is altogether more probable, that they were intended to be used in the construction of those public buildings, which the Romans were in the habit of erecting, in conquered provinces, alike as records of their military successes and symbols of imperial power.

³ "Hic picta Sacæ, fucataque Medus,
Hic gemmata niger tentoria fixerat Indus."
Stilico, lib. i.

⁴ "Neu defensus calore
Aurea submoveant rapidos umbracula soles."
Panegy. Honorii Augusti.

Of the interior arrangement of the Roman soldiers' tent, we know very little. The soldiers probably made themselves as comfortable as they could in the straw which, according to Pliny, was at least occasionally spread upon the ground,¹ and the generals also, are said to have had sometimes no better furnished quarters.²

Lipsius laughs at the idea of any special bedding, and begs his interrogator not to bother him with such nonsense.³ Indeed, it is only after the establishment of the Empire of the East, the relaxation of military discipline, and the general enervation of the people, that we learn the soldier no longer used, as formerly, a stone for a pillow, but feather-beds and spring mattresses.⁴



THERE are many reasons for believing, that tents continued to be considered an indispensable part of the equipment of Roman armies, until the fall of the Western Empire (A.D. 476). It is probable also that the Gothic kings, who adopted in a measure the Roman tactics and arms, made use of tents for the shelter of their troops.

In the Empire of the East, where many of the arts of life continued to flourish, and where for a long time Roman military customs were at least nominally observed, tents always appear to have been considered as essential to the proper equipment of an army. The Emperors Maurice and Leon, and other Byzantine writers, distinctly state that the whole imperial army was, at the time of their writing (A.D. 590-900) provided with tents.⁵ So

¹ Pliny, book viii. c. 48.

² "Et lego Scipionem Æmilianum ipsum primum in stramento dormuisse."—*Lipsius*, lib. v. p. 60.

³ "Non culina, non cubicula et lecti? Rideo. . . . Do cubiculis aut lectis apage."—*Ibid.* lib. v. p. 59.

⁴ "Et non saxum erat, ut antehac armato cubile, sed pluma et flexiles lectuli."—*Ammianus Marcellinus*, lib. xxii. c. 4.

⁵ Leon, "Institutions Militaires," traduites en François par M. De Maizeroy. Paris, 1778; tome i. p. 163.

in that curious old Greek "Chronicle of the Wars of the French in the Morea"—wars carried on from 1204 until 1296—we learn that tents were used by the imperial troops, as also that those of the chiefs were more or less imposing.¹

Whether, at the time of the fall of the Western Empire, and for several succeeding centuries, tents of skins or canvas were in general use in the armies of the several warlike races, then inhabiting central and western Europe, is very doubtful. The Goths would appear at times to have made use of tents; while the Huns, perpetually on horseback, had little occasion to use them.² Indeed, Jornandes makes but a single allusion to a tent—*intra tentoria serica*—that, in which the body of Attila was placed after his death.³

Ammianus Marcellinus speaks of the presence of tents in German camps, at the time of the expedition undertaken by Jovian in the year 367,⁴ and other writers have spoken of tents in describing the historical events special to Germany and Gaul at a later time. But very little is known of the shelter employed, even in the armies of the Merovingian kings. Tents are sometimes mentioned, as if their use was known, but they appear to have often been mere booths, *ex ramis factis*, as described by Gregory of Tours.⁵ Nor is it certain that the troops of Charlemagne were better sheltered, although it is probable that in the time of that sovereign, princes made use of tents, and even of splendid tents. At least, we are told that on a certain occasion, Haroun-al-Raschid sent many rich presents to Charlemagne, among which were a wonderful clock, an elephant, and a magnificent tent;⁶ and it seems the elephant and the clock were regarded as the greater curiosities.⁷ It is most probable that,

¹ Ἡ τέντα τῆς κατοικίας τοῦ σεβαστοκράτορος τέσσαρες στήλους εἶχεν. "The tent of the quarters of the Sebastocrator was supported by four columns."—*Chronicle of the Morea*, lib. ii.

² Ammianus Marcellinus, lib. xxxi. c. 1.

³ Jornandes, "De Rebus Gestis Gothorum."

⁴ Ammianus Marcellinus, lib. xxvii. c. 2.

⁵ Greg. Turon., "Hist. Franc." lib. v.; apud "Script. Rer. Gal.," lib. iii. p. 244.

⁶ Li en voia .j. pavellon
Qu' ainc puis si rice ne vit-on.

Chronique rimée de Philippe Mouskés, tome i. p. 150.

⁷ "Histoire de Charlemagne," par M. P. Granié. Paris, 1819; p. 377.

until the eleventh century, feudal troops were generally encamped *au bivouac*, or quartered upon the inhabitants.¹

According to Strutt the Anglo-Saxons were acquainted with the use of tents, and he has reproduced sketches of two rude bell-shaped tents from an old Anglo-Saxon manuscript. "From the appearance," says he, "of these tents in the delineation, I should fancy they were covered over with a thick strong cloth or leather."² It is quite probable that tents of skin, possibly of cloth, were occasionally made use of by the Anglo-Saxons; perhaps even they may have been used by the Britons. It is very certain, however, from the almost complete absence of allusions to tents in English chronicles written previously to the eleventh century, that their use must have been very limited.

The general use of tents, in the armies of western Europe, probably dates from the time of the first Crusade; although there are many reasons for believing, as I may subsequently have occasion to show, that if the practice of encamping under tents was not borrowed directly from the Byzantines and the Saracens, it was at least during the Crusades generalized in the Christian armies, by the local circumstances of climate and custom, as well as by the discovery of varieties in tent architecture, with which the west was previously unacquainted.

Among the evidences of the enthusiasm with which the project of Peter the Hermit was welcomed, it is said, that everywhere might be seen the assembling of horses, the making of tents and pavilions, and the preparation of arms; and, that speedily this enthusiasm became so general, that:—"There was no route, no city, no plain, which was not covered with the tents and pavilions of a multitude of barons and knights, and men and women of all conditions."³

¹ "Les officiers provinciaux étaient chargés de distribuer les équipements, les vivres, la solde, sur divers points de la route que ces troupes devaient suivre, et l'habitant n'avait pas à fournir autre chose que le logement; servitude militaire à laquelle nul ne pouvait se soustraire."—*Vie Militaire et Religieuse au Moyen Age*. Op. cit. p. 43.

² "Horda Angelcynnan," by Joseph Strutt. London, 1775; vol. i. p. 31.

³ "Vous veissiez appareiller chevaux, palefroys et destriers, tentes et pavillons faire, armures chargier," &c.—*Chronique de Bernard, le Trésorier*.

We are told that the Franks invested Antioch from October to June (A.D. 1097), "pitching their tents around the walls."¹ And again, on Baldwin's march to Jerusalem, the troops are said to have suffered severely, and especially from the rain. "For," says the old chronicler, "in that country it pours down like a torrent, in the winter months only. In consequence, these poor wretches, having no change of garments, died from the severity of the cold, never getting under cover during several successive days. For this calamity, indeed, there was no remedy, as there was a *deficiency both of tents and of wood*."² A hundred years later, the army of Richard encountered a similar hardship, on nearly the same spot:—"Then the rain and hail began to beat upon the men, and killed many of their beasts of burden. The storm was so violent, that it tore up the pegs of the tents, drowned the horses, and spoiled all their biscuit and bacon. The armour and coats of mail also were so rusted, that the greatest labour was necessary to restore them to their former brightness; their clothes were drenched by the wet, and the men themselves suffered from the unwonted severity of the climate."³ "At the dawn of day, the men with the tents were sent forward, and the rest of the army followed. This day was the 20th of January, and they encamped for the night, every man as well as he was able."⁴ These two passages, taken from Geoffry de Vinsauf, show very clearly that the whole army of Richard Cœur de Lion was furnished with tents. Indeed, the chronicles of the period are full of allusions to tents, although they generally refer to a class of which I shall soon have occasion to speak. It is said that William the Conqueror, when he landed at Hastings, encamped his army in tents.⁵ We are alike ignorant, however, of their number, and of their special qualities; it is only at a somewhat later period, that we begin to obtain the

¹ William of Malmesbury, "Chron." book iv. c. 2.

² *Ibid.* in loco citato.

³ "Itinerary of Richard I." book iv. c. 34.

⁴ *Ibid.* book v. c. 3.

⁵ William of Malmesbury, "Chronicle," book iii. But Rapin, according to Grose, says that William quartered almost all his troops upon the monasteries, besides obliging the monks to find them in necessities.

details necessary for a just appreciation of the character of mediæval encampments.

The camp of King Edward II., at the time of his expedition to Scotland, in 1301, is thus described in an ancient French poem, the "Siege of Caerleverok:"—"The army being drawn up, and the mareschal having marked out the ground, and assigned to every one his proportion, then might be seen to arise houses of various fashions, built without the assistance of carpenters or masons, and composed of white and dyed linen; there many a cord was stretched, and many a pin driven into the earth, and many a large tree felled to build huts, whose floors within were strewed with leaves, herbs, and flowers gathered in the woods."¹ It is difficult to say whether tents or huts were most numerous in this particular camp; at any rate, the number of tents must have been considerable.

These tents would appear also to have been, according to the custom of that time, furnished at the expense of those using them, since in the account which Froissart gives us of "How (in 1327) the King of England left the city of York with all his host to go into Scotland," orders were given by the King, that every one should prepare, during a week's time, waggons and tents for the field:—"And then each one provided himself as best he was able, according to his estate."² That most of those who were engaged upon this expedition were, however, without tents, soon becomes evident from the sufferings they endured from the exposure, consequent upon their inability to find a shelter of any kind.³ Froissart, however, alludes very frequently to the use of tents in European armies, from 1325 to 1400, the period which furnishes the incidents of his Chronicles; but they would generally appear, as at the siege of Caerleverok, to have been associated with huts, and bowers, and a variety of temporary expedients to obtain a shelter.

Indeed, Froissart, Monstrelet, and the French chroniclers of the fifteenth and sixteenth centuries, generally speak of the

¹ Cited from Grose. Op. cit. vol. ii. p. 11.

² "Chroniques de J. Froissart," liv. i. c. xxxiii.

³ Ibidem, c. xxxviii.

lodgings of the troops—*leurs logis*; and they very often, in speaking of an encampment, refer to the *lodgings and tents*; as, for example, “*chacun saillit hors de sa tente et de son logis.*”¹ From the incidental statements and expressions of these writers, we may quite rightly infer that tents in mediæval camps were very generally the property of the nobles, and that the troops were usually quartered in the houses of the country or in temporary huts, or bowers of bushes and the branches of trees.

Whenever sieges threatened to be of long continuance, huts certainly seem to have been preferred. Thus, when Edward III. laid siege to Calais in 1346, he ordered “hotels and houses” to be built between the city and the river, made of planks, and roofed with straw and broom, and “as well placed and arranged in streets, as if he had intended to remain there a dozen years.” There was, moreover, in this new city, which the King called *Ville-Neuve la Hardie*, everything necessary to a host; and besides, a market-place, merceries, meat-shops, cloth-shops, bakeries, and “all other needful things, which one could easily get for money.”² So, in 1386, the French making gigantic preparations for an invasion of England, the Constable assembled an army in Brittany; and “Everything was on such a grand scale, that in order to lodge the troops on landing in England, a *wooden city* had been prepared, all the parts of which could be united on the spot.”³ But the expedition failed and the “*belle ville de bois*” fell into the hands of the Duke of Burgundy.

Again, at the siege of Granada, in 1481, it is said that the camp of Ferdinand was of a quadrangular form, “divided into streets like a city, the troops being quartered in tents, and in booths constructed of bushes and branches of trees.”⁴

But if huts were preferred, under many circumstances, tents appear to have been occasionally used by the troops, as well as

¹ “Chroniques d’Enguerrand de Monstrelet,” livre premier.

² Froissart, livre I. partie I. c. ccxcvii.

³ “Histoire des Ducs de Bourgogne,” par M. de Barrante. Paris, 1824; tome i. liv. ii. p. 3.

⁴ “Chronicle of the Conquest of Granada.” Washington Irving. Paris, Baudry, 1842; p. 265.

by their commanders. Thus, we are told that the Duke of Orleans was compelled, in 1406, to abandon the siege of Guienne, because, among other reasons, the rain had destroyed the tents—*les pluies avaient pourri les tentes*.¹ According to Monstrelet, when John, Duke of Burgundy, was about to lay siege to Ham (1411), he obtained from the cities of Flanders fifty thousand fighting men, well armed and equipped. They had twelve thousand waggons and carts to carry their baggage. The Duke awaited the assembling of his forces under the tents and pavilions which he had pitched on a plain near Marguion. He was particularly interested in watching the coming in of the Flemish *communes*, which made a great show, and encamped in the most orderly manner:—"To see their tents, the number was so large, one would have thought the encampments to be real and great cities."²

So Drayton, in referring to the immense booty captured by the English at Agincourt, in 1415, says:—

"Wagons and carts were heaped until they crackt
With arms and tents, there taken in the field."³

On Edward's crossing into France, in 1475, his camp equipage seems to have been remarkably complete:—"Nothing could be finer than the English army, supplied with trains of every sort, tents, waggons, and workmen to pitch the tents and take care of the camp."⁴

In the wars between the Hungarians, the Tartars, and the Turks, in the thirteenth, fourteenth, and fifteenth centuries, tents appear to have been largely used by the combatants on all sides. In 1241 the Tartars are said to have pitched their *tents* only a few miles from Buda, and in 1345, to have moved again on Pesth "in such numbers that their tents covered a space of

¹ "Histoire des Ducs de Bourgogne," par M. de Barrante; tome iii. liv. i. p. 73.

² "Chroniques d'Enguerrand de Monstrelet," liv. i. c. 84.

³ In the rolls of Parliament (1423) are two items concerning tents, inserted into a schedule and valuation of furniture belonging to Henry V.:

"Item—2 tentes de bloy carde linez de toile linge queux furent au Sr Herry d'Escrop, vi. li. xiii. s. iv. d."

"Item—1 tente qui fuist a l'Emperour pris, xxvi. s. viii. d."

⁴ De Barrante, tome x. p. 345.

eleven miles.”¹ The Hungarians would seem also to have been well provided with tents at this time, as they are mentioned very frequently in connection with their movements, and in such a way, as to leave the impression that they were scarcely inferior, either in number or excellence, to those used in the Turkish armies.

Indeed, the use of tents during the middle ages, appears to have been most considerable in those European armies, which were brought most frequently and immediately in contact with the Turks and Saracens.

Perhaps the most remarkable accounts of camps and camp life in the middle ages, are preserved in certain Spanish manuscripts which Washington Irving has attributed to one Fray Antonio Agapida, and which he at least has made a part of our own literature, under the title of “A Chronicle of the Conquest of Granada.”

There we are told:—“While the holy Christian army was beleaguering this infidel city of Baza, through the wonderful activity, judgment, and enterprise of this heroic and magnanimous woman (Isabella) a great host encamped in the heart of a war-like country, accessible only over mountain roads, was maintained in continual abundance. Nor was it supplied merely with the necessaries and comforts of life; the powerful escorts drew merchants and artificers from all parts, to repair as if in caravans to this great military market. Here might be seen cunning artificers in steel, and accomplished armourers achieving those rare and sumptuous helmets, and cuirasses richly gilt, inlaid and embossed, in which the Spanish cavaliers delighted; saddlers and harness-makers and horse-milliners also, whose tents glittered with gorgeous housings and caparaisons. The merchants spread forth their sumptuous silks, cloths, brocades, fine linen, and tapestry. The tents of the nobility were prodigally decorated with all kinds of the richest stuffs, and dazzled the eye with their magnificence; nor could the grave looks and grave speeches of King Ferdinand prevent his youthful cavaliers from vying with each other in the splendour of their dress and caparaisons, on all occasions of parade and ceremony.

¹ Katona, “Hist. Critic.” t. vii. p. 906. Thurocsi, p. ii. c. lxxix.

“ While the Christian camp, thus gay and gorgeous, spread itself out like a holiday pageant before the walls of Baza, while a long line of beasts of burden, laden with provisions and luxuries, were seen descending the valley from morning till night, and pouring into the camp a continued stream of abundance, the unfortunate garrison found their resources rapidly wasting away, and famine already began to pinch the peaceful part of the community. Cidy Yahye had acted with great spirit and valour, as long as there was any prospect of success, but he began to lose his usual fire and animation, and was observed to pace the walls of Baza with a pensive air, casting many a wistful look towards the Christian camp, and sinking into profound reveries and cogitations. The veteran Alcayde, Mohammed ben Hassan, noticed these desponding moods and endeavoured to rally the spirits of the prince. ‘ The rainy season is at hand,’ would he cry; ‘ the floods will soon pour down from the mountains; the rivers will overflow their banks and inundate the valleys. The Christian king already begins to waver; he dare not linger and encounter such a season, in a plain cut up by valleys and rivulets. A single wintry storm from our mountains would wash away his canvas city, and sweep off those gay pavilions like wreaths of snow before the blast!’

“ The Prince Cidy Yahye took heart at these words, and counted the days as they passed, until the stormy season should commence. As he watched the Christian camp, he beheld it one morning in universal commotion. There was an unusual sound of hammers in every part, as if some new engine of war were constructing. At length, to his astonishment, the walls and roofs of houses began to appear above the bulwarks. In a little while there were above a thousand edifices of wood and plaster erected, covered with tiles taken from the demolished towers of the orchards, and bearing the pennons of various commanders and cavaliers; while the common soldiery constructed huts of clay and branches of trees, and thatched them with straw. Thus, to the dismay of the Moors, within four days the light tents and gay pavilions, which had whitened their hills and plains, passed away like summer clouds; and the unsubstantial camp assumed the solid appearance of a city laid out in streets and

squares. In the centre rose a large edifice, which overlooked the whole, and the royal standard of Arragon and Castile, proudly floating above it, showed it to be the palace of the king."

In this description reference is made to nearly all the kinds of shelter common to camps at that period, the prodigally decorated tents of the nobility, the canvas city of the soldiery—which, as the siege continued and the season of storms approached, gave place to the edifices of wood, the quarters of the officers, and the huts of clay and branches of trees thatched with straw, occupied by the common soldiery.

One of the interesting facts noted in this extract, is the presence in the Spanish camp of "cunning artificers" and merchants with "sumptuous silks, cloths, brocades, fine linen, and tapestry." The natural inference is that many, perhaps most, of the tents were made in the camp itself. Indeed, this custom would seem to have prevailed very generally at the time of which I am speaking.

In an old manuscript,¹ which contains a schedule of the rates of pay accorded to the several services in the army of Edward before Calais, there is an entry as follows:—"314 masons, carpenters, locksmiths, machinists, tent-makers, miners, armourers, cannoneers and artillerymen." The tent-makers thus appear to have constituted a special service in the well-organized and equipped armies of the period.²

The age of chivalry was pre-eminently an age of individualism, whoever had power showed the world he had it; while those who had wealth or physical strength, were held in estimation very much in proportion as they were prodigal in the use of these possessions. A knight, distinguished for his courage, strength and skill, was no less honoured by the splendour of his arms. An ostentatious rivalry was thus encouraged, the result of which was that every assembly of armed men became a pageant, and

¹ See note in "*Chroniques de Froissart*," ed. Panth. ; tome i. p. 274.

² It always seems to have been a common custom in the East to have had large numbers of tent-makers in the train of armies. Fifty tent-makers are mentioned as required to accompany the "camp equipage for journeys" of the kings of Persia, by Gladwin, in his "*Ayeen Akbery*."

every camp a theatre of semi-barbaric magnificence and display.

We have just seen how, in their camp before Baza, the Spanish cavaliers vied with each other in the splendour of their equipments; but this rivalry was not limited to a single occasion; splendid armour, costly trappings, and magnificent tents were to be found in every camp in Europe, and were even considered the indispensable insignia of royalty and of rank. Thus in the Chronicle of Fray Agapida, from which I have just made an extract, we are told that the camp before Granada "made a glorious appearance in the setting sun. The warriors' tents of the royal family and attendant nobles were adorned with rich hangings, having sumptuous devices, and with costly furniture, forming, as it were, a little city of silk and brocade, where the pinnacles of pavilions, of various gay colours, surmounted with waving standards and fluttering pennons, might vie with the domes and minarets of the capital they were besieging. In the midst of this gaudy metropolis, the lofty tent of the Queen domineered over the rest like a stately palace. The Marquis of Cadiz had courteously surrendered his own tent to the Queen. It was the most complete and splendid in Christendom, and had been carried about with him throughout the war. In the centre rose a stately *alfaneque* or pavilion in Oriental taste, the rich hangings being supported by columns of lances ornamented with martial devices. This centre pavilion or silken tower was surrounded by other compartments, some of painted linen, lined with silk, and all separated from each other by curtains. It was one of those camp palaces which are raised and demolished in an instant, like the city of canvas which surrounds them." ¹

One might well suppose the worthy Father Agapida, in describing these pavilions, had given to them all the grace, beauty, and fairy-like magnificence peculiar to the old Moorish capital itself; or that he had innocently sketched, according to his own fancy, a kingly encampment in some happy land of enchantment, which he would fain believe had appeared for once as a reality

¹ Op. cit. p. 272.

beneath the walls of infidel Granada. But no, the old chronicler has only stated the facts, and the loftiness of his style even, was probably partly occasioned by a profound sense of the richness and dignity of his subject. On referring to contemporaneous French and English history, we find frequent accounts of similar exhibitions of the fondness for ostentatious display which characterized those times. Thus we are told by M. de Barrante, that Charles the Bold set out upon his campaign against the Swiss in 1476 "with the finest train of artillery that had ever been seen. As for the baggage of the army it was immense. His tents and pavilions were resplendent with gold and silk. His own tent was surrounded by four hundred others, where lodged the seigneurs of his court and the attendants of his house. Without, shone his coat of arms adorned with pearls and precious stones; within, the tent was hung with red velvet, embroidered with foliage in gold and pearls; windows in which the glass was framed in bars of gold had been put into it; within, was the chair of state, where, seated, he received the ambassadors and held meetings of ceremony; it was of massive gold. His coats of armour, his swords, his poignards, his lances mounted in ivory, were wonderfully worked, and their handles sparkled with rubies, sapphires, and emeralds. His seal weighed two marcs of gold, his portfolio, bound in velvet, contained the picture of the Duke Philip and his own; on his collar of the Fleece of Gold, the flashes of the guns were represented by rubies. All these objects were within his tent, as well as an infinite number of articles of furniture and precious jewels, which fell into the hands of the Swiss.

"His *chapel* tent contained almost as many things of value. Here were the shrines and the relics which had excited the admiration of Germany two years before; the twelve apostles in silver, the shrine of St. Andrew in crystal, and an ostensor of marvellous richness."¹

A hundred years before, Philip the Hardy had made a display of tents at Lelighen almost equally remarkable. "Here," says M. de Barrante, "the Duke found a new occasion to show all

¹ "Histoires des Ducs de Bourgogne," par M. de Barrante; tome xi. livre vii. p. 28.

his magnificence. His tent, made of boards and painted canvas, had the form of a castle flanked with towers. His whole suite, numbering 3,000 persons, were provided with lodgings in the neighbourhood, these lodgings were separated by streets, so that his encampment had quite the aspect of a city."¹

And still earlier, in the war between Charles, King of Naples, and Conradin, son of Conrad, Emperor of Germany, which took place in 1268, not only were all the troops well supplied with tents, but many magnificent ones appeared upon the field; and so rich were some of these, that on the defeat of the Germans, it is said, the King gave orders that each soldier should guard the booty he had taken, he himself being quite satisfied to receive, as his share, the splendid tent of Conradine, which was supported by ten columns, and the treasure within it.²

And who has not heard of the interview, which took place in 1519, between Francis the First and Henry the Eighth, near the little towns of Ardres and Guines, on a spot which, from the richness of the tents there used, was afterwards known as the "Field of Cloth of Gold?" Here were pitched several hundred tents, all the finest and most magnificent it was possible to behold:—"For there was nothing used but cloth of gold, and silver, and velvet; and all were emblazoned with the arms of the Princes, and the lords, and ladies, to whom they belonged."

"The principal ones," says the Maréchal de Fleurange, "were of cloth of gold *frisé* inside and out, both rooms, halls, and galleries; and the whole field was covered with tents of cloth of gold *ras*, and stuffs worked in gold and silver."

The tent which was pitched for his Most Christian Majesty, was sixty feet long by as many wide, with a pavilion at each of its four angles; the outside, was covered with cloth of gold and finely embroidered stuffs, and the inside, was lined with blue velvet.

¹ "Histoires des Ducs de Bourgogne;" tome i. livre ii. p. 204. See also Froissart: "Et là étoient de toutes les deux parties tendues tentes, treffs, pavillons, pour eux tenir . . . et là se tinrent en une très belle tente, qui par accord de toutes les parties étoit tendue;" and quaintly he adds that what he says is true: "Car, pour ce temps et pour savoir la vérité de leurs traités, ce que savoir on pouvait, Je Jean Froissart, auteur et proposeur de ce livre, fus en la bonne ville d'Abbeville."

² τὴν τέντα δὲ τοῦ Κονραδῆ ὁποῦ εἶχε δέκα στύλους.—*Chronicle of the Morea*, lib. ii.

Upon the highest point of the tent was an image of St. Michael, gilded with the finest gold.

The tent of the King of England, although perhaps less magnificent, did not fail to agreeably surprise those who saw it. It was built of wood, and covered with tapestry; it was divided into four great apartments, so arranged as to be lighted from all sides, since there was nothing but glass between the columns which supported it, which were painted in imitation of various coloured marbles. The interior of this tent was also magnificently furnished.¹ Strutt has given representations of these tents, taken from an illuminated manuscript in the Cotton Library. "The English tent," he says, "was made of a rich crimson, embroidered and wrought into ornaments of gold; and all around, at the bottom of the roof, is a rich fringe of gold and crimson silk; above the fringe is a narrow compartment like a moulding, which runs all around the tent, in which is written in letters of gold, DEV ET MON DROIT: SEMPER VIVAT IN ÆTERNO; and on the top is a running ornament carved and richly gilt, with the lion, the hart, the greyhound, and the dragon, alternately holding little banners, with the crown and the *fleur-de-lys* at the top; on these little banners are the arms of England, roses, and the portcullis."²

It may be interesting to compare these descriptions with one to be found in Gladwin's "Khojeh Abdul Kurreern," but which I reproduce from Major Rhodes' "Tents and Tent-life."

"Nadir Shah, out of the abundance of his spoils, caused a tent to be made of such beauty and magnificence as to be almost beyond the power of language to describe. The outside was covered with fine scarlet cloth; the lining was of violet coloured satin, on which were representations of all the birds and beasts in the creation, with trees and flowers, the whole being composed of pearls, diamonds, rubies, emeralds, amethysts and other precious stones; and the tent poles were decorated in like manner. On

¹ "Histoire de François Premier," par Monsieur Varillas. Paris, 1685; tome i. pp. 171-72; and "Monuments de la Monarchie Française," tome iv.

² For original and curious documents concerning the "Field of Cloth of Gold," consult the "Rutland Papers" and "The Chronicle of Calais," published by the Camden Society.

both sides of the peacock throne was a screen on which were figures of two angels in precious stones. The roof of the tent consisted of seven pieces; and when it was transported to any place, two of these pieces, packed in cotton, were put into a wooden chest, two of which chests were a sufficient load for an elephant. The screen filled another chest. The walls of the tent, the tent poles, and the tent pins, which latter were of massy gold, loaded five other elephants, so that for the carriage of the whole were required seven elephants."

The same writer says, in another work :—"The bargah (royal pavilion) is of such magnitude, as to be able to contain ten thousand persons; and the erecting of it employs one thousand serash (camp-colour-men) for a week, with the help of machines. One of these bargahs, without any ornaments, costs upwards of ten thousand rupees. They are sometimes finely ornamented with tin. From the price of a plain one may be formed a comparative estimate of what would be the expense of making other kinds."

In a fine old engraving which I have, representing the "total ruin" of the Turks in the great battle fought on the Danube in 1687, are representations of several magnificent Turkish tents, superbly ornamented, and embroidered without and within with arabesque devices. Their richness and beauty will be understood from the following account of an encampment in the time of the Sultan Mahomet IV. :—"The encampment was about four miles from Constantinople. The tents were about two hundred in number, ranged without order, only the grand seigneur's seemed to be in the midst and to overtop all the rest, and well worthy of observation, costing, as was reported, 180,000 dollars, richly embroidered on the inside with gold, and supported by pillars plated with gold. Within the walls of this pavilion were numerous offices belonging to the seraglio. There were retirements and apartments for the pages, chiosks and places of pleasure, and although I could not get admittance to view the innermost chambers, yet by the outer and more common places of resort, I could make a guess at the richness

¹ "Ayeen Akbery; or the Institutes of the Emperor Akber." Translated from the original Persian by Francis Gladwin. London, 1800; vol. i. p. 61.

and greatness of the rest; being sumptuous beyond comparison of any in use among Christian princes.

"On the right hand was pitched the Grand Vizier's tent, exceedingly rich and lofty, and had I not seen that of the Sultan before, I should have judged it the best that my eyes had seen, the ostentation and magnificence of this Empire being evidenced in nothing more than in the richness of their pavilions, sumptuous beyond the fixed palaces of princes erected with marble and mortar."¹

Indeed, in reading these accounts, we can more readily believe them all, to be descriptive of the ceremonial customs of Eastern princes, whose magnificence is the never-ending theme of Arabian story-tellers, than that they can refer to the habitations in the field of those iron-handed warriors, whose hardy prowess and restless love of adventure maintained in Europe, for several centuries, a state of perpetual war.

I have already alluded to the love of display which was almost universal during the middle ages, but this love was scarcely gratified by exhibitions of wealth alone. Solemnities and ceremonials were appreciated very much, as they were addressed to the sensuous tastes which pre-eminently characterized those times. I very much question if there was ever a time when brilliant colours have been more admired. The common costumes of the nobles were in scarlet, and blue, and green, and purple.² The houses of the rich were adorned with the most superb draperies; while on all days of public rejoicing, the exhibition, at the windows, of silks, cloths of gold and silver, and the richest tapestries, was equally held as an indication of respect for the day, and of personal consideration.³

The sails of ships were often of scarlet or purple, or satin dyed in grain.⁴ Even the architecture of this period was strongly

¹ Knolles' "History of the Turks," cited by Rhodes.

² See "Les Arts Somptuaires," par M. C. Louandre. Paris, 1857; also "Costumes in England," by T. W. Fairholt. London, 1860.

³ "Recherches sur les Étoffes de Soie d'Or et d'Argent, pendant le Moyen Age," par Francisque Michel. Paris, 1852; tome ii. p. 129; also, "Les Arts Somptuaires," op. cit. texte, p. 100.

⁴ "All then assembled around the crimson sail of the admiral's (William the Conqueror's) ship."—*William of Malmesbury*, book iii.

marked by the same taste, which built of mosaic Giotto's tower and the noble duomo beside it, and flooded the interior of the cathedrals with those splendid colours derived from arts which are to-day almost lost. But perhaps in mediæval encampments, more than anywhere else, were to be found the very richest effects obtainable by varieties in colour, shade and tint. The tents differed from each other in form, but more especially in colour; one was red, another purple, another blue, another white; while in others was used a variety of brilliant tints, which, with the brightness of the numerous ornaments, the richness of the tissues employed, and the elegance of the forms given to the pavilions, often resulted in the creation of the most brilliant and even imposing spectacles.

In Fig. 11, is a representation of a tent which I have had copied from an illuminated manuscript of Froissart, in the Bibliothèque Impériale (No. 2,643).



FIG. 11.—Tent copied from a manuscript of Froissart in the Bibliothèque Impériale.

It represents the tent of a French knight or baron of the fourteenth century. In form, it may resemble the *papilio* of a Roman officer; but it would be quite impossible for me to give an idea of the richness of its colours. It was probably made of silk; the walls are purple; the scalloped border running around the line of junction between the walls and roof is red, and richly trimmed with gold; the roof is of purple silk or damask; the spiral band on the roof is in gold, and contains perhaps some

“ Les voiles drecies au vent
Fetes de porpre et de cendals
Et de pailles imperials.”

Le Roman de la Guerre de Troyes, cited by Du Cange.

“ D'autres bateaux . . . et y en avoit deux couverts de satin cramoisy.”—*Mémoires de P. de Commines*, liv. vii. c. 15; ed. Panth. Paris, 1854.

inscription; the cords and stay ropes are of finely twisted gold, while an ornamented lance-head, bearing an emblazoned pennon, surmounts the whole. Tents quite like this may be found in English manuscripts of the time, two or three of which have been copied by Strutt.

In Fig. 12 may be seen another tent, which I have had copied also from the same manuscript of Froissart.¹ Although perhaps more graceful, it has a certain resemblance in its form to our



FIG. 12.—Tent copied from a manuscript of Froissart in the Bibliothèque Impériale.

modern tents, but the resemblance is one of form only. The stuffs of which it was made must have been exceedingly costly—of silk or damask of a rich crimson colour; the cords were probably of the finest linen, and the trimmings of gold and silver; the two standards terminated in elaborately carved and gilded lance points; while the monogram of the occupant was emblazoned, in letters of gold, on one of the walls.

One certainly may not be a little surprised to learn that tents

¹ From an illumination representing the camp of du Guesclin at Chisech in Poitou, p. 406. The tent which I have had copied, is surrounded in the illumination, by quite a number of magnificent, tall, steeple-shaped pavilions, of different colours.

“King Richard took the pavillouns
Of sendal and of cyclatoun.
They were in shape of castels;
Of gold and silver the pencels.
Many were the fair gest
Thereon were written.”

Romance of Richard Cœur de Lion.

were so beautifully made, so many hundred years ago ; and the surprise is, perhaps, even greater after one has examined the splendid representations of these tents, with which the old copyists sometimes embellished their manuscripts.¹ But the means for gratifying the general love for displays of material magnificence existed, during the middle ages, in a much larger degree than has generally been supposed. To speak only of the industry most essential to tent-making : the art of weaving was intelligently and extensively practised in western Europe during the thirteenth, fourteenth, fifteenth, and sixteenth centuries. Even long before, coarse fabrics of wool and linen were in common use, and by no means expensive ; of such stuffs the sails of ships and tents were generally made. But, shortly after the time of the First Crusade, an extensive commerce had been opened with Constantinople, Alexandria, and the markets of the East, and silk, velvet, cloth of gold, taffeta, damask, and a great variety of costly stuffs, were distributed throughout Europe, where very soon the fabrication of these tissues was commenced. Manufactories were established, first in Italy and Spain, and afterwards in France and Flanders. So early as the thirteenth century, in Spain, and in the single district of Jaen, there were three thousand villages occupied with the raising of silkworms ; while, in the Moorish city of Seville alone, there were six thousand looms engaged in weaving silks.² Indeed, during the fifteenth and sixteenth centuries, these industries, which scarcely contributed to any end, other than the gratification of individual habits of luxury and the popular taste for display, had attained a development almost incredible. Says a Venetian writer of the time :—"Within a period of fifty years, the industry of weaving has so much increased, that the Government of Venice draws from it an annual revenue of 500,000 crowns, Reggio, a revenue of 10,000,000 of crowns, and Sicily a still greater one ; for, to say the whole in one word, this art

¹ In the collections of MM. Jubinal and Du Sommerard are a great variety of sketches of mediæval tents taken from tapestries. Such tents are also not unfrequently to be found represented on old pieces of *faïence*.

² "Recherches sur les Étoffes de Soie," &c., op. cit. tome i. p. 295.

is now the very nerve of trade, and silk cloths are made which were quite unknown to the ancients.”¹ And Thomas Mocenigo, when Doge of Venice, is represented as having said to the Senate:—“The Lombards buy of us every year, of cloth of gold and silk, to the amount of 250,000 ducats; and bear in mind, that every year also, Verona takes two hundred pieces of cloth of gold, silver and silk, Vicenza, one hundred and twenty, Padua, two hundred, Trevisa, one hundred and twenty, and Frioul fifty.”²

The influence of those displays, special to encampments and tent-life during the middle ages, are still curiously evident in certain existing customs. Every pavilion bore one or more gaily-coloured pennons, or was surmounted by a gilded figure of an animal or a bird, or by some emblematic device.³ As it was often convenient to use symbols of rank, these tent ornaments were frequently selected for the purpose. Thus the flag taken from the tent was entitled to so much of the consideration which belonged to a pavilion, as to finally receive that name—a name which, as applied to a flag, has through the shifts of time become much more familiar to our sailors than to our soldiers.⁴ So

¹ “Livre premier des Antiquités perdues.” G. Pancirole. Traduction de Pierre de la Noue. Lyons, 1617; liv. ii. p. 357.

² “Histoire de la République de Venise.” Par P. Daru. Paris, 1821; tome ii. pp. 304-7. M. Michel mentions by name, *thirty-three* different kinds of velvet known in the middle ages, and *eighteen* kinds of cloth of gold in use in the sixteenth century—“sans parler de la *toile d’or*,” &c.—and the cloths of silver, of which there were an equal number of varieties; and, finally, states that his lists are quite incomplete. (“Recherches sur les Étoffes de Soie, d’Or et d’Argent pendant le Moyen Age,” tome ii. pp. 187, 193, 207, 208.)

³

“J. si très-riche paveillon,
Que tout li pan et li giron
Erent de diverses couleurs,
A oissiaus, à bestes, à fleurs,
Entailliez de riches draps de soie.
J. aigle d’or qui refflamboie
Avoit sus le pommel assise.”

Roman de Percival le Gallois.

⁴ Littré says, that as the word *pavilion* was not only applied to tents, but to cloths used for awnings (*tentures*), the word began to be used to signify a standard. I see, however, no very natural connection between awnings and flags. A much

many of the animals, once used only as terminal ornaments for the tent standards, have been preserved in the coats of arms which the heralds subsequently invented. The Dukes of Brittany are said to have placed upon their tents a red cap lined with ermine, as a token of their love of independence and liberty—a token which has certainly lost none of its ancient significance.

Perhaps one of the most curious vestiges still existing of that sovereignty, once represented in the field by pavilions of silk and gold, may be seen in the armorial emblems of certain families, which are placed under a drapery, the curtains of which fall by the sides of the insignia. These curtains represent the open doorway of a pavilion, and are alike the symbols of princely rank and military strength.¹ The arms of France, and of several other states, are thus placed, and may be seen by any one, on the reverse of certain gold and silver coins.

So the dais, and the *lit de justice*, beneath which kings are represented as sitting in the presence of their parliaments, are to be considered not so much ornaments of the throne, as the emblems of the ancient custom of sovereigns to meet their people, and administer justice, at the doorways of their pavilions.



BUT perhaps I have already occupied your attention too long with subjects which, whatever may be their historical interest, throw little light upon tent architecture in its more practical relations to military life. It is tolerably certain, however, that few if any changes were made in Europe in the methods of encamping active armies, already described,

better suggestion has been made—that *pavilion*, a flag, is not derived from the same root as *pavilion*, a tent. The custom of carrying a flag *at a point* is said to have been a Moorish one; and the name *pavilion*, given to a flag, is said to have originated from this custom, and to have been derived from the Spanish word *pabellon*, an augment of *paves*, whence the French words *pavois*, *pavoiser*, &c. If, however, they both take their origin from the root *papilio*, a flag was called a *pavilion*, most probably by a simple metonymy, the occasion for which I have stated.

¹ De Perrin, op. cit. p. 59.

before the middle of the seventeenth century. Ambroise Paré has given us a facetious but graphic picture of the imperial encampment before Metz, in 1552. The whole German army was there lodged in holes in the ground, which were only covered over with a little straw:—"Nevertheless," as the snow lay on the ground two feet deep, "every soldier had his camp-bed strown with glittering and brilliant stars, more sparkling than had they been of fine gold. And every day they had white sheets where they lodged—at the sign of the Moon. They had no need of combs to get the down and feathers out of their hair and beards, and always had white napkins at hand,"¹ &c.

In the edition of Fronsperger, published at Frankfort in 1566, there are a number of engravings representing scenes common in German camps at that time, and among others, there is a large *eau-forte* by Joste Ammon, which exhibits the disposition of a German camp. The different quarters are numbered, and an explanation accompanies the plate; but nearly all the tents, many of which are richly ornamented, are assigned to officers connected with the administration of the camp. Letters, upon a few open spaces, indicate the positions assigned to certain bodies of troops—infantry, cavalry, and artillery. A few screens, or rude huts of boards, bushes, and straw, are the only quarters occupied by troops, shown in the sketch, which unquestionably represents with fidelity the usual appearance of a German camp in the sixteenth century.

According to certain writers, the Austrians and Hungarians would appear not only to have made use of tents, earlier than most of the German people, but to have been better provided with them, at the time of which I am speaking. Basta, who wrote towards the close of the sixteenth century, speaks of the troops being generally encamped "in cabins and tents;" but he observes that in Hungary, the cavalry was not lodged in town as in the Netherlands, but in the field "in many pavilions." In a plate which he gives, showing how a camp should be entrenched, the whole force—infantry, artillery, and cavalry—are

¹ Œuvres d'Ambroise Paré, tome iii. p. 708.

represented as having tents; those for the troops being wedge-shaped, while those of the officers are circular pavilions with dome-shaped roofs.¹

In 1568, De la Noue regrets, that it was necessary to lodge the troops scattered about in various places;² and he is said to have recommended a provision of tents for common soldiers. But the soldiers still continued to be quartered in their *logis*, as in Froissart's time, as may be seen by consulting De Saulx and subsequent writers.

The Princes of Orange are said to have first put in practice De la Noue's project, by generalizing the use of tents among the troops of their armies. But the statement has been controverted, and would appear to have been based upon the efforts made by Maurice of Nassau, towards the close of the sixteenth century, to establish some order in the arrangement of his camps. Stevin and Solemne, in their accounts of the camps of Maurice and Frederick, represent the troops to have been quartered in framework huts covered with straw; and we may infer from them, that the use of tents was limited to officers. The huts were small—generally about eight feet square and eleven feet high—and were intended for two soldiers only.³

In but one instance does Solemne mention the use of tents by troops—at Oppenheim, in 1620:—"The regiment of militia of

¹ "Le Maistre du Camp General. Mise en lumière en langue italienne par le très illustre Seigneur George Basta, Conte du S. Empire, &c. &c. &c. Traduit en langue française, et déclaré par figures, par Jean Theodore de Bry, Bourgeois d'Oppenheim." Imprimé à Francfort sur le Mein de l'impression de Paul Jacob, aux frais du dict de Bry, l'an 1617. La troisième partie; du Loger.

² "Mémoires de F. de la Noue," c. 16.

³ These huts were built in the following manner:—Two poles, twelve feet long, and forked at the top, were set up, eight feet apart, and sunk in the ground one foot. A ridge-pole was placed in their forks. Four forked sticks, five feet high, served as corner posts, each pair sustaining a pole which answered as a plate; a rafter also connected each corner post with the ridge-pole. These eleven poles, which were tied together, formed the principal part of the skeleton of the hut. The skeleton was, however, completed and strengthened by a lattice-work of sticks—four vertical and nine transverse, at each end, two vertical and three transverse on the sides, while five vertical and four transverse sticks completed the roof—the whole being tied together by cords or withes. The frame-work was now thatched with straw, which for the most part was woven into mats and put on in sections.

Col. Wynenbourg had tents instead of huts. These were twelve feet wide and twenty feet high; each company of 200 men had twenty tents; the tents were placed in a line, and ten soldiers were put in each tent, and each soldier had with his comrade a woman; and they had a bed four feet wide, and, above in the middle of each tent, there was a piece of wood fitted with pegs where the soldiers suspended their muskets most conveniently. On these tents were written the names of the villages or the cities to which they belonged, and the tents covered very little ground, as compared with the huts of straw used by the other regiments."

Solemne declares that:—"The *très-illustre Prince d'Orange, Maurice, de très haute mémoire*, so excellently well ordered the lodgings of his army, that there was not an officer, great or small, or the humblest soldier, who would not confess that he had ample room in his quarters."¹ And an examination of the magnificent engravings which accompany his work—showing the disposition of the different parts of a Dutch camp, the rich pavilions and tents of the officers, the huts of the infantry, cavalry, artillery, and vivandiers—will convince any one that whatever improvements may have been introduced into the art of castrametation, the ordering of encampments has since gained nothing in mere geometrical regularity.

Indeed, it is very certain that camps were nearly everywhere in Europe regularly laid out, some time before the use of tents became general. Thus De la Fontaine and M. de Gaya² give rules for the establishment of camps quite similar to those even

¹ "La Charge du Mareschal des Logis, tant general que particulier, soit de toute une ArmeedeCavallerieet Infanterie en general, que d'une Brigade et regiment de Pied et à Cheval. Œuvre tres necessaire et instructive pour tous Amateurs de la noble Art Militaire et singulierement pour ceux qui desirent honnorablement parvenir a la charge, par David de Solemne, Mareschal de Logis General de la troisieme partie de l'armee de Messieurs les Etats Generaux des Provinces Unies des Pais-bas," &c. &c. Imprimé a la Haye par Henry Hondius Sculpteur, 1632. This work, in folio, one of the completest treatises on castrametation ever written, is perhaps not less remarkable as a splendid sample of the printing and engraving of the time.

² "La Doctrine Militaire," par le Sieur De la Fontaine. Paris, 1671. Sixiesme Partie, "De la Castrametation." "Le Nouvel Art de la Guerre," par De Gaya. Paris, 1692; p. 58.

now in use ; but the only tents they mention are those of officers, and in fact, they both expressly state that the troops were to be quartered in barracks and huts ;¹ while Le Blonde gives it as his opinion, that the troop-tent became well known to the French service, not before the treaty of Riswick, in 1697.²

Towards the close of the seventeenth century, after the great defeat of the Turks before Vienna, the imperial armies appear to have been generally well supplied with tents. Di Marsigli says, the troops of the Emperor Leopold were abundantly provided with tents, immense numbers having been taken from the Turks ; but that the Turkish tents, made of cotton and lined, were thought to be too heavy ; and that for this reason tents were made of German canvas (linen), which was much lighter, as also that these tents were made smaller, and more portable. And he also says, the German officers used tents which they called marquees, and that they improved them by adding curtains, which falling perpendicularly to the ground, formed a sort of gallery between the sides of the tent, which served as an equal protection against the heat and the cold ; and that the Turks finally imitated them in this.

Still, Di Marsigli thinks, the most important military information communicated by the Turks, was that which concerned the manner of using tents.³

The common Turkish army tent of that time—the tent generally used by the Janissaries—was conical in form, and supported by a single mast. The covering was drawn out by cordage attached about two-thirds of the way up its sides. “In the Levant,” says the “*Encyclopédie*,” “tents were made of heavy cloth (canvas) firmly woven, which sheds water easily. The covering was supported by a single mast, and was fastened down, around its border, by cords hooked over iron pins driven into the ground. At two-thirds the height of the pavilion, were attached cords which were stayed out straightly, by means of other pins set farther from the mast than the first ; the cords pull out the top of

¹ “*Le Nouvel Art de la Guerre*,” par De Gaya. Paris, 1692 ; p. 16.

² “*Essai sur la Castramétation*,” par M. Le Blond. Paris, 1748 ; p. xix.

³ “*L'État Militaire de l'Empire Ottoman*.” 1732 ; seconde partie, c. xvi.

the pavilion, giving to it a sharp angle, like that of a mansard roof."¹ This description, intended doubtless to represent the old Turkish conical tent, is correct except in the last statement, which is likely to mislead.² The walls of this tent did not fall perpendicularly from the line of the insertion of the cords, but were fastened to the ground, quite close to the outer row of pins; the cords, when pulled out, did not give therefore to the top of the pavilion a *sharp* angle. In its outlines, this tent represented a cone—or more exactly, it represented a cone surmounted by the apex of a second cone, having a *slightly* larger base. These tents were always lined on the inside with some sort of cloth—generally of cotton; at least, the upper part or dome of the tent, was lined.

The marquee appears at this time to have been used rather by officers than by common soldiers. The marquee was a house-shaped tent, covered by a second or upper roof; it was sometimes used without the second roof, still retaining its name. A peculiarity of the second or outer covering was, that it only covered the roof of the marquee, projecting a little over the ends and sides of the tent. The roof and even the sides of the marquee were lined.

The tents of this kind, which belonged to the principal officers, were always very handsomely carpeted. These officers also, in addition to their marquees, often made use of a sort of square tent, closed on three sides and overhead, but entirely open in front. The Turks were also in the habit of establishing their latrines behind canvas screens, which invariably formed a part of their camping material. In fact, however primitive an idea this people may have had, at the close of the seventeenth century, of castrametation as an art, their camping material left very little to be desired either as regards its abundance or its quality; and its excellence

¹ "Encyclopédie," art. "Tente."

² Bardin, after having quoted the statement of the "Encyclopédie," immediately observes:—"Ces pavillons ont pu être, on le voit, le modèle de nos marquises." Now the tent described in the "Encyclopédie" resembled a marquee in no respect more than does a modern French *tente conique*. The similitude of the mansard roof misled. Another cause of misconception may also possibly have existed in the word *pavillon*, which has recently been chiefly applied to house-shaped constructions; formerly the pavilion was usually a round or conical tent.

was undoubtedly one of the causes of the very general disposition, shown at that time throughout Europe, to place armies in the field under the shelter of tents. Still, the credit of having created and fashioned the camping material of Europe can scarcely be accorded to the Turks. For centuries the Turks had only repeated the knowledge which they had acquired from the Tartars, the Arabs, and the various Oriental races with which for a long time they were closely allied and assimilated. In the East, one may still see tents constructed of nearly every kind of material, and of almost every conceivable form; and there is scarcely any reason to doubt that the types most frequently seen to-day, were those employed hundreds, even thousands of years ago, as also, that they have served as models as well in the construction of the splendid pavilions of the Crusaders and the knights of the middle ages, as of many of the less imposing and more serviceable tents, under which European armies have encamped in more recent times.

The "Encyclopédie" and De Chesnel give to Louis XIV. the credit of having first issued tents to the troops of modern armies; but there is no evidence that tents were furnished by the French Government during the long reign of that king, except to *la maison militaire du roi*, and to certain *corps privilégiés*;¹ and although Turenne and Montécuculi speak of tents in their "Mémoires"² as if they formed a part of a military outfit during the Franco-German wars which took place in the reign of Louis XIV., there existed in the French service, until as late as

¹ Thus, an expeditionary force, sent to the aid of Candia in 1669, numbering about 6000 men, is said to have taken with it "more than fourteen hundred tents." ("Histoire de Louvois," par Camille Rousset, tome i. p. 258.) But the common method of establishing an encampment at this time, is better shown in the following statement, which appears in a communication of Camus Destouches to Louvois, cited in the work referred to:—"The soldiers are lodged at Charleroi in the most pitiable manner. Sixteen soldiers are placed with four beds in a little hut made of straw, which it is impossible to keep warm, without great danger of setting it on fire, and as the floor is always covered with mud, and there can be but little fire, the soldier is constantly suffering from humidity."

² "Mémoires sur la Guerre, tirés des Originaux de M. de T——." Paris, 1738; p. 34. "Mémoires de Montécuculi." Paris, 1746; liv. i. c. 4.

1732, very little uniformity as regards either the form and qualities of the tents employed, or the number allowed to a company. I am quite aware that De Bombelles, who wrote towards the close of the reign of Louis XIV., speaks as if the soldiers had tents, and as if these tents had a fixed size and form—that is, he says they were two paces wide, and that each company was presumed to have eleven.¹ But, inasmuch as the officers still bought their own tents, and the regiments provided themselves with shelter as best they could, it is probable that De Bombelles' account applied rather to a theoretical or model camp, than to one occupied by an active army at the time he wrote. In some of Van der Meulen's battle pictures, may be seen representations of the camps and tents of the time of Louis XIV., which are unquestionably historically accurate. The camps were evidently laid out with very little order, and the tents represented are of nearly every imaginable kind. One may see, side by side, the splendid pavilions of the *noblesse*, the tents of the officers—square, round, conical, wedge-shaped—the make-shift tents of the men—strips of canvas, or blankets stretched over poles, or attached to the sides of waggons, to secure a better shelter from the wind beneath them—and an endless variety of booths and bowers.

Previously to the eighteenth century, the troops in English armies were commonly quartered by billet, or were encamped in "baragues and hutts."² I have already described, with sufficient detail, the quarters furnished these troops while actively employed, during the fourteenth and fifteenth centuries. In the time of Henry VIII., while the tents and pavilions of the king and his courtiers were, as we have seen, magnificent "beyond description," soldiers would appear to have been generally quartered in

¹ "Mémoires sur le Service Journalier de l'Infanterie," par M. de Bombelles. Paris, 1719; tome i. c. ii. art. 50.

² Grose says the troops "were indiscriminately quartered upon all householders, as was practised in England so late as the rebellion in the year 1745." ("Military Antiquities," vol. i. p. 339.) Towards the close of the eighteenth century, Hamilton states that "the billets in England, and I may add in Scotland, are always in public houses." ("The Duties of a Regimental Surgeon," vol. i. p. 12.)

huts.¹ There is a manuscript of the time of Elizabeth, in the Harleian collection (No. 7,364), and referred to by Grose, in which the statement is made that:—"In a companie of 100, the souldiers are lodged in two rowes of cabbans, with a street of

¹ Strutt has a plate, in which there are representations of a considerable number of common tents of the time of Henry VIII. Among these may be seen several tent-barracks—quadrilateral constructions with flat sloping roofs of boards, or of boards covered with canvas, and with canvas side curtains.

A paper has been preserved, showing the composition of the household of King Henry VIII., and how it was lodged at the time he engaged in a war with France in 1545. It is entitled "Hales (i.e. tents), round houses with creasents and their apparell with wagens furnyshed for the carriage of theym delivered at the Kings Ma^{ty}s Commandement by thandes of Anthony Aucher Lievetenante appoynted frome the xvijth daie of July Anno rr, H. viii. dei gra.," &c.

And according to it, the three officers of the stables, "for the use of the stables had 14 hales, 5 round houses, 5 creasents and 2 wagens. Twenty hatchments of the Kings Arms.

"Twelve partitions of canvas of three breades, and one hundred manger stakes. . . .

"The King's Phisitien.

1 hall,
3 round houses,
3 crescents and
1 hatchment.

"The Surgeons and Potticarie.

1 hall,
3 round houses,
2 crescents and
1 hatchment."

. . . and we are told that the tent-makers received as wages sixpence per day.

When the King (Henry VIII.) went to Hampton Court two years later, it is recorded that his Master of the Revels "had to convey to attend the king a large house made of *forse*, with timber and boards, tents, halls, pavilions, and timber houses." The windows of these houses were made of horn, "and 2168 pounds of wax at 6d. was spent in searing 1647 yards of new *vytrye* canvas for the covering of the timber houses and the banketing houses." (See "*Archæologia*," published by the Society of Antiquaries of London, vol. xviii. p. 313.)

I may further note, as evidence that tents and pavilions were used at this period in England, rather by kings and their attendants than by the common soldiery, that in Rymer's "*Fœdera*," under the date of 1415, is a Royal Commission, *De operariis capiendis pro pavilionibus et tentoriis Regis*, and which begins as follows:—"Rex dilecto sibi Johanni Covyn Pavilionario nostro salutem." In the Rolls of Parliament (1485—Henry VII.) Richard Walshe is mentioned as the "Sergeaunt of the Kings tents." At a later time the *Pavilionarius* seems to have been better known as the "Master of the Revels."

eight foote running betweene; which row of cabbans containe each of them five and twenty cabbans of eight foote square," &c.

But in a manuscript in the same collection, dated almost a hundred years later,¹ I find quite the same rule for the encampment of the troops:—"To a companye of foote of 100 must be allowed 2 rowes of huttes or cabbans, each file or row 200 feet deep & y^e breadth thereof 8 feet with a street of 8 feet broad betwixt the two files, into y^e which y^e doors of bothe y^e rowes of huttes must open, each door opposite one against y^e other."² This manuscript throws much light upon the character of English encampments of the time. The general's tent, and the character and disposition of the constructions around it, are quite similar to those shown in Solemne. The tent is formed of four pavilions, placed at the extremities of a cross of canvas covered passage-ways. A sketch of the general's head-quarters, which accompanies the manuscript, is described as follows:—"Y^e figure A denoteth y^e Generals owne tentes for his privacye, y^e others next to it are his dinning room, his chamber of audience and y^e common hall. All y^e other lesser quadrangles which stand about his pavilions betwixt y^e letters C and B, are y^e several officers belonging to y^e court, vid: y^e Secretaries tent, y^e Stewards tent, y^e Gentlemans tent, y^e common hall for y^e serving men, y^e Kitching, y^e Buttery, and so forth. C denotes a row of huttes in which are lodged y^e under officers and servants of y^e court."

Indeed, there are reasons for believing that the proportion of

¹ No. 6008, entitled, "A brief Treatise of War, containing y^e most essential and circumstantial parts thereof, digested into seven sections, by W. T., in the year of our Redemption, 1649."

² Orrery says, the soldiers' huts were eight feet broad and seven feet long, and that each hut accommodated three soldiers; but towards the close of the seventeenth century, the size of the huts would appear to have been reduced. According to Sir James Turner (who, however, calls it "the old way") there should be fifty huts in each row, "8 foot for the breadth" and but $3\frac{1}{2}$ feet in length. Each of these huts was to be occupied by one soldier. And he adds:—"In the *Low Country* wars, the Prince of Orange allowed four foot for the length of every foot-soldier's hut; but the Germans, for most part, allow but $3\frac{1}{2}$, whom, in this point, I have followed in this castrametation." ("Pallas Armata," by Sir James Turner, Knight. London, 1683; pp. 291-293.)

tents used in encampments at a very early period of English history may have been even greater than it was several centuries subsequently. Lord Orrery evidently regarded the hutting of troops as in his time—the latter part of the seventeenth century—a comparatively modern invention. “In ancient times,” says he, “they used tents, instead of huts, for then the way of making war was in the field, and armies were daily in motion, and in such cases, straw, rushes and flags to cover, and wood to make stakes and roofs, were not always at hand, nor to form the roof easie, but now that for the most part war is made in the besieging of strong places, or in standing camps, both officers and soldiers use to hut, which is more warm and lasting than tents.”¹ But if huts were extensively used in Lord Orrery’s time, tents had then by no means been abandoned. Says Evelyn, in his “Diary,” under the date of June 20th, 1686:—“An extraordinary season of violent and sudden rain. The camp still in tents.” And in the same month of the following year we find this entry:—“The camp was now again pitched at Hounslow, the commanders profusely vying in the expense and magnificence of tents.”² This statement is interesting, as it shows that costly tents were still objects of admiration among English officers as late as the close of the seventeenth century, and moreover implies that tents were personal property, a fact which would inevitably lead to ostentatious displays on the part of the wealthy, and a reliance for shelter and cover upon every possible makeshift on the part of the heedless and poor. From such books and documents as are now accessible to me, I am unable to find that troop-tents were considered as essential to the outfit of an English army much before the middle of the eighteenth century. Several forms of army tent were then in general use, sketches of which are given by Grose in his “Antiquities,” and to which I shall soon have occasion to refer more particularly.

Bardin says that the Prussian army was first regularly pro-

¹ “A Treatise of the Art of War, dedicated to the Kings Most Excellent Majesty, and written by the Right Honourable Roger Earl of Orrery.” 1677; p. 86.

² Op. cit.

vided with soldiers' tents, and that it was in imitation of this provision, that tents were given to the French infantry. This statement is probably correct, at least M. de Gisor informs us that in the Prussian service, in the latter part of the seventeenth century, each company of infantry had two tents for the subaltern officers, and twenty-two for the soldiers. Each tent was intended to shelter five men; and a regulation also provided that each tent should have in it two blankets, "His Majesty wishing to preserve the health of his soldiers."¹

If one may judge of the form of these tents, from representations in a ground-plan of a camp (Plate VIII.) in M. de Gisor's book, they were the prototypes of a tent, very frequently mentioned, after it became a practice to place troops in regularly constructed camps, and which was extensively used in the French army during the eighteenth century. This tent, known as the "Cannonière," was wedge-shaped, and was supported by two upright poles and a cross-piece; it was about six feet six inches high, six feet eight inches wide at the base, and six feet six inches long. It had, however, what was termed a *cul-de-lampe*, that is, the rear wall was so formed that it could be stretched out at the bottom of the tent in a semi-circular manner, some three feet and four inches beyond the second standard, thus adding to the interior of the tent a considerable space of a hemi-conical form. The canvas was stretched out from the ridge-pole on each side, and pinned to the ground, through rings, served with cord, in the lower borders of the canvas. The front of the tent was vertical, and triangular in form; a perpendicular opening, from the apex to the base, formed the door-way. It will be seen that this tent was simply a wedge tent, enlarged by bulging out one end. (See Fig. 13.) It took nine and one half French ells of cloth ("toile d'Alençon,") one ell ($1\frac{1}{2}$ yards) wide, to make a cannonière. The cannonière was intended for seven soldiers, and covered about fifty square feet of ground surface, thus allowing to each soldier but seven square feet. This small cannonière was, if an opinion may be expressed from an examination of the plans of encampments in

¹ "La Tactique et la Discipline selon les Règlements nouveaux Prussiens," par M. de G. (de Gisor). Francfort, 1767; tome i. p. 180.

the works of Puységur, Le Blond, and other military writers, the model troop-tent in the French service during nearly the whole of the eighteenth century.

But, as I have already remarked, there was evidently a good deal of variety among the troop-tents first used, while nearly all the descriptions which I have seen of the tent *d'ancien modèle*, are unsatisfactory if not confused. They would appear, however, to have been wedge-shaped, and to have been supported by two upright poles forked at the top (*fourches*), to hold the ridge-pole. They were unstayed by ropes, the canvas coverings, of a single thickness, being simply drawn out and pegged to the ground along the lower borders.



FIG. 13.—A cannonière, from a picture by Van der Meulen.

It is certain that the *cul-de-lampe* was never an indispensable feature of the common troop-tent. And although, as I have remarked, it is not improbable that the *cul-de-lampe* may have been a characteristic of some of the troop-tents first used in the Prussian service, they certainly are very rarely represented with this appendage in German paintings and engravings, of a date anterior to the reign of Frederick the Great. They often-times, from the sketches which I have examined, would seem to have been formed of nearly square pieces of canvas stretched over a ridge-pole, in such a way, as to leave both ends of the tent quite open—that is, without vertical end walls; but as the breadth of the canvas was frequently considerably greater than the length of the ridge-pole, the ends of the tent might be closed, when necessary, with the surplus canvas. Doubtless cords were occasionally attached to the tops of the upright standards and fastened to pegs driven into the ground, a few feet from them; the free canvas at the ends, being thus supported, would enlarge the interior of the tent, and give to one or both of its ends a hemi-conical form. Indeed, it is very probable that the *cul-de-lampe* owes its origin to this fact. Nevertheless, the troops then occupied not unfrequently wedge tents provided with vertical end walls, and similar to that shown

in the sketch below (Fig. 14). Sometimes the ridges of these tents are represented covered with double roofs, or hoods, and it is a very interesting fact, that the hoods are often, in form and appearance, exactly like those I have spoken of as peculiar to the Roman *tentorium*, the only difference being one which leaves no doubt as to the meaning of the horizontal line in the representation (Fig. 9)—two or three cords passing from the long line which shows the limit of the lower border of the hood, to the same number of pegs, planted in the ground a short distance outside of the line of pegs which secure the lower border of the tent itself.¹ Simple wedge-tents, such as that shown in Figure 14, are also to be found in sketches illustrating the movements of the armies under Turenne, Condé, and Maréchal Saxe; and Grose represents tents of this form as having been in use in the

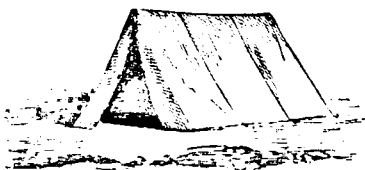


FIG. 14.—A wedge-tent of the seventeenth century.

English army in the middle of the eighteenth century. Indeed, I may again remark that the simplest as well as most primitive form which can be given to a tent, is that of an inverted wedge. Such tents were used by the

ancients, and they are still extensively employed among those people who cling most tenaciously to their ancestral customs, as also wherever simplicity is sought, and the object is to obtain the best results with the least trouble.

In some engravings which I have, representing certain Chinese military operations in the years 1756 and 1758, a number of encampments are shown; in these, nearly all the tents are wedge-shaped, and but for the peculiar distribution of the tents, the

¹ The dispositions, which I have just described, may be seen in a series of engravings, marked "Med. Fol. No. 31. George Balthasar Probst excud. A V." The engravings are without date; but Probst worked in the first half of the eighteenth century. No. 115 is entitled, "Representatio castrorum a fronte." No. 116, "Prospectus castrorum ex parte alæ dextræ." No. 117, "Prospectus castrorum ex parte alæ sinistræ." No. 118, "Representatio castrorum a tergo." These engravings belong to the sanitary collection of Dr. Thomas W. Evans. I may here also remark, that the double roof or hood, as applied to the wedge-tent, may be seen in many French engravings of the same period. One of these I have now before me. (Planche 10^e in "L'Expérience de l'Architecture Militaire," par le Sr. * * * Paris, 1687.)

encampments would be at once supposed to belong to European armies.

Le Père Amiot, in his book entitled "*L'Art Militaire des Chinois*," published in 1772, says the tent used by the Chinese "is five feet five inches high, fourteen feet long, and six feet wide; it is wedge-shaped, and has triangular doors." To continue his description:—"The exterior covering is of coarse white canvas; the tent has an inner lining of common blue cloth; sixteen pieces of iron (sockets) hold together the frame-work, which consists of two upright poles and a ridge-pole. The tent is secured to the ground by eighty wooden pins, which are driven through loops attached to the border of the canvas. The cost of this tent, together with its fixtures, is 110 francs."¹

In French encampments in the time of Louis XIV. the canvas was sometimes thrown over a long bar, one end of which having been raised, was supported by a single *fourche*. Such long, sloping wedge-tents may occasionally be seen in old engravings; Denon has given representations of them in his "*Egypt*," and they are still to be met with in the East.

Another tent, frequently mentioned by writers of the period of which I am speaking, was the *cortine*, or *courtine*, an oblong square tent used by officers (see Fig. 15). This tent was sometimes covered by a *sur-tente* or "fly." "They were," says Bardin, "*cénacles*, made of ticking (*coutil*), covered by a *second* roof fastened to the ground by pickets. If the *second* roof had walls, the tent was called a 'marquise.'"² When these "cortines," "pavillons," "pavillon à mansarde," used by officers, had simply the double roof, they occasionally closely resembled the "hospital" and "officer's" tents now used by the United States Government. The following description of the officer's tents used in the French service in the middle of the eighteenth century

¹ Op. cit. pp. 376, 377, 378.

² Bardin, op. cit. art. "Pavillons." This statement is not correct. The marquises of the Turks, and the tent first known as a marquise in the Austrian army in the seventeenth century, only possessed a *sur-tente*, an over-roof, or fly. The Austrians added to the fly, as Di Marsigli informs us, curtains or walls, thus giving to the marquise its present form.

may be of interest:—"The tents of the subaltern officers are cannonnières, but larger than those for the soldiers. Those of the superior officers are pavilions five, six, or eight feet square, made of ticking; the roofs are seven or eight feet high; they have four curtains, which are called *walls*. The pavilion is covered by a second roof, which extends five or six feet beyond it, and terminates in a *cul-de-lampe* (hemi-cone) at its rear end. Walls are sometimes added to this second roof; the tent is then called a *marquise*. The second roof is stretched out, by cordage attached to pegs planted in the ground, as is the roof of the pavilion; the walls are also fixed to pegs by cords. The rain passes easily through the canvas and the ticking (*coutil*), of which the common tents are made, and falls inside in fine drops; this is what is called *tamiser*—to sift. The *marquise* prevents this, except



FIG. 15.—A cortine or wall-tent of the seventeenth century.



FIG. 16.—A cortine covered by a *sur-tente* or fly, and frequently called a *marquise*.

during a very heavy rain; moreover, it diminishes the heat, which is frequently very great under the cannonnières."¹

Fig. 16 shows a pavilion, or cortine, with a *sur-tente*. Sometimes the *sur-tente* was furnished with walls, which nearly or quite enveloped the tent. A tent so covered is shown in Fig. 17, which represents an English marquee as constructed in the middle of the last century. This tent is apparently similar, in every respect, to the marquee now used in the British army for hospital purposes.

De Perrin considers the marquee to be the lineal descendant and representative of the splendid pavilions, used in ancient times and in the middle ages; indeed, he suggests that its very name was derived from the rank of those who brought it into use. In

¹ "Encyclopédie Méthodique," art. "Militaire;" tome iii. 1787.

respect to the origin of the name,¹ De Perrin may be quite right; but I may observe that outer coverings have very rarely been employed except as a means of more effectually protecting those

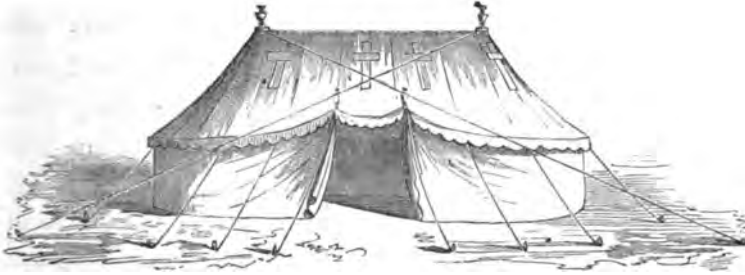


FIG. 17.—An English marquee of the middle of the eighteenth century. Copied from Grose.

within tents from the excessive heat of the sun, and from the rain; as also, that if the use of such coverings is very ancient, it has been by no means strictly limited to persons of rank.

¹ The origin of the word *marquee*—*marquise*—is not certain. Bardin denies that it comes from *marquis*, a title, and states that a distinction was made between tents *marquées de raies*—striped, and those of a single colour; that the word in its primitive form, is seen in the English *marquee*, and that the French soldiers have corrupted *marquée* into *marquise*. Without pretending to state positively either how or when this word first came into use, I believe Bardin's statement is wholly improbable. The word *marquise* has since two hundred years been applied to a tent, not of a peculiar colour, but of a peculiar and definite construction. This tent was a square or oblong tent, which always had, or was intended to have, a *second roof*; and this second roof was not a *lining*, but a second roof stretched *above* and *over* the roof of a tent. If the upper roof was made *à murailles*, with walls completely enclosing the tent, the *enclosed tent* was *originally* still called a *marquise*. It is generally conceded that the *marquee* is of Eastern origin. Now Di Marsigli gives a number of sketches of Turkish *marquees*, and no tent appears to have been known in his time as a *marquee* which did not have a *second roof*, or at least was not constructed with reference to the application of such a roof. This upper roof was not provided with walls—it was a simple “fly;” and he says that a tent provided with such an *upper roof* was called in the *imperial* army a *marchesa*—*marquise*. He says that such tents were used, principally by Turkish *pashas* and officers of rank, and it would appear probable from his statement, that they were introduced into Christian Europe in the seventeenth century, during the wars between the Turks and Austrians. Their use among the Austrians seems also to have been limited to officers, who, according to Di Marsigli, added the walls to the upper roof. The uncertainty which has obscured the reasons why a certain tent should be called a *marquise*, has very naturally given rise to conflicting opinions with regard to the *part* of such a

The Byzantine Emperor Leon (A. D. 900) directs that the troops about to engage upon an expedition "shall take with them their cantines and their *double tents*, if there is occasion, of which one part serves as a roof or *sur-tente* to the other."¹ The Emperor Maurice (A.D. 590), in speaking of the tents used by the Turks and Arabs, commends them as both handsome and commodious; and M. Maizeroy, in noting this fact, does not hesitate to accord to those peoples the credit of having invented the double roof or "fly."² "The Turks," says Di Marsigli, "who possess great wealth, have convenience and elegance always in view, in their encampments. Their tents are impenetrable to rain, to the sun, and to the wind. The general officers and subalterns, as well as the pashas, have *double-roofed* tents."³ So the Jewish tabernacle is represented as having been provided with a roof of skins placed, as a protection, over the covering of the tent.⁴ Indeed, it has been a common custom in the East,

tent which was, strictly speaking, *the marquise*. The "Dictionary of the French Academy," and Furetière, define a *marquise*—"grande toile qu'on tend par-dessus une tente d'armée." French lexicographers have, quite unanimously, agreed to consider the *sur-tente*, or outer tent, as the true *marquise*, excepting the definition of the Academy, or perhaps the authority of Furetière, whose technical definitions are not always trustworthy. Bardin takes the same view, and evidently bases his statement partly upon a passage in Lachesnaie, who—probably—forgot to say that he took it *verbatim* from De Perrin. Now none of these authorities are anterior to Di Marsigli, who distinctly states, as will have been observed, that it is the *under covering* which is called in the imperial armies the *marshesa*; while, as if to make this point still more certain, he calls the *sur-tente*, (the over covering,) the *dome*. In short, a tent was originally called a *marquee* or *marquise*, if not because, at least only *when*, it had been constructed with reference to the application of an outer covering; and it was to the *tent*, and not to this covering, that the name was given. Still, general usage perhaps sanctions calling a *sur-tente*—*the marquise*, as this word is not only at the present time applied to over coverings of tents, but is used also to indicate various awnings, whether of canvas or other materials, projecting over steps leading into houses, &c., and is even applied to the padded or outer door of a double door, which, *en passant*, I may observe, certain etymologists would have us believe received its name from the German *marc*, Low Latin *marca*, French *marque*, in the sense of a *boundary* or *limit*, to wind, rain, &c.

¹ "Institutions Militaires," op. cit. tome i. p. 155.

² Ibid. tome ii. p. 294.

³ "L'Etat Militaire de l'Empire Ottoman," seconde partie, p. 56.

⁴ "And he made a covering for the tent of rams' skins dyed red, and a covering of badgers' skins above that."—*Exodus xxxvi. 19*.

since a very remote time, to employ a second covering for tents. The ordinary private's tent now used in Bengal, in the English service, has an outer "fly" consisting of *three* folds of cotton cloth, while the inner roof itself is *double*. The sepoy's *pall* consists throughout of *three* folds of cloth.

From the descriptions which I have given of some of the tents employed in European armies, during the eighteenth century—and although tents were then at certain times issued to the troops as liberally as they may have been at any time since¹—it must not be inferred, that they were ever regarded as other than expedients—as substitutes for more desirable quarters. They were very rarely employed during the winter months.² Colombier,³ after having indicated the precautions to be observed by men under canvas, says:—"I have thus far spoken of armies encamped during the summer, for it is only at this season that they encamp, except when obliged to do so, since sometimes it is necessary to remain in the field during the other three seasons, despite the rigour of the weather, as was the case at the Zell, where several regiments were under tents in the month of December, and in the French and allied armies before Giessen (1760), in the months of October and November.

"One can easily understand, that it is in these circumstances that troops suffer the most in camp; the rain, snow, and hail—everything tends to multiply the dangers of the situation." And yet, curiously enough, he admits that the mortality is then generally less, under a good administration, than when the troops are encamped during the months of August and September. But he goes on to say: "When the camp is no longer tenable, to avoid the rigour of the season, it is customary to place the troops for a month or six weeks in *cantonnement* before they go into winter quarters." And here again, he observes that often the assembly of large numbers of men in the same village leads

¹ According to Bardin, when the Prussian Government first began to issue tents to the troops, it took *twenty-eight* horses and *sixteen* teamsters to transport the *one hundred and twenty-eight* tents of a single battalion.

² "Campagne de l'Armée du Roi en 1747." A la Haye, chez Henry Scheurleer 1747.

³ "Préceptes sur la Santé des Gens de Guerre." Paris, 1775.

to dangers greater than those they would have encountered, had they remained in camp. "Towards the middle of November *winter quarters* are assigned the troops." These, however, differed in no way from the cantonnement just mentioned, except in the establishment of a few defensible posts, which, with the presumed inactivity of the enemy, permitted perhaps a larger dispersion of the troops among the neighbouring villages.

But sometimes it was necessary to remain in a fixed camp for the winter, and then "barracks were ordered, or at least permitted." This arrangement, by which the troops were sheltered from the cold and the vicissitudes of the weather, "consists in building up of branches, earth, straw, or dung, a sort of hedge around the tent; while excavations are made (outside of the tent) for the kitchen, and that the soldiers may warm themselves. Although these barracks protect one very little against humidity, they at least serve to keep off the wind. Sometimes a roof is put over the tent. When it is solid, and sheds water well, it is an advantage, as it is a greater protection against the cold and rain; but as the soldiers are allowed to make excavations, I should prefer to let them remain in these, during the day, and make them sleep in their tents, barricaded as I have described."

These dispositions, narrated by Colombier, were those generally employed in camps during the reigns of Louis XIV., Louis XV., and Louis XVI.¹ But shortly after the commencement of the wars of the Revolution, the use of tents in the French service was almost wholly abandoned. Hoche assured his troops that it was "more soldier-like, more republican, and more glorious," to take the field without tents than with them. During the great wars of the Empire, the difficulty of obtaining cloth, and the

¹ "Journal des Marches, Campements, &c., des Armées du Roi en Flandres," 1690-94, par Vaultier. "Mémoires de Monsieur de la Colonie, Maréchal de Camp des Armées de l'Electeur de Bavière." Bruxelles, 1737. "Histoire de Louis de Bourbon, Prince de Condé," par M. Coste. A la Haye, 1748. "Histoire de Louvois," par Camille Rousset. Paris, 1864. "Mémoires de Montécuculi," liv. i. chap. iv. art. 5. "Mémoires de Turenne," chap. i. art. 2. "Les Rêveries de Maurice, Comte de Saxe." La Haye, 1756, &c., &c.

To go into winter quarters, *hiverner*, on the approach of cold weather, was as customary during this whole period, as it ever was in the Roman military service.

difficulty of transporting shelter, for the immense armies which were then created, resulted so far in the disuse of tents, that although they are constantly referred to in the Ordinances of the period, as constituting an essential part of the army *équipement*, as a matter of fact, even the generals themselves were rarely provided with them. Nevertheless, the consequences of bivouacking were fearfully disastrous. General Rogniat declared it to be "one of the principal causes of that frightful consumption of men during the last wars;"¹ and Biron affirmed that "this mischievous manner of carrying on war, caused more soldiers to perish than the fire of the enemy."² A partial remedy for these evils was found, in permitting the soldiers in stationary camps to construct huts; but it was so late as 1793, before a French army was fairly quartered in huts. The most celebrated camp of this kind was that at Boulogne (1803-1805). Here an army of 160,000 men had been encamped, at first *au bivouac*; but the soldiers, taking the initiative, began to build huts for themselves, until finally the whole army was thus provided. This camp was subsequently embellished with gardens, arbours, columns in stucco, &c., until, in the language of an historian:—"The austerity which should reign in a camp was united with the elegance which is the ornament of cities."³

Under the Restoration, stationary camps were generally established in huts.⁴ Indeed, it was only so recently as 1830, at the time of the Algerian War, and after years of peace had enlarged the resources of France, and the army had been re-organized, that tents began to be regularly and systematically issued to the troops.

In the English army, after the use of tents had once been adopted, it would appear to have been adhered to much more uniformly, than has been common in Continental armies; and on more than one occasion during the wars of the Empire, their

¹ "Considérations sur l'Art de la Guerre." Paris, 1820; p. 264.

² "Journal de Médecine Militaire," tome ii. p. 5.

³ "Victoires et Conquêtes," tome xv. p. 80.

⁴ "Parmi les effets de campement, ne sont plus comprises les tentes, parceque l'usage s'en est perdu."—*Cours d'Études sur l'Administration Militaire*, par P. A. Odier. Paris, 1824; tome troisième, p. 17.

number is said to have offered an unpleasant sight to the comparatively badly quartered French troops. During the last great war in which the English have been engaged, that of the Crimea, as has frequently been the practice in sieges prolonged into the winter, the troops were for the most part placed in huts.

During the first year of the American War of the Rebellion, the Federal troops were furnished with tents most liberally; but as the war continued, the company tents were replaced by *tentes d'abri*, and to such an extent, that long before the close of the war, the troops were rarely provided with any other shelter.

Probably the most remarkable instance of an abandonment of troop-tents during a campaign, in modern times, occurred in the late Franco-German War, and on the part of the allied German armies. Very few of these, on entering upon the campaign, were provided with troop-tents of any sort. During the months of July, August and September, their quarters were generally *au bivouac*; and as the season grew later, the troops were quartered in the houses of the country, or, if in tents, in those captured from the French.

In speaking of the interior arrangement of Roman tents, I observed, that beyond covering the ground with straw, nothing was commonly done to make them habitable. The practice of thus furnishing the interior of military tents, has almost universally prevailed down to the present time. Where straw could not be procured, dry grass, leaves, herbs, and the fine branches of trees have been used as bedding.¹ In cold countries, and where tents are employed by the whole population, the occupants of tents have very generally made their beds of skins. The Persians, Arabs and Turks are perhaps the only races who have in their

¹ "When straw is issued for the use of troops, it should be made into mats, and not left loose in the bottom of the tent. Mats may be best made as follows: The straw is twisted into ropes; two rows of tent pegs are driven into the ground parallel to one another and two feet apart, and the ropes passed around the pegs to form the web. Other straw ropes are interlaced so as to form the woof, and an excellent mat is made in a short time. Each man should have two mats, one for his head and shoulders, the other for his legs."—*Regulations and Instructions for Encampments*, War Office, 2 June, 1872.

tents systematically used carpets or floor-cloths, as a matter of health and convenience.

The fear of dampness, from a direct contact with the earth, has been the occasion of many devices and suggestions. In the United States during the War of the Rebellion, whenever the size of the tent permitted, bunks were built, often one above the other, as in the cabin of a ship, and this practice has occasionally been employed elsewhere; but as a rule, in military life it has been necessary for the soldier to sleep upon the ground, with or without the intervening straw. The risks of such a practice are considerable at every season of the year. That they might be partially avoided, M. Jourdan Le Cointe was induced, many years ago, to propose the use of a square piece of oilcloth which was to form an accessory part of each tent, and which was to be laid on the ground before the straw was brought into the tent; and it is a matter worthy of note, that among the many advantages he enumerates which might be derived from the use of such a cloth, is this,—those serving as scouts and at outposts “could lie down on the naked earth wrapped up in their cloaks without having to fear the dangers of dampness.”¹ The proposition of Le Cointe was not adopted. Quite recently, however, the English Government has so far recognized the wisdom of the suggestion, as to provide the hospital marquee with such a floor-cloth. Soon after the outbreak of the civil war in the United States, the Federal soldiers were provided with an india-rubber poncho which, among its many uses, served excellently as a floor-cloth within a tent, or as a blanket, upon which the scout could lie down on the ground, in the open air, without the fear of dampness.

As may be supposed, it is only after the middle of the eighteenth century that any criticisms are to be found, concerning the qualities of tents used in encampments. Colombier, who was one of the most intelligent sanitarians of his time, has, however, pointed out certain defects in the *cannonière*, which perhaps will be found none the less interesting, because applicable to some of the tents still in use. As has already been observed, tents were never considered in the eighteenth century as suitable

¹ “La Santé de Mars,” par Jourdan Le Cointe. Paris, 1790; liv. ii. c. 5.

quarters for troops, except during the milder portions of the year.¹ Hence Colombier says:—"Except towards autumn, when the nights and mornings are sometimes cool, the soldier under the *cannonière* suffers much less from the cold than from the heat. He can protect himself from the cold by packing the earth around the border of his tent, or by pinning the border down more tightly, or by stopping up the holes with straw; but it is more difficult to find a remedy for the heat. The sun beats through the canvas, and becomes sometimes almost insupportable. The cavalryman has a remedy for this, as he can spread his cloak over the *cannonière*; the foot-soldier can only make use of leaves. If he had only some blankets given him, he might at times use these as the cavalryman does his cloak.

"I would have the *cannonière* so made that it could be opened at both ends, in such a way, that when it became hot, the end towards the sun might be closed and the other opened. In this way we might always get a current of air, which would diminish the force of the heat."

Jourdan Le Cointe observes:—"The *cannonières* of the soldier are all ordinarily of a very angular form, low and narrow; it is into these strangled sacks that a number of men pile themselves at night. The pestiferous air within them in warm weather frequently causes them to be dangerous."² And he repeats the recommendation of Colombier, that the tents have an opening at


¹ Says Frederick the Great:—"When the campaign is over, one begins to think of winter quarters. . . . Winter campaigns destroy troops, as well on account of the diseases which they occasion, as from the difficulty of obtaining sufficient supplies. . . . It is certain that the best army in the world could not long endure such campaigns; hence war in the winter should be avoided as of all military expeditions the most objectionable." And yet, he observes, it is sometimes necessary, and, "I think I have made more winter campaigns than any other general of this century." And in conducting such wars, he recommends that the troops should be kept in *cantonnements*, as much as possible, and when the decisive moment arrives to march against the enemy, that they should *camp à la belle étoile*, each company passing the night around a large fire. "But as such fatigues are too violent to be long resisted, you will use in such enterprises the greatest possible despatch." ("Instruction Militaire du Roi de Prusse," traduite en français par M. Fæsch. Amsterdam, 1760; arts. xxvii.-xxviii.)

² "La Santé de Mars." Paris, 1790; liv. ii. c. 5.

each end, since "tents which only open at one end, are always infected by suffocating odours or vapours, which cause the men to suffer cruelly during the night," and even "to mutually poison each other when they are crowded together, as in an ant-hill, in a sack, every issue and entrance to which is carefully shut up."

The wishes of Colombier and Jourdan Le Cointe, were practically realized by an Instruction of the year III., which authorized the tents of the *nouveau modèle*. These tents had the form and size of two *cannonnières* brought together front to front. The doorways were on the sides, and when open, left a free passage through the tent.



 F in this general account which I have given of tents as used, principally in war, from the earliest times to the present, I have only spoken of them when used as a shelter for those who are well, it has been for the reason that it is only very recently, that their advantages as a means of hospitalizing the sick have been made a subject of serious consideration.

In another part of my Report, I have stated that the first hospitals organized under tents, of which we had any accounts of sanitary or scientific value, were those established in the Crimea in 1855. While this statement is quite correct, and the hospitalization of the sick under canvas may be said, very truly, to date from the time of the Crimean War, since the first experiment was then made which clearly proved the value of the system,—still, in treating of tents and their uses historically, we must admit that long before that time, tents had occasionally been employed to furnish quarters for those who might have been disabled in war; and if I have chosen to present in this place such historical facts as, relating to this use of tents, appear to me to be most interesting, it has been partly to avoid digressions and detached allusions to a specific use, and partly because I have believed they might here very naturally serve to close the general account which I have given of the tents formerly employed, as also, to introduce the special account which I shall give of those now in use.

It is very certain that among those people who have been accustomed to dwell under temporary shelter, such shelter has served alike for the sick and the well. So also, in armies in ancient times, the quarters given to the troops, whatever may have been their character, were occupied alike by the sick and the well. After tents had been introduced into the Roman army, each soldier considered the tent occupied by his *contubernium*, as his home; if he was ill he retired to it, if he had been wounded, he sought a refuge in it.¹ Nor was the custom of thus regarding the army tent peculiar to the Romans, as may be inferred from the many instances in which the older historians, both Greek and Latin, speak of the large numbers of sick and wounded found in the tents of captured camps. Often these accounts are quite specific, and show that the wounded there received, were the subjects of special care and solicitude. The learned Freinshemius, in his supplement to the life of Alexander, by Quintus Curtius, doubtless had the proof in hand when he said:—"He (Alexander) treated his wounded with extraordinary care, he visited them from tent to tent, even the common soldiers, and assuaged the sufferings of such by presents, by praises, and by promises."² And Amyntas speaks as if it was a common practice in Alexander's army to treat the wounded in their tents.³

It is evident also from the account which Thucydides gives of the raising of the siege of Syracuse by the Athenians, that the sick and wounded had been very generally taken care of during that siege in their tents.⁴ And, according to Livy, during the war which the Romans carried on against the

¹ "Castra sunt victori receptaculum, victo perfugium . . . patria altera est militaris hæc sedes, vallumque pro mœnibus, et tentorium suum cuique militi domus ac penates sunt."—*Livy*, lib. xlv. c. 39. See also, *Livy*, lib. xli. c. 4, and Dionysius of Halicarnassus, lib. viii. c. 10, and lib. xi. c. 4; indeed, a vast number of instances might be cited in which the *camp* is spoken of by writers of Roman history, as a refuge for the sick and wounded.

² "Q. Curtii Rufi de Rebus Gestis Alexandri Magni." Argentorati, anno ix. (1801), p. 64.

³ *Ibid.* lib. vii. p. 54, "vel in tabernaculo ægri et vulnera curantis."

⁴ Thucydides, lib. v. c. 75.

Samnites, about the year 321 B.C., Papirius Crassus, wishing to gain the esteem of his troops, visited the wounded in their tents.¹ So Tacitus, in the account which he gives of the civil war between Otho and Vitellius, and of the sharp conflict between the legions Rapax and Adjutrix, says that after the action, "in the same tents, relatives, friends, and brothers dressed each other's wounds."² The statement is also made by Lampridius (A.D. 222), that Alexander Severus visited his sick soldiers "who were in tents," and encouraged even the humblest by his kindness:—*Ægrotantes ipse visitavit per tentoria milites, etiam ultimos.*³

But it would be quite impossible to say, in view of this practice of permitting the sick and wounded to take refuge in their tents, that these were used as a means of hospitalizing the sick. It was only long after the establishment of the Roman Empire, that the importance of maintaining an infirmary or hospital, in the army or legion, was even suggested. It has been inferred from a passage in the treatise on *Castrametation*, written by Hyginus Gromaticus in the time of Trajan, that the Romans were then in the habit of treating their sick in camp in hospital tents. And Hyginus certainly speaks of the place where the *valetudinarium* (infirmary) should be established in the camp, at a distance from the *veterinarium* and workshops:—*ut valetudinarium quietum esse convalescentibus possit.*⁴ Masquelez, in commenting on this passage, the substance of which I have given, repeats the opinion of Lange, that, as none of the writers preceding Hyginus, not even Josephus, have made mention of the hospital, when speaking of the camp, the *valetudinarium* was probably a creation of Trajan's time ;⁵ while Colombier says

¹ "Ipse circum saucios milites inserens in tentoria caput, singulos, ut sese haberent, rogans," &c.—*Livy*, lib. viii. c. 36.

² Tacitus, "Hist.," book ii. c. 45.

³ *Æl. Lampridius*, "Alexander Severus," c. 47; and Gratian is said to have had the same habit:—"Vidi te circumire tentoria; Satin' salve? querere, tractare vulnera sauciorum." (*Ausonius* "De Gratiano.")

⁴ Hygini Gromatici "De Castrametatione" liber.

⁵ Masquelez, "Étude sur la Castramétation des Romains." Paris, 1864; p. 367. See also Hyginus Gromaticus, edition of Lange; Göttingen, 1848.

that he was "acquainted with no (Roman) writer, after Hyginus, who alludes to the *valetudinarium*,"¹ and therefore doubts very much if at any time it was considered essential to a camp.

The *valetudinarium*, of which Hyginus speaks, was very probably only a sort of convalescent hospital intended for *convalescentibus*—those who, having been ill, had rejoined the legion before they were able to endure all the hardships of the camp, or for such as, suffering from trifling ailments, might have been fairly classed with the *valetudinarians*.

But in view of the entire absence of the details necessary to an appreciation of the character of the *valetudinarium*, and the importance accorded to it in the Roman army, it is very doubtful if it was anything more than a temporary device. The Roman troops were probably treated, when ill, only in quarters, which were sometimes houses and sometimes tents, but never *hospital tents*.²

I have already had occasion to speak of the slight attention paid to the sick and wounded during the middle ages. Military hospitals were then quite unknown, and the helpless victims of war were commonly abandoned to their fate, and the chance of obtaining succour from the personal charity of those to whom they might be able to appeal. As among the Romans, doubtless the quarters of the troops, whatever they may have been, were the habitual places of refuge for the sick and disabled, who were permitted to remain in them, if likely to recover speedily, or were subject to be discharged, if considered effectively *hors de combat*.³

¹ Colombier, "Préceptes sur la Santé des Gens de Guerre." Paris, 1775; p. xviii.

² I have elsewhere stated that *contubernium* was a name often given to the *squad* of soldiers occupying the same quarters or tent. These soldiers were called *contubernales*. Now, Vegetius, when speaking of sick soldiers, has used the words *agri contubernales*. ("De Re Militari," lib. ii. c. 10; lib. iii. c. 2.) This expression most unequivocally conveys the idea that although *agri*—sick—soldiers nevertheless continued to be *contubernales*—occupants of the same quarters. Indeed, the existence of military hospitals of any sort, among the Romans, yet remains to be proved. The arguments adduced in proof are generally quite supposititious, since they are based to a considerable extent upon the fanciful interpretations of scholiasts.

³ According to Ambroise Paré, the Germans, on raising the siege of Metz, in 1552,

I have found but a single instance, in the course of my own reading, in which a hospital organization is said to have been maintained in camp, before the close of the sixteenth century, and curiously enough, this relates to a tent hospital.

In the "Chronicle of the Conquest of Granada," from which I have already made several extracts, it is said that:—"In the spring of 1484, the ancient city of Antequera again resounded with arms. In a little while there was a chosen force of six thousand horse and twelve thousand foot assembled in Antequera, many of them the very flower of Spanish chivalry, troops of the established military and religious orders, and of the Holy Brotherhood.

"Every precaution had been taken to provide this army with all things needful for its extensive and perilous inroad. Numerous surgeons accompanied it, who were to attend upon all the sick and wounded without charge, being paid for their services by the Queen. Isabella also, in her considerate humanity, provided six spacious tents, furnished with beds, and

"left behind in their tents, pavilions, and lodges, many sick." It is evident, however, from his quaint description of the quarters of the German army, which I have quoted on a preceding page, that very few were in tents. (Paré, *op. cit.*, tome iii. p. 707.)

So, in Sammonte's "Storia di Napoli," we are told that Braccio da Mantova, a celebrated condottiere, engaged in the service of Don Alphonso, of Spain, in 1423, having been attacked by Francesco Sforza, was seriously wounded, and that Braccio was carried on a shield to the tent of his conqueror, who sent to his assistance the surgeons of his troop. Braccio died. But Sammonte adds, in the same connection, that many other wounded were treated in camp, in their tents. And so after Wallenstein had repulsed, on the 4th of September, 1632, the assault which Gustavus Adolphus then made upon his camp, he is said to have gone around addressing words of consolation to the wounded soldiers, who had been carried to their tents. (Schiller, "Geschichte des Dreissigjährigen Krieges.")

Aubrey, in his "History of Cardinal Richelieu," says that after every engagement, the Cardinal sent his confidants to inquire after the wounded, and to assist them by presents of money, &c. "*in their tents and huts.*" And Audouin, in a passage cited on page 143 of this Report, says that during the sixteenth and seventeenth centuries, all nations continued to treat the wounded and sick "*in tents and quarters.*"

It is evident, however, from the context in each case, that these statements are to be accepted literally, only in so far as they show that the wounded, in the times referred to, were not provided with special shelter, but were occasionally permitted to occupy their quarters, at least temporarily.

all things requisite for the wounded and infirm. These continued to be used in all great expeditions throughout the war, and were called the Queen's Hospital. The worthy father Fray Antonio Agapida vaunts this benignant provision of the Queen as the first introduction of a regular camp hospital in campaigning service."¹

This passage would certainly seem to support the truthfulness of the proverb, that there is nothing new under the sun, at least in so far as the mere use of tents in the hospitalization of the sick is concerned. But admitting it not to have been one of those "weeds of fable" with which Irving confesses this tract of history was too much overgrown, the principal value which we can accord to the establishment of Queen Isabella, is its right of priority. Whatever may have been the good results obtained by it, they bore no fruit. The experiment was nowhere repeated, and would have faded from the memories of men, but for the indefatigable industry of some Spanish monk, to whom no detail was too insignificant, which might add to the glory of his country, or the honour of its sovereigns.²

The medico-military literature of the sixteenth and seventeenth centuries passes over, almost in silence, the whole subject of field hospitalization. From it one can obtain very little information concerning even the quarters of the troops, or any of those conditions which most directly influenced the health of the army. That the historical and military "*mémoires*" of the

¹ Op. cit. chap. xxvii. p. 88.

² That too much importance may not be attributed to the passage cited in its bearing upon questions relating to the first use in the field of regular camp and more especially tent hospitals; and, inasmuch as Ballingal ("*Outlines of Military Surgery*") appears to have been *particularly* familiar with the writings of the "worthy Fray Antonio Agapida," I may here note: that in fact there never was a Fray Antonio Agapida. The name of this imaginary personage was used by Irving as a collective expression for the various sources from which he took his narrative, including among these his own imagination. It is much more probable, however, that the passage quoted contains facts derived from some one of the numerous chronicles consulted by Irving, in the preparation of his "*Chronicle*," than that the statement is a fiction of his own. Still, as an authority upon any historical subject, Irving has but little weight; and his Mr. Diedrich Knickerbocker is about as good evidence on the history of New York, as his Fray Agapida on that of Granada.

period should have been equally silent, is scarcely surprising; indeed, the whole subject of hospitalizing the sick of armies was so little thought about, by the class of writers who produced these works, as to have scarcely been made the subject of a passing remark. Sickness and death were considered the inevitable conditions of war, and the mortality from disease, the tribute demanded by an inexorable fate alike from the victor and the vanquished. Few general officers conceived that they could possibly do more, in behalf of the sick, than discharge them from the service, or consign them to such quarters as chance, necessity, or an ignorant parsimony had provided.

We only learn that a few hospitals, such as they were, existed somewhere, and that the sick were occasionally taken care of in camp; and it is not improbable that tents may in some instances have been especially assigned to the treatment of certain cases. But it may be safely said, that at the close of the seventeenth century, the care of the sick in camp was the subject of very few fixed regulations in any army in Europe. So far as the French service is concerned, this fact is very well shown in a passage in Bombelles, which is as follows:—"The sergeants should never take soldiers to the hospital on their own responsibility; they should do this, only by the order of the surgeon-major, and by that of their officers, who frequently prefer to have them treated in a *separate tent*, at their own expense; for every soldier who goes to the hospital runs a great risk of never coming back, either by reason of death or desertion."¹ Thus it appears, that at the time of which I speak, officers (company or battalion) could have the men taken care of at *their own expense*, in a *tent*, if it *so pleased them*.

Indeed, this state of things continued very generally, until the middle or latter part of the eighteenth century. The infrequent references made to tents by nearly all writers on medico-military subjects until towards the close of the eighteenth century, is certainly very remarkable. No allusion is made to them by the author of the "*Mémoires concernant les Hôpitaux Militaires*," presented to the Council, July 31, 1736. The "*Ordonnance du*

¹ Bombelles, "*Mémoires*," tome i. p. 152.

Roi portant règlement général concernant les Hôpitaux Militaires," of the 1st of January, 1747—up to which time there had been, as regards the hospitals, according to Bardin, nothing but "arbitraire, désordre et dilapidation"—is silent upon the subject of tents. Chennevière reproduces this "Ordonnance" in the second volume of his "Détails Militaires," published in 1750; and although adding much curious information concerning the organization of hospitals both fixed and ambulant, he refers to the use of tents for hospital purposes, neither in this volume, nor when he again wrote upon the organization of army hospitals, in the 5th volume of his "Détails," published eighteen years later. The "Encyclopédie," in the article on "Les Hôpitaux Militaires," which appeared in the Supplement of 1777, makes no mention of the employment of tents. Nor does Daignan, in his treatise on military hospitals, even allude to the existence of tents.¹

Munro is, in fact, one of the earliest medical writers who refers to the use of tents for hospital purposes. In an "Essay" published in London in 1769, he says:—"The sick soldier should be sent either to the regimental or general hospital; or at least, if these hospitals are far off, and it be impossible, from any cause, to convey the sick to these places, they should be put under tents." This recommendation, in his book, of the use of tents for hospital purposes, is supported by a foot-note, which is as follows:—"Certain surgeons-major serving in Germany always took with them, on going into the field, a number of reserved tents, which followed the regiment with the medicines; and whenever their soldiers fell sick in camp, if they were not near villages where they could establish the regimental hospital in a house, they directed the reserved tents to be pitched, and the ground to be covered with a plenty of straw, and with blankets, that the sick might lie there and be taken care of, until there should be a favourable opportunity of sending them to the general hospital."²

¹ "Ordre du Service des Hôpitaux Militaires," par M. G. Daignan. Paris, 1785.

² Médecine d'Armée." Traduction par M. le Bégue de Presle. Paris, 1769; tome i. Introduction, seconde partie, p. lvii.

Although no date is given to indicate when "certain surgeons-major" served in Germany, that very circumstance makes it probable, that a reference is made to facts connected with the campaigns—which occurred a few years before the publication of the Essay—between 1757 and 1762. As the Prussian army is said to have been "regularly provided" with tents, some time before the general employment of such shelter in the French service, it is not unlikely that in Germany tents were first made use of on the Continent, as a means of sheltering the sick, as also, that the use of tents for hospital purposes in English armies, may have been adopted from their allies, as were a multitude of still existing English military usages, during the campaigns in Flanders and Germany of the first part of the eighteenth century. Munro also, in speaking of hospital ships, says:—"They ought to take on board when receiving their provisions, a number of large tents suitable to lodge the sick and wounded immediately on making a landing, in those places where the troops are to remain some time. When, however, a siege is anticipated which may last some time, and it may not be possible to have suitable places for the sick until the close of the siege, it is well to attach to the fleet a vessel or two, loaded with wood or other materials suitable for constructing temporary pavilions or huts for the sick, if such materials cannot be obtained where the troops are to operate. Such pavilions or huts covered with thatch, are very necessary in warm climates, because the rays of the sun, which fall perpendicularly upon the canvas of the tents, render their interior insupportably hot."¹

M. Bégue de Presle, in a "discourse preliminary" to the work of Munro, to which I have referred, and of which he was the French translator, alludes to the use of tents as follows:—"The neighbouring villages are selected for these hospitals (*hospitaux ambulans*), the farm-houses, churches, and barns serving as wards. If these conveniences cannot be obtained, the sick are placed under tents. If the sick are put under tents, every precaution must be taken to render a sojourn there as little injurious as possible. The earth should be beaten down and

¹ Op. cit. Int. seconde partie, p. 82.

sprinkled with sand; the beds should be placed upon shavings or straw; earth should be thrown up around the edges of the tent, which should also be surrounded by a ditch; the tent should be covered with several pieces of canvas; perfumes should be burned within it; a little fire should be placed in a chimney made of turf, or at least one should be lighted outside of the tent. There ought to be several supplementary tents, into which might be put apart, those sick with contagious diseases. It would be profitable, however, to establish in place of the tents light frame-work barracks, which might be easily and quickly put up, as also taken down."

The first instance, within my own knowledge, in which the use of tents was *recommended*—without reference to the existence of other means of shelter—in the organization of hospitals for the sick and wounded, may be found in a work published in the year III. of the French Republic. After the observation, that it is customary to establish the ambulant hospitals in large buildings—generally convents—and that these buildings are very rarely suitable for such a purpose, these statements follow:—"The proportion of deaths to the sick in the field hospitals is commonly sixteen per cent.; in the sedentary hospitals, the proportion is three per cent. This difference in the ratio of the deaths to the sick, depends upon the comparative facility with which pure air may be obtained in the sedentary hospitals.

"The way to correct this vice of the hospitals which follow armies, would be to organize them under tents—*sous des tentes*—instead of establishing them in buildings. The happy results which have recently been obtained at the camp infirmary of the School of Mars—*au camp de santé de l'École de Mars*—should be an inducement to multiply these establishments. By means of such a system those successive lines of hospitals might be dispensed with, as also the repeated transportation of the sick, which employs a large number of waggons and horses; and in fact, those epidemics which are brought from camps into the interior of the country by convoys of the sick."

And again, in another chapter, it is observed:—"The air must always be considered as the first agent in accomplishing a cure, as that, without which, all other assistance must be ineffectual. This fact should make every one feel how important

it is to form in the rear of armies *camps de santé*, and to treat the sick under tents where the air can renew itself easily and completely." And the statement is added:—"It is only in the winter, or in seasons especially rainy, or in special cases of disease, that the sick should be sent to hospitals or placed in barracks."¹

No recognition of the value of tents in the hospitalization of the sick could be expressed more clearly than this; and the reasons assigned for such a use are as valid and as comprehensive as had they been founded upon the results of an extensive experience. That they were not so founded is, however, certain. Unquestionably, towards the close of the last century, a hospital was once organized under tents at the École de Mars, and with a "*succès heureux*;" but as I have found no allusion to this experiment in any contemporaneous writer, and have been unable to obtain any details concerning the installation, or in fact any statements concerning it, except those which I have here reproduced, I can only infer that it attracted very little attention at the time, and that the propositions of the writer, luminous and meritorious though they be, are to be considered historically rather as the motives of a project than as the inductions from practice.

A few years later, the use of tents for hospitals was recognized by the French Government in an official decree, from which I shall make a few extracts.²

"Should there be no place for a field hospital (*hôpital sédentaire*), or should the place be unsuitable, the Commissaire can have the sick barracked, or put under tents; he can also have tents pitched or barracks constructed for an ambulance (*hôpital ambulant*), which may seem likely to remain a considerable time at a fixed post." (II. Sec., Art. 2.)

In the same decree we are told how the divisions of the ambulances appointed to follow the different columns of the army were to be organized; "and in such a manner, as to form in the

¹ "Programmes des Cours Révolutionnaires sur l'Art Militaire," op. cit. c. viii.; and also, chap. sup. "Sur la Santé des Troupes."

² Arrêté du 24 thermidor, an viii, (August 11, 1800.) See "Législation Militaire," tome iv. p. 4.

field one or several hospitals of *first relief, even under tents*, in the absence of buildings." (IV. Sec., Art. 27.)

Again, we find that:—"Soldiers affected with simple itch, or gonorrhœa uncomplicated, shall be treated under tents, to wit: in the armies of the South from the 21st of April until the 23rd of September, and in the armies of the West and North from the 21st of May until the 23rd of September. In the camps, and attached to each army corps, there shall be a certain number of tents set apart for the treatment of the itch." (VIII. Sec., Arts. 75-7.)

These extracts present everything said upon the subject of tents, in this ordinance of the French Government relating to hospitals; and in fact, Articles 2 and 27 state, substantially, everything which has since been said in official ordinances. It was very seldom, however, that the terms of the decree were acted upon, as we may learn by consulting Larrey, Percy, Desgenettes, and other *officiers de santé* under the First Empire. At least, except at the École de Mars, no one appears to have discovered that a hospitalization under tents possessed any special advantages, or was to be considered in any other light than as a substitute for the inaccessible or unavailable shelter of more substantial constructions.

Larrey seems to have been particularly unfortunate in his experience. "At the battle of El A'rich," he says, "the wounded were placed under tents upon the wet earth, exposed to the continual rain which fell during the siege of this fort. Eight were attacked with tetanus, which assumed every form, and was followed by death in each case." Referring to this incident in another place, he informs us that "the tents were bad," and moreover, that numbers of the wounded were only under the cover of palm leaves, "alike unprotected against the rain and dampness."¹ These are the only allusions Larrey makes in his "*Mémoires*" to the use of tents.

Dr. Hennen, who served as an army physician during the Peninsular campaign of 1812, says:—"Marquees are excellent

¹ Larrey, "*Mémoires*," Paris, 1812; tome i. pp. 244, 281.

as hospitals in good weather.”¹ But I can only conclude, after having consulted the writings of Guthrie, Faulkner, Millingen, and other English surgeons, that during the early part of this century, tents were rarely used even in the British service—except perhaps for the regimental infirmary—at any season of the year, when other shelter could be procured. Indeed, until the time of the Crimean War, they were employed in no European army as a means of hospitalizing the sick, except occasionally and in very limited numbers.

The description which I am about to give of the tents now in use in the armies of some of the principal military states, will show with sufficient clearness the character of the shelter which has been provided for the sick and wounded of modern armies, when it has been thought expedient to place them in hospitals under canvas ; and that my account may be in this respect as complete as possible, I shall indicate the qualities of each tent model with special reference to what I believe to be one of the most important and useful services, which may be secured by the employment of portable shelter in the field.



BEFORE attempting, however, to describe in detail the tents of the present century, those now used in the construction of camps, and more especially of hospitals, it may not be improper to present, in a general way, the essential facts derived from an historical study of tent architecture.

The greatest differences in the construction of tents, have been occasioned by the more or less abundance of the materials from which a temporary shelter could easily be made. Thus, where the common arts of life are unknown, grass, the bark and branches of trees, and even earth, are used, to obtain a temporary shelter ; and in such a way as generally to result in the erection of non-portable constructions, which are to be considered huts rather

¹ John Hennen, “Principles of Military Surgery,” London, 1829.

than tents. So the impossibility of obtaining materials from which a portable shelter can be made, has often forced modern armies to have recourse to equally primitive means of defence against the inclemency of the weather. Wherever the materials from which tents might be constructed have existed in abundance, a preference has generally been given to that material which was supposed to answer the purpose best at the least cost.

If the Romans used skins, it was because they were cheaper than woven stuffs, and because they better protected, from the rain, both the men and their arms. If the Syrians used, and still use, tents of cloth, it was—it is, because woven fabrics have long been easily obtained in the East, and because, while lighter than skins, they afford a shelter quite sufficient, in climates mild and comparatively rainless. Indeed, the Tartars and the nomads, of the more rainy portions of Asia, have always used tent coverings of felt or of skins.

The Syrian tents of woven fabrics were only introduced into Europe, when the materials from which they were made had become abundant and relatively cheap, and when the importance of using, for military purposes, the lightest and most portable tents, began to be understood.

The permeability of canvas coverings to rain, has always been considered an objection to their use in Europe, and a variety of special remedies for this evil have been adopted as well as suggested. A sharper pitch than is common in Syrian tents, has generally been given to the roof of the European tent. In the East, wherever the weather is generally fine, probably the most common form used is that of the rectangular pavilion; the pitch of the roof is frequently wholly one way, and is commonly very slight. In the West, wherever the pavilion form may have been adopted, the roof has not only had a double pitch, but the angle enclosed has been quite sharp. So also, it has been found expedient in the West to adopt the Eastern *sur-tente*, or “fly,” but curiously enough the fly, having one principal object in view as used in the East, was adopted in the West, principally for another purpose: in the East, the fly is rarely used except as a *sun shade or parasol*, in the West, the fly is rarely used except as an *umbrella*.

An attempt has been made to render the common single canvas tents of the troops less permeable to rain, by restricting them to wedge-shaped or sharply conical forms. It has been often stated, although originally, I believe, by Di Marsigli, that the Turks were in the habit of making their tents very low and flat-roofed, because, accustomed to sit upon cushions on the ground, there was no occasion that their tents should be lofty in any part. Now the Turkish conical tent is certainly flatter than are the conical tents most used in Europe and the United States, but the reasons for the flatness of the roof are, because the roof is less frequently called upon to serve as a watershed, and because, by making it less sharply conical the tent stands more securely, and a considerable economy is obtained in the ground-surface covered.¹

The material of which modern tent-coverings have been made has always been some sort of woven stuff, and generally the tissue has been of linen. *Toile* is the common word used to specify it by French writers of the eighteenth century, and this word was applicable to "any simple tissue composed solely of linen or hemp."² I have elsewhere stated that the *cannonière* was made of *toile d'Alençon*; and Colombier says, this was *assez épaisse*—moderately heavy. Tents were sometimes said to have been made of *coutil*; but this was only "*grosse toile*," used for "bed-ticks, bolsters, pillows, and tents."³

The "Encyclopédie," in speaking of the use made by the Tartars of felt, in the construction of tent-coverings, proposes

¹ I may note a fact with which old campaigners are familiar. The sides of all conical tents can be made to incline more or less sharply, or in other words, the height of the tent can be diminished, and the base diameter increased, by sinking the mast in the earth, while by planting the mast above the level of the ground, the dimensions of the tent are inversely changed.

Barth recommends for African travelling, "a strong, spacious, and low tent," and again he says:—"All tents intended for travellers in hot climates should be well lined, and not too high. Those which we received (from the English Government) were quite unfit for the country whither we were going, and while they could hardly withstand a strong blast of wind, they scarcely excluded the sun, particularly after a little wear and tear." ("Travels and Discoveries in North and Central Africa," by Henry Barth. Philadelphia, 1865; p. 29.)

² Encyclopédie, art. "Toile."

³ Ibid. art. "Coutil."

the employment of that material in the construction of tents for military purposes; but the suggestion would never appear to have been adopted.

Puységur, however, seems to have successfully suggested that tent-coverings might prove less permeable and more durable if made of a sort of oil-cloth;¹ at least it is said that, towards the close of the last century, heavy canvas, made of flax or tow, and covered with a composition principally of wax or resin, was occasionally used "to cover tents, gun carriages, waggons, and carts for the army."²

It is very difficult to ascertain now the exact grades or qualities of the tissues most commonly employed in the French service for tent coverings, even during the first half of the present century. Occasionally hemp canvas—or rather, *toile écrue*—has been used for the tents of the superior officers, although these have generally, more recently, been made of *coutil*; and often this ticking has been striped with blue, in which case the tissue has been made partly of cotton. The troop-tents have generally been made of light flax canvas.

M. Michel Lévy and E. Boisseau have concluded a summary account of tents, by observing:—"The subject of tents, which has been greatly complicated, is in reality very simple; their construction has been determined by a few general principles only. The frame-work is evidently the essential part, since it establishes the form and capacity of the tent, and no rational classification can rest on any other basis. From this point of view tents may be divided: first,—into tents having a single mast; secondly,—into tents having two masts, with or without ridge poles; thirdly,—into tents having several masts or props; fourthly and finally,—into tents without masts."³

This classification is, however, wholly impossible, as it would bring into the same group the marquee and the wedge tent, constructions entirely unlike each other, not only in form and capacity, but in several other specific respects. The fact is, that the mechanism of the frame of a portable tent is quite a

¹ Puységur, "Art de la Guerre." Paris, 1749; tome i. p. 216.

² Encyclopédie, art. "Toile Cirée."

³ "Dictionnaire Encyclopédique des Sciences Médicales." Paris, Victor Masson, 1871; art. "Camp."

secondary matter, and one which commonly, both practically and in principle, has very little to do either with the form, capacity, or value of the tent. The writers quoted have, however, remarked with great justice, that the question of tents has been much confused by the disposition shown by every inventor of the slightest modification, to attach his name to the tent thus modified.

But setting aside minor differences, tents cannot be well classified on any one basis. If classified according to *form*, the groups might be named the "*wedge*," the "*conical*," the "*pyramidal*," and, for the want of better words, the "*tower-shaped*," and the "*house-shaped*." Under the *tower-shaped* would be included the dome-crowned pavilions of antiquity and the middle ages, and small circular tents with flat roofs, like the modern French *tente de conseil, nouveau modèle*; under the *house-shaped*, marquees, rectangular pavilions, and many of the so-called "*wall-tents*." When classified according to the *materials* of which the coverings are made, we should have in separate groups, tents of *skin*, of *felt*, and of *cloth*—those of the last group, subdivided according to the nature of the cloth, into *goat's hair*, *woollen*, *linen*, *cotton*, *impermeable water-proof coverings of oil-cloth*, &c. &c. If classified according to a very important point in construction, tents might be divided into *double tents*, *single tents*, and *single tents with double roofs*. Or they might be divided into two great and widely-different groups—into *tents having perpendicular walls*, and *tents having inclined walls*; or into *tents drawn out and sustained by cordage*, and *tents which maintain their form and steadiness without cordage*.

It will be seen at once, how difficult it is to classify objects which, although possessing certain features in common, yet differ from each other in so many very essential respects. If the writers referred to have failed to establish a satisfactory classification of tents, I do not propose to offer in this place a better one; but in considering the qualities of a tent, I shall refer to them in their relations to the several classes of tents—as determined by *form*, *material*, and other special peculiarities of construction—to which the tent under consideration may be assigned or compared.



THE first tent, now in use, which I shall describe, is the one known in the British service as the "marquee," or "hospital marquee." This tent is a very old one, and its form is so exactly represented in Fig. 17, page 325, that a verbal description of it will be readily understood. As has been already observed, the "marquee" is a double tent, a large outer tent completely enveloping a smaller one—the true tent. The average distance between the two tents is about eighteen inches. The inner tent is 28 ft. long, 15 ft. wide, and 12 ft. high.¹ The inferior part has the form of an ellipsoid, enclosed by walls 5 ft. high; from the line where the walls join the edge of the roof, the interior space has the form of a triangular prism, to the ends of which are attached two hemicones. The tent is supported within by three standards and a ridge-pole, each formed of two pieces. The standards are planted in the ground on a line in the plane of the long axis of the tent, one in the middle of this line, and one on each side of the central standard, and 7 ft. distant from it. The ridge-pole is 14 ft. long; and it supports the outer tent. The ridge of the inner tent is held up by a series of "slings" fastened to the ridge-pole. The outer and inner roofs are stretched out by cords attached to pickets; forty cords, or "bracing lines," hold the inner roof in its place; forty-two cords are used for the outer roof; in addition to these there are two "weather lines," each

¹ These figures are taken from Dr. Thomas W. Evans's Report on "Voitures et Tentes d'Ambulance," made to the French Commission at the time of the Exposition of 1867, and are the measures of a "hospital marquee" then exhibited by the British Government. But there is a singular disagreement among the measures which I have seen in books. Thus, in the "Rapport de la Haute Commission Militaire," the lengths of the long and short axes of the inner tent are stated to be respectively 9 m. 20 and 4 m. 50. Parkes, without stating whether his measurements refer to the inner or outer tent, says:—"Length, 33 ft.; breadth, 12 ft.; height, 12 ft.; total cubic space, 3,366 ft." He states in a note, however, that the measurements apply to "the older pattern—the new pattern is a little less."

90 ft. long. The inside walls are made of four separate pieces, as are also the outside walls. The inside and outside walls are hooked on to their respective roofs, and fastened by means of loops to wooden pegs driven into the ground. One hundred and eighty-four pegs, large and small, are used to retain the marquee in position.

The tent has two doors facing each other, one on each side. The walls or curtains, both on the outside and on the inside, can be raised up or detached if necessary. There are besides four hooded ventilators, or openings in the roof. The English Government has also provided the marquee with a waterproof floor-cloth made of painted canvas. The material of which the coverings are made is light brown linen canvas of good quality; 362 yards of this are required for each tent. The weight of the marquee (including pegs) is 507 lbs.; the waterproof floor-cloth weighs 145 lbs.; the total weight of the tent is therefore 652 lbs. The Government estimate of the cost of a marquee complete is £28.

Qualities.—This tent possesses certain merits. It is large and spacious, cubing sufficient space for a considerable number of sick—twelve or fourteen. The outer covering renders it quite impermeable to rain. It is easily kept warm—more easily even than a common camp hut. In no hospital tent can better conditions be maintained for a limited number of men than in this, although it is not always easy to keep it as well aired as may be desirable. “The usual method of ventilating marquees is by opening or raising the sides; but this can hardly be said to be sufficient, even in favourable weather, and still less is it so when from rain or high wind the sides cannot be opened. Even in fine weather it was remarked that the air under the roof of the marquee was hot and stagnant, although the sides were open, because there was no provision for its escape above. What is really wanted to render the ventilation sufficient is to make large and properly protected apertures around the top of each pole; were this done a marquee would be rendered far more suitable for a field-hospital than it is at present.”¹ It is probable that were the suggestion

¹ Report of the Sanitary Commission, presented to both Houses of Parliament, 1857; pp. 138-139.

here made adopted, the evil referred to might be obviated. It is evident that a tent *completely* shut in by another, an air space intervening, must ventilate itself slowly—the air stagnates between the walls; and even when the sides of the tent are raised, a stratum of foul air may rest constantly overhead, or infection may lurk in the *coins morts* of the folds of the canvas.

But the chief disadvantages of the *marquee* are its size, its great weight, and its cost. It offers too much surface to the wind. It was constantly being blown down in the Crimea, and will always be exposed to this accident on temporary camping grounds where the soil is loose, or it may be impossible to have recourse to special means of support. Its great weight renders it difficult of transportation. It was for this reason that few of the regiments in the British army in the Crimea were able to obtain their hospital *marquees*, embarked with them on shipboard, until long after their arrival before Sebastopol, the surgeon making such use as he was able, in the meantime, of the miserable shelter of "one bell-tent."¹ Such an experience enforces in the most practical way the importance of not making tents so large and heavy that the transportation of *one* even may become a burden. I have also a theoretical objection against the English *marquee*: its construction does violence to one of the first principles of common economy. The exterior tent serves only to render the shelter less permeable to rain, wind, and frost. Now this exterior tent is twice as large, twice as heavy, twice as difficult to carry, and twice as costly as the one it protects. Great impermeability, to wet especially, is certainly an excellent property in a tent; but each degree of such impermeability has an absolute value, and whoever may pay in various ways for a high degree of this special excellence more than it is absolutely or relatively worth, is sure to make a bad bargain. If one has a jewel, it may be desirable to have a case to keep it in; but it is a poor jewel which is worth less than its casket.

The "bell-tent" used in the British army is a troop-tent, and has been used for hospital purposes only in emergencies. Its

¹ See "Medical and Surgical History of the British Army," p. 503.

form is indicated by its name: it is a round tent, with perpendicular walls, one or two feet high, and a conical roof, supported by a central pole and short stay-ropes (see Fig. 18); the diameter of its base is 14 ft., its height 10 ft., and the area of its base 154 square feet. It cubes about 512 ft., and is presumed to be capable of sheltering on the march from twelve to fifteen men. It weighs when dry 65 or 70 lbs. The covering is of linen canvas of fair quality, although it has occasionally been made of cotton canvas.

Qualities.—As originally constructed the bell-tent was quite



FIG. 18.—The bell-tent of the British Army.

without means of ventilation; "now a few holes are made in the canvas near the pole;" but these apertures are of little service. During the middle of the day in warm weather the tent is hot and uncomfortable, and even when unoccupied, the air within it soon loses its freshness and becomes close and oppressive to those entering the tent.

Captain Galton, in speaking of this tent, says:—"It is so peculiarly objectionable, as to make it a matter of surprise that it was ever invented and used. It is difficult to pitch, it requires many tent-pegs, it has ropes radiating all around it, over which men and horses stumble, and it is incommodious and ugly."¹ The

¹ The "Art of Travel," by Francis Galton. London, 1867, p. 154.

regulation bell-tent has been the subject of various modifications, the most important of which has been an addition to the height of the perpendicular walls. The interior of the tent is thus made more convenient, and as the sides can be looped up, the tent is much better fitted for service in tropical climates.

A number of tents have, since twenty or thirty years, been "invented" in England, some of which possess real merit; although I believe I am correct in stating that none of these inventions, whether "patented" or not, have been on any occasion adopted by the English Government.

One of these is known as "Edgington's three-poled tent." This tent is supported by three poles, sunk in the ground on the same line, a central tall pole, before and behind which are the shorter poles. The tent when stretched out has two ends and six sides; the ends are short vertical isosceles triangles; the sides are formed each of one tall inclined isosceles triangle and two tall inclined scalene triangles. (See Fig. 19.)

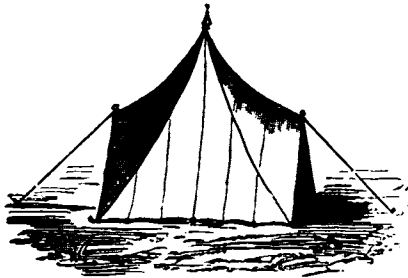


FIG. 19.—Edgington's three-poled tent.

These tents are made of different sizes; that of medium size covers a ground surface 14 ft. 6 in. square, is designed to accommodate fourteen men, with knapsacks, rifles, &c., and weighs when packed with its fixtures 172 lbs. This tent has

but two exterior stay ropes, and the covering is fastened to the ground by a small number of pegs.

In some of Edgington's tents the central pole is so contrived as to be used as a stove-pipe, while an opening at the apex of the tent is designed to serve as a ventilator.

The material of which these tents are made is linen canvas, coloured or uncoloured. A lining is often employed, which, forming a sort of inner tent, makes the construction warmer in the winter and cooler in the summer.

Qualities.—Edgington's tent stands very firmly, and is undoubtedly one of the best single-roofed tents now used. Its chief fault is, that its pointed form and the pitch of its roof are such that it must always remain a single-roofed tent; no awning

can be placed over it. This fault it has in common with conical tents. It has also, although in a less degree, a fault peculiar to them, as also to all tents with sloping walls—a want of space in the upper part of the tent, with a waste of space in the lower part. Moreover, the two storm-ropes by which the tent is stayed are highly inconvenient. They are fastened just where such ropes should not be—obstructing the entrance of the tent. One or two straggling ropes attached to a tent are a cause of accidents more frequently than the numerous stay-ropes of a marquee or wall tent, which may be seen, and thus avoided. The provisions for securing ventilation are also very imperfect and insufficient.

Major Godfrey Rhodes, the author of “Tents and Tent Life,” has invented a “patent” tent, in the construction of which he states that he has had especially in view solidity, roominess, &c. Major Rhodes’s tent is a sort of “umbrella tent,” that is to say, his tent is not stretched out by cords and pickets, but is stretched *over* a framework, either circular or oblong. This framework is made of bamboo poles, the number depending upon the size of the tent. In his “field” tent they all spring from a central ring, as the ribs of an umbrella. The ends of the poles when forced into the ground, form a dome-shaped framework, which supports the covering. This is held down by the poles themselves, which pass through the loops of a twisted cord, that lies in a circular form upon the ground, and to which the covering is attached by straps.

In the oblong “hospital” tent—a sketch of which is shown in Fig. 20—the bamboo poles are united together in a series of semi-circles. No central poles are employed in these tents, and only a small number of pegs are used; the “field” tent is quite unprovided with pegs and stay-ropes. The coverings are of cotton canvas. The “hospital” tent is 30 ft. long, 15 ft. wide, and 10 ft. high, and weighs 395 lbs. It is intended to give accommodation to twenty sick.

Qualities.—These tents are well shaped to resist the wind, and are remarkably roomy. The tents, in a word, are unquestionably good ones; but I am inclined to doubt if they are as sturdy as Major Rhodes would have us believe. I remember once having

had an occasion to use a tent constructed on the same general principle, that is to say, without outside pickets and stay-ropes, and without a central pole, but supported by perhaps a dozen light ash ribs, at the foot of each of which was a flat perforated metallic plate holding an iron pin nearly a foot in length, and forced into the ground when the tent was pitched. This tent was constantly being upset by the wind, and the only way I could keep it overhead was by attaching to it two or three storm-ropes, after which it behaved like any other well-regulated tent. One fault of Major Rhodes's "patent" is, that its sides cannot be conveniently raised; but its principal and fatal fault is to be found in its excessively complicated construction.



FIG. 20.—Major Rhodes's hospital tent.

With reference to the impermeability to rain which these tents may possess, I may make a general remark: the fewer points of support a piece of canvas covering touches, other things being equal, the less permeable it is. A piece of cotton canvas (duck), when stretched out, if *unsupported*, is quite impermeable to rain; if it rest, either by design or accident, upon a bit of wood, or any hard substance, the water, if it rain, will soon almost certainly be seen oozing through the canvas and trickling down the side of the support. I could not confirm the accuracy of this statement more completely than by referring to an observa-

tion which Baron Larrey incidentally makes when speaking of the leakage to which the French *tente conique* is liable :—"The *strings even*, that serve as cordage within, become so many conduits along which the water flows."¹

The number of poles used to support the hospital tent—*twenty*, exclusive of the ridge-pole—is inconveniently great. The "bamboo," or other special poles, are liable to get broken, lost, &c., and can in the field only be replaced by common heavy poles. This tent is, moreover, single-roofed—a hospital tent should always have a double roof. Major Rhodes, since having written his book, seems himself to have been convinced of the existence of numerous faults in the construction of his "hospital tent," as I learn it has been superseded by "Major Rhodes's patent hospital marquee," which appears to differ in no way—judging from the advertiser's wood-cut and specifications—from the Government marquee, except in having a "special frame." This frame consists of four upright posts, supporting rafters, which are united by a ridge-pole. The "curvilinear formed frame," the "pliable ribs," the "double twisted ground-rope," the "metallic socket-pieces," all the distinctive features of Major Rhodes's really original tent have thus apparently been relegated to the limbo of impracticability, by the inventor himself.

Mr. George Turner has also invented a tent, which he commends highly for its *stability, ventilation, &c.* (See Fig. 21.) This tent is circular in form; it is 10 ft. high, and 16 ft. in diameter; it has a roof and walls. The roof is in the form of a cone, 16 ft. in diameter at its base, from which the walls fall perpendicularly to the ground. The tent is supported by a central pole, and a framework of stays made of galvanized wire cord; these stays radiate from a metallic collar adjusted to the top of the pole, and are fastened to the ground by iron pegs, from nine to twelve inches long. The stays are three-sixteenths of an inch in diameter, and each one will stand a strain of 600 lbs. The roof is made of "mineralized india-rubber double texture fabrics;" the walls are of common cotton canvas. Mr. Turner

¹ "Rapport sur l'état sanitaire du Camp de Châlons," par M. Le Baron Larrey. Paris, 1857.

has provided his tent with an arrangement for the suspension of hammocks:—"By means of light wooden struts or rods, one end being attached to a loop or eye fitted to the wire rope stays, and the other hooking into a flange fitted at a convenient distance from the bottom of the pole." Mr. Turner suggests the use of the hammocks as "ambulance litters." The tent is heated by means of a stove, the pipe of which forms the pole of the tent. It is ventilated through an opening at the top, which is shielded by a hood. This tent is designed to afford shelter for eighteen men. With the waterproof covering and the fixtures

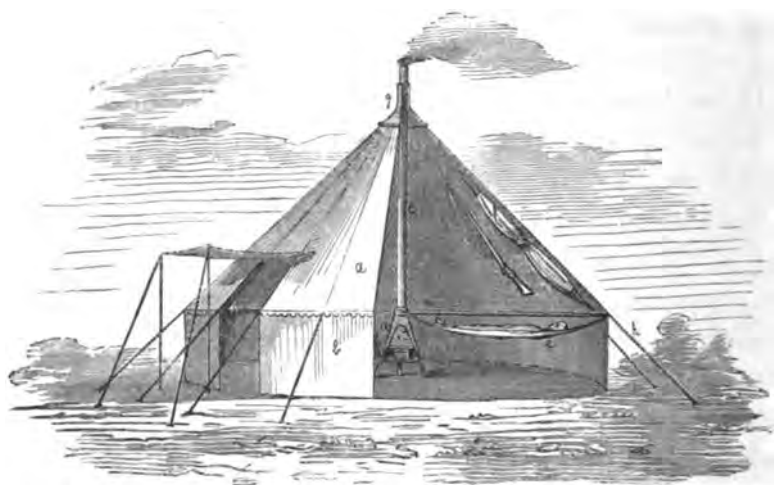


FIG. 21.—Mr. George Turner's tent.

complete it weighs nearly or quite 300 lbs.; the covering alone weighs 100 lbs.

Mr. Turner also speaks of a "novel and peculiar adaptation of his system" for a general field hospital. He would cause six or eight marquees to branch off from a common centre, in the form of a star, so as to embrace a number of wards in connection, yet separated one from the other:—"A construction of this nature, with six wings each 60 ft. long by 16 ft. wide, would afford accommodation for beds, and possess ample means for warmth and ventilation, and effect a great saving in weight over the same number of marquees containing equal accommodation if fitted separately."¹

¹ "Journal of the Royal United Service Institution," vol. iv. No. xii. May, 1860, p. 86.

Qualities.—Mr. Turner's tents are doubtless very good tents; still, a number of objections can be offered against them. With their fittings they are heavy and complicated; the metallic stays, whether supporting the tent or folded up with it, are constantly wearing the canvas; the iron pegs are heavy and liable to be lost, and, as has very justly been said of iron pegs:—"Their value to natives is so great, that to prevent loss by theft is next to impossible."¹ The India-rubber fabrics of which the roof is made are objectionable from their impermeability to air. The idea of using the mast of the tent as a stove-pipe is not an original one. The suggestion was once made—and I believe to some extent it was acted upon—that the mast of the U.S. "Sibley" tent could be so used; it was, however, soon found to be impracticable. A pipe which is solid enough not to bend or be broken is altogether too heavy to form a part of a tent; moreover, a stove-pipe is too dirty to be packed or stowed with a tent; while if the pipes are stowed separately, one is exposed to all the inconvenience which might arise should they not arrive on the camping ground with the tents.

The British army has, up to the present time, made but very little use of shelter-tents, although probably quite as large a number of models have at different times been proposed in Great Britain, as have been exhibited in countries where such tents are more generally employed.

One of these models is described thus:—"Each man carries a canvas sheet, made up of a quadrangular (5 ft. 9 in. \times 5 ft. 3 in.) and of a triangular piece (2 ft. 8 in. height of triangle \times 5 ft. 3 in. base). Buttons and button-holes are sewed along three sides, and a stick (4 ft. long and divided in the middle) and three tent-pegs and rope also are provided. Two or four of these sheets can be put together, the triangles forming the end flaps. A very roomy and comfortable shelter-tent, 4 ft. in height, is formed, which will, with a little crowding, accommo-

¹ "Shifts and Expedients of Camp Life," by W. B. Lord and T. Baines. London, 1868, p. 64.

date six men, so that two sheets can go on the ground."¹ This tent weighs 6 lbs. 14 oz. per man.

Another quite similar tent has been proposed. The tent is formed of two sections—oblong pieces of canvas, which in shape may be said to be square pieces (about 7 ft. in length and breadth) elongated by attaching to the opposite ends triangles having from base to apex a length of about 4 ft. The sections are furnished with rows of buttons and corresponding button holes on their inner edges; and they are supported by two sticks or standards 4 ft. 4 in. in length, and an inch in diameter; each one is divided into two sections that it may be the more portable. When the tent is pitched the triangular flaps close the ends of the tent snugly, overlapping widely if they fall perpendicularly; but they are generally stretched out so as to form a *cul-de-lampe*, or porch, at each end of the tent. Thus arranged, the tent is 4 ft. 4 in. high, 7 ft. in breadth, and 10 ft. 8 in. in length. This tent affords plenty of room for two men. A section, one of the tent-poles, and half of the pegs, weigh 8 lbs. 2 oz.²

Without entering into a special discussion of the merits of these models, I may state that I believe them both to be good ones. They are somewhat larger and heavier than shelter-tents in general. But the principal defect of shelter-tents is their very small size; they are, when pitched, not only not comfortable, but they are also often scarcely inhabitable, by reason of the open ends. The two sections of both the tents just described form a complete tent; and although the latter model weighs twice as much as the French *tente-abri*, it is, as a shelter, incomparably superior. The equipment of an English infantry soldier weighs 56 lbs.; of a Russian infantry soldier, 60 lbs.; of a Prussian infantry soldier, 63 lbs.; of a French infantry soldier, 69 lbs. As a principle, the soldier should carry the smallest possible weight, and "should not be made," as the Crown Prince of Prussia once remarked in my presence, "a beast of burden." I believe the weights generally carried by soldiers may be reduced with advantage.

¹ Parkes' "Practical Hygiene," p. 322.

² "Camp Life and its Requirements." A. H. Baily and Co., London, 1872; p. 47.

Nevertheless, it is evident that a difference of a few pounds above or below the weight fixed upon as the proper average to be carried, is a matter of no great consequence if any important object is to be attained thereby ; and I know of none more important than that which has in view the assurance of a suitable shelter for the soldier.

I may conclude this account of English shelter-tents by mentioning a portable shelter highly commended by Parkes as "an improvement over the French tent and better than the American poncho tent." Each section or sheet is prepared with a hood, and is intended to be worn as a cloak on the march. Two sections form a tent for three men, the third sheet being spread on the ground. Sticks, pegs, &c., do not form a necessary part of the equipment ; rifles, &c., being used to support the tent in the absence of sticks. I have never seen a specimen of this tent, and am consequently unable to appreciate its merits. It has, however, obvious defects. A great number of attempts have been made to construct tents of cloaks, overcoats, &c. One of the first tents of this kind—the *tente Reveroni*—was proposed as early as 1726, and one of the last figured in the collection of war material exhibited by the Dutch Government at the Exposition of 1867. These tents have all proved to be failures. An instrument made to serve a great number of purposes is generally not well adapted for any one of those purposes. A simple sheet of canvas forms a better tent section than if a hood or any other attachment, foreign to its use as a tent, be fitted to it. Common canvas is speedily ruined if laid upon the ground. The use of rifles, swords, and bayonets as supports is inadmissible ; from a material point of view it is as necessary they should be protected against wet as it is that the soldier himself should be.¹

Passing from English tents to French tents, and continuing

¹ Since this page was written I have been informed that the Italian Government has recently suppressed the supporting-sticks or *bâtons* of the *tente-abri*, for the purpose of lightening the weight to be carried by the soldier, and has directed that the tent be sustained by muskets. The fact is sufficiently important to be stated. I am not induced by it, however, to change any opinion which I have advanced concerning this method of propping up tents.

my special subject, I may observe, first, that the *tente-abri* has in principle been long employed. Rhodes says the Macedonians used small tents intended for two men, but he gives no authority for his statement; in any event, it is highly probable that such tents may have been used in ancient times, as may be inferred from the existence of the diminutives of *σκηνη* and *tentorium* (*σκηνίδιον* and *tentoriolum*).

But to come down to more modern times: in an engraving, which I have, representing an attack upon a town and camp on the Ems, and bearing the date of 1568, there are quite a number of representations of small wedge tents which could scarcely have sheltered more than two persons. As every soldier had at this time to provide himself with a shelter as best he could, it is very probable that tents were often made of small pieces of woven stuff, which the soldier himself could carry, and which, propped up by some simple framework, afforded a cover at night, not unlike that which is still a favourite domicile among the Gipsies.

One of the earliest, certainly one of the most singular, accounts of the use of shelter-tents, is that given by Patten in a description of the Scots mode of encampment, just after the battle of Pinkey, in 1547:—

“Here now to say sumwhat of the maner of their campe: As they had no paulions or round houses, of ony commendable cumpass, so wear theer fewe oother tentes with posts, as y^e used maner of makying is: And of these fewe also, none of abooue xx. foot length, but most far vnder; for the most part all very sumptuously beset (after their facion) for the love of Fraunce, with Fleur-de-lices, sum of blue buckeram, sum of black and sum of oother colours. These whyte ridges (as I calld them), that as we stood on Fauxsyde Bray, dyd make so great mouster toward vs, which I dyd take then to be a number of tentes; when we cam, we found it a lynnen draperie of the coorser camryk in dede, for it was all of canuas shetes, and wear the tenticles, or rather cabayns and couches of theyr souldiours; the which (much after the common bylding of their countree beside) had they framed of iiij. sticks, about an elle long a pece, whearof ii. fastened toogyther at one end aloft, and the ii. endes beneath

stict in the ground, an elle a sunder, standing in facion lyke the bowe of a soowes yoke: Over ii. such bowes (one as it wear at their hed, thoother at their feet) they stretched a shete down on both sides, whearby their cabain becam roofed lyke a ridge, but skant shit at both endes, and not very close beneath on the sydes, onles their stiks wear the shorter, or their wiues the more liberal to lend them larger naperie: Howbeit, win they had lyned them, and stufed them so thick with strawe, when they were couched, thei wear as warme as thei had bene wrapt in horse dung."¹

The French account of the origin of the *tente-abri* is sufficiently curious to be worthy of mention. It seems that after the abolition of tents in the armies of the Republic, the disastrous effects of prolonged bivouacs became so evident, that a somewhat singular practice was not only permitted, but was officially recognized and encouraged. There was always a necessity in the army for a considerable number of long strong sacks, called *sacs à distribution*, for the transportation of bread, vegetables, grain, &c. These the soldiers, in the absence of other shelter, began to use, whenever they could get hold of them, as *sleeping bags*. The Ordinances of 1778 sanctioned this novel use of the sacks. By an Ordinance of the year II., one sack was issued to each man; it soon became known in the army as the *sac de campement*, and was subsequently extensively used by the troops as a shelter in all active campaigns. The armies which were sent to Algiers from 1830 to 1840 were supplied with such sacks. But the discovery was made by certain soldiers engaged in those expeditions that the *sac de campement* was much less serviceable as a sleeping bag than when used as a roof. That they might the better make these roofs, the soldiers were frequently permitted to rip open their sacks; and shortly after whole regiments were to be seen camped in the little tents which they were thus enabled to construct. This sort of shelter was in very general use in the French army, when in the field, until the *invention* was recognized by the issue of the regulation *tente-abri* in 1848.

The *tente-abri* of the French army is formed of two rectangular

¹ Quoted by Scott, in "The British Army; its Origin, Progress and Equipment," vol. ii. pp. 472, 473.

pieces of canvas, 5 ft. 9 in. long (1 m. 76) by 5 ft. 4 in. wide (1 m. 64). These two pieces are buttoned together longitudinally, and the canvas, raised upon two sticks (*bâtons*), the ends of which pass through two small holes in the outer edges of the canvas, is stretched out by its lower borders so as to form a wedge-shaped roof open at both ends. The weight of one section, one support, and three pegs, is 1 kil. 690 grammes—or about 3 lb. 11 oz. As each soldier, on entering upon a campaign, is furnished with a section which he carries as a part of his “kit,” he is able to form at any time with one or more of his comrades a shelter, that is certainly vastly better than none.

For active campaigning a tent of this sort is almost indispensable. Its uses are, however, very strictly limited to furnishing a shelter for soldiers who are well. It is not necessary in this place, therefore, to consider at length either its merits or defects. One of its defects is very apparent—the rectangular piece of canvas is too small; the consequence is that the tent is both too narrow and too short; it is not long enough to cover the body of a moderately tall soldier.

This defect has been the occasion of numerous attempts to construct other models of *tente-abri*, some of which in several respects are certainly improvements upon the regulation model. One of these—M. Waldéjo’s tent—is made of lozenge-shaped pieces of canvas, the sides of which are 2 metres long. When two of these are buttoned together and propped by a central stick, the canvas forms a pyramidal tent about $1\frac{1}{2}$ metres high, resting upon a base 2 metres square. With four pieces a much larger tent can be made; indeed the unitary section and its buttons and button-holes are arranged for a variety of combinations. Although this tent has never been adopted by any Government, the tests to which it has been put have been the occasion of a number of favourable official reports to the French Government. Its great merits are that, without being heavier it is much more roomy than the common model, and that with two sections a completely closed tent can be made.

As early as 1860 M. Barbe proposed to give to the ordinary section of a *tente-abri* the form of an isosceles triangle, with a base breadth of 1 m. 76, and a height or length of 3 m. 28.

By uniting three or more of these triangular sections, pyramidal tents could be constructed offering conditions quite similar to those of the Waldéjo model. Whatever the advantages of the modifications suggested, the simplicity of the rectangular sheet has always been so strong a point in its favour, that it has been nearly everywhere adopted as the best section for a shelter tent.¹

Inasmuch as in the campaigns of 1866 and of 1870, the Germans entered the field unprovided for the most part with tents of any kind, the suggestion has recently been made by certain writers that the shelter-tent could, with advantage, be dispensed with. Such an opinion I cannot entertain. During the whole war of 1870 the German armies suffered immensely from being deprived of shelter. The waste of men from diarrhœa, pneumonia, rheumatism, and fever, caused by avoidable exposure, would have often put a stop to the movements of these armies had they not been constantly strengthened by reinforcements, and to an extent unparalleled in modern war. Germany proposed a short campaign, and men were the cheapest part of her war material, while to France they were the most costly. To have engaged upon a campaign where half or two-thirds of the army on both sides should have been disabled in a month, simply by excessive fatigue and exposure, would have subjected France to the power of Germany without a battle. This consideration shaped in part German tactics, which, under the special circumstances, may have been quite justifiable from a strictly military point of view. It would be impossible, however, to deduce from an exceptional fact a general rule. Moreover, the practice of quartering troops—a whole army—upon the inhabitants of the towns, villages, and cities, in the country where the war may be conducted, is an abomination. It is in the end subversive of military discipline, is demoralizing and brutalizing to the soldiery, is an invasion of those personal rights recognized by the laws of modern war, and, by debauching

¹ "Des Inventions et des Perfectionnements dans le Matériel de l'Armée et à propos d'un Nouveau Système de Tente-Abri." Paris, 1865. H. Alexis Bel. "Notice sur la Tente-Abri à Lacets," par Alfred Vernier. Bordeaux, 1863. "Projet d'Amélioration de l'Abri des Troupes en Campagne," par Paul Barbe. Strasbourg, 1860.

the morality of the people, becomes an arm of warfare only worthy of savages.

No tent of special construction has yet been allowed by the French Government for the shelter of the sick of its armies. Three troop-tents of different models are now in use in the French service, which are employed, whenever it may seem necessary, for the hospitalization of the sick.

The "tente nouveau modèle," or "bonnet de police," is the most ancient, having been authorized by an "Instruction" of the year III.

This tent has the form of a triangular prism, to the ends of which are joined two hemi-cones. It covers an elliptical ground surface 19 ft. 8 in. long and 13 ft. wide; the tent is 9 ft. 10 in. high. The covering is supported by two standards and a ridge-pole; the ridge-pole is 6 ft. 8 in. long; a shelf also—*planche à pain*—is placed between the two vertical poles, steadying them, and forming a convenient place upon which to put, or from which to suspend, the effects of the soldiers. The canvas is fastened to the ground by short looped cords attached to twenty-three wooden pickets. Two curtain-shaped doors give entrance to the tent; the doors are closed with straps and side-buckles, or may be opened, and held out horizontally by two small props. The tent weighs 130½ lbs., cubes 24 metres, and was originally intended to accommodate sixteen men. It was made of brown linen canvas for the troops, and of striped cotton and linen canvas for the officers.

Qualities.—It is well-formed and fairly solid; it is secured by few tent-ropes; it is not heavy, and can be readily pitched and struck. The objections to its use, particularly as a hospital tent, are these:—First,—its permeability. French tent canvas is almost uniformly of an inferior quality; it is not firmly woven, and the rain is sure to sift through a single roof formed of it, in the most uncomfortable manner. Secondly,—no sufficient precautions have been taken to have the tent well aired. Baron Larrey, speaking of this tent, has observed:—"When the doors are closed, and the tent is thus shut up, the air becomes rapidly so close and hot as to interfere with respiration; at the same time it becomes infected with the odours of straw, leather, and emana-

tions of various kinds. Hence spring the pernicious consequences of overcrowding, and the diseases which break out among men who remain seven or eight hours out of twenty-four surrounded by such an atmosphere."¹

The "*bonnet de police*" is at present little used, none having been made for the Government since several years; the reputed cause of its having been condemned was a want of solidity, exhibited particularly in the Crimea, on the 14th of November, 1854, when the tents of this model, then largely used by the troops, were nearly all blown down.

The "tente Tacconet," or "tente elliptique," was introduced into the army about forty years ago. It is claimed to be an invention of the house Tacconet of Paris, "fournisseurs;" and, as a sample of tent architecture, was presumed, when adopted, to have left scarcely anything to be desired, as may be inferred from the following rather florid encomium:—"Their researches, precious discoveries, and unfaltering zeal, have gifted France with a camping material unequalled in Europe; our camps of instruction have become objects of curiosity and envy. The house Tacconet has furnished models to almost all the Powers of Europe. Turkey and the Barbary States have in their turn wished to have our tents; and even the Dey of Tunis has asked for one, which has been made for him expressly. In short, our castrametation has become an art."² It is but proper to say that this tent is only a slight modification of that just described; it had nearly the same form, was supported in the same manner, and sheltered the same number of men; in one respect it was inferior—the officers' tents of the *nouveau modèle* having been provided very generally during the early part of the century with *sur-tentes*, or double roofs. It possessed in general, however, the same qualities. During the Mexican war the "*tente Tacconet*" was used quite exclusively by officers. Although it is still to be seen in French encampments, the Government has

¹ "Rapport sur l'État Sanitaire du Camp de Châlons," par M. le Baron Larrey. Paris, 1858; p. 34.

² "Réglement sur le Service des Armées en Campagne," par M. Durat La Salle, 1846. "Notice Historique," p. xx.

ceased since several years to give orders for its construction. A sketch of this tent is shown in Fig. 22.

The "tente conique," or "marabout," is a copy, with slight modifications, of the circular tent used by the Turks. It is supported by a single pole, and, when stretched out, has an interior diameter at its base of 18 ft. 8 in., and a height of 10 ft. 8 in. It has a curtain or wall 14 in. high (36 centimetres), which drops down vertically around its base, and is pegged to the ground on the inside of the tent. To each breadth of canvas, at its junction with the curtain, is attached a short cord, which, fas-

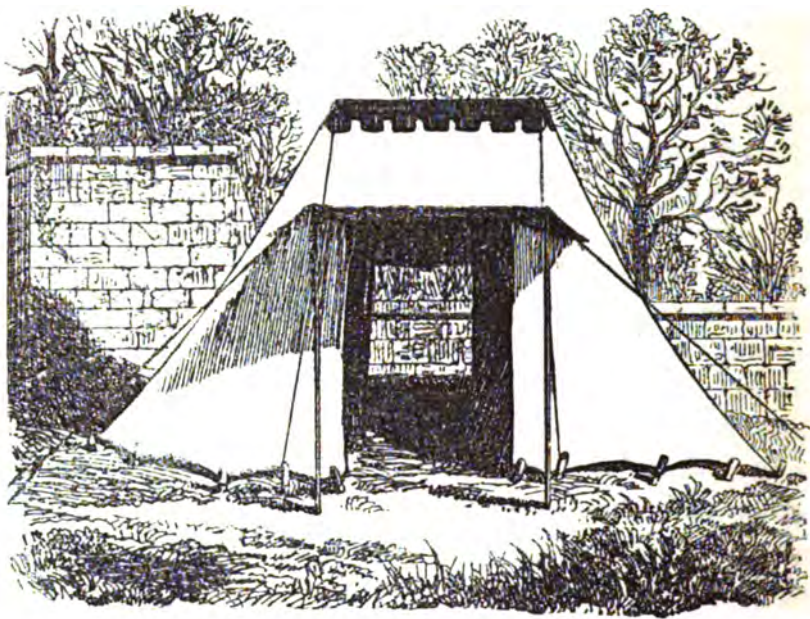


FIG. 22.—The French tente elliptique.

tened to a picket, serves to stay out the tent. The extreme diameter of the tent from picket to picket is 6 m. 80, or about 22 ft. 4 in. There are two doors in the *tente conique*, arranged as in the *bonnet de police* and the *tente elliptique*. At the summit of the mast is a cap, that overhangs an opening in the top of the covering, formed by a metallic ring, about twelve inches in diameter, over which the canvas is sewed. The opening is intended to serve as a ventilator, and is regulated by lifting up or depressing the cap.

The material of which this tent is made is brown linen canvas ;

its weight is 72 kilogrammes, about 158 lbs.;¹ and its cost, 239 francs.² It cubes 30 metres, and is intended to furnish a shelter for sixteen men. (See Fig. 23.)

Qualities.—The conical form is the one which insures the greatest stability to a tent; a fact of importance in itself, and of additional importance since the stability given by the form alone enables one to dispense with the use of long and inconvenient stay-ropes. The tent can be easily ventilated by raising a section of the curtain, while the opening at the top always permits



FIG. 23.—The French *tente conique* (marabout).

a certain escape of air. The *tente conique* is easily pitched and struck. It is a good troop-tent, and, if made of less permeable stuff, would be an excellent one.

Its great fault, especially when considered as a hospital tent, is its permeability. The canvas is not sufficiently close, and is also too pliable; the rain *sifts* through it, or if caught in its loose folds, filters through into the interior.³

The “appel d’air” at the summit of the tent is not suffi-

¹ In the article on camps in the “*Dictionnaire Encyclopédique des Sciences Médicales*,” published by M. Victor Masson, it is said the marabout weighs 57·50 kilogrammes; probably this weight does not include that of the pole, pegs, &c. Seventy-two kilogrammes is the official weight.

² This is the price given in the “*Rapport de la Haute Commission Militaire*.” The estimated price at the Intendance is as follows:—Canvas, 67 m. 60 at 1 f. 70 per metre = 114·92 francs; cost of making up with the accessories = 57·65 francs; total cost, 172·57 francs.

³ The French verb “*tamiser*” is the equivalent of the English verb *to sift*, but whenever a Frenchman says of his tent, “*elle tamise*,” he means to say, “It leaks like a sieve.”

ciently large; moreover, at one metre (39·37 inches) from the centre, it forces the men to stoop in moving about.¹ In a word, it lacks roominess, a fault which it has in common with all conical, wedge, and pyramidal tents. When such tents are used by troops, the space within their outer borders may be almost wholly utilized, and the inconvenience resulting from the pitch of their roofs may be of no great consequence; but when the sick are treated in such tents, either the space represented by the apex of the ground angle is almost wholly lost, or the inconvenience of the sloping roof will be found by the surgeon quite intolerable.

Moreover, in addition to the difficulty of being always able to use advantageously the space within conical tents, their interior cubic capacity, as compared with the ground they cover, is in reality considerably less than that of tents having other forms.

The conical *form* is the most expensive form which is employed in the construction of tents. The "*tente conique*" with a diameter at its base almost equal to that of the long diameter of the "*bonnet de police*"—and requiring in its construction nearly twice as much canvas—has a capacity only six cubic metres larger than the "*bonnet de police*."

The French also occasionally use a "marquise." It is designed, however, especially for general officers, and as a place of council; an "Instruction" of the year XII. gave to each colonel or commander of a regiment such a tent in addition to the tent used as a lodging.² This marquee has a double roof and double walls; the walls are about a yard high, and the outer roof, bordered with a festoon, projects over them. It has the same size as the "*tente Tacconet*."³

Qualities.—It can be fairly well ventilated by raising the walls by means of a double system of cordage:—"It is the model the best designed for the purpose had in view, and might with certain modifications itself serve as a model for a large division ambulance tent."⁴ (See Fig. 24.)

¹ Larrey, "Camp de Châlons."

² "Instruction pour le Campement de l'Infanterie." Le Ministre de la Guerre. Alex. Bertier, Paris, an xii.

³ "Le Spectateur Militaire." Paris, 1836; tome xxii. p. 227.

⁴ Larrey, "Camp de Châlons," p. 36.

More recently a council tent has been introduced under the name of "*la tente de conseil du nouveau modèle*." This construction may be described, in a word, as an umbrella tent. It is a conical tent supported by a central mast 11 ft. 6 in. high, from the upper part of which radiate eight horizontal bars, each about 6 ft. in length, that serve to prop out the walls of the tent. The diameter of the tent at its base is about 20 ft. Two doors placed in opposite walls face each other.

Qualities.—This tent is spacious and roomy, and well adapted for the purpose it is intended to serve. It is made, however, of light and inferior canvas. Singularly enough the coverings of

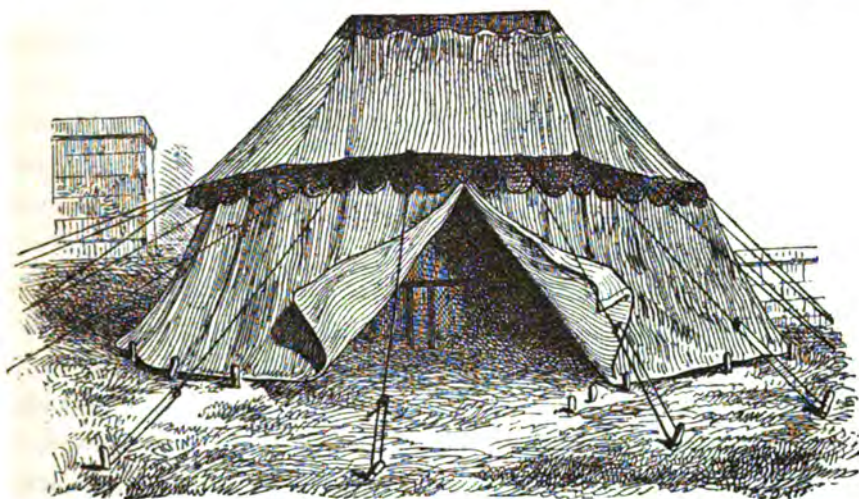


FIG. 24.—French marquee—*tente de conseil*.

the two council tents or "*tentes d'officier*" I have described, are made of "*coutil*"—ticking, while the soldiers' tents are "*en toile*"—canvas.

A hospital tent made by M. Le Fort in 1869, and adopted to some extent by the French "*Société de Secours aux Blessés*" during the recent war, merits notice. As this tent, however, is said by its inventor to have been designed with the purpose of remedying certain defects peculiar to "*la tente américaine*," I shall reserve my description of it until I have indicated the character and qualities of the tent, the inconveniences of which M. Le Fort proposed to avoid.

Quite recently a model "surgeon's tent" has been made by

the "Dock du Campement"—a Paris house—for the "Société de Secours aux Blessés," and in accordance with the following specifications, furnished by a committee of that society:—

The tent must be solid, light, portable, easy to pitch, and so roomy that a surgical service of eight or ten persons can move about within it, and work without inconvenience.

There should be room also for at least two amputation tables, stretchers, cantines, instrument boxes, medicine cases, &c.

The ventilation should be sufficient for the escape of all emanations, and the air within it should be renewable at will.

The light within should be sufficient for operating—even if the tent is entirely closed.

The tent must be capable of being rapidly cleaned—freed from straw, dirt, and detritus of all kinds.

It is also necessary that the access to the tent be made easy for the stretcher-bearers, who should be able to go in and out readily without difficulty, and without interfering with each other.

In accordance with these specifications a tent was constructed which very closely resembled the "*tente elliptique*" just described—in fact, scarcely differed from it except in certain matters of detail. The tent is at its base 8 metres long and 6 metres wide; it is $3\frac{1}{2}$ metres high. The framework, of pine, is composed of six pieces—square—10 centimetres (4 inches) thick, fitted with sockets, so as to form two standards, each $3\frac{1}{2}$ metres high, and a ridge-pole $3\frac{1}{2}$ metres long. The covering is supported wholly by this framework, and is secured simply by the pegs, which fasten its border to the ground, no cords of any kind being employed.

The tent has two doors; the one in front is $3\frac{1}{2}$ metres high, and nearly 6 metres broad; when closed it forms a side wall, when opened and supported by two props it forms a sort of portico in front of the tent (see Fig. 22); the second door in the opposite side wall is smaller, and, fitted with straps and buckles, is usually closed.

For purposes of ventilation, and that the tent may be the more easily kept clean, at each end two large openings (*baies*) have been cut quite down to the ground; these are each 80 centimetres

wide and 90 centimetres high. The *baies* are so arranged as to be readily opened or closed.

To increase the means of ventilation, four *louvres* (*lucarnes*) have been inserted, two being placed in each end near the summit of the tent. These openings are covered by raw hide hoods. Four windows are also placed in the tent, partly as ventilators and partly to secure light. The windows are placed—two at each end—a little over a metre from the ground—about half-way between the *baies* and the *lucarnes*; they are closed by curtains, to which weights are attached, that slide down on pulling a cord.

The tent is made of the best French regulation flax canvas (*du type ministériel*), weighing about 500 grammes (1 lb. 1½ oz.) per metre of 80 centimetres width.

The weight of the tent is about 110 kilogrammes (242 lbs.); when rolled up it forms a bale 2 metres long, with a diameter of 65 centimetres.

The tent plainly made without inscriptions or ornaments of any sort costs 575 francs.

Five persons should be able to pitch the tent in ten minutes.

Qualities.—This tent is intended for a special purpose—to be used on the field by the *ambulance volante* simply as an operating room. The form of the model is well adapted to the object in view; it assures a fair degree of solidity, without cordage, and makes it relatively easy to pitch and strike. The dimensions render it to a certain extent free from a great objection to tents with sloping walls—want of head room.

The provisions for opening the tent, whether for entrance, exit, or the purpose of ventilation, are abundant.

Its special faults are these: The covering is made of linen canvas, which, being only of a single thickness, is quite permeable. It is particularly desirable that the interior of a tent for the *ambulance volante* should be kept dry, as well for the preservation of the instruments and the surgical and medical material there assembled, as for the comfort of the persons who may be within it. If it is not thought expedient to employ a fly, the covering of such a tent should be made of cotton canvas. The *lucarnes* are not sufficiently large to assure the ventilation, if it become

necessary, on account of wind or rain, to close the doors, *baies*, and windows. This objection might be partially obviated by changing the place of the windows, which are now at the ends and about half-way between the ground and the ridge—inserting them in the roof above the doors.

A general objection to this tent might be offered on the ground of its being limited to a special service. It is not a good hospital tent on account of its permeability, and because it fails to respond to certain conditions desirable in such a tent. The numerous *baies*, windows, and doorways, serviceable as they may be in an operating tent, are objectionable in an hospital tent, as it is impossible to perfectly close them, and in cold, windy weather they serve as inlets to disagreeable currents of air.

Altogether the model is an excellent one for the purpose intended, and had it been made of cotton canvas instead of linen, would scarcely have left anything to be desired.

Among the tent models exhibited at a "conours" of the French "Société de Secours aux Blessés," opened in February, 1873, was one contrived by M. De Moulmier. This tent was said to have been intended to serve as a troop-tent, and also as a hospital tent. The model was circular; it had walls 5 ft. high, and was covered by a conical roof; its extreme height was 15 ft., and its diameter at the base 16 ft. It was supported by a central pole, and by its walls. The walls consisted of 18 solid wooden frames, 5 ft. by 3 ft., within which sheets of canvas were inserted. These frames, jointed together and set up in a circular manner, formed the walls. The roof was fastened to the sections of the wall by means of loops and hooks. The framework employed in this tent was strong and heavy, and the constructor appears to have had recourse to it as a means of obtaining a secure support for *hammocks*, sixteen of which were exhibited in the tent suspended between the walls and the central mast.

Qualities.—The model was constructed quite regardless of weight—a terminal ornament on the mast weighing ten or twelve pounds, and apparently in utter ignorance of the most important principles to be observed in the construction of an army tent.

At the same "conours," M. Couette exhibited a number of tents, one of which is, perhaps, worthy of notice. It is a hip-roofed

tent, 10 ft. high and 18 ft. broad, its length to vary according to circumstances. It is propped up by a series of supports about 6 ft. apart, and united by a ridge-pole, in sections. The supports are each formed of four limbs—two long ones and two short ones. The long limbs are united at the top by a hinge; when opened, they form the branches of a compass, and when planted in the ground are separated at their points by a distance of 4 ft. 6 in. From each branch of the compass, 6 ft. 4 in. from the ground, springs a strut about 6 ft. long. The struts are united to the branches of the compasses by hinges. All the limbs are made of strong elastic wood, and are faced with a strip of iron; being square in form, they fold up together compactly. When the compasses have been erected, and the tent covering has been thrown over the ridge, the struts prop out the covering, giving to it the form represented in Fig. 33. The roof has, however, a second angle, as the covering is made with perpendicular side walls, nearly a metre high, and is stayed out by cords which emerge from the tent, on the lines upon which the side walls are attached. The cords are bolt-roped across the inner face of the roof.

Qualities.—This tent would be simplified and improved by suppressing the perpendicular side walls and the stay ropes. The only noteworthy characteristic it possesses is its system of support. This, in principle, is a very good one. The numerous hinges are, however, objectionable; and iron sockets ought to have been placed above each strut hinge, into which the foot of an extemporized stretching piece could be put, should the hinge be broken or the strut itself lost. M. Couette has placed in his tent a number of net-work windows, which can be closed by curtains. The advantages of this arrangement are questionable.¹

¹ The *manteau d'armes*, which is included by the French among the *effets de campement*, is not unfrequently spoken of as a *tent*. It has never, however, been used, as may be inferred from its name, for any purpose except to cover arms and to protect them from wet. The company muskets being arranged around an upright post *en faisceau*, were covered by a small conical tent, for which the upright post (*chevalet d'armes*) served as the pole. This tent was 6 ft. high and 18 ft. in circumference at the base. By the Ordinances of 1753 and 1788, two *manteaux d'armes* were issued to each company. The *manteau du chevalet de piquet*—covering arms resting against a horizontal bar—instead of being conical was house-shaped, or *en mansarde*. The model in use in the French army in 1867

The tents now in use in the Turkish army are of two kinds. The one used by officers is a large conical tent, varying in diameter from 14 ft. to 20 ft. It is supported by a central mast, and is stayed by ropes attached to pickets. From the base of the cone a wall or curtain drops vertically to the ground, a distance of from 2 ft. to $4\frac{1}{2}$ ft. The covering is made of strong cotton canvas, and the inside is generally lined with some coloured stuff also of cotton.

The tent furnished the troops is in form quite similar, although generally somewhat smaller. It resembles very closely the French "*tente conique*;" it differs from it, however, in being made of doubled widths of cotton canvas, instead of linen canvas of a single thickness, and in having walls which lap widely over each other at the doorway, thus securing the inside more completely against rain. The ventilation is also better provided for than in the French tent, the opening at the top being larger and more controllable. The Turks have employed also a hospital tent, which is thus described by Major Rhodes:—"It is of a long oval shape, supported by a pole at each end, and having a ridge-pole or rope connecting both together; long ropes fastened to the sides at about three feet off the bottom, and then pegged to the ground, secure the tent. It is made of a doubled white cotton canvas."¹

The Prussian "troop tent" is very similar to the English bell-tent. It is 14 or 15 ft. in diameter, and is supported by a central pole 11 ft. 8 in. high; it is intended to shelter fifteen or eighteen men, and weighs 80 lbs.

The Prussian "hospital tent," as specified by the Regulation of 1862, is constructed as follows:—"It has a rectangular base 64 (English) ft. long, by 25 ft. 9 in. wide. The base is divided into three parts; the middle one is 53 ft. 9 in. long, and the parts at the ends are about 5 ft. long. The middle space is intended for the beds; the end compartments are designed to lodge the *personnel*, and furnish a place for the

weighed, with the gun rack, 25·3 kilogrammes, and cost 55·64 francs. The *manteau d'armes* would appear to have been rarely used except in the French service—it having been the custom in most armies for the soldier to stack his arms at night, or in rainy weather, in his quarters or in his tent.

¹ "Tents and Tent Life," p. 92.

necessary utensils. On a line running down the middle of the tent are four posts, 16 ft. 6 in. high, intended to support the ridge-pole, which holds up the roof. The roof is covered with sail-cloth tightly stretched, that the water may rest at no point and thus filter into the tent. Impermeable canvas may be employed, but it has the inconvenience of impeding the circulation of air, and of increasing the heat to an insupportable degree. Sail-cloth is therefore preferable."¹

This tent is intended for *fourteen* beds, which are arranged as shown in the diagram (Fig. 25). It is supported by a wooden

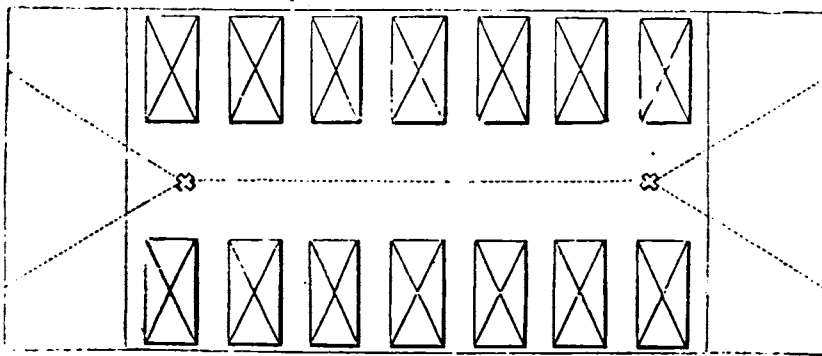


FIG. 25.—Ground plan of the Prussian hospital tent for fourteen beds.

framework of standards and plates, and is stayed by a multitude of ropes attached to strong pickets, including eight storm-ropes fastened to the main standards. The tent is not provided with a double roof. Its general appearance when pitched is very well presented in the illustration (Fig. 26).

I remember having seen at the Exposition of 1867 a *model* Prussian hospital tent, somewhat smaller than the one described, but very similar in its construction. It was an oblong wall tent, 43 ft. 8 in. (English) long, about 20 ft. wide, and 14 ft. 3 in. high. The side walls were 5 ft. high. It was divided into three compartments, as is the regulation tent, and was supported by a tubular iron framework within, and by cords and pickets without. Two circular ventilators were placed

¹ "Étude sur quelques points d'Hygiène Hospitalière," par G. Chantreuil. Paris, 1868; p. 13.

in the roof. The tent had a second roof or fly, which was attached to the roof, on the line of the angle of the side walls, by a series of buttons. The canvas covering was of brown linen of fair quality.

This tent was the subject of much criticism; nevertheless in November, 1867, the Prussian Government resolved to adopt it, with certain modifications, as will be seen from the following account of the "Field hospital tent for twelve beds," which I reproduce substantially from the official account then published. The tent is house-shaped, 28 ft. (Prussian) long by 20 wide.

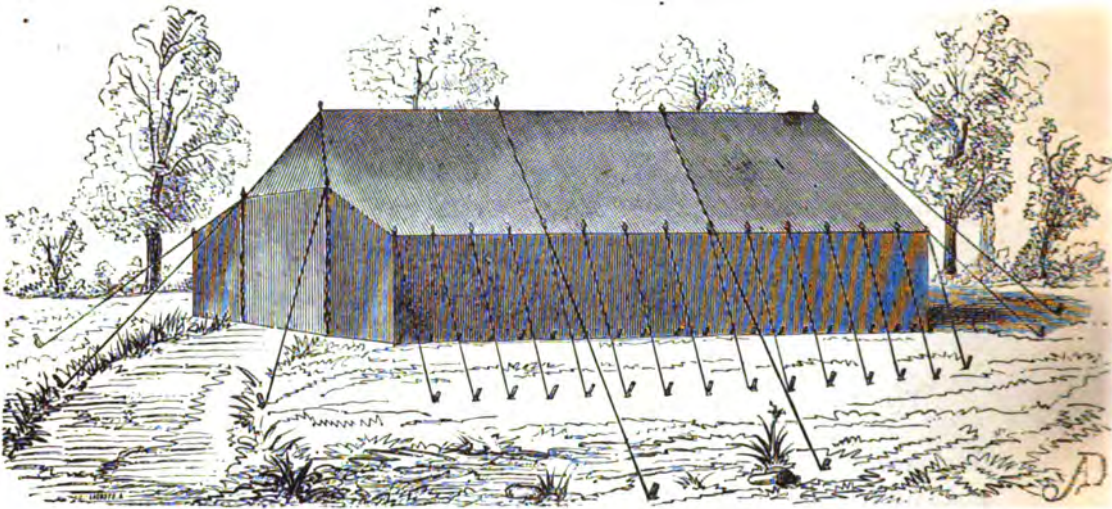


FIG. 26.—Appearance of a Prussian hospital tent for fourteen beds when pitched.

The side walls are 5 ft. high, and the distance from the ground to the ridge is $13\frac{1}{2}$ ft. It is supported by a framework composed of straight sections of wrought tubular iron. The disposition of this framework is shown in the accompanying sketch (Fig. 27). Three large iron standards *a a a* support the ridge pole *h h*, and each is fixed by a collar to a flat cruciform plate *g*, which rests on the ground. The connection between the standards and the ridge-pole is strengthened by four jointed braces *b b b b*. Each standard terminates superiorly in a cap *c*, mortised to receive the ridge-pole and the rafters, and bearing a terminal spindle to support the flags. There are five posts on each side, *e e e e e*, each resting upon a ground plate *g*, and

each terminating in a wormed spindle. Two bars, each in four sections, connected by hinged joints *ffff*, unite the side posts, the spindles of which pass through holes pierced to correspond. The rafters are the six rods *dd d d d d*, which are fitted to mortises in the side posts and the caps *ccc* of the principal standards.

The covering may be said to consist of four distinct parts, the *side walls*, the *end walls*, the *roof*, and the *sur-tente*.

The side walls are of common sail-cloth (linen), and are pro-

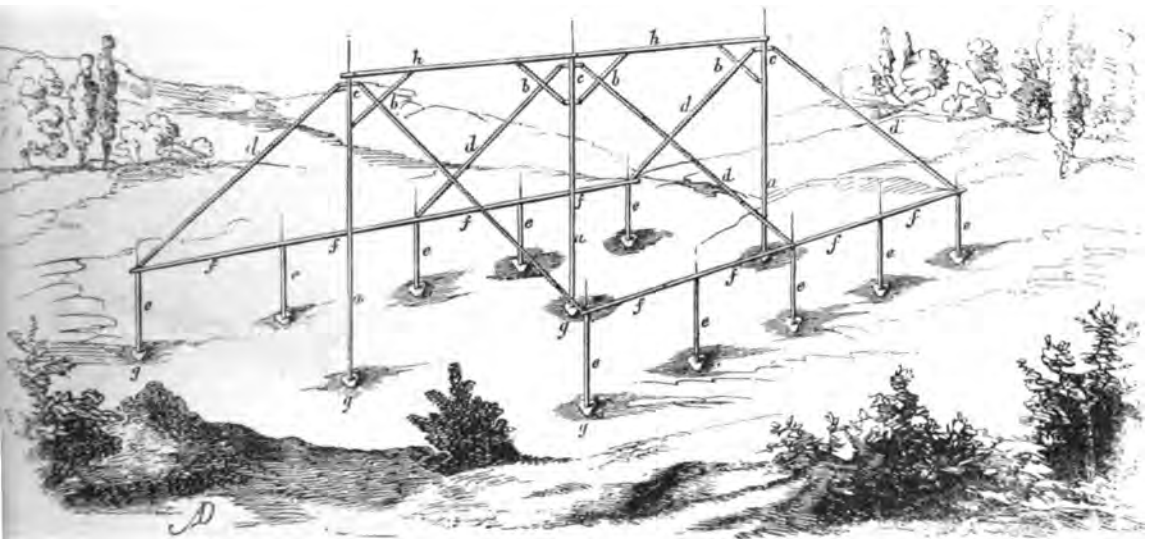


FIG. 27.—Diagram showing the framework of the Prussian hospital tent for twelve beds.

vided at the lower borders with bands of tarred cloth, six or eight inches wide; along the upper borders are five leathern straps and a few strings, by means of which they are fastened to the plates *ffff*; the lower borders are secured by pegs driven into the ground.

The roof is of ordinary canvas, and, stretched over the rafters, is brought down to the plates and passed over the spindles of the posts *eeee*. The borders of the roof, however, overlap the side walls quite a foot, and thus close the imperfect joints existing between the side walls and the plates to which they are attached.

The end walls, which serve as doors, are simply two pairs of

C C

curtains, of material similar to that used in making the roof, and to which they are tied by a number of strings.

The *sur-tente* is made of very heavy sail-cloth, which rests directly upon the roof, and is stretched down and kept in its place by nine cords attached to pegs in the ground.

The tent is moreover stayed by six storm-ropes, two of which are attached to each main standard; they are fastened to the ground by iron pins; eighty additional pins are required to hold in place the several parts of the tent. At one end of the tent a

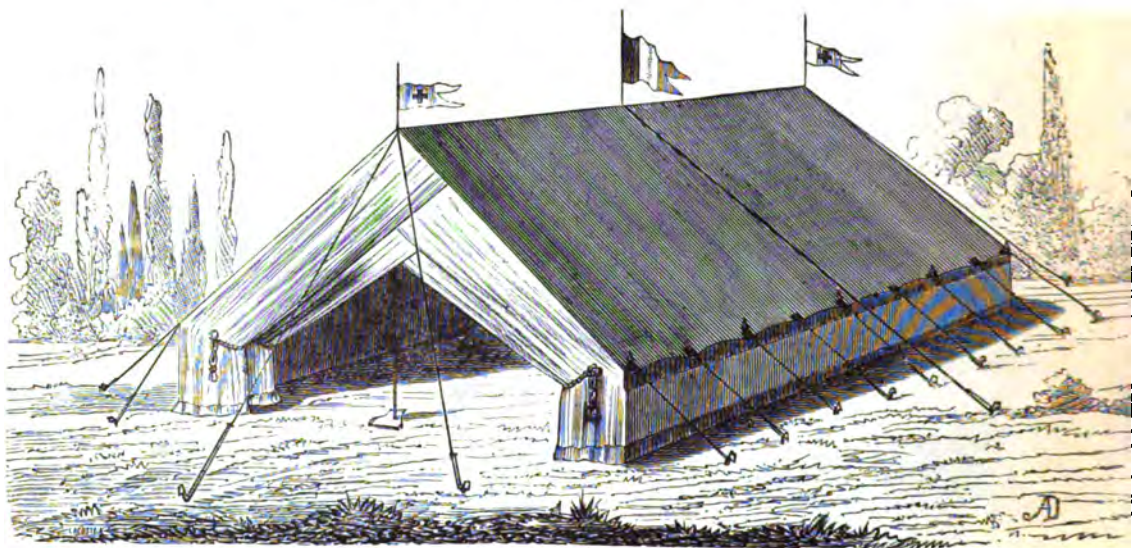


FIG. 28.—Appearance of a Prussian [hospital] tent for twelve beds when pitched.

small ante-room is made by suspending a second curtain about four feet from that which serves as the outer door.

The construction is surmounted by three flags, two hospital flags and the national flag; and its general appearance is very well shown in the sketch (Fig. 28).

The total weight of the tent is about 440 kilogrammes, or a little less than a thousand pounds.

Qualities.—These hospital tents are all roomy, may be fairly well ventilated, and under many circumstances would furnish excellent quarters for the sick. They all, however, possess several radical faults. They are too large—indeed their size renders them wholly unsuitable for campaigning. Their transportation is always difficult, and frequently impossible, on account of

their great weight ; while the surface they expose to the wind when pitched is quite incompatible with security. They are even much less sturdy than the English marquees. The model at the Exposition of 1867, although pitched *en permanence*, with every precaution, and in a particularly sheltered spot, was quite a wreck before the close of the season ; it had been partly or wholly blown down a number of times, and its iron framework twisted and bent into the most inconceivable forms. It would have been difficult to have furnished a more complete illustration of the impracticability of issuing to any service in an active army large house-shaped tents. Although recently these tents have generally had a second roof or fly, the advantages to be derived from this, whether as a *parasol* or a *parapluie*, have been almost wholly lost by placing it in close apposition with the first roof.¹ An iron framework is most objectionable : it is liable to rust, and when rusty it soils everything which it touches, it is liable to get out of order, and when out of order, in the field, can neither be easily replaced nor repaired.² The plan of lodging the nurses, as provided by the Regulation of 1862, is a bad one, aside from its adding needlessly to the already excessive size of the construction.

A tent employed by the Prussians during the late war is shown in Fig. 29. It is a small square construction intended to contain but two beds, and to be used especially for the treatment of those suffering from contagious hospital diseases. It is supported by a light wooden frame of standards, plates, and rafters, and is braced with cords attached to pickets. It has a projecting pyramidal roof, and the covering is made in sections. It can be opened on all sides, while the curtains, on the two sides proper, are so constructed as to be rolled up or down as the occasion may require.

¹ "Voitures et Tentes d'Ambulance," par Dr. Thomas W. Evans. Rapport du Jury International, Paris, 1867.

² The idea of employing an iron framework appears to have been first put in practice in Prussia. At least, I find it stated as a novelty in a number of the "Mechanic's Magazine" for the year 1840, that "the King of Prussia has recently caused a large tent, supported by an iron framework, to be erected at the camp in Silesia."

Qualities.—This tent is certainly a convenient and excellent tent, especially for the purpose it was intended to serve, but the model is evidently too complicated as well as too heavy to be suitable for campaigning. Although I have no measurements of this tent, it would appear from the sketch to give a much larger cubic space to each patient than could be allowed to each patient generally, without increasing the burden of transportation to a degree quite impracticable.

The old-fashioned Austrian and Italian “long-tent,” in use in the Austrian service until quite recently, was a wedge-shaped tent 40 ft. long and 13 ft. high; it weighed 900 lbs., and was intended to shelter fifty soldiers.



FIG. 29.—Prussian tent for the treatment of contagious diseases.

A few years since the Austrian Government adopted a form of tent proposed by Capt. Theurekauf, a sketch of which may be seen in Fig. 30, and which Major Rhodes describes substantially as follows:¹— It is a large single-poled tent, in length 22 ft. and in width 26 ft. inside ground measurement. It has triangular-shaped door ends; the top of the triangle from the ground is 7 ft. 6 in., and its extreme width at the bottom is 12 ft.; the end walls fall perpendicularly. The canvas side walls are 3 ft. high, and are fastened on the inside by hooks. The tent-pole is of one piece of wood 4 in. in diameter; its length is 13 ft.

¹ Cf. Rhodes, “Tents and Tent Life,” pp. 164-167.

6 in.; it is inserted into the ground 1 ft., and is there retained by a block of wood. Eight feet distant on each side of this pole is placed another pole 3 in. in diameter and 8 ft. 6 in. long, to be sunk in the ground 1 ft.; a "bread-shelf" rests on the tops of the short poles. The stay-ropes are fastened to the central pole, and secured to the "bread-shelf." The doorways are ventilated by two circular openings.

There are twenty-four small wooden pegs for the walls and entrances, and eighteen large pegs for extending the roof. This tent weighs $387\frac{3}{4}$ lbs., and costs about 100 dollars. An officers' tent is used, made after the same general model.



FIG. 30.—Captain Theurekauf's Austrian tent.

Qualities.—The tent is roomy, and stands solidly; it is said never to have been blown down. It has few and short ropes. The storm-ropes are all on the inside.

But the tissue with which it is covered—hempen canvas—is loosely woven and quite permeable to rain. It is, moreover, a single-roofed tent, and its form is not well adapted to the use of an awning or fly.

Another tent used at the present time in the Austrian army is known as the "marching tent." In form, it somewhat resembles the French "*bonnet de police*." It is 18 ft. long, 14 ft. wide, and a little over 7 ft. high. It is supported by a central

pole 7 ft. high, to the top of which a bar, $5\frac{1}{2}$ ft. long, is fastened in the form of a T. To each extremity of this bar two cords are attached and pegged to the ground, 9 ft. from the foot of the central pole. To the top of this pole also two cords are attached and fastened to the ground, one on each side, and 7 ft. from its foot. Over the framework of cords the canvas covering is now thrown, and secured to the ground by wooden pegs. The tent has a door at each end; it weighs $69\frac{1}{2}$ lbs. (English), and accommodates 10 men.

Qualities.—It will be observed that in this tent, as also in the one just described, the “weather lines” are on the inside of the covering—an arrangement which certainly results in some advantages. The lines support the covering, as well as give steadiness to the standard, and thus become not only additionally useful, but at the same time cease to interfere with people in their movements around the tent. The horizontal bar which forms the ridge is, however, weakly supported, and liable to get out of order.

In the Austrian army, no tent has been especially provided for hospital purposes. But the large soldiers’ tent is presumed to furnish ample accommodation for 8 sick, and the “marching tent” for 2 sick. They are, however, badly adapted for the treatment of the sick, as well on account of their forms as the quality of the material of which the coverings are made.

The tents employed in the Italian army are “shelter-tents,” “conical tents,” and “marquees.” No special hospital tent is used.

The shelter-tent is formed of three rectangular sections, each 1 m.77 in length and 1 m.70 in breadth; they are thus a little larger than the French sections; they are fabrics of strong linen canvas—although attempts are now making to employ cotton tissues for this purpose; the sections weigh a trifle over a kilogramme each. The system of support has already been alluded to. This tent is furnished to soldiers and non-commissioned officers.

Conical tents are issued to officers; but when the sick are treated under canvas it is usually in these tents. The Italian conical tent is a modification of the Turkish “*tente conique* ;” it is also made of strong white cotton canvas. The upper part of the tent is doubled with blue canvas. The covering is supported by a

central mast, and is retained in place by 44 pegs and pickets. The tent complete weighs 42 kilogrammes, and costs, according to the Government estimate, 157·60 francs. It is presumed to be capable of accommodating five sick persons.

Qualities.—For common field service the Italian conical tent is greatly superior to those generally used in European armies; made of fairly good cotton canvas, it is a comfortable water-proof tent. It possesses also whatever advantages are special to its form; but the conical form is not a good one for a hospital tent—it is in fact a very bad one, and for reasons which have already been indicated. I may, however, mention in this connection, one objection applicable to all “bell,” “conical,” and “circular” tents, ranging from ten to twenty feet in diameter: the circular ground plan renders any convenient disposition of the beds quite impossible. If the tent is small—less than 15 ft. in diameter—but one or two beds can be put in it; if it is somewhat larger, the centre of the tent is so obstructed as to very much interfere with the common duties of the attendants.

The marquees have generally been employed by superior officers—a few have been used for hospital purposes; but this use was for the most part during or immediately subsequent to the Crimean War.

The Russian “infantry” tent is 14 ft. square, with side walls 7 ft. high; it is supported by a centre pole and four corner poles. It is intended to shelter fourteen men, although occupied generally by a smaller number. The side walls can be raised more or less completely. The officers’ tents differ in no way from the “infantry” tent, except that their roofs are usually made of double canvas, or are covered with impermeable rubber cloth.

The Russians have no special hospital tent, but the infantry tent is roomy, and its form is well adapted for hospital purposes. It is, however, unprovided with a double roof, and offers too large a surface to the wind.

In the United States a variety of tents have at different times been employed—“wall-tents,” “bell-tents,” “umbrella-tents,” “wedge-tents,” &c. Those most commonly issued to the troops have been the wedge, the shelter, and the Sibley tents.

The wedge-tent differs in its form in no essential respect from

those already described under that name, and represented in the woodcut on page 322. The United States tent is 6 ft. 10 in. long, 8 ft. 4 in. broad, 6 ft. 10 in. high, and cubes 194 ft. It is supported by two standards and a ridge-pole, and is not stayed by cords. The covering is of common cotton canvas. The tent is intended to furnish a shelter for five or six men. It is unprovided with ventilators, is made with but a single entrance or door-way, and is, as generally constructed, a poor tent for any purpose.

It should always have a window or two, covered by a flap, or *louvre*, placed in the upper part of the roof.

The shelter-tent was issued to the troops during the last years of the War of the Rebellion, to the exclusion of nearly every other model.

The United States shelter-tent in form, size, and manner of support, resembles the French regulation *tente-abri*. Each man carries one section (a third of the tent) and a stick. Each section is about 6 ft. long by 5 ft. 6 in. broad.

During the War of the Rebellion, however, the sections, instead of having been made of linen canvas, were made of strong firmly-woven cotton cloth, rendered impermeable by a covering of caoutchouc. They could thus, if not forming a part of a tent, be used as blankets on the ground, and often rendered in this way most excellent services. Moreover, each section had in the middle a short transverse slit, through which the soldier might pass his head, and thus use the section in rainy weather as a cloak (poncho). Each section of an American shelter-tent was therefore a part of a tent, a water-proof blanket, and a cloak.

The shelter-tent in American camps was frequently pitched in a way unlike that employed in French camps. Thus two or three sections of *tente-abri* were sometimes placed together side by side, their upper ends fastened to a ridge-pole, and their lower ends stretched out and pegged to the ground. A screen was thus made which formed the back and roof of the tent. The triangular spaces at the two ends were each closed by another section. The front of the tent was left open; on the ground before it a fire was built up, the heat from which, reflected and concentrated by the roof and sides, as in the old-

fashioned kitchen utensil known as a "baker," made this form of tent very comfortable. These constructions were sometimes called "baker-tents," "half-faced camps," &c.

I am sorry, however, to feel compelled to destroy the illusion, which doubtless exists in the minds of most Americans acquainted with army life, that the half-faced camp is a "Yankee invention." Capt. Marcy certainly speaks of it as "a method practised a great deal among mountain men" in the far West;¹ but many people have discovered, as Capt. Galton has justly observed,² that "the main object before sleeping out at night is to secure a long wind-tight wall, and the next is to obtain a roof."³ And he afterwards states that a very common means of accomplishing this object has been thus:—"Support a cross-bar by two upright standards; against this cross-bar a number of poles are made to lean; on the back of the poles abundance of fir branches are laid horizontally; and lastly, on the back of these are another set of leaning poles, in order to secure them by their weight."

But the half-faced camp is not even a very modern invention. The sketches of German camps of the time of Charles V., in Fronsperger, show numerous examples of such a shelter. Sometimes a square piece of canvas or a blanket was arranged in the manner I have described, and sometimes the sloping shield was formed of boards or of poles thatched with straw or some similar material.⁴

The Sibley tent is a modified copy of a Comanche lodge. (See Fig. 31.) This lodge, or wigwam, is made by covering a framework of straight slender poles with skins. Three poles about twenty feet long are tied together near the top; they are then

¹ "The Prairie Traveller," by Randolph B. Marcy. New York, Harper and Brother, 1859, p. 134.

² "The Art of Travel," by Francis Galton. John Murray, London, 1867, pp. 135-137.

³ "A slight amount of shelter will protect a man from wind, and a very small piece of canvas or waterproof judiciously placed will protect him from rain."—*Regulations and Instructions for Encampments*, War Office, 2nd June, 1872. Plate xxi. of this book contains representations of straw and canvas "lean-to shelter."

⁴ Fronsperger, op. cit. See cut opposite page xii. and the large *eau-forte* opposite page lvi.

raised up, and their large ends are planted upon the circumference of the circle which the lodge is to cover. A sufficient number of poles are now set up on the same circumference, their tops dropping into the forks of the first three. The frame is now covered in, a place being left open for a doorway, above which is suspended a blanket, that may be drawn down when necessary. The lodge is also open at the top, or, rather, each side of the apex is covered with a flap of skin or cloth, that to the windward being generally propped out by a short pole. A constant draught is thus maintained, especially when a fire has been built upon the ground within.

The Sibley modification dispenses with the numerous poles. A single central mast, resting upon an iron tripod, supports the covering, which is of cotton canvas. The tent has the form of a cone, is about 13 ft. high, and has a diameter at its base of 18 ft. It cubes 1,102 ft., and will shelter comfortably twelve or fourteen men.



FIG. 31.—A Comanche lodge.

There is a large opening at its apex, over which is a hood which can be raised or closed at the sides by cords that hang down within the tent. The covering is supported solely by the mast and the pegs which fasten it

directly to the ground. When the doorway is closed, the canvas overlaps within and without. (See Fig. 32.)

The Sibley tent cost in 1861 63·71 dollars (gold.) It has since ceased to be an article of equipment in the United States army. Although originally intended to serve as a troop-tent, the Sibley was occasionally used as a shelter for the sick.

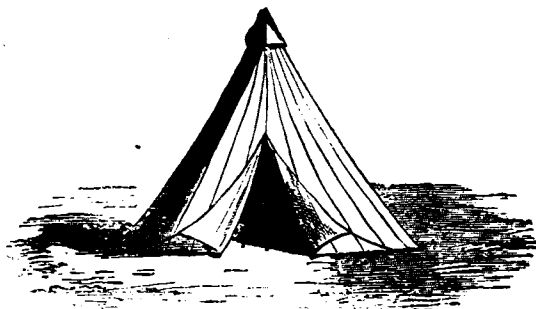


FIG. 32.—A Sibley tent.

Qualities.—The Sibley is one of the best conical tents with which I am acquainted. The material of which it is made is fairly impermeable, it stands firmly, and its elongated form gives more headroom than is usually found in conical tents. Ventilation is also well assured. The objections to its use, as a shelter for the sick, are its form, and the absence of a second roof, which if not absolutely necessary to keep the rain out, would—could it be applied—make it far more comfortable, particularly in the summer, as its walls cannot be easily raised.

The wall-tent used by the United States Government as a hospital tent is thus officially described:—"Hospital tents must in future be made according to the pattern of the present tent, and of the same material, but smaller, and having on one end a lapel, so as to admit of two or more tents being joined and thrown into one with a continuous covering or roof. The dimensions to be these: In length 14 ft., in width 15 ft., in height (centre) 11 ft., with a wall 4 ft. 6 in., and a 'fly' of appropriate size. The ridge-pole to be made in two sections after the present pattern, and to measure 14 ft. when joined. Such a tent will accommodate from eight to ten patients comfortably."¹ As this description may be considered scarcely satisfactory, at least by one unacquainted with the "pattern of the present tent," I shall furnish some additional details. The tent, like the old French "*cortine*," is shaped like a "small house;" it is nearly square, with vertical ends, and with vertical side walls; its roof has a double and quite steep pitch. It is supported within by two perpendicular poles, 12 ft. long, to be sunk in the ground a foot, and united together by a ridge-pole, which, notwithstanding the "official" statement, is generally a single pole. When pitched, the canvas is stretched into position by fourteen cords, each 8 ft. long, attached to wooden pickets or pegs; the side walls are fastened at the bottom each by seven pegs, and each vertical end wall by five. Two storm-ropes attached to the tops of the upright poles secure the tent. Over the tent is thrown a *sur-tente*, or "fly," overlapping about a foot the angle formed on each side by the roof and wall of the tent.

¹ "United States Army Revised Regulations." Washington, 1863; p. 318.

To be still more specific, I should say that the poles are made of light, strong wood (ash or cedar); the standards terminate at each superior extremity in an iron spindle, intended to pass through holes corresponding at the ends of the ridge-pole. When the ridge-pole has been attached in the way indicated to the standards, the framework is completed. It will be observed, however, that the iron spindles project through the ridge-pole three or four inches. The covering which forms the tent proper having been laid upon the ground and unrolled upon its side, this framework is passed within it, and the spindles are pushed through two small holes, which will be found at the upper and outer angles of the covering. The large square piece of canvas which will be discovered rolled up with the tent is the "fly," or second roof. Upon examining it, two holes will be found in it, each one in the middle of an outer border. Suppose the tent to be lying flat upon the ground, and the framework to have been properly introduced. The fly may now be drawn under it until the hole in each border reaches the corresponding spindle, over this it is slipped, when the outer half of the fly is brought forwards over the ridge-pole, enveloping it, as well as the tent. Two places having been properly prepared in the ground, into which to sink the standards, the tent is raised, and a few pickets having been driven into the ground, it may be temporarily stayed by slipping over their heads the nooses of the bracing cords. The pickets are afterwards permanently placed at such a distance as shall permit the tent being drawn out so as to cover a rectangular ground surface 15 ft. wide. The side and end walls are then pegged to the ground; and the fourteen cords of the fly may be attached to the fourteen lateral tent pickets, double-notched for the purpose, or to fourteen pegs, seven of which are driven into the ground on each side, and a little beyond those which secure the tent. The fly is supported by the ridge-pole, but it nowhere in its descent touches the roof of the tent, and is separated from it at the angles of the roof and the side walls about 10 in.

I may here call attention to the way in which the cords are attached to the pickets. The cords, 8 ft. in length, are doubled upon themselves, forming long nooses; these are simply dropped

over the heads of the pickets. The tent is stretched out by pulling upon that part of the noose which forms the short part of the cord, and which, passing through one end of a small oblong piece of wood, terminates in a knot; the long part of the cord passes through a hole in the other end of the same piece of wood; this piece of wood completes the noose. When held at right angles to the cords, the long cord slides freely through it, but its tendency when left to itself is to assume a position parallel with the cords, thus locking the noose firmly. As all tents are more or less loosened or tightened by the hygrometric state of the atmosphere, this simple contrivance for securely holding and tightening and loosening the tent, as the occasion may require, is most convenient. The way in which the key acts will be at once understood by referring to Plate IX. (Appendix).

Doorways 8 ft. high are cut in each vertical end of the tent, and are closed by overlapping canvas secured by strings. The covering is made of cotton canvas (duck) firmly woven, which weighs 14 oz. to the yard (28 in. wide). The tent proper contains about 74 square yards of canvas, and therefore weighs, when made of 14-oz. canvas, 83 lbs. 4 oz.; the fly contains about 32 square yards of canvas, and weighs 36 lbs., thus giving a total of about 120 lbs., exclusive of poles, pins, and cords, the weight of which may be estimated at about 35 lbs.; the complete tent therefore weighs about 155 lbs. Such a tent complete cost, in New York, in 1870, 100 dollars *currency*. But the cost, as well as the weight of the tent, are considerably reduced by using lighter grades of duck; and this is sometimes done, although the advantages are perhaps more than counterbalanced by the faults special to inferior materials.

Qualities.—The tent has a good *form*; it is roomy, and there is no lost space in it. It has the proper size for a field tent; it is perfectly transportable; a pack mule can carry one with the poles and pickets. It does not offer so large a side surface to the wind as to be easily blown down. Whoever may have designed this tent, evidently proposed a practical compromise between a desirable roominess and a desirable steadiness. Shorten the side walls and the tent will stand more firmly, but

its interior will be more inconvenient; whatever may be added to their height makes the tent more roomy, but at the same time it weakens its power to resist storms. As a campaigning hospital tent, I believe that nothing could really be gained by altering in any way either its form or size. The pitch of its roof is sufficient to shed water well, but its impenetrability to wet—one of its principal excellences—is to a great extent a property of the tissue of which it is made. A piece of firmly woven *cotton canvas* is water-tight; rain collected in its folds will not filter through even slowly; it does not *tamise* except when the rain beats with the greatest violence, and even then but slightly. But the superiority of the American hospital tent depends largely upon its outer roof. I have already, when speaking of the marquee, had occasion to mention some of the advantages of a second covering or roof, and I have elsewhere said that no hospital tent should be unprovided with such a roof. It is a protection against rain and dew, and is a protection against the direct heat of the sun. These are obviously important considerations. By sheltering the tent beneath from rain and wet, the outer roof also accomplishes indirectly an object of great importance. Air passes through wet canvas with difficulty. The air, consequently, within a damp, wet tent, becomes impure much more speedily than when the canvas is dry. Moreover, the canvas when wet attaches to itself a much larger proportion of organic molecular matter—in short, becomes more speedily infected—than when dry. A large fly, therefore, by keeping the tent beneath it dry, assists in maintaining the purity of the air within the tent. In this connection I may mention an advantage it possesses over the outer covering of the marquee. This outer covering protects the inner tent from becoming wet; but it becomes itself, especially when wet, a great obstacle to the circulation of air, hence the frequent complaints of the heat and mustiness of the air shut in between the walls of the marquee. The fly, on the other hand, while protecting the tent from wet and dew, obstructs in no way the exit of the air from within. As a parasol, also, the fly is greatly superior to the outer tent of the marquee, and for the same reason, since it allows the air to be constantly swept from beneath it. The American tent stands

in the shade of its fly, which constantly catching the wind, and flapping and drawing as would a sail, encourages an active circulation of air between itself and the tent. Admitting that the principal use of the fly, as also of the outer covering of the marquee, is to protect the tent beneath or within from rain, and that the ventilation of a marquee may be made as complete as is desirable, an advantage which will always rest incontestably with the fly is this: containing less than one-half the number of square yards of canvas entering into the tent itself, it covers and completely protects against rain more than half of the tent. To cover a tent completely by an outer covering, as is done in the English marquee, requires nearly double the number of yards of canvas necessary to make the tent itself. To state the principle generally: *the American fly at one-fourth* of the expense gives nearly or quite *three-fourths* of the shelter obtained by the outer tent of the *English marquee*.

As the question whether a field hospital tent should be protected simply by a fly, or covered entirely by an outer tent, is really an important one, I wish to discuss it with the most perfect fairness. A tent completely covered by another tent is certainly better protected against the wind, and is warmer than a tent placed under a fly. This is a fact about which there can be no doubt. I may remark, however, that when an outer covering is used, the warmth of the inner tent is only obtained by interfering with its natural ventilation, and that the evil resulting from this interference probably often quite compensates for the particular advantage referred to.

As a rule men within tents are much more likely to suffer from excessive heat than from excessive cold; and unless it could be shown that single canvas tents were necessarily uncomfortable except when placed inside of other tents, I should object to such a procedure for the reasons already given. I shall show elsewhere how single canvas tents can be kept sufficiently and comfortably warm during the winter in temperate climates. But I may observe here, without reference to any system of heating, that if it is considered of such paramount importance to be able to say, this or that tent is warmer than other tents, it would be well if the constructors of such warm tents paid a little more attention

to the materials of which their tents are made—at least, before attempting to make them warmer by means which are objectionable in principle, besides being enormously costly, especially when we consider the small positive advantage usually gained.

It should be particularly observed that the fly is not simply an outer roof. It is a roof disposed in a particular manner, with a free, clear interval between it and the roof of the tent itself. This is a most important point; it involves well-known principles which are represented in the umbrella and parasol. A thin tissue stretched out overhead may serve as a very effective protection alike against rain and the rays of the sun. If the same tissue were applied directly to the body, it would be found to have lost nearly all its special powers of protection. Simple and evident as are the principles involved, they have been more than once overlooked by the constructors of tents; and one of the most remarkable and singular instances of such an oversight is to be seen in the new Prussian regulation hospital tent.

A large fly, one which projects well over the sides of the tent, and applied, as I have explained, so as to leave a free space open to the wind between itself and the tent, protects a tent admirably both as an umbrella and as a sun-shade.

But the fly is often of great value for another purpose; it may be used, whenever the season permits or occasion requires, as a supplementary or independent tent. If it be desired to increase the capacity of the tent, the fly is simply brought forward, the hole in its posterior edge slipped over the spindle in the top of the first standard, a new ridge pole and standard improvised, and the fly itself stretched out on either side; it now forms a most convenient awning or verandah in front of the tent.

If tents be wanting where flies are used, a series of large wedge-tents may be at any time extemporised;—and I may add that this was done again and again during the War of the Rebellion, not so much because of the want of tents, as because the fly alone seemed to furnish all the shelter required. Another advantage possessed by this American tent is of such great importance, that I am surprised it has been so universally overlooked by those who may have in times past interested themselves in tent architecture. In accordance with the official regu-

lation :—"It must have on one end a lapel, so as to admit of two or more tents being joined and thrown into one, with a continuous covering or roof." In a word, each American hospital tent, while complete within itself, is a *component part of a large tent or pavilion*, the size of which may be determined at will. Generally in the establishment of field hospitals four or six of these tents are united together, so as to form a long pavilion ; the doors are thrown open between them, and the vertical walls which separate the tents are rolled back on either side ; a long ward is thus formed, each tent opening freely into the one adjoining. The general advantages of this practice are great. First,—the sick are more easily and better taken care of in a large open ward than when they are isolated, and it is necessary to visit them from tent to tent ; secondly,—they are less exposed to draughts of air from the constant opening of the doors ; thirdly,—they are more completely sheltered, the tents protecting each other ; fourthly,—the tents stand more solidly ; fifthly,—the tents are more easily and economically warmed ; sixthly,—the ground space of the camp is economized.

Conical and pyramidal tents cannot be thus united ; and if it were said either of the Prussian tent, or the English marquee, that it is large enough for any hospital tent, my reply would be, admitting this to be true—while large enough to be conveniently spacious within, they are each so large and heavy, that the difficulty of transporting a single tent is a constant source of inconvenience as well as of misfortune. The American tent, it will be seen, is at the same time small and large ; small, whenever it may be necessary to transport it, and, when pitched, as large as one may choose to make it. I believe the American tent to be the most valuable model yet offered for the hospitalization of troops in the field ; an opinion which, expressed by me in 1867, when a delegate to the Conference of the International Société de Secours aux Blessés, I had the satisfaction of seeing sustained almost unanimously by the members of that Conference.¹ I believe that both in size, and form, and disposition, it is better fitted than any other model with which I am acquainted to serve in the field

¹ "Comptes Rendus," op. cit. part i. p. 137.

as the *unit* of a simple and efficient system of tent hospitalization. I do not wish to say that I believe this tent is perfect—it can most undoubtedly be improved. The extent of such improvements, however, must be largely a matter of opinion, depending on the relative importance attached to the realization of the conditions desirable in a hospital tent. I have already said that, however desirable it may be to increase the height of the side walls, this cannot be done without diminishing the sturdiness of the tent; and several of its faults are similar in this respect, that any attempt to remedy them would be quite certain to result only in the substitution of one fault for another. I believe the chief defect in the American hospital tent is the absence of suitable provisions for its ventilation; as now made, the only direct method of renewing the air within it is by opening the doors and raising the side walls, both of which procedures are objectionable in the winter, and may be at any season of the year. They besides assure no regularity in the supply of air; this at one time may be excessive, and at another, particularly at night, is likely to be quite shut off. Two or three openings near the ridge ought to be cut in each tent; these should be covered with a flap to which a short prop is attached—the extremity of which may be inserted in a pocket fastened to the lower edge of the opening, whenever it may be desirable to open one of the apertures. I may add that the tents used at the American ambulance were all thus furnished with ridge ventilators. The objection to its straggling cords is one applicable not only to it, but to all wall-tents. Unlike most, however, the American tent is amenable to treatment with regard to this evil. As the tent is stayed out at the sides alone,¹ the pickets may be replaced on each side by a bar placed parallel with the angle formed by the roof and side walls, on a level with it, and but a few inches from it. To this bar the stay-ropes may be tied; the space in front of the tent, as also that in the rear, thus remains open. Whenever it is probable that a tent may remain for some time on the same ground, if possible, this is the best way to pitch it, as, while avoiding the inconvenience of the cords and econo-

¹ Practically, the *storm-ropes* of this tent are seldom used.

mizing the ground surface, the tent itself is rendered much more secure than when held only by pickets.

In the summer of 1867 I had the opportunity of directing the attention of a number of scientific gentlemen to the excellences of the American tents exhibited by Dr. Thomas W. Evans, at the Exposition Universelle, and forming a part of his remarkable "sanitary collection." Among these gentlemen was Professor Le Fort of Paris, who then expressed without hesitation his belief that the best results might often be obtained by treating the wounded under canvas. A year or two afterwards he pro-



FIG. 33.—M. Le Fort's field hospital tent.

posed a tent which has many merits ; a description of it I shall here give, and in his own words.

Le Fort's Tent.—"By a special arrangement, I have been able to get up a model free from the inconveniences belonging to the American tent. The arrangement consists in the employment of a compass offering a *point d'appui*, to form the roof, and serving at the same time to establish and permanently maintain the separation of the two coverings.

"The skeleton of the tent is composed of two upright poles united at the summits by a horizontal bar slipped through a sheath made in the first roof. The two coverings descend parallelly, (as may be seen in Figure 33,) to the edge of the roof, they then reach the ground, where they are fastened by a few pickets. The vertical walls corresponding to the gables are also formed of double canvas, and are each pierced with a double

door, which is opened by rolling up the canvas on itself, and fixing it by a couple of straps. The outer roof has on each side, on a level with the ridge, three whistle-shaped windows; the inner roof is pierced on the same level with a considerable number of openings. The circulation of air between the two coverings and the interior of the tent is very complete, guarantees against any elevation of temperature, and assures a constant and active aëration, especially when the doors are open. The compass is formed of two wooden poles joined at the centre upon a metallic cylinder, which slides freely along the length of the vertical support. The free extremity of each limb of the compass terminates in an iron spindle provided with a screw point and a couple of nuts. This spindle passes through holes pierced in the border of the canvas on a level with the inferior angle of the roof; the interior covering rests upon the shoulder formed by the extremity of the wooden pole; the exterior covering rests upon a nut screwed down twenty or twenty-five centimetres upon the metallic spindle; the second nut, not shown in the design, and which, moreover, is not indispensable, prevents the covering from slipping off the compass. The borders of the two coverings, from the ridge to the ground, are bolt-roped, as are sails; these ropes, attached to pickets, assure the solidity of the tent, for they are more or less put upon the stretch, according as in lifting up the centre of the compass the free extremities of the limbs are separated. Another cord runs horizontally from one end of the tent to the other, fixing and marking the edge of the roof. That of the outer roof terminates in a free end, to be attached to a picket sunk in the ground; it steadies the roof, and prevents the distortion of the compass by the tension of the canvass. It may be observed *en passant*, and without entering into details, that a few girths sewed on to the canvas may be used to advantage in place of the bolt-ropes, which are greatly affected by the hygrometric state of the air. Besides the two doors placed in each end, a wide door opening as an awning is cut in the sides, which form the lateral walls.

“A very simple modification, and one which neither increases the cost of construction nor the difficulty of installation, allows a disposition to be given to the tent shown in the

following sketch (Fig. 34)—an arrangement by means of which the patient can be placed in the open air during the heat of the day, without being exposed to the rays of the sun. It is only necessary to divide the interior covering into two parts, one of which shall form the roof, the other the lateral walls; these walls are made to slide as curtains upon a horizontal cord, running from one end of the tent to the other and attached to the braces; they may be thus gathered in towards the angles. An inspection of the designs will enable one readily to understand the advantages this ambulance tent, which we have used the past season, has over the American tent. The clear space (and



FIG. 34.—M. Le Fort's field hospital tent as modified by himself.

consequently the quantity of air allowed to each patient) is greatly augmented by reason of the vertical walls; far from being obliged to stoop on approaching the beds, one may go into any part of the tent, even with his hat on, without hitting the roof anywhere.

“The circulation of air, as well between the coverings as within the tent itself, is as complete as one could wish, and it may be increased or diminished according to the state of the weather.

“The hygrometric state of the atmosphere incessantly modifies the tension of the coverings. Raising or depressing the compass suffices to remedy these modifications; nothing of the sort is possible in the American tent.¹ The canvas being double at

¹ This is an error. The wooden keys attached to the stay-ropes and described on p. 391 were designed to correct, so far as there was any necessity for doing so, the

every point, the sick are much more completely protected, as well against the heat of the day as against the cold during the night.

"The ambulance tent which we have proposed measures five metres on each side; that is to say, it covers a superficies of twenty-five square metres. It can receive without being overcrowded six beds, with an interval of a metre between each; and the cubage to be allowed to each patient is not to be estimated in a hospital under canvas as in an ordinary hospital. Each tent made by the house Husson, of canvas 'hystasaspes,'¹ costs about 800 francs. The cost amounts, therefore, to 133 francs per bed. The weight of the tent is a little over 100 kilogrammes (220 lbs.). By uniting together end to end several of these tents, wards may be made for ten, fifteen, twenty, or more sick. The wards will communicate by the doors in the vertical ends, or they may be divided into separate sections by closing the doors. To hold the tents together, all it is necessary to do is to place a clamp pierced with two holes over the spindles of the two free and contiguous branches of the compass."²

At the commencement of the late war a considerable number of tents were made by the house Husson for the French "Société de Secours aux Blessés," and several kindred associations. Con-

effects of the atmosphere referred to. Indeed, M. Le Fort himself seems to have partly recognized the object of the keys, as more recently he has said ("La Chirurgie Militaire," p. 173):—"The American tent requires an extravagance—(*un véritable luxe*)—of stay-ropes, and these ropes must be constantly manipulated in tightening and loosening the canvas according to the constantly varying hygrometric state of the atmosphere."

As experience is always worth more than a theoretical opinion, I may remark that during the six months our tents were pitched at the American ambulance I never had occasion myself, nor did I ever see anyone attempt, to tighten or loosen the cords. I do not say this was never done, I only wish to say that tightening and loosening were seldom required, and that *loosening* was rarely if ever required, on account of the immediate shrinking of the canvas from wet, even when coming in the form of rain. The shrinkage of cotton stuffs from wet is slight.

The English marquee requires *eighty-two* stay-ropes. If the twenty-eight or thirty ropes of the American tent are for M. Le Fort *positively, un véritable luxe*, I am a little curious to know what may be his *comparatives* and *superlatives*.

¹ This name is given by the house Husson to canvas which has been prepared by having been passed through a solution of sulphate of copper, &c. The process is covered by a patent.

² "Des Hôpitaux sous Tente," par Léon Le Fort. Victor Masson, Paris, 1869.

structed nominally in accordance with the plan proposed by M. Le Fort, they differed in certain respects, as the accompanying sketch will show (Fig. 35). The tents were united together end to end; they were destitute of a double roof, and the quality of the canvas made of flax was so inferior to that used by M. Le Fort in the construction of his own tents, as to greatly invalidate the conclusions drawn from their experimental use.

Qualities.—The tent originally proposed by M. Le Fort is an excellent one; it not only has a double roof, but it has double

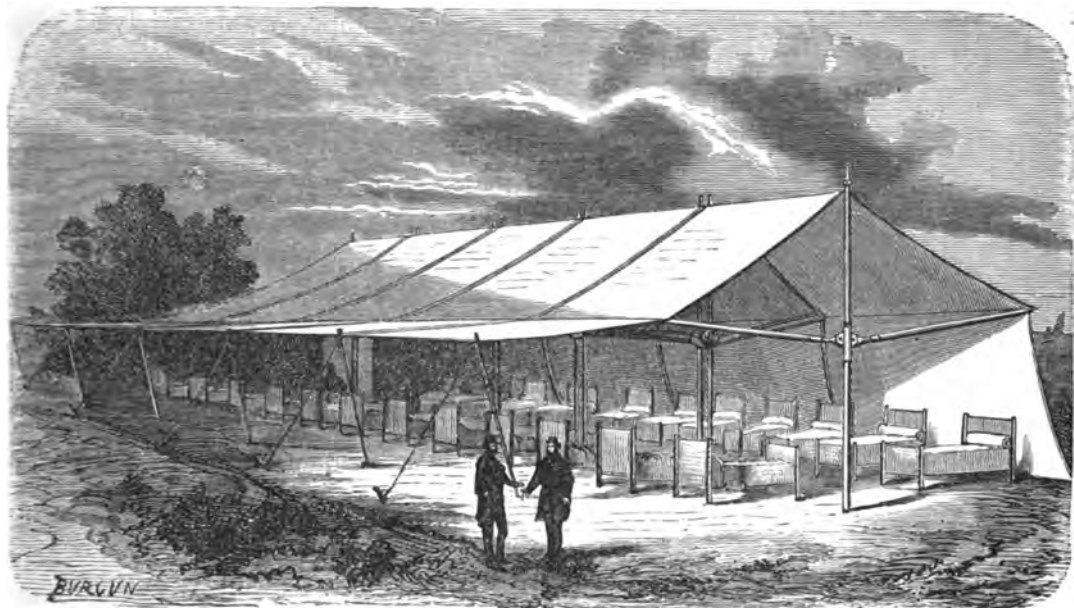
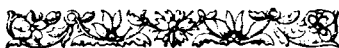



FIG. 35.—Modification of M. Le Fort's field hospital tent, adopted by the French "Société de Secours aux Blessés" in 1870.

sides; it is roomy and impermeable. As regards ventilation it could scarcely have been made more perfect. It has, however, in my opinion, several defects—and in making this statement let me say, that it would be impossible to make a tent which should not have defects; it will necessarily be more or less perfect in some respects, and more or less imperfect in others; it will be found that certain desirable qualities cannot be secured without sacrificing others of almost equal importance, or which, if not really so, may seem to other constructors of tents of equal or even greater importance. The best tent, as the best

instrument of any kind, is the one in which the excellences greatly overbalance the faults—is best, if you will permit me to say it, in spite of its faults. But I am now to speak of the defects of M. Le Fort's tent. Its framework is too complicated, each tent is supported by *seven* poles, and *four* of these are *jointed*—that is to say, liable to break, get out of order, and become useless. It should also be said that to reduce their weight all the poles have been made so slender as to be easily bent out of straight lines, as also to be in constant danger of breakage. The material of which the covering is made is cotton stuff of a good quality; to make it, however, according to M. Le Fort, still more impermeable (fairly good cotton canvas requires the application of nothing to make it impervious to wet), it has been steeped in a solution of sulphate of copper. The tissue charged with sulphate of copper, if theoretically less pervious to rain, unfortunately becomes to the same degree less pervious to air. M. Le Fort might reply that the measures which he has taken to secure the aëration of his tent are sufficient to allow him to *shut up the pores* of the canvas, should he choose to do so. If such is the fact, it would perhaps have been better to have applied to the canvas a coating of caoutchouc, or some other substance which would have given to it complete impermeability. The superiority of good cotton canvas when used as a tent covering depends upon its possessing the two invaluable qualities of impermeability to wet and permeability to air. The only motive which can justify the application of any preparation to a *cotton* canvas tent covering, is the desire to give to it increased durability. Should the canvas *hystasaspes* prove to be considerably more durable than unprotected tissues, the objection now offered to its employment could scarcely be maintained. The Le Fort tent stands by no means securely; it relatively offers to the wind a surface greater than that of an English marquee, and this, without either bracing-lines or storm-ropes; in a word, it is a fair weather tent. Entertaining the idea that the American tent could be improved, M. Le Fort has certainly succeeded in realizing his idea, in so far as he may have produced a tent roomier and more accessible to the open air. He has, I believe, however, failed, in so far as his tent is much heavier, much more costly, less secure when pitched, and more likely to get out of order.



S will have been observed, the coverings of modern tents have been made of quite a variety of strong, heavy tissues of hemp, flax, or cotton, or of these materials mixed; such tissues also have occasionally been especially prepared by the application of certain substances to insure greater impermeability or durability.¹

There is but one kind of canvas now employed by the French Government in the fabrication of tents—*tentes coniques*, and *sacs tentes-abris*. The tissue is made of Picardy or Belgian flax; it is known as *toile trois fils*—of three threads—and should weigh 500 grammes per metre of 80 centimetres breadth. The Government, however, recognizes a minimum weight of 400 grammes per metre; and it may be here remarked that the hygrometric properties of flax cause all coarse unbleached tissues made from it to vary quite 20 per cent. in weight, according to the amount of humidity present in the atmosphere.

A piece of French regulation canvas 4 centimetres square, and containing 16 square centimetres, is composed of 120 threads (maximum), 70 of warp and 60 of woof; as the threads of the warp are double, the total number of threads is 200. The two threads of the warp are parallel (untwisted), and each of the two rather heavier and more firmly twisted than the woof thread. The threads, however, of both warp and woof are wanting in regularity.

According to the official specifications, a square centimetre of this canvas must contain 32 or 33 warp threads and 14 or 15 woof threads. The tissue must respond also to a dynamometrical test—viz., a strip 40 centimetres long and 5 centimetres broad should sustain a weight of 240 kilogrammes in the direction of the

¹ Tent coverings have also occasionally been made of wool, or of cotton and wool mixed. I am not aware, however, if such tissues have ever been employed by Governments to an extent worthy of note. Whatever the special excellence of such coverings, their high cost must always be an obstacle to any very extended use.

warp, and a weight of 160 kilogrammes in the direction of the weft. French tent canvas is pliable, but feels rather harsh to the touch; its colour is a dark brown, the natural colour of the flax.

Hemp has occasionally been used in the fabrication of French tent coverings,—“but only exceptionally; the high price of the best qualities of the material which it would be indispensable to select for this purpose, the great difficulties to be overcome in weaving—*dans le tissage à sec*—a thread No. 16, regular and free from knots, so as to arrive at the production of a tissue well closed and uniform, the waste attending the different processes of manufacture, are so many causes which have determined the Government to prefer flax to hemp in the fabrication of tent coverings.” These reasons seem to have had no less weight with other Governments, as hemp is at the present time rarely employed in Europe in the fabrication of tent canvas.

English (Government) tent canvas is now made of the “best long Baltic flax;” it weighs $10\frac{1}{4}$ oz. to the yard (27 in. wide), and, although lighter, is more closely woven than the French canvas. The thread also is finer, more uniform, and of a clearer colour than the French thread, and the quality of the tissue is apparently superior to that used in France. The quality of the canvas is determined by its weight, the number of threads in a square inch, and its general appearance, but no strength test is used.

Austrian (Government) tent canvas is made of flax-thread No. 16 and No. 10, and weighs $20\frac{3}{8}$ loths (306 grammes) per metre, of the breadth of a Vienna ell (78 centimetres). The tissue must contain nineteen threads (weft) in each quarter of a square inch, and is, moreover, subjected to a dynamometrical test.

The flax tissues used for tent coverings in different countries vary considerably in weight, strength, fineness, colour, &c.; they all possess, however, certain common characteristics. The linen fibre is about $\frac{1}{2000}$ of an inch in diameter, is cylindrical, with little knots or swellings at intervals; it is roughened also by the frayed and partly detached elementary fibres composing it; it is hard and strong, although perhaps not harder than the cotton fibre.

Linen, as well as hemp threads, are hard and stiff, not regular, smooth upon their surfaces, and inelastic. The meshes between the threads are seldom perfectly closed, as may be seen by looking at almost any piece of linen canvas held up before a window. By examining the canvas more closely with a lens, the threads may be seen crossing each other like wires, or, rather, like sinewy cords of catgut, leaving distinct interspaces at each crossing.

There are several qualities of cotton canvas used by the United States Government for making tents; these are commonly distinguished as 8-oz., 10-oz., 12-oz., and 14-oz. "ducks," the specification being derived from the weight of the tissue per yard of 28 in. width. While the 8-oz. and 10-oz. ducks are used for making common tent coverings, hospital tents are generally made of 12-oz. or 14-oz. ducks.

A piece of American 14-oz. duck 4 centimetres square, containing 16 square centimetres, is composed of 125 threads, 75 of warp and 50 of woof; but the warp threads are each formed of three distinct threads, and the woof threads of two distinct threads; thus the total number of threads in such a piece is 325. A square yard weighs about 18 oz., or $\frac{7}{10}$ oz. more than an equal measure of French canvas—a difference equivalent to about 4 per cent. When the cotton threads are unravelled, they look considerably larger than the flax threads of the French tissue, on account of their greater elasticity; the result is that, although a square yard of 14-oz. cotton duck weighs but a trifle more than an equal measure of French regulation tent canvas, it seems to have considerably more *body* than the French canvas.

American duck is pliable, smooth to the touch, and, when new, has the colour of common unbleached manufactured cotton; its whiteness is never dazzling, and, after a little exposure, it assumes a drab colour. Its quality is determined by its weight and the number of threads in a square inch. No dynamometrical test is employed.

Cotton canvas is no longer used in the British army for tents. That formerly employed weighed 7 oz. to the yard, 27 in. wide.

The Italian Government employs cotton canvas almost exclusively for the construction of large tents. The tissue used is 75 centimetres broad, and weighs 245 grammes per metre—that is to say, about $7\frac{1}{2}$ oz. to the yard, 28 in. wide.

The several varieties of cotton canvas which I have mentioned resemble each other in certain essential respects. The fibres of cotton vary, according to the quality of the sample, from $\frac{1}{1000}$ to $\frac{1}{4000}$ of an inch in diameter, and appear, under the microscope, like flat twisted ribands; they are smooth, have a certain strength, and are very hard. Cotton thread is very regular, is pliable and elastic, and has a soft downy surface. These qualities of the thread make it easy to fabricate tissues quite free from visible meshes. Indeed, under a lens it will be difficult to find an open mesh in a good piece of American duck. American canvas is probably not woven as closely in the loom as French canvas, but the meshes will be found to have been packed with minute fibres pushed in and constantly held in place by the elasticity of the threads.

Very widely different opinions are entertained at the present time with reference to the respective merits of cotton and linen tent coverings. I presume, however, that few persons would venture to affirm that cotton tissues were inferior to linen tissues for tent coverings *per se*,—at least, the argument in favour of using linen is usually expressed by a single word—cheapness. Coarse linen tissues have generally been thought to be more durable than those of cotton, while at the same time they have commonly been offered in the market at a smaller first cost.

These points are of sufficient importance to be considered; and if we find that the durability of such linen stuffs is very much greater than that possessed by corresponding cotton stuffs, and that their first cost is, as a rule, very much less, we shall certainly have to admit the justice of the argument, unless we can finally prove that the use of linen canvas is attended with disadvantages which are at least an equivalent for its relative cheapness.

I believe, however, that the durability and cheapness of linen tissues, as compared with corresponding cotton fabrics, have been commonly greatly over-estimated. The destructive influences to

which canvas is exposed when made into tents are various and numerous; and although linen may wear better under special circumstances than cotton, under others it is certainly no more durable.

It may be summarily said that tents are destroyed—(1) by the wear of actual use; (2) by the wear and tear of transportation; (3) by exposure to the weather; (4) by mildew; (5) by a variety of accidents to which they are exposed, such as being torn by bodies pushed against them from within or without, “sparks of fire from camp fires and stoves,” &c., &c.

With regard to such wear as comes from ordinary use and handling, cotton fabrics are not inferior to linen. If linen fabrics are believed to wear better than those of cotton it is usually only an *a priori* conclusion from the well-known fact that linen fabrics are, when new, much stronger—that is to say, can resist, without being rent, a greater tractive force than similar cotton fabrics. But it is not altogether easy to ascertain the relative strength of flax and cotton fibres, or of flax and cotton threads, the strength—tenacity—of these threads depending greatly upon the relative amount of twisting they receive; and cotton usually requires more twisting than flax to develop a corresponding degree of tenacity, as the flax fibres are long and knotty, and consequently hold together better. One fact is certain: American 14-oz. duck, when new, will by no means respond to the French dynamometrical test.

In reply to a question, concerning the relative durability of cotton and linen sails, addressed to an American sail-maker of large experience, I received this answer:—“Cotton sails generally wear *three* years; after this time they are not to be depended upon. Linen sails generally wear *two* years, with more mending than cotton. Linen sails *grow thin* by wear. After a time cotton sails grow weak, but they do not grow thin by wear.” This statement is not surprising, for although linen canvas when new is stronger than cotton canvas, its inelasticity and hardness cause it to wear out much faster when subjected to the same use. Linen canvas becomes with use both thinner and lighter; cotton canvas grows lighter with wear, but it does not become in the same proportion thin, on account of the elasticity of its constituent fibres. “A fibre,” says M. Alcan, “of a given strength, but

without elasticity, would be much less suitable for making thread or cloth than one of less strength but sensibly elastic. This last property, although less generally appreciated than the first, is therefore quite as useful.”¹ The hardness and stiffness of linen and hemp tissues are particularly noticeable when they are wet or even damp. A small piece of French tent canvas, if immersed in water, will curl up like a piece of leather when heated, and its hard, horny surface then greatly exposes it to wear from friction. And I may here remark that it is a well-known fact of common experience that linen articles of apparel will not stand frequent washings better than similar cotton articles. The smooth fibres of cotton slip over each other easily, the knotty and gummy fibres of flax and hemp slide over each other with more difficulty, with more friction and more wear.

With regard, therefore, to two of the principal causes of the destruction of tents—the wear of actual use and the wear resulting from transportation—I presume there is very little, if any, ground for preferring flax to cotton as the material from which to make tent coverings.

Probably the principal cause of the destruction of tents is their liability to become damaged by exposure to the weather. Such damage is shown by a loss of strength in the tissue which, without losing substance, grows weak, and becomes, as it is popularly expressed, *rotten*. This condition is so directly connected, however, with one of the specific causes of the destruction of tents—mildew—as to be hardly separable from it.

To what extent tissues of cotton are more or less exposed than those of linen to “rot” and mildew, it is not altogether easy to decide, in the absence of careful comparative experiments, which alone can definitively settle the point in question. One fact is certain, that especially in damp, hot, coast climates, unless great care is taken, tents both of linen and of cotton are liable to become mouldy, and are perhaps more frequently condemned on account of being rotten than because unserviceable from actual wear.

I doubt, however, if there is generally much difference in the

¹ “*Traité Complet de la Filature du Coton*,” par M. Alcan. Paris, 1865 ; p. 72.

durability of linen and cotton tents when both are pitched permanently and exposed only to the destructive influences of the weather. The common opinion among the French *fournisseurs* whom I have consulted has been, that a regulation French tent (*tente conique*) should last, if pitched permanently in such a climate as that of Paris, two or three years. In reply to the question addressed to the English War Office:—"How long might an English hospital marquee be expected to remain serviceable if, pitched permanently, it was exposed only to the destructive influences of the weather—say in such a climate as that of Aldershot (England)?" the reply was, "Eighteen months." To a similar question, the reply received from the Surgeon-General's Office at Washington was as follows:—"A tent of cotton canvas, if pitched permanently, and exposed only to the destructive influences of the weather, in such a climate as that of Washington, could not be expected to remain serviceable more than three years." To a similar question, the Italian War Office replied generally:—"There is no doubt that these tents (of cotton canvas) thus exposed would remain for a long time in a satisfactory condition. The average service life of a tent (*tente conique*) is four years." To a like question the French Intendance also replied generally:—"The present *tente conique* cannot be used more than four months without undergoing repairs. This four months' lastingness would doubtless be sensibly reduced if the tent were subject to numerous transportations and repitchings. Three successive campaigns of four months, separated by long intervals during which the tent is repaired, usually result in so much wear as to indicate the necessity of replacing it."

It is an opinion among certain French *fournisseurs* and fabricants of awnings that linen canvas, when exposed to the weather, lasts about a third longer than cotton. *Per contra*, the opinion of American sail-makers is that linen "rots quicker" than cotton, and "because of its tendency to absorb water."

Now it is a well-known fact that flax and hemp are exceedingly hygrometric, and imbibe water rapidly whenever it is present in the atmosphere. Coulier found that common cotton and linen sheetings imbibed moisture hygrometrically in the

proportion of 0.084 and 0.153 to the gramme of each;¹ that is to say, linen showed nearly twice the moisture-absorbing power of cotton. Coulier also established the fact that the hygrometric properties of linen tissues increased in proportion to their coarseness. But this is not all: not only do the hygrometric properties of the flax fibre cause linen canvas to absorb more moisture than cotton canvas would do under the same circumstances, but the structure of linen canvas, the openness of its meshes, causes it to hold a still larger proportion of water when exposed to dew, mist, and rain; while cotton canvas similarly exposed, to use the expressive language of one of my correspondents, "sheds water like a board."

Moreover, flax and hemp, especially the latter, contain much more organic matter than cotton in addition to the purely textile fibres, and even these are always more or less glued together by a gummy, resinous substance known as *pectin*. So that instead of being composed as are the fibres of cotton, of simple elementary cells, the linen fibre is composed of cells soldered together by foreign matter—matter which is moreover soluble in water.²

The hygrometricity of hemp and flax, and the large proportion of organic matter they contain, cause these substances to be very liable to ferment and rot when brought together in large quantities, as on board of ships and in warehouses. The danger thus sustained by cargoes of hemp is often very great, and it is a rule among shippers never to take on board hemp in damp, wet weather; special precautions also are always adopted to preserve the cargo from dampness and subsequent heating.

These facts would certainly seem to indicate that flax and hemp tissues are more affected by climatic conditions than those of cotton, and that linen fabrics are more likely to become rotten when long exposed to dampness.

Mildew, or the development of cryptogamia in the tissue of the canvas, is only a name given to a way in which canvas

¹ M. Michel Lévy, "Traité d'Hygiène," tome ii. p. 101.

² Alcan, op. cit. p. 94.

becomes rotten; but its chief predisposing cause appears to be moisture, and where this is associated with a warm temperature the disease is pretty sure to soon manifest itself. This is one of the chief specific causes of the destruction of tents in certain climates, and every one acquainted with the subject knows that, even in France, one of the difficulties connected with preserving tents arises from their liability to become covered with *les piquûres*. Indeed, the physical qualities of linen would seem to especially expose it to such attacks.

We may fairly conclude, therefore, that if in exceptionally dry climates, or where great care is taken, linen is more durable than cotton, the advantage in this respect would be quite on the side of cotton when exposed to moisture or the climatic or special conditions which favour the development of cryptogamic spores.

The frequency with which canvas, whether of flax or cotton, is destroyed or seriously damaged by mildew, has led to various attempts to protect it from this special cause of injury. Generally the object in view has been to preserve the sails of ships; but so far as I have learned, attempts in that direction have met with a comparatively limited success. During the War of the Rebellion the American Government made a considerable number of experiments, the object of which was to test the value of certain preparations that were said to have preservative qualities when applied to tent canvas. But I have been officially informed that these preparations all proved to be of little, if of any, value. Still, the end to be gained has appeared to be of so much importance as to recently induce the Government to commence a new series of experiments, and "with the promise of more favourable results."

A few years since, the house Husson, of Paris, which is largely engaged in the manufacture of coverings for vans, &c., adopted a process which they assure me has been very, if not entirely, successful in protecting such coverings, whether of cotton or linen, against mildew. These coverings, if not worn out, are affirmed to last eight or ten years. The process employed by the house Husson consists essentially in passing the canvas through a bath containing a solution of the sulphate of

copper. Canvas so treated shrinks, and becomes more dense, and to the same extent more impermeable. It also takes a light green colour; but the principal and most important alteration effected is said to be a very greatly diminished liability to rot and mildew.

The cotton canvas employed in the construction of the tents used as an experimental hospital by M. Le Fort, in the grounds of the Hospital Cochin, had been prepared by the house Husson in the way mentioned; and it is perhaps not one of the least interesting facts connected with M. Le Fort's experiment that after *four years' constant* exposure the coverings of his tents were still in excellent condition.

With regard to the other causes of destruction (accidents, &c.), they act with nearly, if not quite, equal force on cotton and linen tents.

The single respect therefore—so far as durability is concerned—in which linen coverings would seem to have an advantage over those of cotton is their greater tenacity—their smaller likelihood to be torn. But linen loses its strength all the while much more rapidly than cotton; so that after a limited service there is really very little difference, even with regard to tenacity, between the two tissues.

The question of first cost is one of scarcely less consequence. In the United States, since the great extension given to the culture of the cotton plant, nearly all cotton fabrics have been considerably cheaper than corresponding fabrics of flax. Tent coverings, as well as the sails of ships, are now made in the United States almost exclusively of cotton. The small quantity of linen canvas used is of foreign production, and, paying a duty, costs in the market about 10 per cent. more than cotton duck of a corresponding grade.

In certain countries, however, the most immediate evidence of the comparative cheapness of using linen tent coverings has appeared in their smaller first cost price as compared with the price of corresponding cotton tissues. In Europe, the price of cotton per kilogramme has always been greater than that of flax; and one of the results of the American Rebellion was an enormous increase in this difference in cost.

Undressed Belgian and Picardy flax has cost, in France, for several years, from 130 to 140 francs per 100 kilogrammes. In 1861, the price in the French market of short staple Georgia cotton ranged from 198 to 216 francs per 100 kilogrammes; but in 1863 the price of the same grade ranged from 580 to 640 francs per 100 kilogrammes. Since the American War, the prices of cotton have fallen, and the quality specified now ranges in price from 220 to 250 francs per 100 kilogrammes.

While, however, the first cost of a pound of cotton is now considerably greater in Europe than that of a pound of flax, the manufacture of a given weight of cotton is attended with greatly less waste of raw material, and is accomplished with much less labour. In short, cotton is converted into cloth much more economically than flax.

If in 1861 raw flax cost in France 135 francs per 100 kilogrammes, and cotton in bale 209 francs per 100 kilogrammes, canvas of equal weights could have been manufactured as cheaply from cotton as from flax.

It is in France generally estimated that the manufacture of flax into tent canvas is attended by a waste in the course of dressing, carding, &c., of from 40 to 45 per cent. Thus, 100 kilogrammes of raw flax are generally found to be composed as follows:—

	Kilogrammes.
Long fibres	60 to 55
Tow	35 to 40
Shives, Dust, &c.. . . .	5 5

	100 100

But the waste of dressing is also increased from 15 to 18 per cent. during the operations of spinning, weaving, &c., so that 60 kilogrammes of long fibres—representing 100 kilogrammes of flax before dressing—only furnish an average of 50 kilogrammes of tissue.

I am not able to give the exact amount of waste attending the conversion of given samples of American cotton into tent duck. It is certain, however, that raw cotton contains proportionally greatly less waste than either flax, hemp, or wool. According

to M. Alcan, the better qualities of cotton yield a maximum waste of from 5 to 7 per cent. in being prepared for the carding machine, while the waste in carding ranges from 6 to 9 per cent.¹ In short, we have a waste of perhaps 10 per cent. attending processes which are followed by a waste of 40 or 45 per cent. when flax is used. The small amount of foreign non-textile matter in raw cotton not only results in an immediate economy, but reduces the expense of the processes preparatory to spinning and weaving. But even these processes are more cheaply conducted. The cost price of spinning 1000 metres of No. 18 cotton yarn is in France, according to M. Alcan, 0·14 francs, while the cost of spinning an equal measure of flax yarn of the same number is 0·17 francs—a difference of 3 per cent.²

So many special circumstances affect the prices of textile fabrics, that it is almost impossible to establish a just comparison between the nominal prices in different countries of even quite similar grades of tissue; moreover, the commercial or contract price in no case represents the net cost of production. Nevertheless certain facts relating to the prices of linen and cotton tent tissues may not be without a certain interest.

The French Government now pays for regulation (flax) tent canvas 1 franc and 70 centimes per metre.

English regulation (flax) tent canvas costs the Government 9½*d.* per yard.

Italian regulation (cotton) tent duck costs the Government 2 francs per metre.

American 8-oz. (common tent) cotton duck costs in the market 25 cents currency (about 20 cents gold) per yard.

American 14-oz. (hospital tent) cotton duck costs in the market 45 cents currency (about 37 cents gold) per yard.

That is to say:

	Francs.	Pence.	Cent ^s .
8,000 square centimetres of French tent canvas (flax) cost	1·70	16	31
6,260 " " English " " " "	1·00	9½	18½
6,498 " " American (14 oz.) canvas (cotton) cost	2·00	19	37

¹ Alcan, *op. cit.* pp. 298-333.

² *Ibid.* p. 99.

In other words, the relative prices of equal superficies of French, English, and American tent tissues of the specified qualities are to each other as $31 = 23 = 45$. It should be observed, however, that the French and English tissues are lighter than the American, a circumstance which reduces somewhat the apparent difference in the prices. Thus, 6,498 square centimetres of American 8-oz. duck cost but 20 cents (1·08 francs, or 10*d.*). But, on the other hand, 7,500 square centimetres of Italian 7½-oz. (cotton) canvas cost 37 cents (2 francs, or 19*d.*), the relative prices of equal superficies of American and Italian canvas of nearly the same grade thus being to each other as 23 to 37. The causes of the relatively high price of the Italian duck cannot be attributed even principally to the relatively high price of raw cotton in the Italian market. But it is not my purpose to investigate this subject.

We may conclude from the facts here presented that canvas of a given quality can, at the present prices of the two raw materials, be made in the United States more economically of cotton than of flax; as also that where, as in France at the present time, the price of raw cotton is not more than 60 or 70 per cent. higher than that of undressed flax, canvas of a specified weight and quality can be manufactured from the one substance nearly, if not quite as cheaply, as from the other.¹

An inquiry concerning the relative merits and demerits of tissues of cotton, flax, and hemp, when employed as coverings for tents, will show that they depend for the most part upon the mechanical structure of the tissues and the physical properties of the materials of which the tissues are made.

¹ It may be remarked that the prices of cotton canvas in Europe are still controlled by the exaggerated prices commanded by cotton a few years since. Thus, English 7-oz. tent duck now sells in London, nominally, at *one shilling* a yard (27 in. wide). But this price represents the former cost of cotton, a limited market, &c. rather than the actual cost of producing the tissue to-day, when Georgia "ordinary" and "middlings" are quoted in the Liverpool market at 10¼*d.* to 10½*d.* per pound.

Special duties and a depreciated currency may also, in certain countries, give an inflation to prices. Probably causes of this kind partly explain the very high cost of Italian duck, as also of Austrian (linen) tent canvas, which, while lighter than the French, or even the English regulation canvas, yet costs the Austrian Government, per metre of 78 centimetres width, 69 kreutzers, a sum equal to 1·79 francs.

It seems to be very difficult to weave the large, hard, and inelastic threads of flax and hemp in such a way as to completely close the meshes—at least, without fabricating a tissue excessively stiff. In any event, linen tent canvas is never very closely woven, and is filled with almost innumerable visible apertures. Hence its great permeability to rain, to the rays of the sun, and to wind. Linen tents promise a shelter, and they oftentimes furnish none. The slightest rainfall *sifts* through them to an extent not only uncomfortable but prejudicial as well to the health of those under them. Nor is this the only evil which arises from their permeability to rain. It often becomes very difficult under linen tent coverings to keep the food, clothing, and arms of the soldiers from being spoiled or seriously damaged. Even in dry weather the occupants of linen tents are constantly liable to be incommoded by humidity—so much so, indeed, as to make it necessary to have recourse to special precautionary measures.¹

During the War of the Rebellion, and after the price of cotton had become excessive, a considerable number of linen tents were purchased by the American Government. But their issue was soon discontinued, and for the very sufficient reason that, to use the words of the Quartermaster-General, “American soldiers will not use linen tents without grumbling.” The Government therefore concluded, and most wisely, to issue tents which, although then purchased at nearly three times their usual cost, should fairly answer the purpose for which they were intended.

Another objection to the use of linen tent coverings is that they furnish a less complete protection against both excessive heat and cold. The rays of the sun strike through the imperfectly closed meshes of the canvas, sometimes with almost unabated force. That such tents are hotter in the summer than those of cotton is also partly owing to their colour; and this is one of the reasons why white cotton tents are almost universally preferred

¹ “In dry weather and moonlight nights the dew is abundant even under tents (French); the clothing, the boots which are to be worn the next day, everything which may be injured by dampness, should be covered up, or shut up in a valise.”—*Études sur l'Établissement des Tentes dans les Camps*. Paris, 1869, p. 26.

in tropical or semi-tropical latitudes. That linen tents are at times colder than those made of cotton results also from several special facts. While linen tissues are more pervious to water and sunlight than those of cotton, they are also more pervious to air, and from the same cause. American sailors will tell you that their sails *hold the wind* better than foreign sails. And their assertion is true. The cold, dry wind readily penetrates through linen and hempen tissues, and thus renders tents made of them very uncomfortable quarters during blustering, wintry weather.

Again, while linen is a better conductor of caloric *per se*, its hygrometric properties often increase its heat-conducting capacity. The water held in the tissue of a tent covering contributes to a loss of heat principally by requiring for its evaporation a considerable quantity of heat which is in this way constantly being abstracted from the interior of the tent. And it should be remembered that all bad conductors of heat, when more or less saturated with water, dry very slowly, while good heat conductors dry rapidly. Thus, cotton tents when wet dry slowly, while linen tents when wet dry much more quickly, and, consequently, abstract the heat from whatever body may be near them much more rapidly.

But the statement which I have made on a preceding page, that the open meshes of linen canvas cause it to hold more water when wet than would a similar surface of cotton canvas, may be denied. It may be said that linen threads swell when wet, and that most of the apertures visible in dry linen canvas cease to be visible when the canvas is wet. It is quite true that after French regulation canvas has been rained upon for a while nearly all the meshes are closed up—that is to say, cease to be visibly open. But the hygrometricity of the material causes the water to penetrate through the canvas and diffuse itself over the inner surface. When wet *upon one side*, linen stuffs soon become wet *upon both sides*, while cotton stuffs, *when wet on one side, remain dry on the other*. The hose of garden-engines is occasionally made of cotton or linen canvas. Hose of good linen canvas leaks at first; the meshes close up as the canvas becomes wet, and it ceases to leak rapidly; but the surface of the hose continues to sweat profusely. Hose of good cotton canvas does not leak

immediately, and either does not sweat or sweats under the same pressure, greatly less than that of linen.

Again, it may be said that a given weight of cotton canvas will absorb or hold in suspension more water than an equal weight of linen canvas. I readily admit that cotton cloth will hold in suspension more water than an equal weight of linen cloth; and this fact needs a word of explanation.

There is a great difference between the hygrometricity of matter and its power to hold water in suspension. Hygrometricity is a word used to express the property which matter possesses of absorbing the vapour of water. Substances possess this property in very different degrees; but this property, whether possessed in a high or low degree, is no measure of their capacity to imbibe or take up water when they are immersed in that fluid. Cotton tissues, if immersed in water for a certain length of time, will take up and hold in suspension—by what is termed *interposition*—more water than similar linen tissues. Thus, while according to Coulier's table, cotton cloths for linings absorbed in a given time hygrometrically 0·084 grammes of water for each gramme of cloth, and each gramme of linen linings in the same time absorbed hygrometrically 0·153 grammes of water, after *immersion* the cotton linings were found to contain 0·903 grammes of water to each gramme, and the linen but 0·580 grammes of water to each gramme.

So in an experiment made by myself. On taking a piece of French regulation canvas containing 40 square centimetres, I found it weighed, when dry, 2·2 grammes; at the same time, a piece of American 14-oz. duck, containing an equal number of square centimetres, weighed, when dry, also exactly 2·2 grammes.¹ After having immersed both pieces in a tumbler of water for ten

¹ It may be noticed that equal measures of French canvas and American 14-oz. duck in this instance had equal weights. Theoretically, the duck should have been slightly the heaviest. Now small equal linear measures of even the same piece of tissue rarely have equal weights. Moreover, it is practically very difficult to measure surfaces of tissue with exactness. The condition in the experiment of most consequence was that equal weights of tissue be used. As a matter of fact, a reason why cotton tissues can hold more water, in a state of *interposition*, than linen tissues, is their relatively greater bulkiness.

minutes, on weighing them—after the water had ceased to drop from them—I found the piece of linen weighed 3·6 grammes, and the piece of cotton 3·9 grammes ; that is to say, the piece of linen had taken up 1·4 grammes of water, and a piece of cotton canvas of an equal weight and an equal surface had taken up 1·7 grammes of water. This fact—the water-holding power of cotton—is not surprising ; it is a natural and inevitable result of the relative looseness and elasticity of cotton tissues. Woollen fabrics, which are still more elastic, as a consequence take up and hold mechanically a vastly greater relative quantity of water.

The facts now stated would seem to militate against some of the special advantages claimed for cotton tissues. But it should be remembered that the property of holding water in suspension by interposition is quite independent of the penetrability or impermeability of the substance possessing that property. Good cotton canvas coverings, when exposed to the rain, are *rarely wet through*—are rarely saturated with water. Good linen canvas coverings are *easily wet through* and saturated ; and it is precisely because they are so easily *saturated* that the beating of the rain or the flapping of the canvas *shakes the fine spray from the inner surface of linen coverings*. When used as a tent covering, with *one surface* exposed to the rain, French canvas contains more water per square metre than American duck, as well in a state of interposition as hygrometrically. As a result, therefore, of its mechanical and physical qualities and properties, French linen canvas is damper in fair weather and wetter in rainy weather than American cotton canvas.

The facility with which hemp and flax absorb moisture results in another objection to the use of tissues made of these materials for the construction of tent coverings. In proportion as they become damp and wet they shrink, and become hard, stiff, and disagreeable to handle. It is difficult to pitch tents when wet, and also difficult to pack them ; when pitched it is frequently impossible to close the doors and windows from the same cause.¹

¹ An order was issued by the French Government in 1843 that after every rain-fall the tents should be thrown open until they were dry. "Yes," it has been remarked, "when they have the time to dry ; but if it is towards evening it had

The shrinkage also is often so considerable as to endanger the stability of the tent, the tent pins being frequently drawn out of the ground, and the canvas torn at the points where the cords are inserted. Cotton canvas also shrinks when wet, but it shrinks much less than linen.

An objection has been made to the use of cotton canvas on account of its whiteness, which, it has been suggested, might in camp be provocative of certain affections of the eyes.¹ I am inclined to believe such an influence to be quite theoretical; moreover, cotton canvas, when exposed to the air, soon loses its whiteness, and if such was not the fact, some tint might easily be given to it by the manufacturer.

In view of the facts here presented, I shall not hesitate to affirm that cotton tissues are intrinsically greatly to be preferred to those of hemp and flax for tent coverings; and I believe also that an extended experimentation would show that, taking all the causes into consideration which deteriorate tents, tents made of cotton stuffs are more durable than those made of linen. Flax tent tissues can be furnished in Europe at the present time undoubtedly somewhat more cheaply than those of cotton; still the very important question arises—is the small economy secured by this fact an equivalent for the inferior quality of such tissues? I am very much inclined to doubt if it is in any case;—it certainly is no equivalent when these inferior tissues are employed in the construction of hospital tents, where impermeability to rain and wet is one of the first and most indispensable of conditions.

better not be done, for if the tents have not entirely dried they cannot be closed." And the same writer in another place observes:—"In damp weather the canvas shrinks and the tent is closed with difficulty, all the fissures gape," &c.—*Étude sur l'Établissement des Tentes dans les Camps*, op. cit.

¹ Larrey, "Camp de Châlons," p. 30.



MAY resume this account which I have given of the characteristics and qualities of the tents now in use by indicating in general, and in brief, the qualities which a hospital tent should possess.

Its form should be well adapted to its special use ; it should have walls as high as compatible with solidity, and it should be rectangular, that each tent may, the occasion permitting, serve as a unit in a series. It should be covered with material fairly impermeable to rain, while not impermeable to air. It should have a double roof, as much to shelter it from the sun as from the rain. Proper ventilation should be secured ; first,—by two doors facing each other ; secondly,—by so disposing the walls that they can at any time be easily raised ; thirdly,—by a sufficient number of openings at the ridge. It should be easy to pitch, and stand sturdily in its place ; it should be easy to strike, and so light as to be but a small burden for a horse or a mule. It should be simple in its construction, and be provided with no fixture which, if broken or lost, cannot anywhere be extemporized. The standards should be as few in number as possible, and of wood rather than metal. The pickets and pegs should be made of hard wood, and no more cordage should be used than is absolutely indispensable for the security of the tent. The cordage also should be so arranged as to incommode as little as may be those having occasion to walk near the tent ; the doorways especially should be unobstructed by stay-ropes. And, finally, the tent should be made of the very best materials, each of the best quality, and all fitted together in the most skillful and conscientious manner. Indeed, these conditions cannot be insisted upon too strongly. The whole result—the success or the failure—in every attempt to hospitalize the sick in tents, will depend upon the fidelity with which these final conditions have been observed in their construction.

The form of the tent, as well as many of those architectural dispositions upon which I have spoken at some length, have merely a secondary importance, since the very best model might be worse than worthless if constructed of unsuitable materials.

One of the principal objections to the use of tents has arisen solely from the poor quality of the canvas which has too frequently been used in their construction. Much of the complaint in the English camps in the Crimea was occasioned by this fact. "We cover," said the correspondent of the "Times," "numberless vans and railway waggons at home with durable tarpaulin; we cover our soldiers abroad with tents made of porous canvas such as Pickford would scorn to use." The immediate consequences of the use of tents made of such materials were certainly deplorable, but scarcely more so than some of the conclusions loosely drawn from the experience.

Unfortunately the tendency to reason from particulars to universals is so strong, that few men can form an idea of anything which belongs to a class, without attributing to it all the properties which they themselves have observed in certain individual members of that class. Those who have only seen leaky tents, suppose that all tents must leak. Those who have only known uncomfortable tents, suppose that all tents must be uncomfortable. Indeed, it is often painful to hear the opinions upon tent hospitalization of persons who never saw a good tent, and who, because they may have known certain miserable sick to have been deluged by autumnal rains under the worthless canvas of some single-roofed troop-tent, rush to the conclusion, that tents in general are responsible for results, which can only justly be attributed to the most flagrant faults in their construction.

If the sick are to be treated under tents, particularly if it is proposed to establish a comparison between the results there obtained and those obtained where other kinds of shelter are resorted to, it is quite indispensable that the tents employed be fairly suitable for the service in which they are to be used, or at least that the tents selected for the experiment be not the very worst specimens of tent architecture that ignorance and parsimony may have constructed.

In selecting a spot upon which to pitch the tent—presuming that the general location of the camp or hospital shall have been chosen so far as possible in accordance with sanitary laws—a hard, gravelly soil is to be preferred. Such soils are naturally dry, and are the most amenable to drainage. Gardens and smooth lawns should be shunned above all places. This is a point which can scarcely be sufficiently insisted upon, since they are of all places the most attractive in bright, dry weather; but they are generally difficult to drain, and at the very first heavy rainfall the artificial soil with which they are covered will be seen oozing through the smooth green turf, to finally convert, should the season be wet, the whole surface around into a quagmire, that will probably baffle every effort to suppress it. This is a serious inconvenience; but perhaps the gravest objection is that such soils contain more or less decomposing matter, and may possess all the necessary conditions preliminary to becoming the chief factors in the propagation of camp infections.

Again, a hard gravelly soil gives to the tent a more solid footing, and the tent pegs once driven into the ground will be found to hold firmly both in wet and dry weather. It is well to secure a place which has a slight slope, as it also occasionally may be to profit by the protection afforded against some prevailing wind by the brow of a hill or a grove of trees; but the attainment of such conditions is secondary to that of securing a spot where the character of the soil itself is least objectionable.

It has often been recommended that tents be placed under trees.¹ The object, of course, is to obtain a shade. In dry tropical climates tents may be so placed; but such locations are generally in temperate latitudes highly objectionable by reason of the

¹ It has been said to have been a rule among the Romans to encamp their troops under trees in all hot countries. The rule referred to is probably that of Vegetius, who says:—"Soldiers should not be encamped upon arid mountains or fields destitute of the shade of trees." "Ne aridis et sine opacitate arborum campis, aut collibus . . . milites commorentur." (Lib. iii. c. 2.) While it would be very difficult to construe this passage into an advice to *encamp* men *under* trees, in practice such encampments were certainly not common in Roman armies. To have a few trees in the camp, or to have many upon its borders or in its immediate neighbourhood is often to be desired.


constant dripping from the trees during wet weather, and the relative humidity which always exists in their immediate neighbourhood. A location under single trees is also objectionable on account of the eddies of wind which they create—to say nothing of the special dangers they may invite in countries where thunderstorms are common. Moreover, direct sunlight not only exerts a hygienic influence of great value, but it is a most powerful disinfectant, and hospital tents should be fairly exposed to its action. By using tents with flies, and capable of being freely opened on all sides, the solar heat will only very rarely in temperate climates be an occasion of discomfort.

In pitching a tent the pickets should be pointed well towards its walls, and driven deeply into the ground. The cords and stay-ropes should be so adjusted that they may be easily tightened or slackened to correspond with the variations in the tension of the canvas occasioned by the presence or absence of atmospheric moisture; and I may add, that the coverings of tents when first pitched should be left rather too slack than too tense.

The ground should be ditched to correspond with the lines of the watershed,¹ as also properly prepared within the tent. Some sort of flooring should be employed if the tent is to remain long in the same place. In any event, the earth within it should be well beaten down, or what is much better, if one has the time and means, the surface soil should be removed and be replaced by gravel or sand. In placing the beds or other articles of furniture in a tent, care should be taken that they do not press upon the walls or even rest against them, and no object should be suspended from any part of the canvas.

¹ It has been said that "half an hour's work on a wet day, when the natural run of the water can be seen, will do more to keep the camp healthy than a day's labour in dry weather." ("Regulations and Instructions for Encampments," War Office, 2nd June, 1872.) However true this statement may be, it should never induce one to omit, where rain may be expected, to establish trenches around the tents *immediately* after they are pitched; to wait until "the natural run of the water can be seen," would be in many cases to wait until, by being "drowned out," the occupants of the tent had been taught how important trenches are.



HE various objections which have at times been urged against tents have induced certain persons to recommend the abandoning of attempts to hospitalize the sick and wounded under canvas, except in the absence of other means of shelter; while other persons, recognizing that a canvas shelter may possess certain advantages, have endeavoured to remedy the faults presumed to be special to tents by modifying their construction, by building them more solidly, and giving to them some of the characteristics of ordinary habitations. Such modified tents have usually consisted of frame-works, covered with canvas only in part, the remaining portions of the construction—the roof or the sides, as the case might be—being formed of boards or some other substantial covering. These constructions—half tent and half hut, like some of the old Roman tabernacula—have received the name of tent-barracks. Indeed, the re-inventors of tent-barracks have proposed something more positive than a mere correction of the faults of tents; they announce that these constructions, when used as hospitals, unite all the special advantages of tents with all the special advantages of barracks.

The following are said to be some of their principal advantages. They can be opened to the air much more freely than barracks; they can also be erected considerably more cheaply. It is not necessary to transport them from place to place; they can be erected when and where they are needed; they can be easily built so as to afford more room than can be obtained in tents; the interior space can be arranged more conveniently, and can be more completely furnished. Tent-barracks stand more steadily than tents, and one is less troubled within them by the swaying, rustling, and flapping of canvas; they moreover suggest to their occupants more of security than tents do, and they really afford greater security in several respects. They are not only

not as easily blown down, but they are not as easily broken down. They are provided with doors and with windows, &c. &c. Some of these relative advantages which I have specified I believe to be rather nominal than real. The tent-barrack certainly has one advantage over the tent—it has windows. If this be a circumstance of no great hygienic consequence, it is nevertheless of considerable importance. People, whether sick or well, certainly do like to look out of doors; a window, next to a fire-place, is generally the most cheerful spot in a room. We can get along without windows just as we can without fire-places, but most people would prefer to have both in an apartment where they were to remain a long time.

But if something can be said in favour of tent-barracks, much also can be said against them. They are non-portable constructions, and it requires some time to erect them and fit them up as hospitals. They must, consequently, be prepared in anticipation of occasions, of opportunities of special usefulness which may never occur; their use is thus limited to sedentary establishments.

A tent-barrack exposes to infection more material than a tent does, while it is much less easy to cleanse and thoroughly disinfect it. Not being portable it cannot be easily removed to a new locality should the outbreak of an epidemic render such a movement desirable. Should it be removed, it would be almost certain to carry the germs of the infection with it. It is quite as difficult to properly heat a tent-barrack as it is a tent, and from the same cause—the rapid loss of heat. Where the same means of heating are employed, the heat will generally be found to be more equally distributed at any given time within a tent than within a tent-barrack. The air escapes from a closed tent, as it also enters it, equally over a large surface. The cold air enters a tent-barrack very unequally—in short, its natural ventilation when closed is inferior to that of a tent. Always more subject to draughts and currents of air than tents, tent-barracks are quite as likely to become disagreeably warm in the hot sunshine, while they are, through the joints of careless carpentry and loosely fitting curtains, even more permeable to wet than cotton tents. Nor do they realize a single important advantage pos-

sessed by barracks over tents. Barracks protect both persons and property, in several respects, much better than tents. But tent-barracks, as well as tents, may be torn, broken down, perhaps overturned. Canvas is by no means a sure protection even against projectiles thrown by hand. A person without difficulty may enter or escape from a tent or tent-barrack clandestinely through the door, or by raising a wall, or pushing aside a curtain; valuable articles cannot therefore be kept with safety in such constructions. But barracks cannot be easily entered except by the doors, and these can be bolted or locked. Barracks can be made comfortable by ordinary means of heating—by common stoves and fire-places. Barracks can be divided into rooms which afford privacy to their occupants. Now a tent-barrack commonly lacks quite as much as a tent the special qualities to which I refer, qualities which have caused barracks to be very generally preferred to tents in the organization of military hospitals, and always, I believe, for the different offices connected with such establishments.¹

Nevertheless, there are undoubtedly many competent judges who believe that tent-barracks are not only better than tents for office purposes, but that for the hospitalization of the sick they possess nearly all the special advantages of tents, while free from some of their peculiar disadvantages. In short, the tent-barrack has been considered as an establishment which combined in itself the merits of both the barrack and the tent, to the exclusion of the defects peculiar to each. To what extent this opinion is well founded I shall leave you yourself to judge, after I have described the three or four forms of tent-barrack now best known.

¹ Barracks certainly possess over tents many great advantages of convenience. But considerations of special convenience should not be allowed to unduly influence the dispositions and character of the constructions which are to form a hospital. It is to be presumed that hospitals are built rather for the welfare of the sick than the convenience of the well. Houses and barracks furnish to surgeons, nurses, and attendants more comfortable quarters than it is usual to find in tents, and I am inclined to believe that a knowledge of this fact has greatly delayed and interfered with the general adoption in armies of what is called the open-air treatment of the sick. But the general use of tents for the sick and wounded would rarely necessarily preclude the employment of those kinds of shelter best suited for other and special purposes.

One of the earliest models (represented by Fig. 36) was used by the Prussians during the Austro-Prussian War of 1866. It consisted of a framework supporting a wooden roof with a double pitch. The roof projected laterally, and was open at the ridge the whole length, the opening being shielded by a false roof. The gable ends were boarded down as far as the tie-beams; a floor elevated above the ground, about a foot, was put in the construction.

This barrack was characterized by its walls, both on the front and on the sides; these were formed of canvas curtains permanently attached to the plates and tie-beams. By means of the

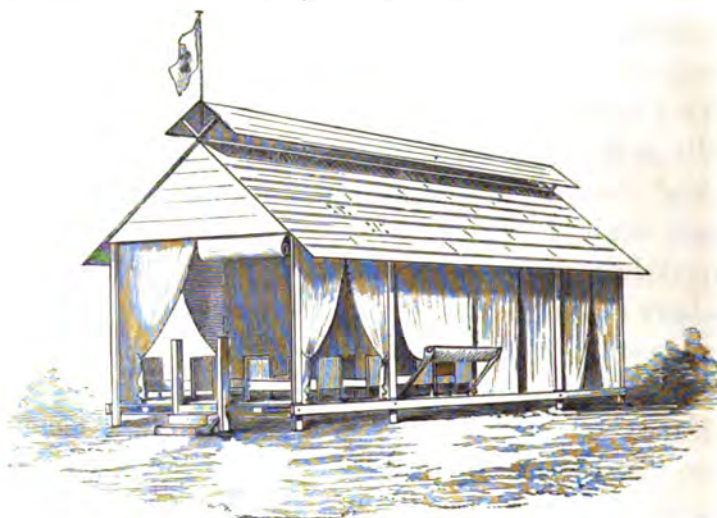


FIG. 36.—Prussian tent-barrack employed in the War of 1866 (model No. 1).

curtains the interior of the barrack could be completely enclosed, or it could be thrown open to the air more or less completely by pushing the curtains aside or by rolling them up and securing them at the top by buttons.

Another form, in some respects simpler, also used during the same war, is described by Fischer.¹ It differed from the one represented in Fig. 36 in being unprovided with a floor and in having lateral wooden walls, the upper halves of which were mov-

¹ "Lehrbuch der allgemeinen Kriegs-Chirurgie." Berlin, 1868. (Figs. 36 and 37 were taken from this work.)

able. In this barrack the ends alone were furnished with curtains, as shown in Fig. 37.

During the Austro-Prussian War the experiment was made at Trautenau by Volkmann of employing, for the treatment of the wounded, a sort of shed-barrack—something like, in its general appearance, the sheds occasionally used on farms. The experiment was pronounced highly successful. At the suggestion of Baron Mundy, of Vienna, and in accordance with plans furnished by him, the "Société de Secours aux Blessés" organized in the Park of St. Cloud, in June, 1871, a shed tent-barrack hospital containing two hundred beds; each ward-barrack contained

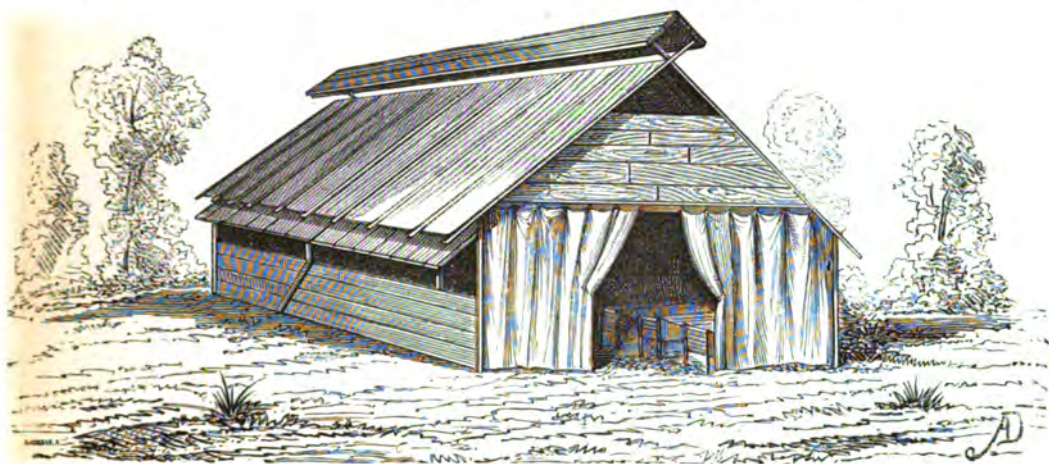


FIG. 37.—Prussian tent-barrack employed in the War of 1866 (model No. 2).

twenty-five beds. By referring to Fig. 38, which represents one of these barracks, it will be seen to differ in several respects from the two forms I have just described. It was practically a long shed, the front of which was or might be closed by canvas curtains; it was $98\frac{1}{2}$ ft. long, 16 ft. 4 in. wide, 19 ft. 7 in. high in front, and 13 ft. high behind. The barracks were frameworks, covered with boards, battened both on the sides and on the roof; the roofs were covered also with impermeable tarred paper. They were painted black on the outside with a heavy coating of coal tar; on the inside the walls were whitened. Each barrack was floored with matched boards, and in each the rear wall was pierced with eight movable windows; the curtains—of which there were ten—were attached above by rings to iron

rods; at the sides and the bottoms they were secured when closed by buckles and hooks; when opened they might be pushed aside, or they might be braced out by means of poles, as shown in the sketch. As the curtains depended from the ridge, the interior of the barracks could thus be completely exposed to the open air in fine weather, and without that liability to draughts existing in constructions open on all sides. One or two of the ward-barracks were divided into apartments by lateral side curtains. The

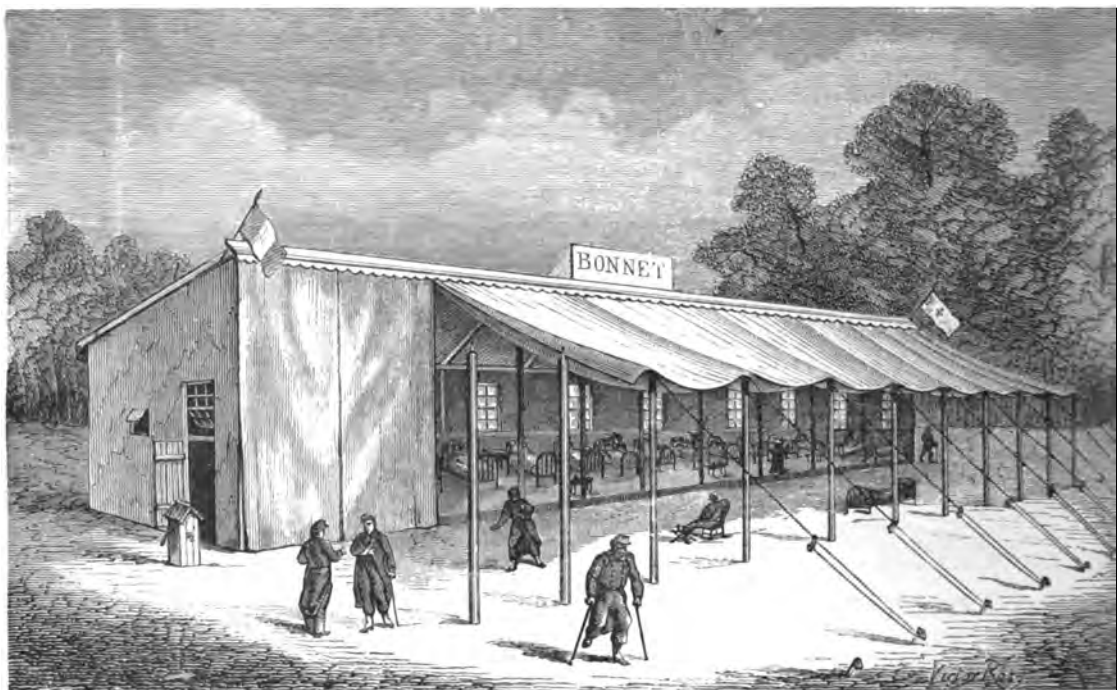


FIG. 38.—Perspective view of one of the tent-barracks of the Ambulance organized by the "Société de Secours aux Blessés," in the Park of St. Cloud, in June, 1871.

barracks were all supplied with water, as they were also with the furniture common in permanent hospitals.

They were solidly built, and were unquestionably the most elaborate examples of tent-barrack architecture which have yet been constructed. It may be observed that in these constructions the barrack predominated over the tent; it was a circumstance which added considerably to the first cost of installation, and may also have been the occasion of a less active aëration, when the curtains were all closed, than at times may have been desirable.

As no heating apparatus was used in these barracks, there was no means of forcing the air to circulate within them, and its purity was only maintained, as it might be in almost any apartment, by keeping a large number of doors and windows open.

If the *roofs* of the barracks had been of canvas permeable to air, an interchange between the interior and exterior atmospheres might have been constantly going on through the tissue, and one of the advantages of using tents thus secured; but as the curtains were disposed, I am inclined to think that generally when closed very little air passed through them. The air which then entered and escaped from the barracks probably accomplished these acts principally by creeping under the curtains or through the folds of their loosely fitting sides. As the curtains were only raised during the day, and when the weather was fine, the portion of the time during which the barracks were open was really very small. It was necessary to close the curtains also whenever the wind blew strongly against the front of a barrack, and in this event, the air pushing past their imperfectly fitting borders circulated in gusts in the interior.

As these shed-barracks, while roofed and floored as ordinary barracks, were thus greatly exposed on one side, it was impossible to place within them but a single row of beds. This fact alone will always prove a most serious economical objection to their construction. They were condemned while in use by some of the most competent French sanitarians, as a "*contre-sens hygiénique et économique*." We have not learned that the surgical results obtained were remarkable in any respect; and as the experiment is never likely to be repeated, this verdict may be accepted as final.¹ Where, during the summer season, it may be impossible to construct a suitable cover from a want of the proper material, or of sufficient time, a roof or awning may

¹ In the autumn of 1871 this ambulance was "given to the army" by the "*Société de Secours aux Blessés*"—*à la seule condition que sa destination ne serait pas changée (!)*. Its proximity to the camp of Villeneuve l'Étang seemed to render it a desirable acquisition; but it was found impossible to heat the barracks or to make them in any way comfortable, and the Ambulance was shortly after abandoned. The sick of the neighbouring camp have since been sent to the military hospital at Versailles.

be adjusted to some wall already built, and a shelter thus extemporized, which is better than none, for the sick, and which, as an annex to a general hospital, might prove useful in the treatment of convalescents or of special cases. These considerations can alone warrant the construction of shed-barracks.

In 1868 M. Le Fort erected a tent-barrack as an annex to the Hospital Cochin, that possessed more characteristics peculiar to the tent than to the barrack. In fact, it offered (to those who might be treated within it) all the sanitary conditions special to a tent with double walls. This construction, which is still in use, and appears in fairly good condition in the *fourth year* of its

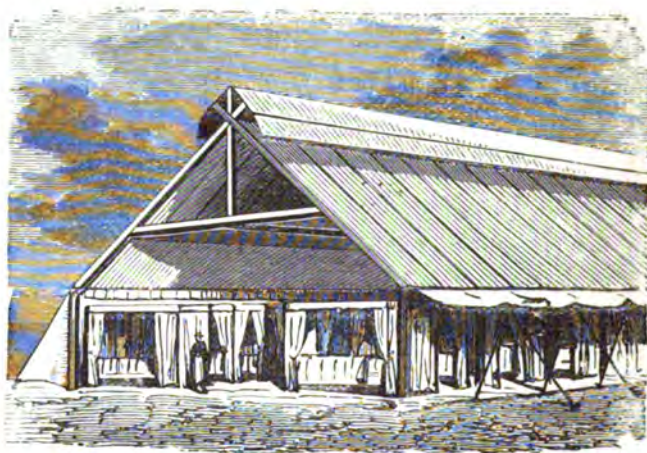


FIG. 39.—View in perspective of the tent-barrack erected by M. Le Fort as an annex to the Hospital Cochin in 1868.¹

service, I shall now describe. I would, however, first call your attention to Fig. 39, which will give a general idea of the barrack; the front wall has been entirely removed, and one lateral wall lifted up in such a way as to exhibit the interior. The frame is supported by six posts on each side, and distant from each other 4 metres, thus giving to it a length of 20 metres; its breadth is seven metres. The posts are of light wood, square in form, 10 centimetres thick, and 2 metres 25 centimetres high above the ground. To each one is attached a principal rafter, a

¹ The writer desires to express his obligations to M. Le Fort, who has been so kind as to furnish him with the electroplates for Figs. 33, 34, 35, and 39.

solid plank 4 metres 80 centimetres long ; this crosses at the summit of the roof, in the form of an X, the rafter from the post opposite. The upper branches of the X, which are very short, give a support to the false roof or lantern. Each rafter is united to its neighbour by a plank 4 metres long, 15 centimetres wide, and 34 millimetres thick ; these planks, placed lengthways and edgeways, form the ridge. A similar plank passes from post to post in such a way as to form the eaves of the tent, the canvas bending over it being continued to the ground as a lateral wall. Four or five light rafters are placed between the principal rafters, to complete and sustain the roof. The principal rafters are kept from spreading apart by a tie-beam and a king-post. By this arrangement a light but pretty solid framework is obtained. The canvas is now put on in the following manner :—First, the outer covering—cotton canvas prepared by being immersed in a solution of sulphate of copper—is adjusted. This consists of two large sections, one for each side of the barrack. Each section is drawn up to the summit of the framework, and each is fastened to the other by means of straps, which, passing over the ridge-board, are secured to buckles on the inside of the corresponding section. The sections of canvas are therefore not directly joined together, but are separated by an interval of about 6 in. The false roof is now covered by a hood or band of canvas, which falls down upon the roof on each side, but is gathered up in such a way as to permit the free exit of the air which may arise through the opening between the two sections forming the roof. The canvas on each side is now drawn down to the angle of the roof, where it is attached by straps to the horizontal bar or plate which passes from post to post. The bottom of the canvas is furnished with loops, by means of which it is attached to hooks screwed into a piece of timber buried in the ground along the whole length of the barrack. The inner tent is now arranged : it is made of white cotton cloth, and consists of two parts, a ceiling and side walls. The ceiling extends horizontally the whole length of the barrack, just under the tie-beams, and is held in its place by cords and wires, which, fastened to the framework above, pass through a series of rings sewed upon the upper face of the cloth. The ceiling is formed of two lateral sections,

between which is an interval of 3 in. or 4 in., corresponding with the interval or opening immediately above, between the two sections of the outer covering. The walls of the inner tent now slope down, following on the inside the course of the rafters, to the horizontal bars or plates, to which they are attached. To these bars curtain rods are fastened, from which the perpendicular portions of the walls hang in sections or curtains.

When the weather is fine, the inclined walls of the outer tent may be raised, as shown in the sketch. They thus form a sort of covered gallery, where the patient may walk or sit, at the same time protecting from the sun the interior of the tent.

The perpendicular curtains of the inner tent can be more or less completely opened, according to the weather, so as even to place the patients, whenever thought proper, quite in the open air. This construction is not floored, but the ground was carefully prepared, and the surface dressed with coarse gravel; gutters lined with bitumen conduct the water, shed by the outer roof, to the street near by. The shelter thus obtained is considered by M. Le Fort sufficient for eighteen or even twenty-four beds. Although two stoves are placed in it, the construction was not designed to be used during the colder months, and it has been regularly abandoned each year when the weather has become frosty.

The earliest use of permanent barrack-tents with double walls appears to have been made at Berlin. In 1864 Dr. Fischer described one which had been attached to the Charity Hospital of that city. A plank floor was laid, supported by a series of posts several feet from the ground. Its length was 114 ft. and its (interior) breadth 23 ft. A framework was erected upon this floor, with two rows of wall posts on each side; a tarpaulin weighing nine or ten hundredweight was placed upon the roof as a covering. The outer edge, provided with gutters, was secured to a plate, resting upon the outer line of posts supporting the roof. Canvas curtains were let down from the plates supported by the first row of wall posts quite to the floor, so as to form the inner (true) walls of the pavilion; around these was a gallery covered by the projecting roof. At the outer edge of the floor of this gallery—a lateral extension of the floor of the

pavilion—curtains were placed which could be *pulled* up by means of pulleys, so as to quite shut in the gallery. This construction was therefore a wooden framework roofed by an impermeable water-tight and air-tight covering, and enclosed on the sides by two lines of curtains distant from each other the width of the gallery. The pavilion was divided into two wards by partitions, between which were a bath-room and water-closet. Each ward contained twenty-one beds.

It will be seen from these descriptions which I have given of tent-barracks that there are two kinds or types. In one of these the construction is essentially a barrack, in the other it is essentially a tent. Nevertheless, in the barrack type many of the special advantages of the barrack are lost; as I have already remarked, it affords no security as regards the safe keeping of either property or persons, neither can constructions of this class be easily and economically warmed; they have consequently only been proposed and used for summer hospitals. Their only advantage over common barracks—aside from their somewhat smaller cost—seems to be the possibility of throwing them widely open at the sides. Whether, in order to obtain this object, it is wise to give to barracks a special form which unfits them for service during a considerable portion of the year, I am much inclined to doubt. It seems to me preferable to construct barracks in such a way that they may fulfil every purpose for which such buildings are erected, that they may be used at all seasons of the year, but so arranged that during the warmer months they may be freely opened to the air by means of movable walls, or some other device. As for the tent-barrack which preserves the essential features of the tent—which, in fact, scarcely differs from a marquee, except in being more solidly supported within—I can only say that it seems to me to be the preferable form. It would certainly be very difficult to realize more completely than M. Le Fort has done, in the large tent annexed to the Hospital Cochin, the best conditions to be obtained under a shelter of canvas, not simply during the summer, but as well during the winter; and I may here again remark that such a tent is much more easily warmed than any one of the more barrack-like constructions I have described. The difference in

cost between this tent-barrack and those of the first class, if neatly built, is also usually in its favour.

It seems to me expedient, whenever the occasion may require the establishment of a military hospital that in all probability will be used for a year or more, or even for several months, to employ two kinds of construction—well-built barracks, and large, strongly-secured tents. The barracks will furnish quarters for the attendants, can be used as offices, and will afford suitable store room. They also, if well constructed, if so arranged that they may be opened freely, will offer to the sick sanitary conditions scarcely inferior to those obtained, in the finest portions of the year, in the barracks which most closely resemble tents. The large tents will completely secure for the sick whatever advantages may be derived by treating men under canvas, advantages which I believe I have elsewhere satisfactorily shown to be both real and important.

In constructing a tent for use in the field as a campaigning tent, its size must necessarily be limited. The tent and its fixtures must be easily transportable, while it should not offer to the wind so large a surface as to be blown down, when supported and fastened by the fixtures and pegs which belong to it and are presumed always to go with it. In constructing a tent for a special service, a service which gives to the installation more or less of permanency, the transportability of the tent is a quality of less consequence, as is also its solidity, if fastened in the usual manner. There are a variety of ways by which a tent not excessively large can be fixed strongly in its place the moment it is decided to give permanence to the installation. Still, in the construction of a large tent not intended to be frequently transported and re-pitched, lightness may be a desirable condition. It should only be so large as to secure within it a convenient interior, and the necessary sturdiness should be obtained for it by the employment of such fixtures only as are absolutely indispensable. It should also be made of as few pieces as possible; the type to be preferred is the simplest one.

The tent proposed by M. Le Fort, although one which would answer very well in the construction of a military hospital upon the plan I have suggested, since in the fulfilment of sanitary

conditions it leaves scarcely anything to be desired, nevertheless seems to me to possess certain defects which can, perhaps, be partially remedied. It is a double tent, one tent being placed within another larger one. This mechanical fault I have elsewhere noticed. The framework is altogether heavier than is necessary, and there is too much gearing about the tent ; moreover, it cannot be closed up tightly. The employment of numerous curtains attached to sliding rings, and of sidings fastened by buckles and thongs is objectionable ; unclosed apertures exist everywhere, which let in the air in currents. If it be said that these apertures serve to ventilate the tent, I can only reply that this mode of ventilation is often undesirable. In cold, windy weather, the fewer irregular holes and apertures in the walls of a tent the better, providing the ventilation is properly maintained, as it should be, by openings in the roof, and a circulation of air through the canvas forced, if necessary, by means of a well-contrived heating apparatus. I should prefer also for a permanent installation a different floor. If an earth floor is to be used, coarse gravel is perhaps the best material which can be employed ; but however easy it may be to remove and renew the gravel in places where it may have been soiled, such a floor must, sooner or later, become unclean, as well from the detritus of one kind and another which daily falls upon it, as by reason of its capacity to absorb gases. Where tents may at any time be repitched, an earth floor may be sufficient ; but if the installation is to be permanent, some other kind of floor should be used both as a matter of convenience and of health.

If large tents can be employed with advantage in the organization of sedentary hospitals, I know of no better form than that of the American hospital tent, a pavilion covered by a *sur-tente*, or "fly." The pavilion may be made large enough to be sufficiently convenient within, and may be strengthened by a framework strong enough to give it the necessary sturdiness. It can, moreover, be modified in such a way as to permit its being more easily opened to the air and light than are the American field tents.

In plate X. (Appendix) may be seen a sketch of a tent designed by Dr. Thomas W. Evans, and in the construction of which,

while endeavouring to secure those qualities particularly desirable in an installation that is to have a certain permanence, he has sought to remedy, so far as it might be done, the mechanical faults I have noticed in speaking of M. Le Fort's tent, and several of which are more or less likely to be reproduced in any attempt to construct a large, strong, sturdy tent, intended to be used as a sedentary hospital. The pavilion proposed by Dr. Evans is constructed in the following manner:—Six posts, square, 4 in. thick, 8 ft. 7 in. long, are sunk into the ground 2 ft. on lines which are to correspond with the side walls of the tent. The second post is placed 14 ft. from the first; the third, 14 ft. from the second; the fourth, 4 ft. from the third, for a reason which will appear; while the fourth, fifth, and sixth, are 14 ft. apart. The sides of the tent are therefore 60 ft. long.

The upright posts are united on each side by square bars, rounded on the upper and outer angles, 4 in. thick; these are placed horizontally from the top of one post to that adjoining. The extremities of these bars are secured to the posts by means of sockets.

The two lines of posts are now united at each extremity by a cross-bar, which is square, 4 in. in diameter, and 20 ft. in length. The two bars complete the enclosure of a quadrangle 60 ft. long by 20 ft. broad. Each one of the end bars is propped by two upright posts, similar to those on the sides, placed 4 ft. apart. These posts enclose the doorways. A vertical pole 9 ft. 5 in. long is now erected over the centre of each doorway, its foot resting in a metallic socket. This standard is 5 in. in diameter at its base, and 3 in. at the top, which is armed with an iron spindle; it is flattened on its outer face. Two masts, 6 in. in diameter at the base, and 3 in. at the top, and $17\frac{1}{2}$ ft. long, are sunk in the ground $1\frac{1}{2}$ ft. on a line corresponding with the long axis of the quadrangle, 20 ft. apart. These masts are connected at the top one with the other, as also with the vertical standards over the doorways, by ridge-poles, three in number, and each 20 ft. in length; the ridge-poles are rounded on their upper faces. The two end ridge-poles are fastened to the upright standards by being passed over the terminal

spindles with which the standards are armed. The middle ridge-pole is attached to its fellows by means of sockets. The skeleton or framework of the tent is now complete. I have not remarked, however, an arrangement of considerable importance. Each one of the sixteen upright wall-posts, of the end standards, and of the ridge-poles, is furnished with a row of fixed metallic rings, whose diameter is about $\frac{3}{4}$ of an inch. These rings are screwed into the outer faces of the posts, 6 in. or 8 in. distant one from the other, and all facing in the same direction upwards and downwards; on the ridge-poles they face each other horizontally. (See Figs. 40 and 43.) Such a framework having been erected, it remains to be provided with its covering. This consists of two sections, which are to be united, when erected, at the ends and at the ridge. Each section forms one long roof, two triangular gable ends, two end curtains, and five side curtains.

The curtains are all sewed on to the edges of the roof, and also to the edges of the gable ends. The sides and bottoms of the curtains are provided with button-holes, so also are the vertical edges of the gable ends, and the superior edge of the roof; a narrow lapel projects beyond the line—the angle of the roof—where the roof and curtains meet; into this lapel are inserted the tent-ropes, 2 ft. 3 in. one from the other. In erecting the tent, the sections are unrolled on the ground within the enclosure, the wall curtains being drawn out towards the side-posts, while the long straight edges of each—the edges containing the button-holes—are laid parallel to each other in the middle of the enclosure, along the line of its length.

The long edge of one of the sections is now lifted up, and, beginning at one of the extreme ends, the first button-hole is slipped over the spindle at the extremity of the standard over the doorway; the button-holes are fastened one after the other over the rings on the upper surface of the ridge-pole, until the edge of the section is adjusted along its whole length.

The body of the section is then lifted up and over the horizontal bars—the plates—of the framework, the curtains falling on the outside. The button-holes in the vertical edge of the gable end are adjusted to the rings in the standard over the doorway. The roof is drawn out by the cords attached to the lapel, and

pegged to the ground in the ordinary way, or attached to parallel bars, as shown in Plate X.

The curtains are now buttoned on to the rings in the upright posts, one curtain edge over the other on the sides, the button-holes on the lower edge being passed over rings which are placed in the outer string pieces on which the floor rests (see Fig. 40). I may here say that, presuming it may not always be convenient to use a floor, the lower edges of the curtains are furnished with a series of loops, by means of which the walls can be pegged to the ground in the ordinary way. The canvas is held fast, and is prevented from slipping off the rings by passing a cord through the series, or by means of small keys, as shown in the illustrations.

I have elsewhere objected to the use of straps, buckles, &c., for curtain fastenings, because of the openings which almost always exist, where such fastenings are employed; it is partly to reduce the number of such openings that the curtains have been attached permanently to the roof; it is for the same reason that the edges of two adjoining curtains have been buttoned, one curtain over the other, the edges of the curtains over-

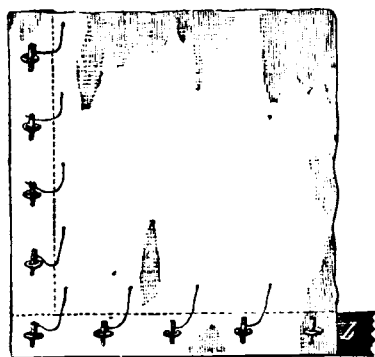


FIG. 40.

lapping slightly for this purpose. In the curtain which rests upon the face of the post, the button-holes are four or five inches from the edge; the free border forms a roll beneath the outer curtain, in which the button-holes are close to the edge. The two curtains being pressed down solidly by the keys or the cord passed through the rings, this roll breaks

or fills up the joints which would otherwise exist.

The arrangement will be readily understood by a reference to Fig. 41, where one curtain *c* is shown buttoned over the ring *b* in the post *a*. The edge of the second curtain *d* is also buttoned



FIG. 41.

upon *b*, and will be observed to have been rendered slightly convex by the free edge of the curtain *e*. Fig. 42 shows a section of the curtain *e* buttoned over the rings *b b b*, with its free edge *c* rolled up. The curtain *d* may be brought forward and buttoned over *b b b*, as shown in Fig. 41.

It is now necessary to arrange the fly. This is in three sections, each 20 ft. broad and about 30 ft. long. It is in sections—first,—that it may be the more easily adjusted; secondly,—that the air between it and the roof of the tent may have a free outlet; this is desirable not only because a better ventilation within the tent is thus maintained, but because the strain to which the fly, were it in one piece, would be subjected whenever the wind is high, is greatly lessened; thirdly,—that, the season permitting, one or more sections may be advanced so as to form an awning in front of the tent.

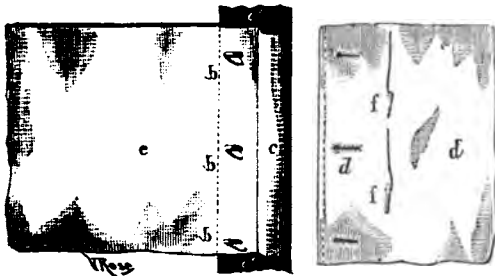


FIG. 42.

The three sections of the fly are placed upon the portion of the roof, which we are presumed to have erected, each folded *outside in*; that is to say, each section being in its place, one half resting upon the portion of the tent it is to cover, the other half being thrown *back* over it. The fly having been thus placed for the moment, the section of the tent still supposed to be on the ground is lifted up, and beginning at the extreme end, the first button-hole is slipped over the spindle at the extremity of the standard over the doorway, and the button-holes one after the other are fastened to the rings in the ridge-pole as already described. Before, however, the second section has been adjusted far, a small perforated block or ball, two or three inches in diameter, is pushed down upon the spindle just mentioned, and the fly is pulled up, and the hole which will be found near its outer edge and corner

is passed over the top of the spindle; as the second section of the tent is attached to the ridge-pole, the fly is drawn up and over on to the same side. Balls are placed on the spindles of the three remaining standards, after the two sections of

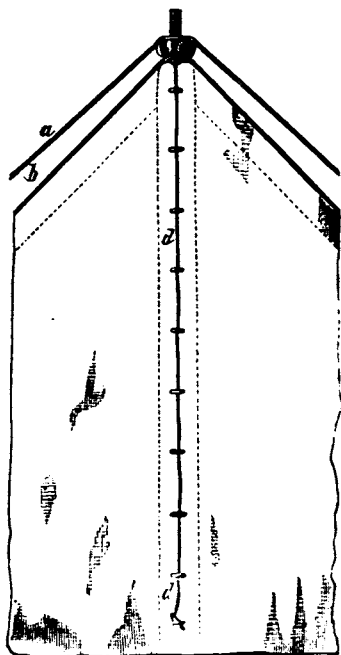


FIG. 43.

the tent have been united upon them, and the fly is adjusted as has already been described. The section of the tent is now brought forward over the framework, to which it is fastened, as in the first instance, and stayed out by cords similarly attached. The fly is then pulled down on either side and fastened by cords to pickets driven into the ground, or to a bar, as shown in Plate X. The fly is adjusted as in the common American hospital tents, except in not resting directly upon the ridge-pole; the balls placed on the spindles, separating the fly from the tent, permit the air to circulate more freely between it and the tent. (The ball is

represented in Fig. 43 by the letter *e*; its effect to separate the fly from the roof of the tent *b* will at once be seen.) The tent as now pitched has four large unclosed openings; those at the ends are intended to be closed by light swinging doors, those at the sides with windows—not however necessarily; as will be seen by looking at Plate X. a curtain can be drawn down to fill the space intended for the window, should it for any reason be difficult to obtain one. Ridge ventilation is provided for by louvres which can be opened or shut at pleasure.

The ventilation, however, will be chiefly secured during cold weather by the heating apparatus. During the warmer portion of the year the side and end curtains can be rolled up as shown in Plate X.; they are sustained by straps, which are employed when the tent is closed to attach the roof to the bars or plates which connect the upright posts.

The floor, if one is employed—and one always should be, if

possible, in a permanent installation—it will be best to prepare before the tent is erected.

The ground should be levelled—in fact, it would be well to remove six or eight inches of the top soil, and replace this with coarse gravel.

String pieces are then to be laid down lengthwise on the sides of the tent, to furnish an attachment to the lower borders of the curtains, the other string pieces should traverse the tent; they should only be large enough to support the floor, and should be forced into the gravel until their upper faces are level with its surface. When the flooring is laid it will therefore rest directly upon the gravel.

The floor will be made of rough unmatched boards; and it should always be covered by an impermeable oilcloth over its whole surface. Such a floor is perhaps as perfect as it is possible to have in a temporary hospital. It is solid, not dusty, contains no dead air beneath it, no foul matter can accumulate under it, it is non-absorbent of gases, and can always be easily and very perfectly cleansed.

But some one may ask:—Why not allow the outdoor air to circulate freely under the floor, as it did beneath the American barrack hospitals? This arrangement, permitting the outdoor air to sweep them on every side, was supposed to contribute much to their healthfulness. But if the floor is impermeable and contains nothing offensive under it, there is no reason why it can be desirable to secure a constant change of the air beneath it. Another and more weighty reason is this: if the outdoor air were permitted to circulate freely beneath the floor of the tent, our ground heat during the winter would be lost. When the weather becomes cold, the tent should be heated by the introduction of hot air in the way described at length in Part III. of this Report. How important a factor this ground heat is, in the maintenance of a steady temperature within a tent, will there be shown. The doors, the upper portions of which may be furnished with windows, may be protected during the winter months by portals or vestibules. Paved gutters should be placed on each side of the tent. It will be found advantageous to fix the tent in the manner indicated in the Plate, by attaching the tent-cords to

G G

parallel bars ; not only is the inconvenience of cordage avoided, but the stability of the tent is thus assured. The tent is intended to accommodate sixteen patients. There is room for eighteen beds, but it will generally be found convenient to suppress two of these to gain room for furniture, &c.

A tent constructed like the one described would be greatly superior to the American hospital tent, for the organization of sedentary hospitals. It is much more spacious, and is relatively less costly.

To form a pavilion 56 ft. in length, four United States hospital tents are required. The canvas of the six ends which meet is superfluous—it is more than this, it is decidedly objectionable. It serves to form dead corners, and offers a large amount of material to be impregnated and infected by miasmatic exhalations.

I believe Dr. Evans' tent to be superior in construction to M. Le Fort's tent, on account of its greater simplicity. There are seventy-one pieces in the framework of M. Le Fort's pavilion; there are but thirty-three in the model I have just described and would commend.

While not designed to follow an army in all its movements, it is not too heavy, including the framework, to be occasionally carried in the train. In well-timbered countries a part, or even the whole, of the framework may be left behind; it would require but a small amount of labour to prepare a framework sufficient to sustain the canvas, which is the essential part of the construction.

This model is also peculiarly well adapted to serve as an annex to a civil hospital, not only for the treatment of surgical cases, but to meet the requirements of certain epidemics—cholera for example, the mortality incident to which disease is largely controlled by the general sanitary surroundings; and this fact was never more strikingly illustrated than in the Crimea, in the very first large tent-hospital ever established.



PART III.

ON THE SPECIAL ORGANIZATION
OF THE AMERICAN
AMBULANCE.



"The benefit of a discovery extendeth to the whole race of man; that of a civil or political reform, only to a particular place. The latter lasteth not beyond a few ages, the former through all time. Moreover, the reformation of a State in civil matters is seldom brought about without violence and confusion; whereas discoveries carry blessings with them and confer benefits without causing harm or sorrow to any."—Bacon.





ON THE SPECIAL ORGANIZATION OF THE AMERICAN AMBULANCE.



T is particularly in times of war that the necessity for military hospitals becomes apparent. To meet this special and immediate necessity it has been the custom to organize hospitals on a temporary footing, and to such hospitals most of the sick and wounded of armies have been taken. The welfare and comfort of the sick and wounded, and the chances of their recovery, have always depended in a large measure upon the suitableness and excellence of these provisional establishments. No law of sanitary science is more absolute than one which may be formulated as follows: *The ratio of the mortality among men, whether sick or wounded, invariably increases in proportion as the respirable air in the apartment or place in which they are sheltered differs in its composition from the mass of the atmosphere at large.* This general proposition is a practical one—it is fundamental—the whole subject of hospitalization rests upon it. Indeed, since many years its importance has been recognized in the construction of civil hospitals, and it has also been regarded in the construction and disposition of permanent and sedentary military hospitals as well.

Unfortunately, however, the idea has been very commonly entertained that it was impossible to realize in temporary field hospitals those conditions now generally considered indispensable in more permanent establishments. This idea was not entertained

by the American International Sanitary Committee, which was founded in Paris immediately on the declaration of war in 1870; on the contrary, their belief was that temporary field hospitals offering all the shelter necessary in the treatment of the sick, and at the same time permitting that abundant ventilation which experience has taught us is so important, particularly in the treatment of the wounded, could be easily and cheaply established. They also believed that the forced transportation of the wounded long distances was often prejudicial in the extreme, as well as costly and unnecessary, and that the welfare of the wounded and the welfare of the army—that the interests of humanity and science alike—could, in principle, be protected best by sending the hospital to the soldier, rather than the soldier to the hospital.


At the very first meeting of the Committee it was “*Resolved*: That this committee organize a field hospital for the treatment of the wounded, which may serve as a public expression of their opinion with regard to the requirements of such an establishment.” It was also “*Resolved*: That this hospital be established under American tents;” such tents, in the belief of the committee, having been already proved to be especially and most admirably adapted to the hospitalization of the sick and wounded on the field, while promising with a proper organization a still wider application in the construction of sedentary army hospitals.

Circumstances of expediency, which have been elsewhere stated, induced the committee to fix their experimental hospital at Paris, where to the writer of this Report was finally entrusted its immediate organization. A location had been selected on the avenue de l'Impératrice, No. 36, and several of the tents erected, on the first day of September, 1870. From this date until the close of the siege, tents, tent-barracks, offices, and establishments of various kinds were added as necessity required, or as increased pecuniary resources enabled us to enlarge the hospital. Thus, when we began our work, it was proposed to establish a “tent-hospital” containing about *forty* beds, but on the 1st of January we had so enlarged upon our original plan as to be able to report to the Intendance *one hundred and fifty* beds, occupied and un-

occupied, sixty of which were in tent-barracks that we had constructed upon the ground, or in tents which, liberated by the construction of these barracks, from services connected with the administration, could be attached to our wards.

It will be seen from this statement that the Ambulance was from time to time so changed in its appearance, as a consequence of development and growth, that a description of it made at any time much before the close of the siege would be necessarily imperfect. I shall consequently describe it as it existed at that time. My general description will be brief, particularly as an engraving accompanying this Report (and which serves as a frontispiece to this volume) will give a much better general idea of the appearance of the Ambulance than it would be possible for me to convey by a verbal statement, while most of the details of the installation may be seen and easily understood by consulting plate I. (Appendix), which exhibits a ground plan of the Ambulance.



HE first impression produced upon a visitor, on arriving at the American Ambulance, was generally one of surprise. It was difficult for a person only familiar with the hospitals of Paris and the ambulances organized in the city during the siege—nearly all established in monumental public buildings, or in hotels and private residences—to understand how such a collection of tents and barracks, as we had erected on the avenue de l'Impératrice, could be made to serve as an ambulance. And yet the first impression made upon the visitor was almost always an agreeable one. The white tents in the square, enclosed by long white-roofed barracks, the bright-coloured awnings of the barracks and tent vestibules, the gravelled walks, the grass plots and the beds of flowers, the little grove on

the right, and the fir-trees planted in the central portion of the grounds, formed in their *ensemble* a pleasing picture—one that failed at least to bring to mind those unpleasant associations so frequently awakened when we pass by the gates of hospitals which have had long histories, and which somehow always seem to stand in the heart of great cities rather like sombre fortresses, in which generation after generation is expected to make its final struggle for existence, than as houses of charity, pity, and succour. We intended that our ambulance should always look bright and cheerful, not only to our occasional visitors, but to the wounded who might be the subjects of our care; and I believe all who may have seen it will be ready to admit that we were very successful in the execution of this purpose.

On entering the grounds by the gate that opened upon the avenue, and passing the sentry-box to the left, the first building which usually attracted attention—as it was nearest the gate—was known to us as the “Administration.” It contained two apartments—a reception room for visitors, and a committee room. But the tents were, of course, always the chief objects of interest; and accordingly we commonly conducted our visitor almost immediately to the pavilion nearest to the administration. Generally before reaching this pavilion, however, our visitor had had time to ask many questions—how the rain was kept out of it in stormy weather, and how the tents were kept warm and comfortable when it was cold, &c., &c.? And this led us frequently to speak of the qualities of the material of which the American tents were made, of the uses of the double roof or “fly,” of the special system of heating that had been adopted, and of many subjects considered at length in another section of this Report. The pavilion, which we are presumed to be now examining, was formed by joining together, end to end, five United States’ regulation hospital tents. It was 80 feet long, including the vestibules attached to each end, and covered an area of nearly 1,200 square feet. Each hospital tent was considered sufficiently large for six camp bedsteads; but while several tents contained this number others did not, the reserved spaces being filled with tables, buffets, and other articles of furni-

ture. Thus, in this pavilion, there were never more than *twenty-six* beds, although there was room within it quite sufficient for *thirty* beds.

The iron bedsteads used by us, although made in Paris, were exact copies of those so extensively employed by the Medical Department of the United States Government during the War of the Rebellion. Upon each of these bedsteads were placed a mattress (a bed-sac filled with seaweed), a pillow filled with seaweed or *crin végétal* (moss of the live oak, *Tillandsia*), simple linen sheets, and a sufficient number of blankets. Each bed was numbered, and by the side of each was a table, or a chair, and a *nécessaire*, for the toilet articles belonging to the patient.

The tents were all floored, and several of them were neatly carpeted. Opening one into the other, they were warmed by a single furnace, the heat from which was thrown into the tents through registers placed at intervals in the floor.

Leaving these tents by the rear vestibule, which served as a closet for the vessels in daily use in the pavilion, but which had been erected principally—as were also all the vestibules placed in front of the doors opening into the wards—for the purpose of preventing a too direct admission of cold air at every opening of the door, we come to the tent barrack known in the Ambulance as No. 4, and indicated on the Ground Plan by the figure 7.

This pavilion was made after the type or model adopted for all the buildings intended to supplement the tents. A light frame-work was planted in the ground having a height of nine feet from the ground to the roof, with a width of about seventeen feet—its length depended upon the room we wished to obtain. The sides of the frame-work were covered with boards, from the ground up to within eighteen inches of the eaves; from this point to the eaves the covering was of canvas only. Doors and windows were inserted in convenient places, and a floor was laid upon string pieces resting upon the ground. Over the whole construction was now thrown a double canvas covering, which, supported by light rafters, formed the roof. The roof projected over the sides of the building about two feet; the canvas covering being turned under the projecting edge, to which it was securely attached by a blue and red hanging border, that

served at the same time as an awning. A tent-barrack constructed in this way was divided into rooms, according to the requirements of the service, the division being effected either by a wooden partition or by a simple curtain, as in the case might be thought best. The *finish* given to the room, as well as the character and quality of the furniture in it, depended upon the use to which the room was to be put. In the administration rooms, as also in all the bureaux and salons, the walls were covered with hangings, and the floors carpeted, while a canvas screen was used as a ceiling, for the double purpose of hiding the nakedness of the rafters overhead, and effecting an economy in the consumption of fuel.

Pavilion No. 7 was sixty-six feet long, and contained—1st. An *operating room*, having a southern exposure, and well lighted. 2nd. A *ward*, containing *twelve* beds, and such furniture as I have before described. That the air-space might not be reduced, this ward was without a ceiling overhead, in which respect it resembled our second and largest tent-barrack ward. It was warmed by a common coal-burning stove. 3rd. A *store-room*, used as a wine closet. Two vestibules, covered with red, white, and blue canvas, were erected for this pavilion—one before the door leading into the operating room, the other before the door leading into the ward.

Pavilion No. 8, fronting upon the central court of the ambulance, was seventy-eight feet long, and resembled No. 7 in external construction, except in having a somewhat greater projection of its roof, intended to protect a side walk which was laid on the ground on the side fronting the court, the whole length of the building. This pavilion contained—1st. A servants' *salle à manger*. 2nd. The *kitchen*, in which were placed two cooking ranges, and two large boilers, as also a number of tables, buffets, shelves, &c. 3rd. The *salle à manger* for the surgical staff and their associates. 4th. A surgical-staff *bureau*, and 5th. The *pharmacy*. This little apartment was furnished with the necessary special furniture, and besides containing the drugs and medicines, for which fortunately we had little use, was used as the store-room for most of our surgical apparatus. A covered passage way separated Pavilion No. 7 from the next pavilion (marked upon

the Ground Plan by the figure 10). This construction—No. 10—was the largest upon the ground, being over one hundred and thirty feet in length, and contained—1st. A *linen room*, which opened upon the passage-way. 2nd. An *office*, opening also upon the passage way. This office was occupied by the superintendent of the linen room, and was used also as a drawing room by the lady volunteer nurses. 3rd. A *provision room*. 4th. A *ward*, in which were placed *twenty-five* beds. Although this ward, known as “No. 5,” contained a smaller number of beds than either of the tent pavilions, covering as it did a superficial area of 1,557 square feet, the interior cubic space was much greater than in any other one of the wards. It was furnished precisely as were the other wards, except in having been heated by two stoves so arranged as to contribute to the ventilation of the apartment, in accordance with a modification of the Péclet system introduced into American barrack hospitals by Dr. W. H. Hammond.¹

Leaving this pavilion, we come to “ward No. 1,” formed by a series of six regulation hospital tents, and arranged both externally and internally as the tents of the first series already described. A plank walk, passing to the left of these tents, led from the court of the ambulance to a small grove, nearly in the centre of which the latrines were established. Continuing in the same direction, we come to the first of a series of four constructions occupying the eastern side of the ground. This building was small and contained but two rooms; in one all the soiled linen coming from the wards was placed and arranged before being sent to the laundry; the other was used as a *dead-house*. The second construction was much larger and contained three rooms, one used as a *store-house* for articles in bulk; another, provided with shelves, racks, &c., served as a *depository* for guns, knapsacks, clothing, and other effects of the inmates of the ambulance; the third room was the *salon* or drawing-room of the aids volunteer. As the gentlemen who had offered us their voluntary aid in the service of our ambulance waggons were compelled to pass a considerable part of each day at the ambulance,

¹ Péclet, “Nouveaux documents relatifs au Chauffage et à la Ventilation.” Paris, 1854, p. 88.

in order to be able to respond promptly to any call that might be made upon us, either for *waggon*s, *stretchers*, or *stretcher-bearers*, it became necessary to provide them with suitable quarters. The apartment given to them was one of the largest in the ambulance, and the aids volunteer themselves so furnished it as to make it by far the handsomest and most attractive. The third building was erected to serve as a *stable* and a *shed*; the stable contained seven stalls—four for horses, and three for our cows; the shed, open on the front, was sufficiently large to shelter four or five carriages. A fourth building—a *dormitory* for the hired male nurses, completed this series of constructions, which extended to the avenue de l'Impératrice.

Between the stables and the administration, and bounded on the one side by the tent-pavilions, and on the other by the avenue de l'Impératrice, was an open space, the front yard, if I may so call it, of the ambulance. Several of our waggon were generally stationed upon the part near the stable; here also our coffee-waggon stood, under the shelter of a kiosk, in the centre of a small garden. Two flagstaffs had also been erected upon this portion of the ground; one near the avenue supported, quite a hundred feet aloft, an immense "red-cross" flag; the other, less lofty, bore an American flag until long after the close of the siege. Not far from the middle of this space stood a circular tent occupied by the *chef de service*. Passing to the right, on to the walk leading from the gate to the court of the ambulance, we come to a large round tent, nearly thirty feet in diameter, standing almost in the centre of the encampment. This tent contained *ten* beds, and was reserved for the treatment of wounded officers. It was furnished with a vestibule, was supplied with water, was heated by a stove, and provided with tables, buffets, chairs, &c., but aside from its size and special use, and that it differed from the square tents in being unprovided with a double roof, it represented no principle of interest or value not elsewhere shown. Upon the side of the ambulance bordering upon the *rue Villejust*, were two small buildings which stood side by side; one sheltered and protected a *hydrant* and *filter*; the other was used as a *bucket and hose-room*. A water supply had been secured for each pavilion, by a series of pipes communicating with the hydrant, but the com-

bustible materials of which the ambulance was constructed, and the serious consequences that might be apprehended from a fire, rendered it expedient to take unusual precautions against such a calamity.


It will be observed, that the *five* wards we are presumed to have visited, contained an aggregate of just *one hundred* beds. Our "field hospital," in a word, was capable of receiving 100 wounded, and was supplied as well with all the accessory offices necessary to a complete and independent hospital. As the limited extent of the grounds rendered it inexpedient to attempt to treat in tents, or tent-barracks erected upon them, a number of wounded exceeding 100, we therefore—when we found, in the month of December, that it was quite possible and, as it also seemed, desirable, to extend our work—attached to the ambulance as a dependency a large house in the immediate vicinity. In this house, No. 27, avenue de l'Impératrice, were placed *fifty* beds, many of which were reserved for the use of those who might be brought in from the field but "slightly wounded," while a considerable number always furnished us with the means of providing for such convalescents as we wished to keep under our own care and direction, until their health might be fully re-established. The American ambulance was therefore really composed of a "tent hospital," a "tent-barrack hospital" and "a house converted into an hospital," and which contained altogether the *one hundred and fifty* beds which we were able to place at the disposition of the "Intendance."

I may remark, however, that although special circumstances gave to the ambulance many of the features of a sedentary hospital, it was always essentially a sedentary ambulance—that is to say, the house and the barracks were never considered as other than mere dependences of the tents, which always held the post of honour, not only topographically, but from the higher hygienic importance attached to them. If the tents were fixed, and remained six months upon the same spot, it was simply a necessity which resulted from the investment of the city. Had the siege been raised—had the French army been able to leave Paris, our ambulance would have been able to follow. It became a sedentary ambulance, therefore, by the force of attendant circum-

stances, but never at any time lost its essential and distinct character of a field hospital. Nearly the whole value of its history depends upon this fact being clearly and perfectly understood.

I believe I have alluded in this brief description to nearly every construction in the ambulance, which would be likely to interest the common visitor. I have also thought it best in this general way to introduce a more comprehensive account of its organization, an account which shall give its history as an exponent of certain principles of hygiene, and indicate the value of the material measures employed by me to put those principles into practice.



F the American ambulance during the siege of Paris awakened the liveliest interest among those who visited it, if before the close of the siege it became more extensively, certainly more favourably, known than any other ambulance in Paris, it was not so much because it was regarded as an expression of international sympathy and good will, as because it represented a system of ambulance construction unlike in many respects any that had ever before been employed. At the American ambulance it had been proposed to erect a number of tents, and there, under such shelter as canvas alone might afford, to treat the wounded who might be brought from the field. And this system had been proposed, not from any want of buildings nominally suitable for hospital purposes, but from the conviction that tents were better fitted for the treatment of the wounded, than more permanent constructions, not only in mild climates, or during the warmer portions of the year in central Europe, but alike in winter and in summer in all temperate latitudes.

If I have said that the system proposed and finally adopted at the American ambulance was one unlike in many respects any ever before employed, this statement is so important that I cannot leave it without explanation and support. I have certainly not wished to say that at our ambulance tents were for the first time employed in Europe or elsewhere to give shelter to the sick and wounded, nor did I intend to convey the idea that they had not occasionally been so used in armies at all seasons of the year.

Since the time of Louis XIV., tents have been regarded as more or less indispensable in most European armies. They have served at times both in summer and in winter to give shelter to troops in the field, and have occasionally been used for the hospitalization of the sick and wounded when other shelter could not be procured ; but when other shelter could be obtained for the sick it has almost always been employed in preference.

The first establishment of what may properly be called "a tent hospital," of which we have any exact and scientific account, was made at Varna, in 1855,¹ and as the results were unexpectedly good, and have obtained some notoriety, several writers who have recently spoken of hospitalization under tents have referred to that installation, not only as the first, but as one established with a clear understanding even of the principles which the American ambulance was intended to represent. M. Michel Lévy, however, under whose direction the ambulance at Varna was organized, says:—"From the month of June the increased number of our sick (mostly cholera patients) *compelled* us to treat a part of them in tents." Referring in 1862 to the

¹ This statement, which I make on the authority of MM. Lévy, Chantreuil, Le Fort, and others, is perhaps not strictly correct. Scrive says that in accordance with a letter addressed by him to the Intendance of the army on the 19th of July, advising the establishment of tent-hospitals, on the following day "the principle of hospitalization under canvas was consecrated by the installation in the open country of a great hospital under tents upon the elevated plateau of Franka, about seven miles from the city. A convalescent dépôt of similar organization was at the same time established upon the plateau of Schiferlick. This new kind of hospital, attended with complete success, suggested the idea of establishing similar camp-hospitals at Varna for the cholera patients themselves."—SCRIVE, *Relation Médico-Chirurgicale de la Campagne d'Orient*, pp. 70, 71.

"good results" of this measure, he adds:—"The tent hospital, as a permanent installation during the *summer season*, is a novelty of the Crimean War," . . . and that, "with necessary precaution and suitable weather (*l'opportunité de la saison*), the treatment of the sick under tents is unattended with the risks and inconveniences of overcrowding."¹

And he moreover has elsewhere said:—"As soon as the weather grows cold, the tent becomes a shelter insufficient for the sick, and not less liable to infection than shut-up barracks, if it is closed almost hermetically, according to the custom of soldiers; and it is even still more pernicious if the earth is excavated within, *en taupinière*, as was done in the Crimea."² It will be observed from these passages that M. Lévy considered the advantages to be derived from the use of tent-hospitals as necessarily limited by the circumstances of climate and season; and such has been the opinion also of those French and German writers who have since most earnestly advocated the open air treatment of the sick. The apparent impossibility of maintaining within tents during cold weather a comfortable temperature has been accepted as a fact unquestionable, the logical consequence of which has been the limitation of their use, so far as possible, to the warmer months of the year. Scrive, speaking of the use of tents during the siege of Sebastopol, says:—"The tents, the only means of shelter for our hospital, were insufficient to protect effectively against the cold our poor sick, whose toes became frost-bitten, and whose feet even became gangrenous almost without their perceiving it. It was truly a deplorable spectacle; but where everything was wanting, what material preventive was it possible to offer as a remedy for these evils? Moral consolations, this was what medicine was reduced to!"³ Testimony such as this, in the absence of any rebutting testimony, could hardly be regarded as other than decisive. It is not remarkable, therefore, that opinion in

¹ Michel Lévy, "Bulletin de l'Académie de Médecine," 1862, p. 595 *et seq.*

² "Dictionnaire Encyclopédique des Sciences Médicales," p. 574.

³ Scrive, "Relation Médico-Chirurgicale de la Campagne d'Orient." Paris, 1857, p. 433.

France on this subject should have commonly been expressed as follows:—

“In those countries where we cannot make use of that precious resource, abandoned houses, we are forced to establish the ambulances under tents. But in the winter and in cold climates the shelter furnished the wounded by the tissue of a tent is insufficient.”¹

“The American hospital tent, very much simpler, and certainly less costly, than the English tent, is worthy of a serious examination. For ambulance purposes it is greatly superior to the French tent, and would seem to be perfectly suitable for the establishment of temporary hospitals, during *the milder portions of the year (la belle saison)*.”²

“The simple tent is out of the question, the sick are suffocated in it in the summer, and suffer from the cold during the winter. The tents at the hospital in Frankfort are quite abandoned; one our learned colleagues who visited that city last year in the month of August found them empty, although there were in the hospital many sick, who, according to theory, ought to have been in them. Hospital tents and barracks realize much better the conditions sought, but they also present certain noteworthy defects. They are formed of absorbent materials which rapidly become infected in spite of an abundant ventilation; they protect the sick incompletely against variations of temperature, often sudden; it is almost impossible to warm them, which it is frequently necessary to do in April and October. If everything is shut up in order to make the heating practicable, we have substantially only the ward of an ordinary hospital.”³

Chantreuil, the writer of the first and perhaps best French

¹ Art. “Ambulance,” “Nouveau Dictionnaire de Médecine.” Baillière, Paris, 1866. It is only just to Dr. Sarrazin, the writer of this article, to say, that, attached as surgeon-in-chief to the corps of General Ducrot, he was, during the siege of Paris, one of our warmest friends, and that the interest he took in our experiment, and the satisfaction he has often expressed in view of our results, are among the pleasant remembrances which we all, of the American ambulance, shall not soon forget.

² “Rapport de la Haute Commission Militaire.” Paris, 1869; p. 443.

³ Husson, Note sur les Tentes—“Bull. de l'Académie de Médecine,” tome xxxiv, 1869.

monograph upon the open-air treatment of the sick and wounded, says:—"Unfortunately, hospitals under canvas can only be used during the summer months."¹ M. Le Fort, an earnest advocate of tent-hospitals, and the first person in France to seriously urge their annexation to the hospitals of cities, for the treatment of wounds, and certain diseases occurring among the civil population, felt himself compelled to admit that "the tent is warmed with difficulty, and it is scarcely possible to employ it during the four or five winter months."² "I think," he afterwards adds, "that neither tents nor barracks should be employed except for summer hospitals."

I cannot, however, more fairly represent recent European opinion upon this subject than by quoting from the "Compte Rendu" of an International commission appointed in 1867 for the purpose of studying and reporting upon the ambulance material placed on exhibition at the "Exposition Universelle."³ At the twenty-second meeting of this commission, the subject of field hospitals having come up for discussion, the president, Baron Mundy (a delegate from the Austrian War Department), said:—"In my opinion, tents offer such inconveniences as to afford the last kind of shelter (*le dernier abri*) to which we should have recourse. Their dimensions are necessarily limited, on account of the difficulties attending the transportation of very large tents, and yet these are the only ones admissible. The ground upon which the tent is pitched is a grave objection, on account of the humidity which it retains and the emanations it exhales. Cleanliness is here necessarily impossible, while ventilation is inevitably defective. The consequence is that in such a place gangrene is easily developed." Count Rohan-Chabot supported this statement, and quoted to the same effect a passage from a publication by Dr. Appia. Baron Mundy then spoke in favour of the employment of barrack-tents, such as had been used by Stromeyer at Langensalza—a slight modification of the system proposed by Vaidy in 1818, and by De Presle in 1769. The same subject

¹ Chantreuil, *op. cit.*

² Le Fort, "Hôpitaux sous Tente." Paris, 1869; pp. 10, 11.

³ "Conférences Internationales à Paris." Paris, 1867.

being under discussion at the next meeting, Dr. Ring, the delegate for Sweden and Norway asserted "that the worst houses are preferable to tents." Count Serrurier, the Vice-President of the General Commission of Delegates, was of the same opinion. At the twenty-fourth meeting, the President concluded some remarks upon modes of ventilating and heating field hospitals, by affirming that it was useless to consider any methods which might have been suggested for the warming of tents, inasmuch as tents were *completely unsuitable* for the shelter of the sick and wounded during the winter season.

And if evidence of an official character may carry with it more of weight, I may add, that on the 3rd of June, 1868, the Prussian Minister of War issued a circular which contains the following passage :—"Not only is it unnecessary to make a floor in the tents intended for the sick, *since tents should be thus used only temporarily* ; but the floor is absolutely useless, and would be replaced with advantage by a layer of sand well packed down, if there should be any occasion to use the tent *more than four weeks*."

The citations which I have made will very clearly indicate the opinions held by the most eminent hygienists on the continent of Europe concerning the employment of tents in the hospitalization of the sick.

But I should by no means fairly present this subject without making more than a general reference to the conclusions which have been reached by those English sanitarians and medical officers who also have been recently occupied with the questions that relate to the best methods of obtaining quarters for the sick of armies. Public hygiene is emphatically an English science ; and the principal advances that have been made in modern times in the art of applying to populations those laws of health which limit in a general way the rates of mortality and disease have been founded largely upon English inquiries, and have been secured to the world by the results of English practice.

The importance of maintaining a pure atmosphere within buildings or apartments occupied by numbers of men, whether well or sick, may have been long since recognized ; but the first practical measures for maintaining within such apartments a

desired degree of atmospheric purity were adopted in England; while from the time when Hales' clumsy machines were introduced into some of the London hospitals until the present day, ventilation and the various methods suggested for preventing the evil consequences of impure air in hospitals, military as well as civil, have been made a subject of the most careful investigation.

It was, however, only after the outbreak of the Crimean War that the attention of English sanitarians was immediately directed to a consideration of the best methods of hospitalizing the sick of armies. Previously to that war, quarters had generally been provided for the sick in British armies in accordance with those principles and that practice which I have in the First Part of this Report spoken of as then common in European camps. In one important respect, however, there was a difference. Since a very long time it had been a practice in the British army to maintain a regimental hospital or infirmary. This was always practically an *ambulance*; it followed the regiment in its movements, and as buildings were not always accessible, it was occasionally established under one or more tents. The practice of maintaining the regimental hospital under canvas was indeed quite common some time before the Crimean War. This war, opened while the season was still pleasant, and conducted in a country almost totally destitute of houses of any kind, led almost immediately to the hospitalization of large numbers of men under tents. The hospitals so established, it is true, were nearly all regimental, and were only intended for the treatment of the slightly ill, or to shelter the more serious cases previous to their removal to some general hospital; nevertheless, this extensive use of tents of various kinds for hospital purposes led to a serious investigation of the merits and defects of tents when employed as a shelter for the sick, and called forth an expression of opinions, as well official as unofficial, of the very highest importance.

Occasionally the tents were spoken of as furnishing fairly good quarters for the sick in pleasant weather, but they appear to have been very generally considered as quite unfit for a winter service.

Assistant-Surgeon Wyatt, of the Coldstream Guards, reports that:—"The tents have been found a most imperfect protection from the rainy weather, the ground within being often converted into a complete quagmire; and I do not consider the men in their debilitated state will be enabled with safety to occupy tents during a cold winter. I believe that if the sick are to be treated during the approaching winter in a field hospital, some kind of wooden hut will be absolutely necessary."¹

The Surgeon of the 41st Regiment says, writing in December, 1854:—"I have eight circular tents for the accommodation of the sick, *at this season of the year* totally unfitted for their reception, as the weather side is never water-proof. To endeavour to obviate this as well as the cold, I obtained old tents as coverings, which in some measure answered the purpose; but, on the other hand, they rendered the atmosphere so close that I am in doubt which of the two evils is less injurious."²

Dr. McKinnon, Surgeon of the 21st Royal North British Fusiliers, says:—"In fine weather the shelter given by the marquee is excellent, but these tents from their great size are apt to be blown down. It is at all times a difficult matter to preserve them from smell. They soon acquire a tainted odour, which it is difficult to eradicate. It is also no easy matter to regulate the ventilation; there is either too much or too little ventilation."³

To certain "Queries contained in the Director-General's circular letter of June 30th, 1856," Sir John Hall replies as follows:—

"Question 7: Best method of sheltering wounded after an action?

"Answer: Houses, if they can be obtained, are the best shelter for wounded, but where they are unattainable, hospital marquees answer very well.

"It may even be necessary to resort to the common bell-tent, for want of better accommodation; on service it is not always what is best, but what is available at the time, that must be used."

¹ "Medical and Surgical History of the British Army." London, 1858; vol. i.

² Ibid.

³ Ibid. p. 212.

“Question 20 : What description of shelter, in the absence of houses, is best for soldiers and sick, when required to remain stationary during the winter, &c.?”

“Answer : Huts, either wooden or wattle and dab.

“When tents are used in winter they should be double, and have a ventilator in the top.”¹

Similar quotations might be multiplied almost indefinitely from the several Parliamentary Reports which were published upon the Crimean War. It will be observed that, while the objections to the employment of tents, particularly in the winter, are very clearly stated, one of the best authorities on sanitary subjects, although giving a preference to houses, yet affirms that “hospital marquees answer very well” for sheltering the wounded; and he even goes so far as to suggest that they may be used in the organization of stationary hospitals, and that even in the winter time.

This opinion was doubtless founded principally upon the then recent experience of a considerable number of regimental surgeons, who had treated their sick in hospital marquees during the two preceding winters with fair success. Nevertheless, the general verdict was that some sort of wooden hut was indispensable to the organization of a stationary field-hospital under the best conditions; and it is well known that, after the first winter before Sebastopol, the field and division hospitals, as well as most of the regimental hospitals, were established in barracks.

The various reports upon these barrack hospitals and the statements of the plans devised to secure the best sanitary conditions within them, which have in England since emanated as well from individual observers as from official committees of inquiry, have presented the general principles to be observed in the construction of military hospitals in the most complete and exhaustive manner. And no one can fail to remark, in examining the more recent writings of those investigators who have made the health of armies a special study, an increasing disposition to regard with favour a hospitalization of the sick which shall secure, to the

¹ Op. cit. vol. i. pp. 498-503.

largest extent practicable, the benefits of a constant and unlimited supply of air.

Dr. Parkes, in his work on hygiene, says:—"Both regimental and division hospitals move with the force, and are best made of tents. It is now quite certain that good, well-ventilated tents are much better than any buildings which can be got.

"In the rear of the army is the *field general hospital*. The Austrian experience seems to be in favour of making it of tents, moving it up with the army. It must be of great advantage to have it made of tents; they have all the advantage of separate houses, both as to ventilation and separation of patients; have excellent ventilation, if well made; can be shifted from ground to ground or place to place; erysipelas and hospital gangrene are extremely rare in them.

"In rear again of the field general hospital other hospitals must be organized. . . . It seems now quite clear that these hospitals should not be the ordinary buildings of the country organized as hospitals. Such a measure seldom succeeds, and the mere adaptation is expensive, though probably always imperfect. Churches should never be taken, as they are not only cold, but often damp, and there are often exhalations from vaults. The French (?), Austrian, and American experience is in favour of having the hospitals in rear made of tents or wooden huts. The huts are perhaps the best, especially if the winter be cold."

In conclusion, he says:—"To sum up the hygiene of field hospitals in war. The movable field hospitals (regimental, division, and general in rear) to be made of tents; the tents being well constructed, of good size, thoroughly ventilated, the flaps being able to be raised so as almost, if desired, to make the tent into an awning. The stationary general hospital in rear should be of tents or wooden huts, but never of converted buildings or of hospitals used by other nations."¹ Dr. Parkes has in the passages which I have quoted recommended, quite without qualification, the employment of tents in the construction of "hospitals in war." It

¹ "Practical Hygiene." Dr. Parkes. John Churchill, London, 1864; pp. 632, 633, 635.

should not be forgotten, however, that since a long time it has been the custom in the British service to issue tents to expeditionary corps in numbers sufficient at least for the presumed needs of the regimental hospital. With regard to the establishment of a field general hospital under tents, Dr. Parkes would seem to think favourably of it on account of "the Austrian experience." This, it will be remembered, was an experience limited to the summer months.

As he says not a word upon the subject of warming tents, the natural inference is that his preference expressed for them would be controlled by the circumstance of season even in temperate climates, except possibly for the establishment of the regimental infirmary. Indeed, for the organization of stationary hospitals, this writer states that "huts are perhaps the best, especially if the winter be cold." While condemning the custom of converting churches and other buildings into military hospitals, and recommending the employment of "tents or wooden huts" in the construction of such establishments, Dr. Parkes has certainly scarcely specified, with desirable precision, the conditions which, in his opinion, should determine a choice of tents.

Although, in so far as it is my purpose to show that the experiment made at the American ambulance was in several respects quite a new one, I should confine myself to a presentation of such opinions concerning the employment of tents in the hospitalization of the sick as were prevalent anterior to the war of 1870-71, the results of every new war in their relations to this subject are of too much interest to be passed over in silence.

While, in the still existing absence of official and other trustworthy reports on the ambulance service as conducted during the late war, it may be premature to affirm that neither in France nor in Germany was the use of hospital tents then regarded with more favour than formerly, it may be safely said, that in no instance were they selected for the organization of a permanent hospital where a sufficient number of so-called suitable houses or barracks could be obtained.¹

¹ I except, in making this statement, the ambulance established in the Garden of the Luxembourg, *after* the close of the siege of Paris, under the direction of Dr. Depaul, and

Probably the most extensive tent hospital organized by the French during the war was that at Metz; at least, this hospital had a less transient character than several which were only established to respond to some special emergency.

The following extract will show how this establishment was regarded, and the conclusion its history was presumed to teach:—
 “At Metz the number of wounded had so increased, that it became necessary to place on the Esplanade and the open gardens adjoining 100 circular tents (*tentes coniques*), in each of which were placed six or eight men selected from among the slightly wounded.¹ This hospital was one of the first it became necessary to break up. Thus, hospital tents should be considered only as a resource wholly extraordinary and provisional, suitable only for ambulances on the battle-field itself—*des premières lignes*—where the wounded may be placed during the action, before their evacuation.”²

But a more detailed statement, as well as a more authoritative opinion, is given by M. Grellois. “On the 15th of August,” says this writer, “our beautiful promenade the Esplanade was covered with tents, and had all the appearance of a camp. On the 1st of September tents were also pitched in the Garden of Boufflers. These two ambulances, in fact, formed but one But the bad weather and the cold which penetrated the tents forced us to suppress this double ambulance early in November. . . . Towards the middle of November the cold became so severe under the tents (which still remained), that several cases of frostbite of the feet, and of the toes especially, were seen.”³

which, in the disposition of the pavilions, system of heating adopted, &c., was an exact copy of the American Ambulance. M. Le Fort says (“*La Chirurgie Militaire*,” p. 182):—“During the winter of 1870-71 the tent hospital attached to the Hospital Cochin was utilized for the wounded of the siege,” &c. It was only, however, *after* the capitulation of Paris, and after M. Le Fort had returned to the city, that it was opened. In October, 1870, as soon as the weather became frosty, the patients were removed and the tents closed.

¹ According to M. Leplat's report, the number of tents pitched upon the Esplanade was *two hundred and fifty*.

² “*Étude sur la Construction des Ambulances Temporaires*,” par A. Demoget et L. Brossard. Paris, Alfred Cerf, 1871; p. 180.

³ “*Histoire Médicale du Blocus de Metz*,” par E. Grellois, *ex-Médecin-en-chef des hôpitaux de cette place*. Paris, J.-B. Baillière et fils, 1872; pp. 71, 72, 159, 160, 161.

M. Grellois says:—"The tents became so *infected*, as early as the 21st of September, that it was a matter of *urgency* to repitch on new ground as many as possible." But it is only remarkable they did not become infected even earlier, from the account which he gives of the surrounding sanitary conditions. "On this day" (21st September), "I called attention to the extreme filthiness that existed around the tents." The sick were lying on the ground, the most hygienic plan according to M. Grellois¹—four, six, and even eight under a tent—a common army tent, and one totally unfitted for hospital purposes, except possibly in warm and rainless weather. "But what aggravated the situation was"—a circumstance which one would suppose impossible in an army where the least discipline existed—"the tents were filled at times with *marauders*, who, escaping the guards, and in disregard of all authority, crawled into them during the night to slip out at daybreak and recommence their life of vagabondage."

The straw was changed in these tents "as often as considerations of economy permitted;" but finally straw became so scarce that it became necessary "to allow it to become infected."²

Notwithstanding the unfortunate circumstances enumerated, the results appear to have been even more than satisfactory. The surgeon in charge, M. Leplat, reports but 176 deaths among 5,500 treated for wounds as well as diseases. Relatively to the number treated the mortality was small. M. Leplat observes:—"We had hospital gangrene and purulent infection, as they were everywhere; but these complications were only seen in cases of extensive wounds or after capital operations. Hospital gangrene seemed to yield readily to applications of perchloride of iron. *Never have we felt the ill effects of overcrowding; never did any febrile affection take on the form of petechial typhus.* Nor was any one of the surgeons or nurses attached to the ambulance attacked by this disease, the propagation of which among the *personnel* of hospitals is unfortunately too common."³ And that full value may

¹ "I have often heard the poor sick soldier complain *while lying upon the straw*. It is perhaps, nevertheless, the most desirable as well as the most hygienic kind of bedding, where overcrowding may give rise to fears of infection." (Note, p. 203, op. cit.)

² Ibid. pp. 277, 160.

³ Ibid. pp. 346, 347.

be given to the final statements, it should be remarked that typhus appeared with considerable severity in a number of the hospital establishments of Metz during the siege.

But having presented the essential facts connected with the tent ambulance organized at Metz, I will here reproduce the leading conclusions which M. Grellois draws from the experiment.

"A hospital built of stone, well constructed according to certain rules—according to certain forms and dispositions, interior and exterior, determined by hygiene and the art of construction—is assuredly the best asylum that one can offer to the sick and wounded.

"Buildings exceptionally used as hospitals, having been constructed for other purposes, are generally defective. Nevertheless, there are many degrees between the good and the bad.

"I know not why certain hygienists reject in a general way the dormitories attached to lyceums, boarding schools, and seminaries. A certain infatuation has lately taken possession of physicians in favour of barrack hospitals. The results obtained in America by this mode of hospitalization are seductive, I confess, but they have not led me away. The army of the United States was exempt from epidemics due to infection, and the credit of this has been attributed to the practice of placing the wounded in barracks. Had the wounded been placed in good stone hospitals, would they have been less fortunate? I do not know, but I think not.

"Barracks have but a single advantage; it is an important one—it is the rapidity with which they can be built.

"In the summer, barracks are disagreeable to live in; in the winter they are utterly uninhabitable. The single board which separates the inside from the outside is not a sufficient non-conductor of heat. In cold weather the stoves are barely able to maintain a supportable temperature even for those in their immediate vicinity. The pine wood generally employed in these constructions is one of the most hygrometric of woods; it imbibes moisture and sweats it out within the barrack; it swells, and then so contracts when it becomes dry as to leave openings between the boards.

"The floor is subject to the same inconvenience, and opens

passages to the wind from without, and to liquids from within which soak into and contaminate the soil; and it makes little difference in this respect whether the floor is laid directly upon the ground or fifty centimetres above it, as was the case in the pavilions erected at Metz.

"A roof made of boards is bad from every point of view. Is it to be covered with zinc? It then becomes a good shelter against rain, but it augments the inconveniences of the heat and of the cold. With regard to infection—a matter that particularly interests us—the barrack, however it may be constructed, is bad. To resume, barrack your sick and wounded when you are forced to, but be careful not to do it in bad weather.

"Tents have had and still have their warm partizans. These people, I believe, have never inhabited a tent. As a very last resort, or in some exceptional cases, I admit it; but this sort of shelter, whether it be for well men or sick men, is very far from having my sympathies. The inconveniences resulting from atmospheric influences are felt to the very highest degree under tents. Shall I point out the grave inconvenience occasioned by the wind coming up in gusts under the canvas, and covering the food with dust and everything it brings along with it?

"The tent is *no less* than the barrack subject to infection. The canvas imbibes miasms with great facility, and the soil which it covers is soon contaminated with morbid products of every sort."¹

Such are the conclusions which M. Grellois draws from the experiment at Metz!

A number of the ambulances organized at Paris by the "Société de Secours aux Blessés" were sent into the field provided with a few tents. These tents were designed to be used on the field as a shelter while the first dressings were being made, or, in case of an emergency, to be used as an *annex* to some sedentary hospital. They were, however, not constructed with reference to a winter service, and disappeared with the coming of the first frosts. Nevertheless, it may be remarked that M. Le Fort, who served as surgeon-in-chief of one of these

¹ Op. cit. pp. 194, *et seq.*

ambulances, does not hesitate to affirm that the tents answered admirably so long as the season permitted them to be occupied.

In Germany, where the tent and tent-barrack system of hospitalization was first applied in the summer of 1862, no serious attempts have been made to use tents during the winter months. The German tents are generally very large, heavy, and difficult to transport, and tent-barracks have been thought to possess most of their special advantages.

The common practice among the Germans during the late war was to establish the field ambulances in the nearest buildings, from which the sick were evacuated to the rear as speedily as possible. Tent hospitals were rarely employed except quite in the rear of the active armies, and such hospitals were almost without exception closed on the approach of winter, the sick being transferred to buildings of various kinds, which had been turned into hospitals, or to barracks constructed as described in the First Part of this Report. Indeed, so far as I am able to form an opinion from the reports which have come to me concerning the German field hospital service during the late war, there was a decided preference from the outset for some sort of barrack, whenever a hospital was to be especially constructed. The German army took the field almost wholly unprovided with tents of any kind; and if unable to find houses suitable, or in sufficient numbers to serve as a temporary shelter for the sick, huts were constructed, in the most hasty manner, of rough boards; they were often unprovided with windows, but were capable of being opened on the sides all the way around by means of *louvres*, or movable walls.

Where a more permanent establishment was proposed, either tent-barracks were employed such as I have described in the Second Part of this Report, or recourse was had to well-constructed wooden barracks, similar in all their more essential characteristics to those so extensively used in the United States during the War of the Rebellion. In fact, Fischer, who has been one of the most prominent German advocates of the open-air treatment of the wounded, strongly urges the importance of using barracks and *barracks only*, for sedentary hospitals:—"We can only commend the barracks," he writes; "they possess in the summer all the

advantages of tents ; they are less hot within, and the ventilation is much better ; they protect the sick better in bad weather, and they can be put up in a month or six weeks, which is the time generally occupied in preparing for war.”¹

Says Captain Galton :—“ The want of suitable hospitals has led to the erection of a large number of temporary buildings of wood, as well as to the use of tents. Neuwied, Frankfort, Mannheim, Heidelberg, Darmstadt, and Aachen, afford some very good examples of hospital wards of this nature. In all these the effect has been to give the patient as much fresh air as possible. The sides are in many cases capable of being entirely opened, and are so kept. Along the ridge is a very large space devoted to the admission of air. Where the sides are continuous and there are windows, a large opening for fresh air is reserved along the eaves, and frequently along the floor. The floor is raised from 2 ft. to 4 ft. off the ground. In a few cases only are the arrangements for the removal of foul matter so perfect as they should be. There are no doubt exceptions to this good form of ward construction, but the general result will, I believe, form an era in hospital building. I must, however, add, *I saw with regret some of the best being prepared for the winter in a manner to prevent any access of fresh air.* The surgeon of one hospital at Mannheim said he would prefer to keep the wounded in the open air till December, but that the nurses would not stand the cold.”²

It would be impossible to convey more clearly the general German opinion, with regard to the expediency of placing the wounded under a canvas shelter during the winter, than by quoting the statement of Miss Lees :—“ Also, I must add,” says she, “ that whilst attention is paid to hygiene in France, so far as my experience goes it seems to be ignored altogether in Germany, where most military hospitals had *double windows*,

¹ Fischer, quoted by Demoget and Brossard in “ *Étude sur la Construction des Ambulances Temporaires.*” Paris, Alfred Cerf, 1871 ; p. 127.

² “ Report of the British National Society for Aid to the Sick and Wounded in War.” London, 1871 ; p. 58. Here is a case in which a hospital was avowedly, and in spite of the preferences of the surgeon, fitted up *for the nurses*. The misfortune is that, nine times out of ten, the interests of the sick are thus sacrificed in compliance with the wishes of these people.

which in cold weather were never allowed to be opened (!), and where, when they adopted the American wooden barrack system (as at Berlin, Frankfort, Nancy, &c., for reserved lazarettes), they carefully had all the windows *nailed up* at the commencement of winter, leaving only one or two small ventilators movable at the top of the building. At Nancy (where temporary wooden barracks were erected, at an expense of 36,000 florins, for fevers and contagious diseases) the air was so utterly foul and corrupt that a feeling of utter nausea came over me each time I entered one of them. Upon asking if they *never* opened any of the windows, I received a look of indignation and surprise, and was answered, '*Of course* we do; that is to say, the windows themselves are nailed fast to prevent draughts; but there are ventilators in the roof, and we open one or two of them every day *for one and sometimes even two hours.*' This was in February, and they found it difficult to heat them to the degree which German surgeons generally think necessary."¹

Admitting this statement to have been somewhat exaggerated, any one, who is acquainted with the popular prejudices that prevail in Germany and Northern Europe upon the subject of draughts and cold air, will understand the many practical difficulties in the way of conducting an experiment in hospitalization, an essential condition of which is that an almost unlimited supply of fresh air shall be given to the sick. In matters of hygiene German theory is certainly greatly in advance of German practice. Theoretical considerations have determined the construction of numbers of tent-barracks and barracks, very admirably arranged for the hospitalization of the sick. Such establishments have been successfully used in the pleasant portions of the year; but their employment in the winter has scarcely been regarded with the favour one might expect from the excellence of the plans adopted; and one of the principal reasons has been that, with every means for obtaining an abundance of fresh air, there has existed an exaggerated fear of the evil effects which might result from its admission.

Barracks prepared for the winter as Captain Galton and Miss

¹ Op. cit. p. 172.

Lees have described are probably inferior even to common houses, and there could be but little occasion to have recourse to them except in the absence of such houses.

The British Aid Society chose to employ its vast resources rather in aid of the hospitals established by the belligerents than in attempting to organize hospitals of its own. In fact, but one ambulance was sent out from England under its direction. This, known as the "Woolwich Ambulance," was equipped in the most complete manner. Among an immense quantity of stores were included "twelve hospital marquees complete, with water-proof flooring, and twenty-one bell-tents for *personnel*, officers, kitchen, and latrines."¹ But from some cause, probably the lateness of the season, the tents never appear to have been used. Indeed, the only allusion to these tents the chief surgeon makes in his report, relates to a bell-tent "of great service" as a lodging-place for the servants, and he adds, "the only tent in the Prussian division" to which he was attached.

If European opinion has, upon theoretical grounds, been unfavourable to the establishment of tent hospitals during the cold months of the year, European practice has furnished no example within my knowledge of such an establishment, except it may have been determined by the absolute impossibility of obtaining other or sufficient shelter, and for the purpose of meeting an immediate and temporary necessity.

In the United States, at the outbreak of the War of the Rebellion in 1861, everything had to be provided for. The Federal armies were about to operate in regions of the country sparsely inhabited, where the shelter constructed was often scarcely sufficient even for the necessities of the resident population. To supply an anticipated deficiency of available permanent shelter, tents were not only liberally issued to the troops, but were given out with an equal liberality to meet the wants of the medical service. To a regiment of 800 men three hospital tents were allowed, each capable nominally of sheltering eight men, while in addition each division surgeon had placed under his

¹ Op. cit. p. 126.

control a considerable number of reserved tents, for the purpose of enabling him to establish a division hospital should it be necessary.¹ In addition to these liberal provisions in view of the immediate necessities of the troops in the field, arrangements were made for the establishment of "General Hospitals," on a more permanent basis; during the first months of the war, in large public and private buildings, and afterwards in wooden pavilions or barracks.

During the winter of 1861-62, tents were not used, at least in the army of the Potomac, except for the regimental hospital or infirmary; in this hospital only the slightly sick were treated—the severer cases being almost without exception transferred to the division or general hospitals established in buildings at Washington or in its vicinity. The regimental hospitals were heated as a general rule by simple sheet-iron cylinder stoves, the fuel used being wood; and the difficulty of maintaining a comfortable and uniform temperature within them was a subject of frequent complaint on the part of the attending surgeons. Filling, as I did at the time mentioned, the office of an Inspector for the United States Sanitary Commission, and having had occasion in that capacity to visit the hospitals attached to more than 100 regiments, I think I may say with truth that I never heard the tent hospitals spoken of as other than most unsatisfactory places within which to treat the sick. The discomfort occasioned by the ever-fluctuating temperature within them was an objection, at that time unmodified by any opinion based upon a comparison of the mortality rates obtaining in tents and permanent hospitals, among those sick with the same diseases. It was only after the opening of the Peninsular Campaign, in the spring of 1862, that division and general field-hospitals under tents were employed in the army of the Potomac. They soon began to be favourably regarded, especially for the treatment of the wounded, and were established at a number of convenient points in the immediate vicinity of the field of military operations.

¹ A division, in the Federal army, consisted of two or three brigades, and a brigade of "two or more" regiments. The average full strength of a division may be estimated at about 8,000—men and officers included.

One of the largest hospitals of this kind was organized by Dr. John Swinburne at Savage Station on the 27th of June. Over 2,500 wounded were there treated with most excellent results, as compared with those obtained among the wounded of the same army who had been "evacuated" into the general hospitals established in buildings at Fortress Monroe and elsewhere.¹ Again, after the battle fought at Antietam, September 17th, 1862, a considerable portion of the wounded, who were nearly 12,000 in number, were treated under tents, with results much more satisfactory than those obtained in the churches and farmhouses near the field of battle, or in the sedentary hospitals at Hagarstown and Frederick; and yet many of the tents were maintained, without being provided with heating apparatus, throughout the month of October and a part of November, until in fact nearly all the wounded had been discharged as cured, or had so far recovered as to be in a condition to be transferred to some convalescent hospital. It should be observed that the weather, although at times frosty during the months of October and November, was at no time severely cold.

The only serious attempt made during the War of the Rebellion, which I now remember, to treat the wounded under tents during the winter season, was made in December, 1862. The army having reached Fredericksburg, in anticipation of a battle, a large number of tent hospitals had been established on the right bank of the Rappahannock. After the unfortunate battle which occurred on the 13th of December, most of the wounded were brought immediately to these hospitals. The weather was very severe, both cold and stormy; and the difficulty of keeping the long tent pavilions properly warmed with stoves induced the Medical Director to convey the wounded with the least possible delay to the general military hospitals at Washington and Point Lookout. Two weeks after the battle occurred nearly ten thousand wounded had been thus transferred.²

¹ Since this passage was written, Dr. Swinburne has informed me that the hospital was established upon an old camping ground—a bad location—but that he had no case of hospital disease, while gangrene and pyæmia were at this time the causes of a large mortality in the hospitals in the rear, established in buildings.

² "History of the United States Sanitary Commission." Philadelphia, 1866; p. 371.

Several instances might doubtless be referred to in which small tent-hospitals have either been established or maintained during the winter season in the United States. It was generally the case, however, that these establishments owed their existence either to the comparative mildness of the winter climate in a considerable portion of the country, or to the impossibility of obtaining near by what might have been considered better shelter. To a few of the general military hospitals an *annex* of tents was made, which was maintained all the year round; as, for example, at the Lincoln Hospital in Washington. These tents were heated with stoves during the winter, but they were almost invariably reserved for cases which, for special reasons, it seemed desirable to isolate. The results obtained in them, if satisfactory, never, however, seem to have induced any one to suppose that during the winter season the treatment of the sick and wounded in general could be conducted more successfully, or even as successfully, under canvas, as within the wooden barracks of the general military hospitals.

Indeed, one of the special characteristics of the tent-hospital in the American army was its want of permanency. It suddenly made its appearance on the eve of a battle, was maintained for a few weeks until it had fulfilled its mission, and then, joining the column of the army to which it was attached, reappeared, if necessary, on some new field to render a like service.

In brief, American opinion, derived from the experience obtained during the War of the Rebellion, may be expressed as follows. The treatment of the wounded under tents during the milder portions of the year is followed by the very best results; cases of pyohemic poisoning are less likely to make their appearance within them than even within wooden barracks, however well constructed. During the colder portions of the year the special advantages of tents are more than compensated for by special disadvantages, such as render it generally expedient to place both sick and wounded under the shelter of more permanent constructions.¹

¹ If there were over two hundred permanent hospitals established, mostly in wooden pavilions, constructed expressly to be occupied by the sick and wounded, the



FEEL confident that the facts and the opinions, both European and American, which I have presented, will convince you that in proposing to establish an ambulance under the shelter of canvas, not simply as a temporary, but, if necessary, as a permanent installation, we acted almost, if not entirely, without precedent. And I believe you will be equally convinced that the successful maintenance of our ambulance during the whole period of an exceptionally cold winter in a besieged city, where the general suffering from a want of fuel was even greater than that occasioned by the want of food—where, subjected ourselves to the supreme necessities of the siege, we were often forced to see our fires go out without the possibility of renewing them—has at least shown that, contrary to the common opinion, the use of tents is not necessarily limited in temperate climates to a few months in the year. I have said that our tent-hospital was established on the avenue de l'Impératrice, because we were convinced that tents might be employed alike in winter and in summer in all temperate latitudes. I also said something more—I said we

fact at first would seem to militate against the accuracy of my statement as regards American opinion concerning the use of tents even in the summer months. But I may here observe that, while sanitary considerations are always of the greatest importance in the construction of a hospital, motives of general convenience may oftentimes determine the character of the establishment.

Another reason which encouraged the creation of barrack-hospitals in the United States, was the fact that, in a country abounding in lumber of every kind, it was frequently found to be much cheaper to build a barrack than to buy a tent.

While having no reason to change my statement concerning American opinion regarding the use of tent-hospitals, it is only justice to Dr. Wm. A. Hammond, to whom, more than to any other man, the American army was indebted for its hospital system to state that since these pages were written I have found in his work, "On Hygiene," the general affirmation that "nothing is better for the sick and wounded, winter and summer, than a tent or a ridge-ventilated hut."

proposed to erect our tents, believing them to be *better* fitted at all seasons of the year for the treatment of the wounded than more permanent constructions. This evidently was the most important part of our proposition; and whatever originality we may ever be credited with, admitting our experiment to have succeeded, will depend, first,—upon our having had the courage to refuse the numerous convents, hotels, and palaces which were generously placed at our disposition, and the audacity—if I may use so forcible a word—to establish our ambulance for the winter under canvas alone; and, secondly,—upon the means used to make our establishment one suitable for the treatment of the wounded—so suitable as to have been at the time warmly commended by nearly all those who visited it, as also to have been pronounced by the Governor of Paris “*une ambulance modèle*.”

In view of the many accidental and exceptional difficulties incident to a siege, which were constantly embarrassing our efforts, the results of the experiment have shown more completely than we had the right to expect the advantages which may be gained by the treatment of the wounded under canvas at all seasons of the year. While no ambulance or hospital existing at Paris during the siege, in which any considerable number of wounded were treated, escaped an invasion of hospitalism in some one of its forms, the immunity from this evil was in ours so complete as to have enabled our surgeon-in-chief to state in his report:—“There have been no well-marked cases of pus-poisoning.” He also reports that, having performed seven amputations of the thigh, three were followed by complete recovery, and that:—“Among the *two hundred and forty-seven* surgical cases treated at the ambulance, there were *one hundred and twenty-six* cases of *compound fracture*. Notwithstanding this great number of fractures, and the causes prejudicial to health and convalescence previously mentioned, only *forty-seven*, or a little over 19 per cent., have died of their wounds.” Certainly no better results were obtained elsewhere in Paris.

Nevertheless, our success was not more remarkable than that which may have been obtained by others who have preceded us in the use of tents. M. Michel Lévy, speaking of the experiment at Varna, says:—“While at the general hospital, from the 10th of

July to the 18th of September, 1854, there were 1,389 deaths among 2,314 cholera patients; that is to say, 100 deaths for every 166 sick; in the three tent-hospitals established at the same time, there were but 698 deaths out of 2,635 cholera cases; that is to say, 100 deaths for every 376 sick. During the time the cholera patients were being treated in the tents not a single new case occurred."¹

Chantreuil, after having observed that it was quite impossible to judge of the influence of tent hospitalization upon the wounded in the Crimea, on account of the little time the wounded remained under canvas—it having been the custom to evacuate them as speedily as possible on to other hospitals—nevertheless says:—"Quesnay and Pirogoff are in accord with M. Lévy in admitting that the accidents to which surgical cases are exposed were less numerous in tents than in the hospitals, or *even in barracks*."²

Chantreuil also refers to certain experiments made by Kraus in Hungary. That writer, it would appear, reported in 1861 that he had not only never seen a case of hospital gangrene developed in a tent, but that the wounded attacked by this affection, when placed under such shelter, rapidly recovered.

Says Dr. Hammond, in a work published during the War of the American Rebellion, and while the author was Surgeon-General of the Armies of the United States:—"It will, perhaps, not be out of place again to insist on the great advantages of these temporary field hospitals over those located in permanent buildings in towns. Nothing is better for the sick and wounded, winter and summer, than a tent or a ridge-ventilated hut. But in one instance that has come to my knowledge has hospital gangrene originated in a wooden pavilion hospital, and in no instance, as far as I am aware, in a tent."³

¹ "Bulletin de l'Académie de Médecine," 1862, p. 617.

² Chantreuil, *op. cit.* pp. 26-27.

³ Hammond, "Treatise on Hygiene." Philadelphia, 1863; p. 355. Parkes, in speaking of air rendered impure by exhalations from the sick, observes that:—"It is now well known that by the freest ventilation, *i.e.* by treating men in tents or in the open air, hospital gangrene can be entirely avoided. The occurrence of hospital gangrene in a tent is a matter of the rarest occurrence."—*Practical Hygiene*, p. 106.

Fischer, Roze, Boerwindt, Stromeyer, and other German surgeons, have indicated the very excellent results obtained when the wounded and those sick with typhus were treated in the open air, or under the shelter of tent-barracks.¹

Boerwindt had established at Frankfort-on-the-Main, in the summer of 1866, three tent-barracks each containing fourteen beds. These were occupied from the 22nd of July until the 2nd of October by eighty-eight different patients, among whom were fifty-three cases of wounds and thirty-one of typhus. During this period of time four of the wounded died, while of those ill with typhus three died, showing a mortality from wounds of 7·5 per cent., and from typhus of 9·6 per cent. Of forty-seven cases of wounds implicating the bones, and occasioned by fire-arms, forty-two recovered; and yet these cases were more than usually grave. There were *two* wounds of the head, followed by trephining; *two* penetrating wounds of the lungs; *two* of the pelvis; *two* cases of excision of the shoulder, and *two* of the elbow; *five* wounds of the thigh, with lesions, more or less grave, of the femur; *two* wounds of the knee-joint, with one excision; *nine* wounds of the leg, with one amputation; and finally, *five* amputated—one a case of amputation of both thighs—who had been removed from the hospitals of Obermain to the tents at Frankfort.

Chantreuil very justly remarks:—"If we think of the gravity of all these cases, of the miasmatic exhalations which must have come from the liquids bathing the surfaces of these wounds, the sloughs, and the dejections, one can understand how only an abundantly renewed aëration could have prevented the formation of sources of infection; and when we see the success obtained among these wounded, who seemed placed under circumstances the most unfavourable—the cures accomplished of cases which the experience of ordinary hospitals would lead us to consider as hopeless—one is almost forced to attribute the difference in the result to the difference in the nosocomial conditions."²

¹ "Étude sur les Hôpitaux sous Tentes." Schatz, Paris, 1870; p. 57.

² Chantreuil, op. cit. p. 35.

The results obtained by Boerwindt were certainly very remarkable, and were apparently even more conclusively in favour of the open-air, tent, and tent-barrack treatment, than the results obtained by us at the avenue de l'Impératrice.

Two facts, however, must be considered in comparing our results with those obtained elsewhere:—

1st. The respective general hygienic conditions to which the inmates of the several ambulances were subjected.

Our surgeon-in-chief has himself very clearly pointed out in his report the causes of disease which after the 1st of December began to weigh heavily upon the whole population of Paris. The army was especially exposed to these depressing influences, which seriously diminished the probability of recovery in every case, whether of disease or of wounds. It was at this time that the mortality in the city of Paris rose from an average of 981 deaths per week, to an average of nearly 3,000 deaths per week, a mortality rate which still rapidly rose until even after the close of the siege. Dr. Swinburne says in his report:—"From the beginning of the siege to the 30th of November above *sixty* wounded men were treated; of these but *two* died, and the immediate cause of their death was tetanus." If this statement is remarkable, it is certainly not remarkable that as the general sanitary condition of the city grew less tolerable our results became less favourable; that, in a word, when we closed our ambulance on the 26th of March, 1871, we were compelled to acknowledge that our mortality rate had amounted to over 19 per cent.¹

¹ The increase in the death-rate as the siege continued is strikingly evident in the returns of nearly every ambulance. Thus in the ambulance established by the Administration of the ambulances of the Press, in the École des ponts et chaussées: In September, 26 wounded were admitted with no deaths; in October, 35 were admitted with four deaths; in November, 93 were admitted with eight deaths; in December, 45 were admitted with thirty-two deaths; in January, 77 were admitted with seventeen deaths; and in February, 2 were admitted with two deaths. "In the ambulance de la marine, in Paris, the rate of mortality among the wounded increased in each of the periods into which the siege was divided. Thus in the first, there were admitted 23 cases of wounds, of whom four died; in the second, 38, of whom eight died; and in the third, 41, of whom thirteen died; showing clearly that here, as elsewhere, the rate of mortality underwent progressive increase as the siege went on."

2nd. The period of time during which the ambulance or hospital may have been maintained, and the results of treatment subject to observation.

Mortality rates based on a month's experience at an ambulance are evidently worthless; and yet there are surgeons who do not hesitate to speak confidently of the results of treatment after a period of observation thus limited. Boerwindt admits that he lost *four more* of his patients after he removed them from the tents. It is certain, therefore, if 9 per cent. represented the rate of mortality which existed within his tent-barracks, 92 per cent. did *not* represent the rate of recovery; this would range between 92 and 87 per cent., according as the removal from the tent-barracks may or may not have acted as the determining cause of death in the four last cases. The American ambulance was in operation more than six months, and no person reported "cured" died afterwards from his wounds at the ambulance, nor has any such person since died from his wounds *elsewhere*, within my knowledge.

A cause of great uncertainty in appreciating the statistics of most ambulances and military hospitals is the pernicious practice of evacuating the sick from one to another. Of the 1,545 French soldiers who died after amputation of the thigh during the Crimean War, nearly one-half died *en route* to some hospital, and nearly the whole number died after having been "evacuated." What a relief to certain hospitals—the elimination of these frightful figures from their mortality records!

But the vitiating effect of this practice upon statistics is special as well as general. For example: 436,144 cases (of wounds and disease) were entered at the French hospitals during the Crimean War. The losses of the army by death were 95,615; deducting those killed in battle or who died before coming to the hospitals, the deaths amounted to 80,639, or 18·50 per cent. of the cases entered at the hospitals. But, says Chenu:—"The reported number of cases entered does not represent the real number of the wounded and sick, which did not exceed 225,000, since many of them, taken first to an ambulance and thence evacuated into one of the hospitals of the Bosphorus, and from thence to Gallipoli, Nagara, or even to France and Algiers,

figured in the tables of every hospital establishment attached to the army of the East." Now let us suppose a case: A hospital receives five soldiers wounded in such a way as to require in each instance an excision of the head of the humerus; the five soldiers are treated in this hospital during several weeks, at the end of which time we will suppose them all to have died. The records of this hospital would show the mortality after excisions of the head of the humerus to have been 100 per cent. If, however, these five cases had been so evacuated as to appear in the records of five different hospitals, although each case had proved fatal, a consolidated report might show that there had been twenty-five cases of excision of the head of the humerus, and but five deaths; or, in other words, that the average mortality in such cases had been 20 per cent.

The surgical statistics of the Crimean War published by the English Government are among the most valuable with which I am acquainted, and yet they are vitiated to a considerable extent by the causes alluded to. Thus 12,094 wounded officers and men were during the war received into the hospitals in the Crimea; of these 1,840 died, or 15·2 per cent., and 3,573 were *invalided* home; that is to say, 29·5 per cent. were sent home more or less cured. Chenu expresses some curiosity to know what may have been the mortality among this class of cases after they were sent from the hospitals, a curiosity probably rather increased than diminished by a statement made in an obscure foot-note attached to one of the published tables, viz., "*A very large proportion* invalided returned to duty subsequent to their arrival in England." Of the 3,573 men sent home, "thirteen men and three officers died on the passage;" but the statement is almost incredible, that "only *four* deaths took place among men under treatment for wounds in the general hospitals after their arrival in this country," unless the proportion of these men who reported themselves at the "general hospitals" for treatment was relatively small.¹

Indeed, it is far more difficult than one may at first suppose

¹ "Medical and Surgical History of the British Army during the War against Russia." London, 1858; vol. ii. pp. 259, 388, 389.

to find in the records of military surgery statements of those final results from which alone satisfactory conclusions can be drawn. Sometimes the period of observation has been too brief, sometimes the evacuations have been so numerous as to invalidate the tables ; and often these two causes of inexactness are so combined as to render hospital statistics worthless in many respects. Thus we are told that at the French military hospital at Dolma Bagtché, 2,753 wounded were treated from the 1st of May until the 1st of November, 1855; that 741, or 27 per cent., had died of their wounds before the 1st of November; and that 2,009 had left the hospital by "billet" or "evacuation" (73 per cent.).¹ Now this statement gives no idea of the proportion of deaths and recoveries among the wounded ;—741 *had died before the 1st of November*; how many died afterwards? This is the important question. It is as useless to tell us that the hospital at Dolma Bagtché "offered conditions of salubrity more satisfactory than several of the other hospitals near Constantinople," as it is to inform us that the wounds there treated were of more than usual severity. These were conditions which doubtless influenced the results; but *what were the results?*

The ambulance opened at the "Corps Législatif" on the 19th of September, and closed on the 31st of January, 1871, was one of the most successful ambulances in Paris. The total number of the wounded treated there, during the four and a-half months it remained open, was but 136, and the ambulance was closed about the time the causes influencing the general health of the city had reached their maximum development. In the report of the Director, published January 31st, 1871, twenty-one deaths are detailed, showing a mortality rate of 15·5 per cent. Of those who had been received at this ambulance, 115 are reported as "cured or convalescent." An analysis of the "état nominatif" annexed to the report shows, however, that nearly all the 115 persons, sent from this ambulance, were simply transferred in a condition of more or less complete convalescence to some one of the numerous ambulances of Paris.

¹ Salleron, "Des Amputations Primitives et Consécutives, Recueil de Mémoires de Médecine," &c. Deuxième série, vingt-deuxième vol. Paris, 1858.

It is hardly necessary, except for the purpose of showing how difficult it is to compare the results obtained in two ambulances, even admitting the wounds in each to have presented an equal gravity—that I should state that of the 136 wounded received at the “Corps Législatif,” forty-five came “from other ambulances.”

Now, what distinguishes the statistics of our ambulance, what gives to them an especial value, is the fact that they relate to cases under our care from their beginning to the end. We received no wounded man from any ambulance, and we sent no wounded man to any ambulance. Those who left our ambulance left it either cured or dead.

Four amputations of the thigh had been made on or previously to the 23rd of October; before the end of the following month *three* of these cases might have been discharged as “cured.” We preferred, however, to retain them under our care four months longer, until the closing of the ambulance, although, as every surgeon knows, by so doing our statistics were in constant danger of being seriously damaged.

In the almost complete absence of official reports from those who may have had the direction of ambulances and hospitals during the late war, it is impossible for me to establish many comparisons between the results obtained in them and those obtained by ourselves. It may be of interest, however, to make a few additional comparisons, which, fortunately, I am able to do.

The ambulance “Rothschild” was opened at Paris early in October, 1870; its hygienic conditions were exceptionally good:—“A building erected the year before, but which had never been occupied, was arranged in the following manner: On the ground-floor were six large rooms containing fifty beds; on the second-floor were twenty-five beds in twenty-five rooms, quite isolated from each other; on the third floor were also twenty-five beds, distributed as on the second. Arrangements were made that a certain number of beds should always be vacant, that the bedding might be aired, and overcrowding avoided.” The hospital was established on high ground near the Bois de Vincennes. “At no time during the rigorous winter, notwithstanding the scarcity of fuel, did the rooms cease to be suitably warmed by furnaces, while the ventilation was as complete as could be wished.” As

for the kitchen, "by reason of our abundant supplies we were able to furnish vegetables, both fresh and dried, long after they were exhausted elsewhere." At this ambulance—certainly one of the best in Paris—fifty-six wounded soldiers were treated during the siege; of these ten are reported as having died of their wounds—a mortality of 17·9 per cent. But several important facts should be considered in appreciating this result. The wounds were generally not severe. Thus, there were seven cases in which the wounds were produced by fragments of shell, and *all recovered*; indeed, four of these wounds were only contusions. "Most of the severely wounded were kept at the central military hospitals; from these were sent out to their dependent ambulances those cases which seemed, in appearance at least, most transportable." Still four capital operations were performed—three amputations of the arm, and one resection of the humerus; all these operations resulted fatally. But the most remarkable statement is the following:—"All the wounds *involving the bones*, except of the fingers and toes, proved extremely grave; but *two thus wounded recovered*. In one case there was only an erosion of the external border of the humerus; in the other, a comminuted fracture of the cubitus and radius."¹ Of the ten deaths, eight were ascribed to *purulent infection*; two were from tetanus.

An ambulance was established by the Administration of the ambulances of the Press in the École des ponts et chaussées—a building containing nine large halls, fronting upon a garden and a court-yard, with windows opening to the east and west, and occupied by seventy-six beds. This ambulance was exclusively devoted to surgical cases, and was under the immediate personal direction of M. Demarquay, the surgeon-in-chief of the ambulances of the Press. A special room was also here set apart for M. Guérin, who was promising magnificent results from the treatment of wounds by the occlusion of air—*l'occlusion pneumatique*. The ambulance received its first patient on the 24th of September, 1870, and was closed on the 1st of February following—a considerable number of the inmates having then

¹ Dr. Job, "Ambulance de l'Hôpital Rothschild pendant le Siège de Paris, 1870-1871." Delahaye, Paris.

been transferred to the barrack-hospital at Passy. During this period the ambulance received 281 wounded; of which number 63, or 22·4 per cent., had died—before the 1st of February. Of sixteen wounds of the upper extremities, involving the bones, thirteen proved fatal, and the immediate cause of death in each case was attributed to pyæmia.¹

In speaking of *one* of the ambulances of the Press, Dr. Gordon says:—"There were thirty-five cases of wounds of the thigh; of these, twenty-five simple, and no deaths; complicated, ten, and ten deaths." And he observes, in commenting on wounds of this class:—"In cases involving fracture of the femur, the object sought to be attained was to preserve the limb; unfortunately, however, the results—at least in hospitals and appropriated buildings—were little favourable, although, with the advantages possessed by the American ambulance, the success was relatively considerable."²

From the 19th of January to the 24th of June, 1871, there were received into the barrack-hospital at Passy, 1,486 wounded; of these 347 died, or 23·3 per cent.

These returns unquestionably represent very fairly the mortality rates existing in the ambulances at Paris during the siege, at least wherever severe wounds were treated. In several of the large hospitals the death rates *are said* to have been much higher than any here given. That they were so has never been denied, and the evident anxiety to conceal the facts, in certain instances which might be mentioned, furnishes us with all the confirmation of the truth of the statements referred to, which is practically necessary.

The "First ambulance" of the "Société de Secours aux Blessés" established a hospital at Metz on the 21st of August, which was maintained until the 28th of October. "Of the 250 wounded there treated," says Surgeon Liegois, "ninety-six died (38·4 per cent.); perhaps the number was greater, for when we left we transferred eighty-three of the wounded to the military

¹ "Les Ambulances de la Presse." Paris, Baillière, 1873; p. 60, *et passim*.

² "Lessons on Hygiene and Surgery from the Franco-Prussian war." By Charles Alexander Gordon. London, Baillière, 1873; p. 149.

hospital. As may be seen, the mortality in our little ambulance was considerable—I shall even say frightful; but if I may judge from the conversations I had with a great number of surgeons at Metz, it was not so great as that existing in many other hospital establishments in that city. Among the causes of death I shall mention first *purulent infection*. This cause carried off three-fourths of our wounded; afterwards came dysentery, diarrhœa, typhoid fever, gangrene, and tetanus.”¹

Dr. Gross informs us that during the siege of Strasbourg (from the 12th of August to the 27th of September) 383 wounded men, women and children were received into the civil hospital of that city; of this number 146 died of their wounds, or 38·12 per cent.² Among the men the mortality was 41·7 per cent., among the women 40·3 per cent., and among the children 26·4 per cent. One of the immediate causes of death is said to have been *erysipelas*, which, however, only made its appearance towards the close of the siege, “when it attacked a considerable number of the wounded.” *Septæmia* was common:—“A large number of my severely wounded,” says Dr. Gross, “were speedily taken off by acute poisoning of the blood. Eleven died of pyæmia.” *Tetanus* was observed four times, and resulted in three deaths.

The hospital in which the wounded were received offered the ordinary conditions of a civil hospital, although at times the wards were somewhat overcrowded. Two circumstances, doubtless, contributed largely to the high rate of mortality in this hospital. First,—The character of the wounds, which were occasioned for the most part by shells, bombs, and shrapnels; and, secondly,—The nervous excitement and moral depression which resulted not only from the siege, but from the exposed position of the hospital itself; this was struck no less than *thirty-eight* times by shells, between the 23rd of August and the 27th of September.

In several important respects, however, the wounded in Stras-

¹ Liegeois, “*Première Ambulance Voluntaire*.” Victor Masson, Paris, 1871; p. 18.

² “*Notice sur l'Hôpital civil de Strasbourg pendant le Siége et le Bombardement*,” par le docteur F. Gross. Paris, 1872.

bourg suffered less than those in Paris. While, as Dr. Gross says, "the alimentation differed in no respect from that in ordinary times," few of the wounded had been previously exposed to the depressing influences of military service, and the city capitulated before cold weather had begun to act upon the general population as a predisposing as well as a direct cause of mortality.

M. Stutel, in his "*Histoire de l'Ambulance du petit Séminaire de Strasbourg*,"¹ reports the entry at that establishment of 215 wounded, with fifty-two deaths, or a mortality rate of 24·2 per cent.

The buildings occupied by this ambulance were of recent construction, and the wards are said to have been large, airy, and susceptible of an easy and abundant ventilation. "Food never failed for a moment to be abundant—was ample during the whole length of the siege." But here again the effects of the bombardment were often painfully felt, and on one occasion compelled the transfer of all the wounded to the cellars of the establishment. Still, M. Stutel observes that:—"After this time the men were in a certain way habituated to this kind of life," and there was little evidence of any special nervous excitement or depression from the cause alluded to. "We had, nevertheless, and notwithstanding our entirely exceptional hygienic conditions, to contend against the most terrible complications of military surgery—hospital gangrene, purulent and putrid infections." Out of seventeen deaths which followed thirty-nine operations, fifteen are attributed to these causes. Three cases of tetanus are also reported, all having their habitual termination.

Says Dr. Gordon, in his "*Lessons in Hygiene*":—"During the late war the general results of operations have been very unfortunate; in some cases extremely so. Thus in one ambulance within Paris, although the wounded had the advantage of surgical skill of the highest order, the mortality numbered fourteen out of fifteen operations, including excisions, resections, and amputations; of these seven being primary with six deaths, and eight secondary, all fatal. With regard to the mortality

¹ "Thèse pour le Doctorat en Médecine." Paris, 1872.

elsewhere, we learn, from the reports of Ambulance No. 7, that in twelve cases of operations, including amputations, resections, and ligature, collected from Sedan, Balan, and Daigny, the mortality was seven, or 63 per cent. At Beaugency, the rate of mortality from operations of all kinds was 82·7 per cent.; at Asfeld, of sixty operations, including amputations and resections, thirty-five were fatal, or a proportion of 58 per cent.; and among the German wounded treated at the Château of Versailles, out of seventy-five capital operations the deaths were fifty, or 64 per cent.; the recoveries twenty-five. These rates of mortality are no doubt extremely high, in some instances at least higher than they were even in the hospitals of the Peninsular War; and it may be here observed, simply as a point of comparison, that according to the statistics given by Mr. Guthrie, of operations performed in those of Vittoria, Santander, Bilboa, Passages, and Vera, out of 584 cases of capital operations there died 287, or 49 per cent. Thus it is much to be feared that in this respect at least we have made relatively small progress in the art of saving life.”¹

It will be seen from these statements that the statistics of the surgery of the late war quite justify the popular opinion which prevailed in Paris during the siege, that recoveries were more frequent in our ambulance than elsewhere. Dr. Gordon himself, while deploring the high mortality rates which existed pretty nearly everywhere, seems to dwell with no little satisfaction on Dr. Swinburne’s cases of conservative surgery, and concludes his appreciation of our experiment in hospitalization by declaring that:—“Within Paris we had, however, in the American ambulance undoubtedly the most favourable results of any.”²

¹ Op. cit. p. 181.

² Surgeon-Major Wyatt, the colleague of Dr. Gordon in a special mission to the French army, under orders from the English Secretary of State for War, and who remained with Dr. Gordon in Paris during the siege. says, in a letter addressed to Col. Loyd Lindsay, and dated November 7th, 1870, (see Report of British National Society for Aid,” p. 57): — “There has been as yet no proper military ambulance constructed. The best model is that which the ingenious Americans display here, but that is by no means perfect.” *Perfect*—we never supposed it to be; *the best model*—that is all we have ever claimed it to be.



HAVE elsewhere said that the ratio of the mortality consequent on wounds in general invariably increases, in proportion as the respirable air of the apartment or *locale* in which the wounded are treated differs in its composition from the mass of the atmosphere at large. If most satisfactory results have followed the treatment of the wounded and sick in tent-hospitals, it has been principally because they are more completely capable than any other hospitals of a constant and natural ventilation. Formed of a tissue permeable to air and gases, the vitiated air within them is constantly passing out, and is constantly being renewed by fresh air, which enters not only through certain openings, but passes freely through the network of the covering itself. During a considerable portion of the year the doors may be opened, and the walls of the tent so raised as to enable the patient to pass many hours of each day in the open air. In the colder seasons, when it may be necessary to warm the tents, the air within them may be maintained even more constantly pure ; since whenever the temperature of the air within a tent is raised to a degree above that of the air without, the air within the tent begins to escape, or rather is forced into the surrounding atmosphere, from which in turn it is necessarily renewed ; and the rapidity of the outgoing and ingoing currents of air will increase with the difference existing between the temperature within the tent and the temperature of the atmosphere at large.

This circulation is maintained partly through certain openings, some of which in a tent it will be found difficult to perfectly close. But (in my opinion) in cold weather, when the difference between the interior and the exterior temperatures is from 30° to 60° Fah., most of the vitiated air passes out through the tissue of the tent. However this may be, it is certain that at our ambulance, where we maintained a constant temperature of

about 60° Fah. night and day—when we had fuel—the atmosphere within the tents seemed to grow purer as the weather became severe. Never at any time was a persistent odour to be perceived in the tents, except that of tobacco smoke; and it may be interesting to observe, that while this odour clung to the tents during the mild days of the winter, it rapidly escaped whenever the weather was frosty.

I believe the greatest advantage, from a sanitary point of view, to be derived from the general use of tents in the hospitalization of the sick and wounded, depends upon the facility with which the atmosphere within them may be kept pure and wholesome, and the common results of overcrowding avoided.

Another very probable cause of the excellent results obtained in tents may be attributed to the circumstance of their occupants being constantly more or less exposed to the influences of direct light. When the sick are treated in the open air the influence of light upon them must be very considerable. How important a factor this agent may be among the several known to be indispensable, in order to have the best sanitary condition, it is difficult to say. We know, however, that without light the maintenance of health for any considerable time is impossible, and that its invigorating effects upon organic life in general bear a very constant relation to the directness or indirectness with which the light may reach it. If it be true that the light within a tent is not at any time, strictly speaking, direct sun light, the light within a white cotton tent not only is in great part direct light, but the light is stronger—the tent being in the sunshine—than it generally is in any room receiving its light indirectly, and by reflection, as nearly all rooms do. The light of common rooms is also for the most part polarized light—light which has acquired special and remarkable properties, and which must exert an abnormal influence upon those who are constantly exposed to its action.¹


Tent-barracks, in common with tents, are capable of being easily

¹ For facts and statements concerning the sanitary and physiological influence of light, I would refer the reader to a very interesting little work by Dr. Forbes Winslow, entitled, "Light; its Influence on Life and Health."

and naturally ventilated, and whatever reputation they may have obtained, they owe almost entirely to this fact. While, however, the air within a tent-barrack during the summer season may be kept as pure and free from odours of every kind as it may be possible to keep it within a tent, such is not the case during the winter. When the weather is cold and inclement, it is necessary to keep the walls closed. Tent-barracks are heated with stoves, and ventilation accomplished in connection with them, by means similar to those employed in the wards of common hospitals, is scarcely more complete.

The conditions under which the wounded were treated at our ambulance differed in no essential respect from those existing in the other ambulances at Paris, except in so far as the patients were more directly exposed to the influence of the open air. The food used by us was no better than that employed elsewhere; the medicines were the same, and the surgical treatment was essentially the same. It would be impossible to believe *a priori* that a more or less constant and complete exposure of patients to the open air should have no influence upon their health; that the more direct exposure of our patients to the out-door air did not unfavourably affect their health, the surgeon's report abundantly shows; indeed we all, who are familiar with the class of cases treated, are well convinced that it powerfully contributed to enable them to resist the depression occasioned by wounds, the want of suitable food, and the epidemic influence which for several months showed itself—less perhaps in an increased death-rate from semi-pestilential forms of disease, than in the enfeebled vitality and reduced powers of resistance exhibited by the whole population of Paris.



N the First and Second Parts of my Report I have had occasion to notice, with some detail, many facts very closely connected with the experiment made by us during the winter of 1870-71. It remains, however, for me to speak more at length of the general conditions under which the experiment was conducted, of the principal material characteristics of the ambulance, and of the arrangements special to it which I believe to have had the greatest influence upon the results obtained, or at least to be most worthy of notice.

SANITARY STATE OF PARIS.—Probably the most important condition which affected the surgical history of the American ambulance was the general sanitary state of Paris during the whole period of its existence. The surgeon's report reveals no fact more clearly than this ; indeed, it is the only condition between which and the surgical results it would be easy to prove a direct connection, the influence upon these results of nearly every one of the conditions special to the ambulance itself being only more or less probable.

The sanitary condition of Paris had become bad when we received our first patient, and it continued to grow worse rapidly, until in the month of January, when we were treating the largest number, it had become well-nigh pestilential. Improving slowly during the months of February and March, when the ambulance was closed, March 26th, the mortality among the general population was nearly three times greater than usual.

The average number of deaths in Paris for the week ending on the 11th of September, during a period of five years, the four years preceding, and the year following 1870, was 889. For the week ending on the 11th of September, 1870, it was 981. The excess over the average was wholly owing, however, to an epidemic of small-pox then prevalent, and which caused 116 of the deaths reported. Aside from this epidemic the general health of the city

was above the average from the 4th to the 11th of September, 1870. During the week ending on the 18th of September—the city was then invested—the mortality had risen to 1,263; in the week ending October 23rd the mortality had risen to 1,746. The deaths reported during the week ending October 30th were 1,878; during the week ending November 20th, 2,064; during the week ending December 18th, 2,728; during the week ending January 1st, 1871, 3,280; during the week ending January 14th, 3,982; during the week ending January 28th, 4,376; during the week ending February 4th, 4,671. Now the average mortality for this last week, the week ending February 4th, during the five years just referred to, was but 951. On the 4th of February, the death-rate being at its maximum, the first train of provisions entered Paris under the terms of the armistice. After this time provisions came in abundantly and the death-rate slowly but quite steadily declined. The deaths reported for the week ending February 11th were 4,451; for the week ending February 18th, 4,103; for the week ending February 25th, 3,941; for the week ending March 4th, 3,500; for the week ending March 11th, 2,993; for the week ending March 17th, 2,576.

From the fall of the Empire until the establishment of the Commune—from the 4th of September until the 18th of March—the total number of deaths within the city, not including those who may have died in the army outside of the walls, was 77,231. The average aggregate mortality of the *twenty-eight* corresponding weeks during the period of five years, already referred to, was 24,928—a difference of 52,303.

As the population, civil and military, of Paris may be fairly reckoned at 2,000,000 of souls, it appears that death carried off about *four per cent.* of the whole population in a period of *twenty-eight* weeks. The exact per cent. was 3·86; but the percentage of the death-rate in ordinary times is only 1·31. Or to state the fact in another way, during the period mentioned, among every 10,000 persons there were 386 deaths, while in ordinary times during the corresponding weeks, among 10,000 persons there are but 131 deaths.

For the great mortality existing during the siege there were many causes. The most obvious cause was the absence of proper

food. Milk, eggs, and butter had disappeared from the markets after the first fortnight—all highly important elements of food, as well for the sick, as for the very old and the very young.

Nor after this time were fish, chickens, or game of any kind to be obtained in quantities sufficient to exert a sensible influence upon the health of any portion of the population. Vegetables had disappeared from the markets by the end of November, or were sold at high prices in pieces—half a carrot, a bit of beet, a leaf of cabbage, &c. The rationing of meat began on the 8th of October, 100 grammes (a trifle over 3 oz.) being the daily allowance fixed for each adult; and this ration was rapidly reduced to 33 grammes, the daily allowance for some weeks preceding the capitulation.

Bread was not rationed until the middle of December; but its quality, from various causes, had steadily depreciated from the beginning of the siege. About the middle of December flour and grain of all kinds were requisitioned, and bread was made and issued by the municipality at the rate of 300 grammes daily per head. The quantity of this ration was maintained until the close of the siege, but its quality grew rapidly worse by mixing with the flour, barley, oats, rye, buckwheat, rice, &c. These grains, especially the rice, were very imperfectly ground, and caused the bread made from them to be as disagreeable to the taste as it was unpleasant to the sight. The unusual qualities of the bread gave rise to more frequent and bitter complaints than did the complete withdrawal from the alimentation of the city of such important articles of food as milk, butter, and vegetables, or even the short rations upon which the whole population was placed. And these complaints were not limited to the people; they made their appearance even in the medical journals. Says the "*Union Médicale*":—"The bread, the principal aliment of the French people, has become impossible. Examined under a microscope, or even with a lens, there may be found in that compact, heavy, and blackish mass that is distributed to us every morning a complete vegetable encyclopædia; all the grains in creation are there represented, not only by their farinaceous principles, but by their husks and stalks . . . We cannot understand what hygienic council was consulted previous to the decree

of the Government which fixed the ration of bread at 300 grammes. We should be glad to believe that no hygienist had given such advice, nor counselled the distribution for a month to two millions of people of that shapeless and chaotic mass ironically called bread."

Notwithstanding these facts, I am inclined to believe the general population of Paris did not suffer to the extent usually supposed from the want of food. Certain articles were always abundant; wine, animal fats, vegetable oils, coffee—even bread, such as it was, was never scarce—while the stocks of sweetmeats, pickles, dried fruits, canned meats and vegetables, and quite a variety of edible articles which the shops contained, were by no means exhausted when the city capitulated. An important fact, also to be observed, is that the disappearance of an alimentary substance from the market did not indicate its non-existence. Nearly everybody laid in a certain stock of provisions, and the aggregate amount of food thus stored was enormous. It was scarcely before the 1st of January that any persons in comfortable circumstances, or who had been in the least degree thoughtful, began to find their daily bills of fare seriously curtailed.¹ Again, the effect of being deprived of special nutritive elements would only be manifested after the lapse of a certain time.

With regard to the poor, it was often said, and not without reason, that they were better fed during the siege than in ordinary times. Large numbers of this class were enrolled in the *garde nationale*, and, by their withdrawal from the workshops, the general demand for labour was to the same extent increased. The municipality, however, from various motives, among which

¹ When it became evident that Paris was an objective point in the German strategic plan, the Government of the Empire set itself vigorously to work to organize a defence; and during the last week of August under the direction of M. Clément Duvernois, then minister of agriculture and commerce, certain quantities of flour, wheat, &c., were introduced into the city, and contracts were made for the delivery—at a short delay—of siege supplies on a large scale. The Revolution of the 4th of September put an end, not only to the Imperial Government, but to all systematic effort to provision the city. If Paris was able to feed its population for five months or more, official provision is entitled to very little credit for the fact; it is to be attributed principally to the existence of those vast stocks of provisions which the commerce of modern times has the habit of storing in or near great cities.

were perhaps reasons of political expediency, watched over the physical interests of this class with unusual care.

It is a noteworthy fact, that whatever diseases may have prevailed, few cases of scurvy were reported, either in the army or among the civil population. Again, the excessive mortality fell principally upon three distinct classes—the very young, the very old, and the army; and those who suffered most, were those unused to camp life—soldiers in the *garde nationale* and the *garde mobile*.

These facts are revealed in the following tabular statement.

DEATHS IN PARIS.

Ages.	During the six months Sept. 1st to Feb. 28th, 1870-71.	During the six months Sept. 1st to Feb. 28th, 1868-69.	Ratio of the Deaths during the first period to those during the second period.
Under 5	19,016	6,525	2·91
5-15	2,342	715	3·27
15-25	10,760	1,694	6·35
25-40	11,554	3,527	3·27
40-60	10,732	4,500	2·38
60 and above.	13,548	5,019	2·69 ¹

We see from this table that while the deaths under five were nearly *three* times greater than usual, those between fifteen and twenty-five were over *six* times as great as usual. Now it was the class of persons between these ages who were most strongly represented in the army of the defence, and who were moreover least able to resist the hardships and exposures of a life to which they had been wholly unaccustomed. But the whole case is not presented in this table. A classification of the deaths according to sex shows that, during the six months from September 1st to February 28th, 1870-71, the deaths of males between the ages of fifteen and twenty-five were nearly *ten* times greater than usual (9·85); while the deaths among females between these ages were less than three

¹ For this table I am indebted to the "Étude sur la Mortalité à Paris pendant le Siége," par M. Henri Sueur. Paris, 1872.

times greater than usual (2·85),—*less*, in fact, *than the average* increment in the mortality among the whole population. But among the general population between the ages of forty and sixty the death-rate was 2·38 times greater than usual, and among women between those ages it was 2·27 times greater than usual. The remarkable exemption of women from disease and death during the siege may be shown by another statement. Excluding children under fifteen, the total number of males who died during the month of September was 1,328 ; but in January the number reported was 6,551. On the other hand, the number of females over fifteen years of age who died in September was 1,116, while the number reported in January was only 2,582. That is to say, during the siege, in the population, excluding children, the mortality had increased among the males *five* times, while it had scarcely more than doubled among the females.

But it should be observed that the mortality was not wholly owing to causes directly connected with the siege. An epidemic of small-pox, which broke out in 1869, raged for eighteen months “with a violence,” says M. Bouchardat, “unknown since the generalization of vaccination.” Having partially died out in August, 1870, with the introduction into Paris of 100,000 *mobiles* from the country, and the crowding in of nearly 200,000 refugees, driven in from the suburbs by the investing armies of the enemy, fresh material was furnished, and the epidemic broke out again with new fury. From week to week the death-rate increased until the 1st of January, when, for the week ending on that day, 454 deaths were reported from small-pox alone. During the siege proper, from the 18th of September to the 28th of January, 48,752 persons died, and of these 6,663, or nearly *fourteen* per cent. (13·7), died of small-pox.

However important this fact may be from a general point of view, it has a special importance to which I wish to call your attention. The presence of this disease in Paris was accidental, and not necessarily connected with the siege. It showed no special preference for either sex, and consequently was relatively a large element in the comparatively small mortality among females. Had there been no small-pox in Paris, the death-rate among females would have been scarcely more than double that usually

existing. This fact is very significant, as it shows that aside from mere want of food, other causes must have been active in producing the heavy mortality rates which obtained among the population. Want of food contributed to these heavy rates, by depriving a certain class of delicate persons of the food to which they had been accustomed, and by forcing them to use that instead which was not easily assimilated. A cachectic and adynamic condition followed which predisposed to disease, and when disease came, favoured a fatal termination. Indeed, the want of proper food was felt vastly more in the hospitals and among the sick than among the population at large; and if the mortality was higher than usual, it was rather because the death-rates among the sick were extraordinarily high, than because the sickness-rates themselves were excessive. I do not wish to be understood to say that the sickness-rates were not excessive, but simply that the death-rates were still more so—that the health of Paris during the siege, measured by the amount of absolute sickness existing, did not differ so much from its usual health as the mortality rates seem to indicate.

It is perhaps not surprising, for reasons already given, that the disappearance of certain articles of food from the markets and the successive reductions of the municipal ration should have had no visible immediate influence upon the mortality. Thus, after the first rationing of meat in October, and the requisition of vegetables early in November, the death-rate did not bound up at once. In fact, while on the eighth week of the siege 1,878 deaths were reported, on the week following there were but 1,762, an actual reduction of 116. Again, while on the eighth week—the week ending on the 30th of October—there were 1,878 deaths; on the twelfth week, the week ending on the 27th of November, the mortality had only risen to 1,927, an increase of forty-nine deaths during the month. One month after, the weekly deaths had risen to 3,280, an increase of 1,353. What was the cause of this great difference in the mortality rates of the two months? The answer is very easy to give. The immediate cause of the great rise in the mortality during the month of December was the *cold weather* which then prevailed.

The relation of existing atmospheric temperatures to the rise

and fall of the death-rate is one of the most remarkable of the phenomena which appeared during the course of the siege. Whenever the temperature fell the mortality rates immediately increased ; whenever the temperatures rose the mortality rates immediately diminished. Thus, at the end of the eighth week the thermometer rose, and the ninth week showed a falling off in the mortality. On the tenth and eleventh weeks the temperature fell, and the mortality rates increased. Again, on the twelfth week the temperature rose, and was maintained at an average of nearly five degrees centigrade above the average of the week preceding, and the mortality of the twelfth week was only 1,927, while the deaths reported the *preceding* week had been 2,064. But however remarkable these relations, they were less so than those which immediately followed. Up to the middle of the thirteenth week—the 2nd of December—the mean daily temperature had not been below the freezing point ; on that day it fell below the freezing point, and there remained for a fortnight, and the deaths reported on the thirteenth week numbered 2,023, on the fourteenth week 2,455, and on the fifteenth week 2,728. In twenty-one days the mortality had increased by *eight hundred* deaths per week, while in the month preceding, after twenty-eight days, the increased weekly mortality was only *forty-nine*.

But it may be said the want of food did not immediately show its influence on the public health, and that with the supplies of food known to exist in Paris, it could hardly have been before December that famine could have begun to appear as a powerful factor among the causes of mortality. Indeed, it might be added that the disappearance of vegetables a month before, and the rationing of meat six weeks before, and the appearance in the public markets of such questionable meats as those of the dog and cat, would fully account for the rapid rise in the death-rate which marked the first weeks of December.

This reasoning is theoretically excellent. A single fact, however, shows that the causes just mentioned were not sufficient to account for the increase in the death-rate referred to. On the 13th of December the temperature rose, and during the seven days which followed the average temperature was never below 6 deg. centigrade. But in the meantime provisions were growing

more and more scarce each day, and it was during this week that the ration of horse meat was reduced to thirty grammes, and the whole population was put on a bread ration of 300 grammes. The rationing of bread, considered as a sort of official declaration of the desperate state of affairs, caused great consternation, and profoundly affected the *morale* of the city. Famine had never before pinched so tightly. The week preceding the deaths had numbered 2,728—the heaviest weekly mortality yet reported. An immense augmentation might have been expected in the mortuary returns for the week. But such was not the case: the deaths reported for the week ending December 25th were 2,728, *exactly the number reported the previous week*. A mortality increasing at the rate of *three or four hundred* deaths per week had been suddenly arrested—by what? But a single answer can be given. All the general conditions capable of appreciation which influenced the health of the city had changed only for the worse, except one. The weather had moderated, a mild and pleasant week had succeeded a period of constant frost. This was the only respect in which the situation had been altered, and the conclusion was irresistible that its relation to the arrested mortality was that of a cause. Had there been any doubt in the matter it could not have existed long. On the 21st of December the weather became cold again; the temperature fell below zero, and it remained below the freezing point at a mean average of 6 deg. centigrade for *sixteen* days. *Immediately* with the fall of the temperature the mortality increased, rising from 2,728 to 3,280 for the week ending January 1st, and it continued to steadily increase as long as the cold weather continued, until the deaths reached the number of 4,465 for the week ending January 21st. But the next week shows a falling off in the number of deaths—but 4,376 were reported; and on looking at the temperature of the period we find an upward curve corresponding with the reduced mortality. On the 27th of January the temperature fell again below the freezing point, and there remaining several days, the mortality rapidly increased, and culminated, in the week ending February 4th, in 4,671 deaths, the largest number reported for any week during the siege. On the 4th of February the first train of provisions reached Paris from without; but it is

a remarkable fact that the death-rate had again begun to decline two or three days before the arrival of this train, and, as always, in correspondence with a rise of the temperature. But the temperature continuing to rise for nearly ten days, and provisions beginning to come in abundantly, the mortality continued to decline.

From the 28th of January until the 18th of March the temperature fell below the freezing point but once, on the 11th of February and curiously enough its effect was almost immediately shown by a partial *arrest* of the decline of the mortality; the average reduction per week in the deaths from the 4th of February to the 18th of March having been 349, while for the week following the 11th of February it was but 255.

In tracing the influence of cold upon the population of Paris, it should be observed that the winter of 1870-71 was an unusually severe one. For twelve days on one occasion, for sixteen days on another, and for seven days on another, the temperature scarcely rose once above the freezing point, ranging from this point down to -11° centigrade (12° Fah.). In ordinary times the influence of such a protracted period of cold, as that which marked the end of 1870 and the beginning of the year 1871, would have been revealed in the weekly bills of mortality. But the population of Paris suffered unusually from the cold, not more on account of its actual severity than from the absence of fuel. The city was invested before the winter supplies of fuel had been brought in. A large portion, even of the provisions which had been made, lay *en dépôt* outside of the French lines. The small stocks of coal and coke were rapidly exhausted, and wood was requisitioned on the 1st of November. The same month the municipality began to issue coal-dust and green wood obtained by cutting down the shade trees in the parks and avenues. During the severest weather of the winter these two last-mentioned kinds of fuel were alone to be obtained by the mass of the population, and for several weeks before the capitulation, in quantities so small and under conditions such as to be almost worthless, except perhaps for cooking. One of the most painful and, once seen, never to be forgotten spectacles of the siege of Paris, was the distribution of the fuel ration to long lines of shivering men and women, who

stood for hours in the cold, bleak streets waiting each their turn to obtain perhaps two or three little pieces of green wood, almost as incombustible as the ice beneath their feet. During the sharp wintry days of January the fuel famine was more keenly felt than the want of food, and every day of sunlight and warmth was as welcome to the distressed people as would have been the arrival of a train of fresh provisions. A large part of the population during some of the severest weather of the winter had no means whatever of warming their rooms by artificial heat. The poor kept warm by huddling together in their already over-crowded quarters ; and the rich even, rather by shutting out the cold and the fresh air than by the heat of fires.

The hospitals, if generally better supplied with fuel, were nevertheless compelled to be rigidly economical in its use, an economy followed by a proportionally defective ventilation, with its usual consequences.

To appreciate the full extent to which cold influenced the death-rate, the remarkable correspondence between the mortality rates and the existing atmospheric temperature must be associated with the fact already stated, that the deaths among males between the ages of fifteen and twenty-five, that is to say, among those enrolled in the *Garde Nationale* and consequently most exposed to the influences of cold, were nearly *ten times* greater than usual, while among females at a corresponding period of life, among those least exposed to these influences, the deaths were only a little over *twice* as great as usual.

The effects of cold and exposure, as a cause of disease and death, were certainly never more remarkably exhibited. Aside from the epidemic of small-pox, cold was most unquestionably the direct cause of by far the largest part of the mortality during the siege. But it may be said that cold weather does not commonly appear to be so prejudicial to the public health. Certainly not ; there was a cause, a general condition which revealed or let loose its destructive influences. That cause was undoubtedly the want of proper food, and the condition was what the French have well termed *la misère physiologique*—the physiological poverty—the defective nutrition, of the whole population. Badly nourished, deprived of milk, butter, and easily

assimilated animal fats—compelled to resort to a diet deficient in hydrocarbons, or difficult of digestion, the power of resisting the evil effects of cold was greatly reduced by the diminished evolution of animal heat; the fires of life burned dimly, and the blood and tissues had been chilled before even the winter frosts came. It was in this way that the want of proper food produced its worst effects during the siege, not directly by causing starvation or any very near approach to it, but indirectly by limiting the evolution of animal heat, and thus depriving men of the power of resisting the impressions produced by prolonged exposures to the cold.

Every one is familiar with the increased demand and craving for food during the winter, as well as in cold climates; the precise consequences of not responding to this demand, to this natural craving, were never known in all their fearful reality until the publication in the Records of the Department of the Seine of the essential facts connected with the terrible physiological experiment to which Paris was subjected during the siege of 1870-71.¹

The diseases which principally prevailed and proved most deadly were, as might have been expected from the causes at work, diseases of the respiratory organs. Until, however, the fourteenth week—the 11th of December—the proportional mortality from these diseases was less than usual, but 215 deaths

¹ As illustrating the condition to which the troops were brought by the continued action of insufficient food, fatigue, exposure, and cold, Dr. Gordon mentions an interesting incident:—"From the month of September, when the siege began, till the date of the last great battle, it may be said that the great body of the troops lived in the bivouac, exposed to all weathers, with little or no comfort, and without continuous rest. The battle of Montretout and Bougival produced a large number of wounded, of whom sixty-four were sent to the American ambulance. In the course of the evening I visited the portion of that establishment where they were accommodated. On either side of a long tent some were arranged, comfortably put to bed, and there they lay, covered with blood, it is true, but all sound asleep; not a groan was heard, although the wounds of all were dangerous, and of several mortal. Some had limbs shattered by shot or shell; many had severe flesh wounds; one young man had been struck by a Bavarian bullet in the forehead, one half of the missile still projecting; but so great had been the physical wear and tear of all for months before, that their wounds, severe as they were, were yet insufficient to banish sleep when the comforts of a bed and restoratives gave place to the miseries of the previous four months." ("Lessons on Hygiene and Surgery," p. 227.)

having been reported from bronchitis and pneumonia for that week, in a total of 2,455 deaths. On the fifteenth week the deaths from these diseases suddenly rose with the cold weather, which then set in, to 321, and they rapidly increased by nearly two hundred a week, until on the twenty-second week they were the cause of 1,092, or 23·6 per cent. of the 4,671 deaths reported. The mortality from these two diseases, especially that from bronchitis, followed in the closest manner the changes in the temperature—rising with each fall of temperature, and falling with each rise.

Typhoid fever was a prominent contributor to the general mortality, although it fell far behind even small-pox. The largest number of deaths from this cause, 375, was reported on the twentieth week. The mortality rose from 39 deaths on the first week, to 103 on the twelfth, to 221 on the sixteenth, and had only descended to 229 on the twenty-eighth week. Relatively, however, typhoid fever was the most fatal of all the diseases directly occasioned by the siege, as will appear from the fact that during the twenty-eight corresponding weeks of the year 1869-70 the weekly deaths from typhoid fever, never exceeding thirty, ranged between that number and fifteen.

Typhoid fever did not apparently follow in its ascending and descending course the variations in the temperature. This was to have been expected from a disease having a specific character, and which, from the period of its incubation, passes slowly and regularly through its different stages. The heavy mortality of February and March was produced by disease which was germinated when the general mortality of Paris was greatest and its sanitary condition worst.

Diarrhœa and dysentery follow next in order among the fatal diseases. The largest number of deaths from these two diseases—240—were reported on the twenty-sixth week. Nearly all the general facts mentioned as peculiar to the history of typhoid fever characterized also these diseases. They contributed relatively to the general mortality much more than positively, the deaths from them having only ranged from nine to twenty-five during the twenty-eight corresponding weeks of 1869-70. They did not appear to be greatly influenced by the prevailing tem-

perature, and they did not contribute their maximum quota to the mortality until some weeks after the general mortality had begun to decline.

From the special facts here presented, a general idea may be formed as well of the sanitary condition of the city at different periods of the siege as of the causes which were influencing it. I regret, however, my not being in possession of a sufficient number of data to attempt to show the influence of these causes upon the wounded, whether by increasing the actual death-rate, or by developing typical forms of hospitalism among this class of patients.¹ One fact is certain, the army was more exposed than any other part of the population to all the depressing causes special to the siege. It was put upon shorter rations; it was subjected to greater fatigues; it was crowded into closer and more ill-ventilated quarters, and was more exposed to night air, rain and frost.

A large part of the mortality from disease during the siege was contributed by the army, and resulted from the general causes just referred to. The soldier, suffering from their effects when wounded, would under any circumstances have had his chances of recovery diminished thereby; but unable to escape from their continued action—an action which day by day became more and more severe—it is by no means surprising if the mortality among the wounded in all the ambulances of Paris was

¹ Only a small number of the volunteer ambulances have as yet made reports possessing any statistical value. The report of the War Department, should it ever appear, will inevitably be incomplete and most unsatisfactory, while the mortuary returns of the city of Paris throw little if any light on the subject. These returns in principle include all the deaths, from whatever cause, occurring within the limits of the city. As nearly all the ambulances, together with the civil hospitals and the great military hospitals—Le Val de Grâce and Le Gros Caillou—were within the limits of the city, were these returns complete we should be in possession of much of the data bearing upon the mortality of the army during the siege. But on examining the municipal monthly bulletins, I find that in the month of September 37 deaths were attributed to wounds received in battle (*blessures militaires*); in October 333 deaths are attributed to the same cause; in November *no deaths were reported from this cause*; while in December the number had risen to 1,058. In short, the military mortuary statistics of the siege are in about as hopeless a condition as possible, and beyond certain gross aggregates which may approximate the truth, our knowledge is never likely to be much extended.

unprecedentedly heavy, and recoveries among the severely wounded proportionally rare.

It is fortunate that we are seldom called upon to treat either the sick or wounded under circumstances so painful. We were forced to see large numbers of persons die after wounds not usually considered dangerous; and the deaths occurred frequently even after the wounds had nearly or quite healed.

If our mortality rate was unusually high, the most evident and efficient cause—the general sanitary state of Paris—must be taken into consideration when establishing comparisons between our results and those obtained under other general circumstances. Indeed, the only just comparisons are such as may be made between our results and those obtained in other ambulances and hospitals opened in Paris during the same period, and receiving the same class of patients.

I will close this section of my subject by appending two tables copied from the essay of M. Sueur, which show the relations between the weekly mortality and the mean temperature.

MORTALITY.¹

During the Siege.				Average of 5 years (1866-7, 1867-8, 1868-9, 1869-70, 1871-72.)			
1st week, Sept.	4 to Sept.	11, 981	.	Sept.	4 to Sept.	11, 889	
2nd „ Sept.	11 „ Sept.	18, 1,263	.	Sept.	11 „ Sept.	18, 852	
3rd „ Sept.	18 „ Sept.	25, 1,272	.	Sept.	18 „ Sept.	25, 821	
4th „ Sept.	25 „ Oct.	2, 1,344	.	Sept.	25 „ Oct.	2, 766	
5th „ Oct.	2 „ Oct.	9, 1,483	.	Oct.	2 „ Oct.	9, 754	
6th „ Oct.	9 „ Oct.	16, 1,610	.	Oct.	9 „ Oct.	16, 737	
7th „ Oct.	16 „ Oct.	23, 1,746	.	Oct.	16 „ Oct.	23, 761	
8th „ Oct.	23 „ Oct.	30, 1,878	.	Oct.	23 „ Oct.	30, 754	
9th „ Oct.	30 „ Nov.	6, 1,762	.	Oct.	30 „ Nov.	6, 767	
10th „ Nov.	6 „ Nov.	13, 1,885	.	Nov.	6 „ Nov.	13, 781	
11th „ Nov.	13 „ Nov.	20, 2,064	.	Nov.	13 „ Nov.	20, 780	

¹ I am sorry that I am unable to here present a number of facts which should enter into a mortality table—such as the cause of death, and the sex of the decedents. But the city monthly record of vital statistics has—at the time of my writing—only been published down to the 1st of January, 1871, and therefore no official tables covering the whole period of the siege have as yet appeared. While indebted to the gentlemen in charge of the Bureau of Statistics at the Prefecture of the Seine for much valuable information, the only table I can present is unofficial and incomplete, although the facts it contains were derived from official sources, and are entirely trustworthy.

During the Siege.				Average of 5 years (1866-7, 1867-8, 1868-9, 1869-70, 1871-72.)			
12th week	Nov. 20	to Nov. 27	1,927	Nov. 20	to Nov. 27	793	
13th "	Nov. 27	" Dec. 4	2,023	Nov. 27	" Dec. 4	833	
14th "	Dec. 4	" Dec. 11	2,455	Dec. 4	" Dec. 11	833	
15th "	Dec. 11	" Dec. 18	2,728	Dec. 11	" Dec. 18	884	
16th "	Dec. 18	" Dec. 25	2,728	Dec. 18	" Dec. 25	854	
17th "	Dec. 25	" Jan. 1	3,280	Dec. 25	" Jan. 1	856	
18th "	Jan. 1	" Jan. 7	3,680	Jan. 1	" Jan. 7	838	
19th "	Jan. 7	" Jan. 14	3,982	Jan. 7	" Jan. 14	902	
20th "	Jan. 14	" Jan. 21	4,465	Jan. 14	" Jan. 21	903	
21st "	Jan. 21	" Jan. 28	4,376	Jan. 21	" Jan. 28	936	
22nd "	Jan. 28	" Feb. 4	4,671	Jan. 28	" Feb. 4	951	
23rd "	Feb. 4	" Feb. 11	4,451	Feb. 4	" Feb. 11	955	
24th "	Feb. 11	" Feb. 18	4,103	Feb. 11	" Feb. 18	974	
25th "	Feb. 18	" Feb. 25	3,941	Feb. 18	" Feb. 25	995	
26th "	Feb. 25	" March 4	3,500	Feb. 25	" March 4	984	
27th "	March 4	" March 11	2,993	March 4	" March 11	1,020	
28th "	March 11	" March 18	2,576	March 11	" March 18	975	
77,231				24,928			

TEMPERATURE.

*Mean daily temperature at Paris from the 4th of September, 1870,
to the 11th of March, 1871. (Centigrade.)*

Days.	September.	October.	November.	December.	January.	February.	March.
1st		13·5°	10·5°	0·1°	—5·3°	1·0°	7·6°
2nd		12·9	5·8	—2·9	—5·7	4·5	6·3
3rd		12·9	4·4	—0·4	—4·3	3·8	8·8
4th	14·6°	12·4	4·2	—3·4	—7·2	7·5	9·1
5th	17·4	13·1	6·2	—3·3	—6·7	8·2	9·8
6th	17·1	9·5	6·7	—1·7	2·1	9·5	11·5
7th	14·0	11·3	3·7	—0·8	3·4	8·4	11·6
8th	14·2	13·7	4·8	0·1	0·9	9·9	7·7
9th	16·6	13·3	1·7	0·2	—0·2	7·1	6·9
10th	15·9	8·7	1·1	—3·7	—0·6	4·7	9·5
11th	13·9	7·8	3·3	—4·8	—2·4	—1·1	8·3
12th	13·6	10·7	2·5	—0·1	—4·9	—0·9	12·3
13th	13·9	13·7	6·6	5·3	—1·4	4·8	10·5
14th	15·4	13·1	5·5	12·0	—5·7	5·4	8·0
15th	12·0	10·1	7·2	11·5	—6·6	6·0	5·3
16th	11·5	8·0	4·9	7·9	3·7	4·9	2·8
17th	12·4	13·1	5·9	7·4	4·3	5·2	3·6
18th	12·8	9·3	4·6	6·1	3·9	8·6	2·8
19th	12·8	12·3	5·4	7·3	2·0	7·8	
20th	13·4	10·1	7·2	8·1	1·2	9·8	
21st	14·2	10·5	7·4	—2·7	2·8	6·4	
22nd	13·6	10·1	8·9	—6·5	3·6	3·9	

Days.	September.	October.	November.	December.	January.	February.	March.
23rd	13·3°	10·5°	10·5°	—6·4°	2·9°	4·0°	
24th	13·1	9·9	9·0	—9·4	1·8	7·1	
25th	14·6	11·0	10·6	—7·2	0·9	4·3	
26th	14·8	12·6	9·9	—3·6	—0·8	6·4	
27th	14·1	8·3	7·9	—8·2	—4·5	10·3	
28th	14·9	10·0	8·0	—6·3	—2·8	11·1	
29th	15·2	10·8	5·7	—4·3	—0·4		
30th	14·2	10·7	3·0	—6·6	—0·2		
31st		11·6		—5·8	—0·1		

LOCATION: CHARACTER OF THE GROUNDS.—Before speaking of our tents and tent-barracks it may be well to briefly notice the general situation of the ambulance, and the character of the grounds upon which it was placed. In some respects the situation was a good one, in other respects it was a bad one. On the north side of the Avenue de l'Impératrice, about half way between the Arc de Triomphe and the Bois de Boulogne, was an open lot, containing nearly an acre and a-half of ground; it was partially shut in by houses, but fronted directly upon the wide beautiful avenue so well known to all who may ever have been in Paris. Although within the walls of the city, this quarter of Paris is quite suburban, and is covered principally with villas, small parks and gardens. The air was consequently to a considerable degree free from the impurities common to it, where the population is dense. This part of Paris lies, however, in the valley of the Seine, and has always seemed to me to be more subject to inundations of fog from the river than even the central portions of the city through which the river passes. From the Arc de Triomphe the ground slopes gently to the fortifications, from which it spreads out in a low alluvial plain quite to the Seine. As nearly the whole region is unpaved, the special influences upon health of such a formation are much more likely to be exhibited than in the more strictly metropolitan portion of the Paris basin. I certainly do not wish to say that this most delightful part of Paris is unhealthy as compared with other portions of the city, since special causes here contribute to a condition of general salubrity which perhaps it would be difficult to find elsewhere in Paris; I only wish to say, that I should not, from theoretical

considerations, select such a location as one possessing the best conditions for the installation of a permanent camp, and *a fortiori*, for the establishment of a permanent field hospital. Unfortunately, theoretical considerations had but very little if any weight in the determination of our choice. Early in September it became absolutely necessary to pitch our tents somewhere, and get ready for the conflict which was daily becoming more imminent. The great question was not so much where could we find the best place for the tents within the walls of Paris, as of whom could we obtain the privilege of using a plot of ground sufficiently large for our purpose. A lot upon the Avenue de l'Impératrice was generously offered to us, and we immediately accepted the offer. The plot was by no means prepossessing; it was flat, covered with a rank vegetation, and had the appearance of a rich but neglected garden; and I may add that previously to our occupation it had been used for a dog show—several hundred dogs having been encamped there, during a considerable part of the summer of 1870.

The soil was to a certain extent artificial, the plot having been filled in, to a height of ten feet or more, to bring it to a level with the avenue. Unfortunately, this soil contained so large a percentage of clay as to be quite impenetrable to water; inasmuch as the surface, moreover, was almost perfectly level, it became exceedingly difficult to properly drain it; indeed, during rainy weather this most important service was only indifferently accomplished by conducting the drains around the tents to pits sunk in the ground at various places.

The ground was perfectly dry all winter long at a distance of two feet below its surface. The only chance of escape for the water which fell upon it was by evaporation, a process almost infinitely slow under the sombre sky of a Paris winter. The consequence was, that we were always in the midst of moisture, and what was apparently far worse, of *mud*. In fact, this was the greatest inconvenience, resulting directly upon the nature of the soil and the character of the location, to which we were subjected, the whole surface of the ground at every rainfall having been converted into a veritable slough. Plank-walks enabled us for a time to pass dry-shod from tent to tent; but as the season

became wetter, during the thaws of December and January, it was almost impossible for either men or carriages to cross certain portions of the ground. The loads of gravel which we threw upon certain places disappeared almost immediately, and it was only after the worst spots had been paved with large stones, and hundreds of loads of gravel, sand, and tan had been distributed over its surface, and I may also say after the weather itself became dryer, that the condition of the ground could have been pronounced satisfactory. Not only was the mud a source of inconvenience, but it made it frequently quite impossible for us to preserve that tidiness, both without and within our tents, which was desirable, not more as an evidence of our regard for well-known sanitary requirements than as an evidence of the orderly and systematic execution of our police service.

To what extent the condition of the ground, to which I here refer, may have acted upon the health of those treated at the ambulance, I am unable to say ; it may, however, have been the more or less direct cause of several of the cases of bronchitis, pleurisy, and pneumonia—some of them fatal—which occurred when the subjects had so far convalesced from their wounds as to be able to leave the tents, and even to walk about the enclosure. Still, whatever may have been the unfortunate degree of humidity existing in the surface soil without the tents, the earth was always kept dry within them, by means which I shall elsewhere explain.

The geometrical form of our grounds, if a much less serious cause of inconvenience, nevertheless, greatly interfered with any attempt to establish the tents and barracks in accordance with a plan which should give symmetry to the whole installation. Indeed, since the removal of the constructions, having had occasion to re-examine the location, it has been a constant subject of surprise to me, that we ever succeeded in placing our tents and barracks upon it, in a way which shocked the harmonies of proportion and position so little.

While the tents and barracks were arranged so far as possible—consistently with having the freest circulation of air between them all—with reference to convenience and symmetry, and various efforts were made to keep the earth dry and firm, some-

thing also was done for mere appearance' sake. Plots here and there were railed in and planted with flowers and shrubbery.

In the month of September a large number of trees were cut down in the Bois de Boulogne to unmask the approaches to the city. Among these were many ornamental evergreens—pines and firs; a fine selection from these was made, and the trees were soon replanted around our tents and walks. This shrubbery retained its dark green colour during the entire winter, and added much to the picturesqueness of the grounds; although we never attached to its presence the sanitary importance entertained by some of our visitors, who, impressed by whatever was novel or unique in the organization of the ambulance, seem to have been fully persuaded that "those singular Americans" had discovered in the balsamic properties of the fir-tree a specific against the invasions of hospitalism.

THE TENTS: HOW ARRANGED.—I have elsewhere had occasion to speak in a general way of the manner in which our tents and tent-barracks were distributed over the ground, as also how our hospital tents were arranged. I have said that five or six tents were joined together, end to end, in such a way as to form a long rectangular pavilion. I have described also how an American wall-tent is pitched. I may however, in this place, direct your attention to several points, each of some importance.

The tent pavilions (see Ground Plan, Plate 1) were placed parallelly to each other, their ends facing northerly and southerly, the prevailing winds thus sweeping freely between them. Just behind them, and possibly a little nearer than desirable, stood the tent for wounded officers. The tent-barracks for the wounded, Nos. 7 and 10, were placed on each side of the area behind the pavilions. These wards were as far from each other and the pavilions as possible. Barrack No. 8—in which were the kitchen, *salle à manger*, pharmacy, &c.—was built nearly at right angles with the barracks Nos. 7 and 10. It was separated from No. 7 by a free passage-way, and from No. 10 by a covered passage-way. Barracks Nos. 15, 16, 17, 18, and 19, occupied the eastern side of the plot. All the constructions were thus detached as well as separated from each other, so far as convenience and the extent and conformation of the ground permitted.

Our organization having assumed from the first a certain character of permanence, the ground within each one of the tents, as well as barracks, was covered with a floor formed of strips of board laid side by side, and nailed to narrow (two and a-half inch or three inch) string pieces, which rested on the ground.

While this floor answered its purpose very well, for aught I know, I can hardly recommend it when tents are to be kept long standing. The cracks between the boards permit dirt of all kinds to sift through and accumulate on the ground beneath, where it may become in time a source of pollution. To guard against such an occurrence, our floors were once entirely taken up. After the earth beneath had been to a certain extent removed, and the tents closed and thoroughly fumigated with chlorine, the soil was sprinkled with proto-sulphate of iron and the floors relaid. These precautions were doubtless wise, but the necessity for them might have been in a measure avoided had the flooring been covered by some impermeable stuff—oilcloth, for example—which would have had the additional advantage of being susceptible of frequent cleansings.

The trenches which were dug on the sides of each pavilion were a foot broad and about eight inches deep, the earth being thrown towards the tents and banked up against a narrow strip of board, that preserved the canvas from immediate contact with the soil.

The entrance to each tent in which the wounded were treated was guarded by a vestibule, or *tambour*, which was entered by a door closed by a pulley and weight. The principal object of the vestibule was to prevent the too direct entrance of cold air; it was however very useful in several respects; it added to the capacity of the tent, and served as a convenient closet for many utensils in daily use. In the field, a substitute for it, so far as it served to keep out currents of cold air, may be obtained by suspending one or two blankets outside or inside of the tent door.

TENT-BARRACKS.—When our ambulance was first established, we did not propose to make use of any shelter for the wounded except that afforded by tents. For reasons which I have elsewhere stated, it seemed desirable at a later period to increase the number of beds. Suitable tents could not be obtained in

Paris for this purpose, and our only alternative was either to place the additional beds in some one or more neighbouring houses, or erect upon our own grounds constructions which might properly be used for the shelter of our patients. The benefits to be derived from the use of tents in the hospitalization of the sick seemed to us to be so considerable, as to warrant the attempt to secure some of them by the erection of temporary constructions possessing several of the desirable qualities special to tents. In my general description of the ambulance I have stated how these constructions—tent-barracks—were made; that they were made of simple frameworks, boarded up on the sides and at the ends, and roofed with canvas. They were built, however, much less for the purpose of showing a system of hospital construction than with the intention of obtaining, what seemed to be an immediate necessity, an airy shelter for the sick. The buildings were consequently rude, while they were defective perhaps in regard to certain details, which would have been made the subject of a more careful consideration had not everything been put up in a hurry.

Our tent-barracks were certainly preferable to houses for the treatment of the sick; they were new buildings, which had never been occupied, and the fresh air supply was tolerably well secured; but I have always considered them as offering less favourable sanitary conditions than tents. In the first place, they were not as impermeable to water. Three thicknesses of canvas (French) had to be put upon the roofs before they fairly kept the water out, and yet during the whole winter they were constantly leaking at certain points. This leakage was doubtless partly attributable to the quality of the canvas, but it was also partly attributable to the fact that the canvas rested upon a framework of rafters. Had the best American duck been used for a roofing, it would unquestionably have occasionally leaked had it been so *supported*. The use of two or more thicknesses of canvas for the purpose of securing impermeability to wet, resulted in rendering the roof to nearly the same degree impermeable to air; if the roof is really impermeable to air, such a construction cannot properly be called a tent-barrack, it is simply a barrack; whether a roof is covered

with impermeable zinc or impermeable linen is a matter of no moment so far as ventilation is concerned.

It was more difficult to maintain a proper temperature in our tent-barracks than in our tents. It is true they were heated with stoves; but so was tent No. 21. The air entered them at various irregular openings, and escaped to a considerable extent in the same manner. The principal ward-barrack was ventilated by a shaft; but the two ward-barracks were rarely free from the odour peculiar to hospitals. It was thought necessary once or twice to whitewash the walls and rafters within, if partly to improve the light, partly also for sanitary reasons. The only advantages our barracks possessed that our tents did not I have elsewhere mentioned as special to barracks in general. They were roomier than tents, had windows and doors which could be locked and barred, and afforded a *sense of security to persons*, and afforded a *real security for things*, which the tents did not. They consequently answered much better than tents for the various offices connected with the ambulance.

LIGHTING.—The tents were lighted at night by oil lamps provided with chimneys and shades. A lamp was fixed in each tent to one of the upright standards; candles were used for movable lights.¹ In the tent-barracks and offices similar lamps and candles were used. The grounds were also well lighted by oil lamps furnished with strong reflectors. The charge of the lamps gave constant employment to one man. Not one of the least remarkable sights connected with the ambulance was its appearance at night when lighted up; the tents and pavilions, and tent-barracks even, looking rather like immense Chinese lanterns than the habitations of men. The moving lights of the attendants, the coloured signals, the grotesque shadows which appeared and disappeared as suddenly—all these strange effects

¹ It has been remarked that candles are not as good as lamps for lighting a ward, "because they often emit unpleasant odours, especially when the wicks are long or they are snuffed." Lamps are certainly much better than candles for permanent lights, but good candles are by no means as likely to smoke and emit unpleasant odours as equally good lamps. All lamps require constant regulating. For field service, candles are greatly to be preferred to lamps—because it is more easy to transport them, and less difficult to take care of them.

of light often gave a singular and almost weird-like animation to our little encampment after nightfall. By day the barracks were fairly lighted by windows shaded with muslin curtains. The tents only received such light as was diffused through the canvas, and yet I doubt if, during the day even, the tents were less well lighted than the barracks. The absence of windows has been considered an objection to the use of tents; not so much, however, because windows let in light, as because they afford to patients occasional opportunities of relieving the tedium of their confinement by looking out of doors. It is a fact, however, not unworthy of remark, that nearly all our patients manifested a decided preference for the tents, and few, if any, were transferred from them to a barrack who did not express an anxious desire to get back to their old quarters. The barracks lacked something of the cheerfulness which seemed to belong always to the tents, and which was probably largely owing to the uniform diffusion and the softness of the light within them.

FURNITURE.—I have elsewhere referred to the furniture of the tents; and, although briefly, with perhaps sufficient detail. Beside each bed was a chair or a small table. A table also stood near the water-cock, while at the end of the pavilion was a buffet in which were kept the bandages, medicines, feeding cups, and various articles which the nurses might have occasion to use. The wooden furniture in the wards was all of white unpainted wood of the simplest and plainest kind.

The iron bedsteads which we made use of have been occasionally criticised. As the patient is lifted from the floor scarcely more than fifteen inches, even when lying on the mattress, they have been considered too low, especially as the position they force the attendant or surgeon to assume often becomes painful.

But it must be remembered that these bedsteads were proposed and constructed, not as model bedsteads for general hospitals, but as bedsteads for campaigning and for use in field-tents. It was very desirable that they should be as light as possible consistently with strength, and also that they should be low, in order to gain head room.¹

¹ An objection made by the Germans to the establishment of a hospital at Sedan

It would have been difficult to have used a much higher bedstead in our tents. To have increased the height of the bed would have involved increasing the height of the tent walls; and the objection to adding to the height of these walls in portable field-tents has already been indicated. Moreover, if a low bed is sometimes inconvenient for the attendant, it is always very convenient for the sick man, and his interest should be first considered. Miss Nightingale has expressed the opinion that the bed for the sick should never, "under any pretext," be higher than a common sofa. Otherwise the sick man is unable to help himself in many respects, and is additionally fatigued every time it becomes necessary for him to get up or lie down. And it is very singular, she remarks, that persons who only get in and out of bed once a day forget that these efforts are frequently made by the sick, and are often followed by much fatigue. These considerations are of great importance, and may well lead us to the conclusion that our beds were not too low, notwithstanding the criticism referred to, and which I may add—although repeated to me many times by French surgeons—I never once heard from the lips of a French patient. Indeed, I believe that the height to be given to a hospital bed should rarely exceed eighteen inches.

If the American field hospital iron bedstead has any real fault it is its want of strength—a want of strength shown, however, rather by the breakage from rough handling in transportation than from breakage in actual use. Not one of the hundred and twenty-five iron bedsteads used at the ambulance by patients and nurses was broken or seriously injured, during the six months' service to which they were all subjected.

SYSTEM EMPLOYED FOR WARMING AND VENTILATING THE TENTS.—One of the most serious questions that has arisen in connection with winter encampments has related to the best and most practical method of securing a comfortable temperature for those who are placed under canvas.

The general practice in camps since the very earliest times has

under tents, captured from the French, was that the bedsteads in use were too large for the tents.

been to rely upon the heat of fires burning in the open air and outside of the tent.¹ Sometimes they have been placed near the tents—so near as to elevate the temperature of the air within them; but generally they are too far away for this result,—the object in view having always been rather to warm the soldier than the quarters assigned him.

Indeed, it is very rarely that an attempt has been made to warm the quarters of the common soldier. Even when huts were used in former times, the soldier was forbidden under any pretence the use of fire in his lodgings.²

It has been an occasional custom in camps—and one very prevalent during the eighteenth century—to construct special quarters where the soldier might pass a portion of the day, returning to his tent at night only to sleep. These were often subterranean excavations, roofed with earth, in which fireplaces with chimneys had been placed.³ But whatever may be said in favour of such practices in general encampments, it is obvious that they are inapplicable wherever the soldier—whether well or sick—is forced to be a permanent occupant of his quarters. In such cases—if the soldier is to be made comfortable—measures must be taken with a view to the warming of the air within those quarters. But the difficulty of maintaining a proper temperature within tents during the colder months of the year has always been recognized, and has been made even a serious objection to their use, especially—as we have seen—for the hospitalization of the sick. Incapable of storing up heat within their walls, as more solid constructions do, it is impossible to make tents comfortable except by providing in some way for a constant evolution of heat within them. The great difficulty has always been to properly regulate this heat supply. It is very easy to put in a tent a

¹ "The troops exulting sat in order round,
And beaming fires illumined all the ground."

Pope, "*Iliad*," book viii. v. 553-4.

² "In none of which (huts), on any pretence, fire is to be allow'd" (Orrery, *op. cit.* p. 84); and among the instructions given by Sir James Turner is this:—"That no fires be made among the tents and huts, but only in those places which are allotted for them." ("*Pallas Armata*," p. 287.)

³ Colombier, *op. cit.* pp. 274-276.

common sheet-iron camp stove provided with a few joints of pipe (and this, by the way, is the usual practice), and with a little wood build a fire sufficient to warm the air within the tent; but generally after a few minutes the temperature will be found to be most uncomfortably warm. If the ventilators are raised, or the doors thrown open, the warm air rushes out, and the cold air rushing in produces a violent perturbation in the temperature, which will generally be found only to have become so comfortable as to permit the closing of the doors when the fire shall have nearly died out in the stove. The consequence is, that the occupant just at the moment he may suppose himself to have at length succeeded in "regulating" the temperature, will probably be warned by a rapidly-increasing sense of chilliness that his fire has gone out, that more wood must be put into the stove, and his experiment repeated over again. However often one may have occasion to build a fire in this way in a tent, he will rarely succeed in securing within it, except for a very transient interval, a really comfortable and satisfactory temperature.

If the fuel used be coal instead of wood, much better results may be obtained, especially if the tent be large and the stove of appropriate size. As coal burns slowly and very steadily, with sufficient care the evolution of heat may be tolerably well regulated. The chief practical difficulty, when coal is used, will consist in making all parts of the tent at the same time quite comfortable; if the fluctuations of temperature within the tent are not rapid, the air in the immediate vicinity of the stove will often be found disagreeably warm, while that in the remoter parts of the tent may remain unpleasantly cold. But whatever advantages coal may possess as a fuel for heating tents, the opportunities for obtaining it and using it in camps are altogether too infrequent to give them much practical importance.

In proposing any really useful system of warming tents, we must rely for our heat upon the common fuel of the world—wood.

Several methods of warming tents have at different times been suggested or adopted which I may mention. Sir John Pringle says:—"It will be found useful to burn spirits in the evening, in

order to warm and correct the air in the tents.”¹ It is probable, however, that the old army physician makes the suggestion rather for the purpose of *correcting* the air, than for the purpose of warming it. One of the most ancient as well as common methods is that of placing within the tent, on the ground, upon a flat stone, or in a brasier, a quantity of red-hot coals. If the danger from asphixia is less under canvas than within the close walls of a room, the unwholesomeness of the practice sufficiently condemns it. A modification of this method is thus described by a writer quoted by Capt. Galton.² “When living in a tent in New Zealand, during a severe winter we were perfectly numb with cold at night, until we adopted the Maori plan, which is to dig a hole about a foot square in the clear, to cover the bottom with a stone or stones, and fill it at night with red-hot cinders from the camp-fire, and lastly to close the tent excepting a small opening near the top. The cinders are not nearly burned out by morning. They diffused a pleasant warmth through the tent and rendered us comfortable all night. There is no danger of suffocation unless the tent be closed up very tight indeed.” This plan seems to me scarcely less objectionable than the one previously stated, and for the same reason, notwithstanding the assurance of the writer that “there is no danger.”

M. de Presle, as I have elsewhere remarked, speaks of putting within the tent “a little fire in a chimney made of turf.” This is certainly a much better plan than either of the two I have just referred to, and it may be really all that is needed to make an ordinarily large tent perfectly comfortable, if the fireplace is sufficiently large and the supply of wood not deficient.

A much better plan is that of warming the tent by means of a fairly well-constructed fireplace and chimney; this is a very common method in modern camps, and was sometimes practised in the last century.

In Grose’s “Military Antiquities” there is a sketch of an English marquee as pitched a hundred years ago. Outside of this tent may be observed a large brick or clay chimney; the fireplace

¹ Op. cit. p. 99.

² “Art of Travel,” p. 167.

evidently opens into the tent, and a very curious detail in the sketch is the representation of an empty barrel upon the summit of the chimney. The draught of the chimney seems to have been found defective, and a means of improving it suggested which during the War of the Rebellion I had always regarded not only as an original, but as an indigenous invention.

The fireplace and chimney were very frequently used as a means of warming tents in the Federal army during the War of the Rebellion, particularly in permanent camps. I remember having passed several weeks during one winter in a wall-tent, at the back and outside of which a fireplace had been built of stones and mud, surmounted by a chimney some 12 ft. high, made of small sticks, laid crosswise, and well plastered on the inside with mud. The fireplace opened directly into the tent, the canvas having been raised and properly readjusted at its top and around its sides. The cold was quite severe, but as we had a good draught and plenty of wood, our fire was generally a bright one. So far from having suffered in any way from the inclemency of the season, I shall always remember those days as among the pleasantest I have ever spent in camp, if partly by reason of personal associations, not a little from a sort of local attachment to the cheerful chimney corner, which I knew however stormy it might be without, was always in reserve, warmly waiting for my coming at the close of the day.

A fireplace, however, never can be employed without a great waste of heat. Its use in camp presupposes therefore an abundance of fuel, as also that it shall only be erected for the warming of tents of moderate dimensions. The consequence is, that whatever its excellences in certain cases, they are altogether too dependent upon special circumstances to permit their general utilization.

If one can employ with advantage for the warming of tents neither stoves nor open fireplaces, it would almost seem as if any attempt to secure for them a comfortable interior temperature would lead to equally unsatisfactory results. The problem to solve is certainly a difficult one. A mass of air is to be maintained at a certain temperature, while the walls investing it have little power to store up and return back by radiation the heat

M M

subtracted from it. All heat, once having left the mass of air in question, is lost for ever; and not only is this true, but the investing walls interpose but a slender barrier to the heat within, which passes rapidly through them by conduction, or is carried out in the rarefied air which oozes through a thousand pores and fissures in the network of the tissue. The best idea of the rapidity with which heat escapes from a tent, can be obtained by going on a cold day in the winter into a tent provided with a sheet-iron stove: put in the stove two or three newspapers; in a few moments the atmosphere will have become quite uncomfortably hot, and then after a few moments the temperature will have almost as rapidly descended to the degree indicated by the thermometer before building the fire; and the experiment may be repeated again and again, with the same result—that is to say, without any apparent permanent elevation of the temperature, except that produced by the presence of the persons who may have been in the tent.

To warm a tent successfully some method must be adopted which may enable us to store up a portion of the heat generated in excess of that immediately necessary to make the tent comfortable, and to store it up in such a way as that it shall gradually and uniformly escape into the air within the tent. When a fire-place is used it warms the air not only by throwing the heat directly into the tent, but also by being itself a reservoir of heat for some time after the fire may have been extinguished. A tank or two of hot water, such as is used in railway carriages, will in this way often warm a common tent very perfectly; so even will a box of hot sand. But fortunately we have another and much more practical means of providing tents with such a *stock* of heat. If the air within a tent is enclosed on nearly every side by walls incapable of retaining heat, on *one* side it rests in contact with a deep solid wall—the *earth*. It only remains to contrive some ready method by which the ground shall always take up and hold in reserve a large store of the heat generated for the warming of the tent, and our problem will have been solved. The question then is, how can we at the same time warm the air in the tent and the ground under it? There are several ways of doing this. One of these ways is to dig a sort of cellar

under the tent two or three feet in depth, and to then place in it a common stove. The cellar adds much to the capacity of the tent, and its walls, warmed by the stove, serve as a reservoir of heat, which contributes in the way indicated to the steadiness of the temperature within. It was quite a common practice for the officers of the English army to warm their tents in this way while encamped before Sebastopol. A section of a tent so arranged is shown in Fig. 44. It is difficult, however, always to keep the ground when thus prepared sufficiently dry, and experience has shown that tents when so arranged are lacking in salubrity.

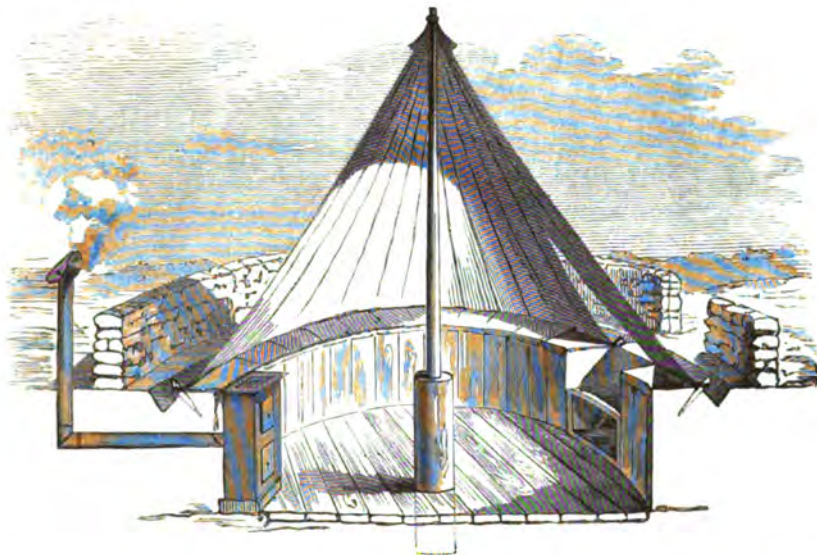


FIG. 44.—Sectional diagram, showing the form of the excavation and the interior arrangement of a Crimean tent.

Another method is to employ a stove, the pipe of which, turned downwards, enters the ground, forming the floor of the tent, and laying horizontally, a few inches below the surface, is joined outside of the wall by a vertical section of pipe that serves as a chimney. Stoves so arranged were also used by the English in the Crimea. Only a small part, however, of the ground surface is warmed, and very slightly, by this method, most of the heat of the smoke being lost in the air, as when the pipe passes outdoors through the canvas in the usual manner.

When with the army of the Potomac, in 1862, I became

acquainted with a system of warming tents by heat transmitted through the ground which was certainly not wanting in originality. The heating apparatus was called a California stove; and if I regret my being unable to give the name of its inventors, it is only just to myself, in view of the system of heating tents, employed at the American ambulance, that I should say that the system I am about to describe was never extensively used in the American army. I remember having seen it adopted but in a few instances, and in no case were the details of the installation alike. I may also observe that General Sheridan—and no one is more familiar with American camp life than he—remarked, when examining the system of heating adopted at the American ambulance,—that “it was the first time he had ever seen an attempt made to heat tents *through the ground*.”¹

I shall describe two methods of applying the system, with which I became acquainted in 1862. In the first the arrangement was as follows:—A hole, about 18 in. deep and 1 ft. square at the top and bottom, was sunk in the ground near the centre of the tent; a trench was then dug, about 8 in. deep and 1 ft. wide, from this hole to a point outside of the tent, and 2 ft. or 3 ft. from its wall; the trench was then covered with flat stones along its whole length, except at the extreme end out of doors; over this open end a chimney of sticks was built up

¹ Dr. J. J. Woodward, of the United States army, informs me that Surgeon D. McRuer, formerly attached to the army of the Potomac, addressed on the 17th of November, 1861, a letter to Dr. Tripler, then medical director of that army, in which he recommended the warming of tents by means of a “California stove,” and asked for a commission of inquiry to examine the four hospital tents to which the system had been applied in his own brigade; as also, that Dr. McRuer afterwards received a sort of general commission authorizing him to visit the different camps and instruct surgeons how to construct the stove. But Dr. McRuer was not the inventor of the system he commended.

I am told by Dr. Eugene Sanger (now of Bangor, Me.), who was well acquainted with Dr. McRuer, that the “California stove” had been introduced into his own and other regimental tent hospitals at Lewinsville (army of the Potomac) some time before the date of McRuer’s letter. Indeed, the name given to the device—a *California stove*—is strongly suggestive, not only that it was not, in 1861, a new invention, but that it was one of those many ingenious conceptions which have been suggested by the necessities of mining, trapping, or a rude life of exposure.

with clay or mud to a height of 8 or 10 ft. The excavation in the ground within the tent served as a *fireplace*; the trench formed the horizontal part of the chimney. The top of the fireplace was covered with a flat stone or a piece of sheet-iron, leaving only a small aperture through which to introduce fuel and regulate the draught, the strength of which depended principally upon the height of the vertical chimney. A heating apparatus thus constructed, after having been used a day or two—the walls of the fireplace and trench having been thoroughly dried and *baked*—worked perfectly; the consumption of fuel was much less than had a common stove been used, and the air within the tent was maintained steadily at a most comfortable and agreeable temperature.

The second method differed from the first in this respect, viz., the fireplace was outside of the tent, and not within it; the trench was continued from the vertical chimney quite across the tent,



FIG. 45.—A tent with a "California stove."

and terminated in an excavation in the ground in front of the door, and a few feet beyond it. The excavation or fireplace was shallow, and the fire lighted upon it burned to a large extent in the open air, only a portion of the heat and smoke being drawn into and through the trench. The tent, however, was well warmed by this arrangement, which was less difficult to manage than that first described. At the Exhibition in 1867, I showed, by a model, how this system was applied to a tent. The model is exhibited in the accompanying engraving, Fig. 45, reproduced, with certain corrections, from a sketch which appeared in the "*Études sur l'Exposition de 1867*," published by M. Eugène Lacroix.

The system I have described will be readily understood by referring to the engraving. The fireplace (A), the chimney of sticks (B), the trench (*b*), the flat stones covering the trench (*a a*), are the essential elements of this very simple system or apparatus, commonly called in American camps a "California stove." The method represented in the sketch is the one to be recommended when two or more tents are united to form a pavilion. When, however, more than one hospital tent is to be warmed, it will probably be found necessary to deepen the fireplace, as also perhaps to cover it over, so as to convert it into a close fireplace or furnace; otherwise too little heat may enter the trench to warm sufficiently the portion of the pavilion nearest the chimney. By closing the fireplace a great economy in the consumption of fuel would also be effected, a matter of small consequence in America, but of great consequence in Europe, or wherever fuel is obtained with difficulty.

The tent pavilions at the American Ambulance were heated by an arrangement which was a modification or improvement upon the method last described, a modification determined partly by the consideration that our tents were erected *en permanence*, and partly by the circumstance of our being in a great city where it was possible to have any apparatus made which might seem best designed to obtain the result wished—a suitable and uniform temperature within our pavilions.

Beneath the first tent, at the northern end of each pavilion, a cellar was dug about 6 ft. deep and 6 ft. wide; its length at right angles to the axis of the tent was 8 ft. at the bottom, and 15 ft. at the top; the walls were vertical on three sides; on the fourth side, as the dimensions given will indicate, the wall had the form of an inclined plane. This inclined plane was *outside* of the tent, and was furnished with steps leading to the bottom of the cellar; it was moreover covered, to keep the rain out, with a wedge-shaped wooden roof. The cellar space beneath the tent was therefore represented by an oblong solid 6 ft. high, 6 ft. wide, and 8 ft. long, and its position under the tent may be said to have been central and lateral; that is to say, a section halving the tent transversely, if prolonged, would halve also the cellar on a line corresponding with its long axis, while the cellar extending 8 ft.

under the tent, projected 6 in. beyond a section halving the tent longitudinally.¹ From this cellar, and along a line 18 in. distant from and parallel with the long axis of the pavilion, a trench was dug to a point about 2 ft. beyond the last tent, a distance of 76 ft. in the pavilion of six tents, and of 62 ft. in the pavilion of five tents. The trench was 3 ft. 3 in. deep where it entered into the cellar; at the distal end it was 16 in. deep; its bottom thus formed a slightly ascending inclined plane. At the top it was 20 in. wide, and at the bottom 8 in. wide; it therefore represented in section a blunt wedge. (See Plate IX. Appendix.) Having thus prepared the cellar and trench, the heating apparatus was introduced.

This consisted of a stove and certain accessories. The stove was very simple in its construction; it was of cast iron, 28 in. high, 18 in. diameter, and arranged for burning either coal or wood. The stove was placed on the floor of the cellar, with its back directed towards and against the open end of the trench; an elbow of $6\frac{1}{2}$ in. pipe was adjusted to the chimney, the under surface of the horizontal branch of the elbow resting on the bottom of the trench; straight sections of $6\frac{1}{2}$ in. pipe were now laid the whole length of the trench to the point where it terminated—2 ft. beyond the last tent; here an elbow was attached to the pipe, which rose perpendicularly out of the ground to the height of 13 ft., where it was crowned with a water cap.² The apparatus for heating the pavilion having been established in the way described, a fire might have been built in the stove; the draught would have been found excellent, and the amount of caloric thrown into the tent altogether sufficient. The heat, however, would have been very unequally distributed, as also subject to great waste. To regulate its distribution, as also to economize it, something more was necessary. The first thing done was to

¹ I have here described the position of the cellar in pavilion No. 1; in pavilion No. 2 the steps leading to the furnace were in *front* of the end of the tent, and not at the *side*, and the cellar was under the vestibule, and not under the tent itself. (See Plates II. III. and V.)

² A reference to the Plates accompanying this Report will make this description perfectly intelligible. The cellar is indicated by the letter A, the trench by B, the stove by *a*, the elbow by *b*, the horizontal section of pipe by the letters *c c c c*, the vertical section by the letter *d*.

cover over a considerable part of the trench, beginning near the stove. This was accomplished by inserting thin plates of iron into the walls of the trench about 6 in. below the surface of the ground, and covering them with earth (Plate IX.); 45 ft. of the trench were thus covered over. The effect of this operation was naturally to create an air-current, drawing most of the heat from the stove into and *through* the trench, to the extreme end of the pavilion, where it arose into the tents from the uncovered portion of the trench. In order, however, that the heat might be introduced directly into the tents (the three) nearest the stove, a grated opening (register) communicating with the trench was placed in the floor of each (Plate V); this could be opened or closed at pleasure; when open, a portion of the hot air arose from the trench directly into the tent; when closed, the hot air was forced on to the next tent, where, if the register was also closed, it passed to the next—until, in fact, it found a free opening from which it might escape into the pavilion.

By covering a portion of the trench (the whole might have been covered, but it was not really necessary), and by the introduction of registers, a proper *distribution* of the hot air coming from the furnace was provided for. To economize all the heat generated, and to secure a constant draught of hot air along the trench, and in the right direction, brick walls were built up around the stove, completely enveloping it, except on the lower half of its front, and except also, I should say, behind, where it was backed against the trench (Plate III.). This envelope formed a sort of air-chamber, and its object, as M. Bréhan has very well said, "was to force the exterior air to lick the metallic surface of the stove, and take up a part of its heat, and thus send it into the trench, where along its whole length the hot air is constantly in contact with the stove pipe, which also adds to its temperature."¹ To the mouth of the brick envelope was attached a sliding iron door, by which the air supply was regulated. To prevent the tents becoming at any time over-heated by the current of hot air, a cut-off, or damper, was placed in the trench 4 ft. from the stove; it was simply a long thin plate of iron, attached to a

¹ "Notice sur l'Ambulance Américaine," submitted to General Morin, with the Plates I. II. III. IV. V. and VI. accompanying this Report.

perpendicular spindle; when open, its planes were parallel with the long axis of the trench; on turning the spindle one quarter of the way round, the plane of this plate being at right angles with the axis of the trench, the trench was closed and the current of hot air cut off. That the heat of the stove in this case might not be wasted, in pavilion No. 2, an 8 in. earthen pipe had been let into the top of the brick envelope, and laid in the ground outside of the tent; this pipe ran under the nearest barrack, into which it opened through a register placed in the floor; the hot-air chamber surrounding the stove was thus connected with a barrack in such a way that whenever the heat generated by the furnace was more than sufficient for the pavilion, the damper being turned so as to prevent the hot air entering the pavilion, on opening the register in the barrack the current of air from the furnace was let into that building. Our heat was thus economized, and a considerable saving of fuel effected.

I believe this general description of the heating apparatus used in the tent pavilions of the American ambulance will be sufficiently intelligible. I would, however, call your attention to the Plates accompanying my Report (Appendix), which represent with great exactness most of the details of this special installation. The explanations attached to the diagrams will cause them to be readily understood.

The system of heating which I have here described was found, when applied to our tents, to perfectly accomplish the object had in view.

It was easy to maintain, by means of it, a temperature within the tents comfortable and uniform in the coldest weather. Says M. Bréhan, in the paper from which I have already made an extract:—

“The thermometer out of doors standing at 29° Fah., we found the following temperatures existing within the tents at 5 ft. from the floor.

“At the entry of the first tent (over the furnace)		57°	Fah.
”	”	second	59°
”	”	third	61°
”	”	fourth	59°
”	”	fifth (farthest from the furnace)	55½°

The hot air as it issued from the first register—the one nearest the stove—showed a temperature of 122° Fah.”

This memorandum is interesting, showing as it does the uniformity of the temperature in every part of the pavilion. The five observations show the average temperature to have been 58.4° Fah. and in no part of the pavilion did the temperature at 5 ft. from the floor *differ from the average* to the amount of 3° Fah. I may remark, however, that M. Bréhan observed the temperature but on a single occasion, and when it was below the average usually maintained, which was a little over 60° Fah.

Says M. Jolly:—“I have many times myself been a personal witness to the fact, that during the rigorous month of December, when the cold was ranging from 14° Fah. to 10° Fah. the temperature within the tents was maintained from 54° to 59° Fah. and that without forcing the fire.”¹ Often, however, I have seen the temperature raised during the severest days of the winter to 65°; indeed, we never had any difficulty in raising the temperature to any desirable degree, and maintaining the same in every part of the pavilion, so long as we were supplied with fairly good fuel.

In this connection also it may not be uninteresting to learn that, in the two tent pavilions erected in the garden of the Luxembourg in imitation of our own (and in each one of which the heating apparatus was an exact copy of that I have just described) similar results were obtained as regards both the distribution of heat and the steadiness of the temperature. M. Cottard, the *interne* of the ambulance, reports that for about a month, from the middle of February until the middle of March, he conducted a series of thermometrical observations, noting the temperature every two hours in different parts of each pavilion; and he states that he found the variations of temperature very slight, and that they were produced quite insensibly—“*Les variations étaient minimes et se produisaient insensiblement.*” The general average temperature ranged from 56° to 58° Fah.

The only difficulty we ever experienced in heating the tent

¹ “*Ambulance Américaine*,” par M. Ch. Jolly.

pavilions dated from the time (January) when it became impossible for us to obtain in Paris any fuel but coal-dust of the most worthless quality, and greenwood from the Bois de Boulogne so charged with water and with sap as to be nearly incombustible.

After this fuel had been used for a few days the draught became defective on account of the condensation, in the more distant portions of the smoke-pipes, of the products of the distillation rather than combustion which was taking place in our furnaces. The deposit left upon the pipes was highly hygrometric, and water rapidly accumulated, particularly in the vertical sections of the pipes; running down, it entered the horizontal portions of the pipes, and soon flowed nearly to the fires. The result was naturally an almost complete arrest of the draught, and a fall of the temperature within the tent; coal smoke began even to enter the tents in a manner very disagreeable. A partial remedy for the evil—the defective draught—was found in burning out the pipe (in each pavilion), and replacing it, after having attached a receiving-box to the angle formed by the junction of the horizontal and vertical sections; an opening was made in the lower face of this elbow, that communicated directly with the box, the bottom of which was also perforated, that the fluid running into it might escape into the ground.

The arrangement will be understood by referring to Plate IV., where the receiving-box indicated by the letter *k* may be seen in its place. Although we never saw any necessity for the use of such a box so long as we had either coal, coke, or dry wood for fuel, our experience has proved it to be one of those accessories which may prove most useful; at any rate, I would recommend, whatever the fuel to be used, that the lower face of the elbow be perforated with a few holes half an inch or an inch in diameter, and that in laying the pipe a small cavity be left in the earth immediately beneath these holes, at the angle of the elbow. Such an arrangement would probably be quite sufficient to prevent the accumulation of fluids in this part of the pipe. Another practical suggestion I may be permitted to make. It would greatly facilitate the cleaning or burning out of the horizontal portion of the pipe, should it be necessary to resort to this expedient, if small traps were cut in the pipe which could be

reached from the openings in the floor in which the registers are set. Such an arrangement would cause the interior of the pipe to be always fairly accessible, and obviate the great inconvenience of taking out the pipe each time it is to be cleaned.

Should it be proposed to give to the installation a character of permanence—to organize a hospital for the winter—perhaps the simplest and most effective method of securing a good draught would be that of placing a small sheet-iron stove at the extremity of the pavilion, near the vertical smoke-pipe, and fitted with a two-inch pipe made to enter the smoke-pipe near the ground. The occasional lighting of a small fire, the burning even of a newspaper in this stove, would be probably all that would be found necessary to secure for the furnace a sufficient draught.

I have said that the temperature within the tent was not only sufficient but uniform, and I have partly explained how this uniformity was obtained—by the sliding door at the mouth of the brick air-chamber, which increased or reduced the quantity of air brought in contact with the hot surfaces of the stove, and consequently the volume as well as the rate of movement of the hot air current; by the registers, established at different points in the pavilion, which could be opened more or less completely at will; and finally by the damper, which enabled us to cut off entirely the hot-air current whenever it might seem desirable. While the difference in the temperature of the air in the several tents forming the pavilion was in no case remarkable, it may have been observed that, according to M. Bréhan's memorandum, the two coldest tents were the first and last—the one nearest the fire, and the one the farthest removed from it. That the tent beneath which the furnace itself was placed should have been colder than the others may seem at first remarkable; the reason, however, is quite apparent. Most of the heat of the furnace was driven by the air current into the trench; the consequence was that the tent over the furnace was dependent for a large part of its heat upon that given off by a slow radiation from the stove, its brick envelope, and the warm earth beneath it. Nearly all the heat developed in the stove was swept into the trench by the current of air, and was either discharged through the registers into the tents, or served to warm

a large mass of earth beneath the tents, and along the line of the trench. Two important facts I may state: the cellar, small as it was, was never hot; while the vertical piece of pipe from which the smoke escaped, outside of the pavilion, was always cold to the touch quite to the ground. We thus, while forcing nearly all the heat to *follow the course* of the chimney, *lost no heat by the chimney*. In fact, nearly every unit of heat generated passed into the tents either directly or indirectly, either as hot air, or through the ground by a slow radiation. 'I have stated how we regulated the temperature in the pavilions. The means described, however, were chiefly intended to *equalize the distribution* of the heat. To equalize the *rate* of the heat supply was an object not less important, and one which I have already said within tents is attended with special difficulties.

This object was accomplished, as you may have already foreseen, by having on hand a large reserve of heat, that was constantly, slowly, and steadily being discharged into the pavilion along its own length. The hot air in its passage along the trench gave up a portion of its heat to the earth, which in turn gradually, by conduction and radiation, gave up its heat to the floor of the tent, as also to the air within it. Sand, clay and earth have a high capacity for heat, and, like all bodies possessing such a capacity, are poor conductors of caloric,—that is to say, yield up their heat slowly. The warm temperature within the pavilion was therefore maintained partly by the direct introduction of hot air, and partly by the evolution of radiant heat; the air gave out its heat quickly; the earth gave up its heat slowly; the air was a transient source of heat; the earth might almost be said to have been a permanent source. If I may use an illustration suggested by the laboratory, the warm earth beneath our pavilion bore the same relation to the air within it that the sand bath does to the contents of a retort which the chemist may be heating—it served to regulate the distribution of the heat, as also, and more particularly, to equalize the rate of its evolution. Had our tents been warmed solely by the introduction of hot air, it would have been impossible to have maintained within them a steady temperature. Suppose the thermometer out of doors to have marked 14° Fah. and within the pavilion to

have marked 65° Fah., the pavilion being at the same time dependent for its heat entirely upon a supply of hot air: on cutting off that supply the interior temperature would have rapidly, and within a few moments, fallen 5°, 10°, 15°, 20°, 30° (Fah.). Now, when this difference existed between the temperatures without and within, we found, that when the hot-air current was entirely shut off from the pavilion, the heat entering the tents by radiation and conduction from the hot earth maintained the temperature within them for a long time above 50° Fah., and that the rate of the refrigeration was so slow that *hours* must have elapsed before the thermometer would have marked a loss of 30° of heat.

I may now mention another great advantage obtained by warming tents through the ground. It keeps the earth constantly dry beneath the floor of the tents, or—no floors being used—beneath the beds of the patients. The humidity which may arise from the ground within tents has been with surgeons a constant cause of fear as well as of complaint, and whenever it may have been present it has most unquestionably neutralized in a measure several of those good qualities which I have endeavoured to show were peculiar to tents. By the employment of a system of heating such as that used by us at our ambulance, the surface of the ground upon which the tents stand will be found to have soon become so thoroughly deprived of its moisture as to cease to be a source of either danger or apprehension to anyone, whether patient or surgeon.

There is a close relation, as everybody has learned, between the heating of an apartment and its ventilation. Whenever the temperature of the air within a chamber is raised to a degree above that existing in the air without, the natural ventilation of the chamber is improved; in other words, the confined air escapes more rapidly by the windows, the doors, and other usual apertures of the room, and is more rapidly replaced by the counter-currents set in motion from without. As the ventilation of all apartments in which men dwell is a subject of the greatest importance, and as the means employed for heating them always contribute to a certain extent to their aëration, efforts have been made to so construct heating apparatus that they should accom-

plish, at the same time and to the largest degree possible, two objects: First,—the maintaining of a comfortable temperature within the apartment occupied; and secondly,—a sufficient renewal of the atmosphere within it.

The relations of heating to ventilation have been most carefully studied, particularly within the past thirty years, by Angiboust, Peclet, Ried, Duvoir, Morin, and many other scientific men, and the practical as well as theoretical conclusions which they have drawn from their experimental researches are not only highly interesting, but of great value.

A consideration of this subject from a general point of view would scarcely be in place in this Report. Nevertheless, the way in which the air within our tents was expelled and renewed may be more clearly understood by keeping in mind a few of the most important facts connected with the general subject of ventilation. There are commonly said to be two kinds of ventilation—*natural* and *artificial*; that is to say, ventilation accomplished by natural forces, and ventilation accomplished by forces created by art.

The walls of few rooms are absolutely air-tight, and gases pass through them by diffusion, and more or less slowly according to their porosity. But most habitable rooms are provided with a variety of openings—doors, windows, and chimneys—and where these openings exist diffusion takes place more rapidly. Here the principal motive force is the difference in specific gravity between the diffusing gases, or, to speak generally, between masses of air having unequal temperatures. The wind, however, must be counted as one of the most active natural ventilating forces. It penetrates even solid walls, and everywhere exerts its influence by increasing the pressure of the exterior atmosphere. The air within our railway carriages would often become dangerously offensive but for the powerful action of the wind.

Of artificial methods of extracting the air from rooms, the simplest illustration is a chimney with a fire in it. In this case artificial heat is used as a motive force; the heated air ascends the chimney with great rapidity, and extracts or *pumps* the air from the room; while to re-supply that which has been extracted, a corresponding amount of fresh air is drawn into the room through various openings. But the outlet of the chimney in common

apartments is not well placed, nor can it be easily increased or diminished to better serve the purpose of ventilation. For this reason it is found that shafts in which an ascending current is created by hot-air pipes, or any simple heating apparatus, extract the air more uniformly, as their outlets may be placed above the floor or in the upper part of the room, and may be opened and shut more or less completely according to circumstances. A certain correspondence, however, should always exist between the position of the inlets and outlets for the air. Where the principal inlets are windows and doors and the *cracks beneath* the doors, the fireplace, as an outlet, is badly placed. Where, however, the inlets are from above, the fireplace may be well placed. In fact, one of the best systems of ventilation, in which heat is used as an extracting force, is that known as *reversed* ventilation, where fresh air is introduced from above, and the outlets of the *cheminées d'appel* are on a level with the floor.¹

There are two other well-known systems in which artificial force is employed as a means of obtaining fresh air. One of these has been called ventilation by *insufflation*, and the other ventilation by *induction*. In the first system, fans are employed to force a current of air into a large pipe furnished with numerous small branch pipes for its final distribution. In the second system, compressed air is discharged into pipes by nozzles so arranged as to communicate with air ducts, through which the air is drawn into the main pipes by rapid and forcible jets of the compressed air. But mechanical devices for obtaining a change of air, however ingenious they may be, are generally very inefficient. The conclusion arrived at by General Morin, after numerous experiments made at the Lariboisière (hospital), where the fan was used in connection with the *cheminée d'appel*, was that the fan expelled about fifteen per cent. of the air evacuated, and that the balance, eighty-five per cent., passed out through the *cheminée d'appel*.² In short,

¹ See "La Réforme des Hôpitaux par la Ventilation Renversée," par M. Félix Achard. Paris, Eugène Lacroix, 1865.

This also is the system most successfully adopted by General Morin for the ventilation of the amphitheatre of the Conservatoire des Arts et Métiers.

² "Études sur la Ventilation," tome i. p. 423.

the two methods of ventilation first mentioned—ventilation through natural openings, and by extraction by heat—are the most efficient methods now known for effecting a change of air in rooms, and they are in principle the same; that is to say, the motive force used in each is the difference of pressure between the air within a room and the air exterior to it, a difference of pressure which results generally and principally from a difference of temperature.

One of the practical difficulties in ventilation has always been to regulate the supply of fresh air: it is not only necessary that the air of an apartment should be frequently changed, but it must be changed regularly, and in such a way as not to give rise to currents or draughts of air. Draughts are inevitable in buildings where natural ventilation is resorted to. Draughts are also inevitable in all apartments where the air escaping must be replaced by air entering through a limited number of apertures of a limited size; in these cases the rapidity of the moving currents will be inversely as the number and size of the openings, and the inconvenience of the draught will be felt in proportion as the apartment is small. Indeed, it is almost impossible to maintain a proper degree of atmospheric purity in small apartments, occupied by a number of persons, by means of natural ventilation, on account of disagreeable draughts.

Of artificial methods of extracting foul air, the simplest, as I have already remarked, is a chimney with a fire in it. But here again, in the application of this system, particularly in small apartments, we find it giving rise to draughts; and, notwithstanding the great sensible movement, the air is often imperfectly renewed, the currents sweeping along the floor, while the air in the upper part of the room gets close and disagreeable.

A partial remedy for draughts is found in warming the air which flows into apartments to take the place of that which has escaped. The currents may still exist, but when the air has been warmed they cease in a measure to be disagreeable.

Probably the best system of artificial ventilation for an ordinary room is that which combines the evacuation of the vitiated air by a shaft or *cheminée d'appel*, with a provision for a corresponding supply of warm air. Unfortunately the evacua-

tion of the air is usually much more rapid through the shaft than the injection of warm air, and, in consequence, the balance of the air supply is drawn in irregularly through various openings. This system in its simplest form was used in our tent-barracks. A horizontal air shaft was laid under the floor; outside the barrack it terminated in a vertical section which served as an inlet; inside the barrack the shaft opened beneath a stove. This stove was surrounded by a metallic jacket pierced with holes; the heat of the stove, and the general evacuation of vitiated air from the ward, caused a strong current of air to enter the shaft, while the air was forced to pass around the hot surface of the stove, before entering the ward through the openings in the jacket. The *cheminée d'appel* was a vertical shaft which received, and was heated by, the ascending stove pipe.

This method of ventilation may be occasionally wanting in power, and its use is limited to the winter season; but for temporary barracks in the winter, I believe it to be equal if not superior to all other artificial methods of ventilation. It is incontestably superior in two or three respects—it is simple and easily applied; it involves a very trifling expense;¹ and, what is by no means its least merit, it is sure to work in the *direction* intended—a fact which will be appreciated by those who have witnessed that special kind of *ventilation renversée* which is too frequently incident to more complicated systems. This system was employed in nearly all the American barrack hospitals, and has been used perhaps more frequently than any other in the German barracks since erected.

But to return to the ventilation of our tents. How was this accomplished, and what relation to it had the system of heating employed? It is very evident that they were indebted

¹ It possesses a very striking theoretical advantage, to which, however, perhaps too much importance has been attached; the shaft is worked by a force—heat—which would be often otherwise wasted. In a *résumé* of the principles of artificial ventilation, M. Jolly says:—"5° On devra utiliser pour l'appel la fumée, c'est-à-dire la force perdue du foyer servant à chauffer l'air nouveau." ("Traité Pratique du Chauffage, de la Ventilation, &c.," par V. Ch. Jolly. Paris, 1869.) The principle is an excellent one, but its value in any given case must depend equally upon the relative cheapness of its application and effectiveness.

for their ventilation almost wholly to the action of natural forces. Strictly speaking, no artificial means whatever were used within the tents either for the purpose of expelling foul air or of introducing fresh air. There were no *cheminées d'appel*, nor had permanent inlets for fresh air been provided. A strong current of fresh air did at times enter the trench and escape as hot air through the registers into the pavilions ; but it should be observed that this current of air was introduced for the purpose of obtaining a more equal distribution of heat rather than for the purpose of obtaining a supply of fresh air. As a source of fresh air the trench was doubtless of service, but this service was incidental. The hot air which came from the trench was necessary to the maintenance of a uniform temperature through the whole length of the pavilion, but it was not necessary to the maintenance of atmospheric purity within the pavilion. Much, if not most, of the fresh air which entered the tents, entered through other channels. I have elsewhere stated that air can pass through the walls of all habitations, and that it does so more or less slowly according to their porosity. Sometimes this diffusion takes place very slowly, as through walls of plaster ; it is more rapid through walls of brick and wood ; it is still more rapid through walls of canvas.

The canvas of a tent, when interposed between two gases, is a porous diaphragm, or septum ; and if interposed between gases of different densities, these would diffuse into each other inversely as the square roots of their densities. But aside from this porosity or capillarity of canvas, which causes it to be everywhere permeable to air and gases, canvas is often largely provided with what may be called natural openings. An examination of a piece of the best linen canvas shows it to be full of small but quite visible apertures. The number and size of these apertures vary greatly with the quality of the canvas, and it is difficult to estimate the exact space they represent in any piece of canvas ; but it may be safely said that such apertures represent in their aggregate for each square yard of canvas an opening rarely containing less than four square inches,¹ and often exceed-

¹ A square inch of French regulation tent-canvas contains on the average about

ing a foot square. Suppose they represent an opening two inches square in each yard of canvas; in a tent like the American hospital tent, the walls and roof of which contain about 70 square yards of surface, these little apertures would represent in the aggregate seventy openings, two inches wide and two inches long. Now, a room of a capacity equal to that of an American hospital tent, although occupied by five or six persons, if provided with two windows properly disposed, of such a size as to represent the aggregate surface of the seventy openings just mentioned, could not fail to be well ventilated, if the difference between the temperatures of the interior and exterior air was 20° or 30° Fah.—a minimum difference whenever it is necessary to resort to artificial heat.

These statements will cause it to be understood why tents are so much more susceptible of natural ventilation than ordinary rooms. Indeed, it is not impossible that the question may have occurred to you, why is it, if the small apertures represent in the aggregate so large an opening, the air should so frequently become close within tents when special means of ventilation are not resorted to, when the walls are not raised, &c. ? And this leads me to observe: First,—that the size of the apertures varies very much according as the canvas is wet or dry. After the tent

30 threads, crossed by 44 or 46 threads, and may be said to represent a pavement composed of 1,300 or 1,400 little, not quite regular, squares. Now between many, if not most, of these there are visible apertures or meshes. The number of these apertures, plainly visible on holding a piece of this canvas between the eye and the light, may be safely estimated at 800 per square inch. Their average diameter cannot be less than $\frac{1}{400}$ of an inch—that is to say, the meshes occupy at least $\frac{1}{400}$ of the surface, and thus represent in the aggregate for each square yard of canvas an opening containing 6.4 square inches. But French regulation tent-canvas is of a fairly good quality. I have frequently seen linen canvas, used for making tents, in which the *holes* between the threads represented nearly a *quarter* of the surface. While these apertures are so very visible, and play no inconsiderable rôle in the ventilation of tents made of linen, the meshes are scarcely visible in fairly good cotton canvas. In a piece of American regulation tent-canvas which I have now in my hands I cannot detect, even with a *lens*, a single opening *through* the canvas. The meshes, therefore, in well-made cotton canvas, or, in other words, in an American tent, cannot be considered as contributing very much to its ventilation. The canvas is permeable to air and gases, principally because, although unprovided with many visible apertures, it is still highly porous.

coverings are wet with rain or dew, as is often the case at night, when ventilation is generally most required, these little apertures are to a great extent closed up. Hence, as I have elsewhere remarked, the importance of employing a double roof, and, as I may here remark, one of the advantages of warming tents, the canvas being permeable to air very much in proportion as it is free from moisture. Secondly,—the air generally escapes from and enters into a tent or room much more rapidly through a few large openings than through a great number of smaller openings; and the principal reason is because the wind, which is one of the most powerful of our ventilating forces, acts much more effectively through large openings than through small openings. The force of the wind is broken by the coarsest canvas, and although the currents of air find their way through the small interstices of the tissue, and thus assist in ventilating the tent, the volume of air thus brought into a tent is much less than would be introduced under the same circumstances through two or three open windows of a moderate size. We must regard, therefore, the little apertures visible in canvas of a fairly good quality simply as outlets and inlets for the escape and entrance of air by diffusion. Through them any gas confined within a canvas covering will be diffused into the surrounding atmosphere, in accordance with the law stated above. Now, gases at different temperatures diffuse into themselves in conformity with the law which regulates their diffusion at the same temperatures into each other. As with simple gases, so the bulk of a mass of air varies with its temperature. How much it varies we learn from Regnault, who proved its dilatation to be for every degree of Fahrenheit $\frac{1}{491}$ th part of its bulk; that is, 491 cubic inches of air at 32° Fah. become at 65° 524 cubic inches, its volume having thus been increased about 7 per cent., which percentage also indicates its diminished density and its power of diffusion.

These statements concerning the mechanical qualities of canvas and the physical properties of air will indicate how the ventilation of tents may be accomplished even when they are shut up—by the simple diffusive power of atmospheres at different temperatures. A canvas tent within which the air is warmed by a fire is the best illustration which can be suggested of effective

natural ventilation. Neither special inlets nor outlets for air, nor shafts, nor driving fans are needed ; the elevation of the general temperature necessary for the comfort of those within the tent in the winter season, with the free action of the wind without, is all that may be required to maintain a ventilation in every respect satisfactory—satisfactory, not only because it is sufficient, but because it is accomplished regularly and without draughts.

If a free ventilation can be secured without draughts in a tent pavilion, it is because in canvas walls the openings are not large enough to admit the air in currents, and have been uniformly distributed and vastly multiplied over a wide surface. No principle of ventilation is more generally accepted or more frequently repeated by writers on the subject, than that the number of both the outlets and inlets should be multiplied as much as possible. "Hygiene demands," says M. Piron, "that the air should be renewed constantly and insensibly—not through a large opening, but through the greatest possible number of *bouches*—inlets—only so large that the velocity of the air currents may in nowise prove uncomfortable to the sick. This velocity cannot exceed 1m. 25 per second; for if moving at the rate of one metre per second the wind is scarcely perceptible, at two metres per second it becomes a light breeze."¹

If the openings through the canvas are very minute, the number of the apertures compensates for the smallness of each, and all that is necessary, in order to establish a circulation between the interior and exterior atmospheres, is to create a difference in their pressures, and this difference will always measure the rapidity and completeness of the interchange—an interchange which has been compared to the phenomenon of osmosis, but which is more strikingly like that special interchange of gases which is constantly being accomplished through the walls of the pulmonary vesicles, through which are diffused in outgoing and ingoing currents, the gaseous products of respiration, and the fresh air which is essential to life.

I feel confident, indeed, of the truth of my assertion,—that no

¹ "Projet d'Hôpital Militaire," par F. P. J. Piron. Paris, 1865, p. 41.

system of heating a special dwelling has ever been proposed which may have contributed more powerfully to the abundant ventilation of the same, than did the system of heating I have just described, and which was used at our ambulance during the winter of 1870-71. When heat is introduced into an apartment it warms the air within, and at the same time tends to ventilate it. These two effects are the principal effects sought; to obtain them we *use* our heat. The heat at any time present in the tent pavilions served to make the air within them comfortable, and at the same time, by rarefying it, powerfully contributed to its rapid expulsion through the tissue of the canvas. The very fact that the canvas, as I have before remarked, offered but a feeble barrier to the escape of the warm air, became now an important condition in the maintenance of the purity of the atmosphere within the tents. That which, when the common means of heating tents are employed, is an evil—the rapid escape of the heat—became, on the introduction of our system of heating, an unqualified excellence; we had heat enough to make the tents comfortable, and, in addition, enough to expel the foul air, and thus make them healthful.

As I have said, nearly all the heat generated in the furnaces entered the pavilion; the cellar was cool, the vertical smoke-pipe was cool; very little heat was lost; nearly the whole amount was necessarily used, either to warm the tents or to ventilate them; and as the temperature within the tents seldom rose much above 65° Fah., it will be readily understood how powerful a motive force we constantly derived from our furnaces, for the expulsion of the air from the tents, and its induction from without.

But it has been sometimes asked:—"How do you know that sufficient air enters by the doors, and, especially, that large volumes of air pass out and in through the canvas, either directly or by a sort of exosmotic and endosmotic action—that, in short, your tents are well ventilated?"

One distinguished scientific gentleman said to me that he should be much better satisfied about this matter, when the rates of the expulsion of the air from the tents, and of its renewal within them at various degrees of interior and exterior temperature, had been determined by a series of carefully conducted experiments;

and the gentleman left our grounds convinced, I presume, that it was at least very probable we were deceiving ourselves as to our air supply, because we could not furnish him with anemometric tables in proof of our affirmations.

I have just spoken, and perhaps at sufficient length, of the tendency of gases at the same or different temperatures to diffuse into each other when not enclosed by impermeable walls. In order, however, that the diffusive power of gases may be fully exercised, it must in no way be obstructed; and whenever gases are enclosed by canvas walls, those walls are certainly obstacles which interfere more or less with the rapidity of their escape and dispersion into the surrounding atmosphere. To what extent the canvas walls of tents may hinder the tendency of the outer and inner atmospheres to diffuse into each other,—or to express the idea more clearly, at what rates, under the usual differences of temperature, the air may pass out of a tent by diffusion, and *how many cubic feet of air may thus in return be supplied to each patient per hour*, are certainly interesting questions. I may observe, however, that it would be very difficult, if not impossible, to determine with exactness the facts desired; and furthermore, that if a quantity of air having been completely shut in by canvas walls, the rates of its diffusion were noted at certain exterior and interior temperatures, such rates of interchange would be absolutely valueless as a means of establishing the rates where the same conditions did not exist; and it is scarcely necessary to add, that the conditions essential to an exact experiment never obtain in tents, especially when in use. The conclusions of transcendental mathematics are as inapplicable to special cases as their premises are absolute; logic, if less certain in its premises, often opens to us the nearest and the surest way to truth, and generally possesses the great advantage of being more direct in its applications.

One fact is very certain; if the canvas covering of a tent opposes in any way the free passage of air through it, it is, nevertheless, exceedingly permeable; that it furnishes innumerable outlets and inlets for air, is a fact revealed by the most careless inspection. I shall therefore answer the question "How do you know your tents were well ventilated?" as follows:—In the first place,—

re-stating in a general way the inference from the physical properties of the atmosphere and the qualities of canvas, because we know the quantity of heat introduced into the tents was great, as also that its escape from the tents was rapid;—now as cotton is not a rapid conductor of heat,¹ and as the canvas covering our tents was a porous reticulated tissue, very pervious to air, it is more probable that most of the heat escaping from a tent passed out with the ascending rarefied air, than that it was lost by conduction. In the second place,—it is highly probable that the ventilation was sufficient, because odours were rarely perceptible in the tents, and never were persistent. This is a fact of the greatest importance. Chemistry furnishes few and poor tests of the salubrity of an atmosphere; it can detect the presence of few of those exhalations which have an organic origin, and which are often, at the same time, the chief causes of insalubrity, and perhaps the principal factors in what is known as an atmospheric epidemic condition. The sense of smell does what chemistry fails to do; it detects the presence of many of these exhalations, and enables us to make a qualitative analysis of the air in a hospital ward, sufficiently complete to permit us to pronounce with tolerable certainty as to its purity. In the third place,—because it is a well-established fact that typhus is a disease produced by dwelling in an atmosphere greatly vitiated by animal exhalations; now I believe I may safely say, that an epidemic of typhus was never known to break out in a hospital under canvas; in any event, typhus has rarely been known to originate in such a hospital: it therefore follows that within such hospitals, the air is not greatly vitiated by animal exhalations. It should be observed, moreover, that the amount of air space given to each person in a tent is necessarily very small. An American hospital tent, when pitched, contains but 1,627 cubic feet of air; when five persons are placed in one,

¹ Cotton wool is one of the best known non-conductors of heat. According to Péclet, if the conductivity of copper is represented by 64.00, that of sand may be represented by 0.27; of carded wool, by 0.044; of cotton wool, by 0.040; of eider down, by 0.039; and that of unsized brown paper, by 0.034. (Péclet, *op. cit.* pp. 105, 106, 107.)

each has but 325 cubic feet of air; counting the air displaced by furniture, &c., each patient has an air space of scarcely more than 275 cubic feet. Now, if a number of persons were shut up in a room, 14 ft. long, 15 ft. wide, and not 8 ft. high, and without either windows or a chimney, we should naturally expect the most serious consequences; such results did not follow when the air space was thus limited in our tents: the inevitable conclusion is, that the air supply was better—in a word, that the air was being constantly renewed within them.¹

As I have elsewhere spoken of the general means taken to secure for the tents a sufficient fresh-air supply, by raising the walls, and opening the doors and ventilators placed in the roofs, it may not be necessary to again revert to them.

By means of the system of heating, adopted at the American ambulance, a comfortable temperature was maintained in the tents during the coldest and severest months of the winter; the ground upon which they were pitched was deprived of its dampness, and the air within them kept fresh and pure, to a degree unusual in any hospital, and to a degree remarkable in view of the small cubage of the pavilions and the large number of patients and attendants constantly within them. I believe that a considerable part of the success attending the surgical treatment at our ambulance must be ascribed to conditions which could not have been maintained within the tent pavilions, had any of the usual modes of heating tents been adopted. I do not know how it would have been possible to have secured by any other system or apparatus such freedom from dampness, such a comfortable and uniform temperature, and a ventilation so perfectly satisfactory. I cannot therefore insist too strongly upon the special merits of our system of warming tents. The attempt made at the American ambulance to treat the wounded under

¹ As I have not noticed in this connection the existence, in the roof of each tent, of a window (14 inches by 12), I may here observe that the windows were rarely opened in cold weather. Then every crevice in the canvas was shut as tightly as possible, and it was then also that the air within our tents was always the purest. The windows and doors were only opened when the general temperature was relatively warm, or when the heat from the furnace was in excess, to facilitate its escape.

canvas during the winter months, and in the belief that better results might thus be obtained than could be hoped for, were the wounded placed under the shelter of more substantial constructions, undoubtedly seemed to many persons hazardous. The experiment in its relations to military surgery was certainly one of the most important which has ever been made, and an unusual degree of interest has naturally existed among sanitarians to know the final results. These results our surgeon-in-chief has presented in his report.

I believe the world will pronounce them to have been even more than satisfactory when compared with the results obtained elsewhere in Paris. If this be the conclusion of those most competent to judge—as to whether we succeeded or failed in our attempt to treat the wounded in tents during the winter—I shall again give it as my opinion, that our success in this respect was largely attributable to the very effective system of heating adopted.

Having described the heating apparatus, and considered its merits as a means of warming and ventilating tents, it were perhaps well if something should be said with reference to the economy of using it. I have already alluded to the fact that very little heat was lost. This economic fact, very important in view of a permanent installation, may be of less consequence when the installation is only temporary. The question in this case might be, at what expense could the apparatus described be furnished? As the cost of the apparatus will naturally depend somewhat upon special circumstances, the question may best be answered by the following statement:—

The cellar and the trench for each one of our pavilions were prepared by our own attendants (*infirmiers*). We consequently paid nothing, directly, for the labour, which represented, perhaps, the work of one man for three days. For each stove and the accompanying apparatus, pipe, registers, brick-work, and the labour of setting up the same, we paid out two hundred francs (the labour may have represented one man's work for two days). All the labour, however, connected with the work of preparation, as well as of the installation, could very easily have been done by five or six men in one day. The apparatus is one, conse-

quently, which can be introduced into a pavilion of tents without loss of time. It required on our part, a cash outlay of two hundred francs, in one case, for a pavilion of five tents, in another, for a pavilion of six tents. The average cost of the apparatus having therefore been but thirty-six francs for each tent, the apparatus must be considered as having been extremely cheap.

If the tents be pitched in the field, where stoves, iron pipe, &c. cannot be obtained, and should it be thought desirable to make use of the more primitive system which I have described on a preceding page, the only cost it would entail may be expressed by the time or labour expended in its construction. Two or three men in one day could very easily prepare the fire-place and trench, and build the chimney for a pavilion of four or five tents. With regard to the material, in this case, for the construction of the apparatus, we may be quite sure that everything really necessary will almost always be found near at hand. It will rarely be difficult to find a sufficient number of stones to roof over the trench. In countries where stone cannot easily be obtained, clay will answer for this purpose very well. If it be impossible to obtain either stone or clay, the vertical chimney may be built of turf or sticks plastered with mud, and the trench covered with mud or turf supported by sticks, to within a distance of a few feet of the fire-place. It will be necessary to support the earth covering the remaining portion of the trench with scraps of iron or some other incombustible material.

WATER SUPPLY.—A hydrant existing on the premises, it seemed desirable for several reasons to have a water supply at various points in the ambulance. Pipes were accordingly laid down, which placed the hydrant in communication with each one of the wards, as also with the kitchen. It is scarcely necessary to say that, apart from contributing to the security of our property in case of fire, and effecting a great saving of labour, the arrangement contributed much to the comfort and well-being of our patients, as also of our nurses.

The importance of having a sufficient supply of good water near an ambulance, is so considerable as to have sometimes induced writers to attribute to such a supply more of relative importance than properly belongs to it among the several requisites of a good

locality. Certainly, wherever water is unobtainable, it would be impossible to establish an ambulance, and wherever the water is unsuitable for drinking, it would be unwise to establish one. But it is rarely difficult in most civilized countries to find, pretty nearly everywhere, water which is fairly potable. Whatever, in certain cases, may be the relations of water to health and disease, as a rule, too much importance is popularly attributed to the specific properties of certain potable waters; and Pinel long ago very justly said:—"a residence in large towns, like Paris and London, is apt to induce diarrhœa at first among strangers, much less, however, on account of the water than by reason of a combination of many other causes."¹

The evil repute which has been attached to many waters has often resulted from overlooking certain agencies, less apparent but far more potential in their influence upon health. The water at our ambulance was thus once pretty generally pronounced to be the cause of a tendency to diarrhœa that declared itself. This tendency was afterwards, I believe, quite satisfactorily shown to have had another cause; not until, however, a large filter had been adjusted to the hydrant, which subsequently served the double purpose of clarifying the water, and reassuring such persons as had suspicions as to its wholesomeness.

The water used on our premises was that generally used in Paris. Until within a few years, the drinking water of the city was furnished almost entirely by the Seine. Even at the present time, nearly half of the water daily used is obtained from this source, and is issued to the public after having been mixed with aqueduct water. The service of the aqueducts was interrupted during the siege, and the population of Paris was reduced to have recourse, for the most part, to the Seine for its water supply. That there should have been a reduced consumption of water during the siege is not remarkable, but the absolute reduction was remarkably great; and not the least surprising fact is, that even the amount of Seine water distributed was scarcely more than half that usual in ordinary times, as appears

¹ Pinel, "Nosographie Philosophique," vol. ii.

from the following statement, in documents published by the Prefecture of the Seine:—

DISTRIBUTION OF WATER IN THE CITY OF PARIS DURING THE MONTHS OF
AUGUST AND DECEMBER, 1870.

Source.	August.	December.
	Cubic metres.	Cubic metres.
Seine	2,595,559,000	1,348,274,000
D'Oureq (aqueduct)	3,089,657,000	
De Midi (springs)	23,023,000	
De Nord „	3,234,000	3,546,600
Grenelle (Artesian well) . . .	10,726,000	11,226,000
De la Dhuis (aqueduct) . . .	494,015,000	
	6,220,214,000	1,363,046,600
Marne (river)	641,929,000	
Passy (Artesian well)	213,373,000	211,380,000

The water of the Seine contains solid matter, and, as is the case with most rivers, in very variable quantities, according as the waters are *troubled* by rains, freshets, &c. The solid matter per litre, when the waters are most disturbed by the causes mentioned, amounts to as much as 5 decigrammes per litre, or 35 grains per gallon: it is, however, generally much less, and averages only about 8 grains of sediment per gallon. According to Letheby, the water of the Thames contains, during the winter, on the average, 83 grains of sedimentary matter per gallon. It is difficult to determine the exact quantities of organic matter in any given measure of water, but the relative quantities present may be estimated by the amount of ammonia in equal measures of water. A litre of water, taken from the Seine just before it enters the city, was found by Boudet, in 1861, to contain 0·000,08 grammes of ammonia; another litre, taken just after it had left the city, was found to contain 0·000,28 grammes; and a third litre, taken from just below the point where the sewers discharge, was found to contain 0·002,30 grammes, or, in other words, it contained about *twenty-nine* times as much organic matter as the first sample.

The principal mineral which enters into solution in Seine water is the carbonate of lime, derived from the chalk formation

through which the river passes. This carbonate is present in the water in the proportion of about 10 grains to a gallon.

The following analysis of Deville shows the minerals and the amounts of each contained in 100 litres of Seine water:—

Silica	2.44 grammes.	Chloride of sodium	1.23 grammes.
Aluminium	0.05 „	Sulphate of potassium	0.50 „
Oxide of iron	0.25 „	Nitrate of soda	0.94 „
Carbonate of lime	16.55 „	„ magnesia	0.52 „
„ magnesia	0.27 „		—
Sulphate of lime	2.69 „	Total weight	25.44 „

A large proportion of the organic matter in the water, as well as a certain part of the mineral matter existing in the water not wholly in a state of solution, is precipitated by standing in the reservoirs before distribution, as also by the partial filtration to which it is there usually subjected. During the siege, however, a large part of the water, used even for drinking purposes, was distributed without having been filtered.

I do not know if French opinion, whether popular or scientific, concerning the special qualities of the water of the Seine, has much changed since the time of Parmentier, who replies to all the objections which can be raised against its use, by saying:—“The constant wholesomeness of the water of the Seine has been the subject of numerous theses sustained in the universities; its good effects have been celebrated by the most distinguished poets; the immortal Boerhaave, a most respectable authority, felicitates the Parisians on the possession of a water which unites all the qualities which could be desired to make it agreeable to the palate, light in the stomach, and favourable to digestion. In fact, the Emperor Julian in his time expressed the same opinion, which, indeed, has always been confirmed. . . . The Parisians are therefore not wrong if they regard themselves as favoured by nature, if they never end their eulogiums of the Seine, if they are proud with the delight of seeing it divide their city, if they contend, in short, with assurance, that this river is the most admirable of all rivers, and its waters the best of all waters.”¹

¹ “Dissertation sur la Nature des Eaux de la Seine,” par M. Parmentier. Paris, 1787; p. 8, *et passim*.

If it might be difficult to justify all these praises, it would certainly be equally difficult to prove that the waters of the Seine act, or have ever acted, in a general way prejudicially to the public health.

Apart from the supply derived from the Seine, Paris is usually chiefly furnished with water from the Ourcq. The waters of this stream are charged with magnesian salts, and have been thought of doubtful salubrity.¹

The water from the aqueduct of the Dhuis also exhibits the presence of a larger amount of mineral matter than the water of the Seine. Paris was deprived of water from these two sources during the siege.

I do not believe the practice of obtaining directly from the Seine, and near or within the city, a large portion of the drinking water served to the population of Paris, is a commendable one. Still, until some conclusive evidence is offered that it is inferior to the average drinking water of modern cities, we must conclude not only that our ambulance had a sufficient water supply, but that it had a tolerably good one as well.

KITCHEN.—The kitchen (Plate 1, No. 8 B.), was a room 17 or 18 ft. square, and contained two 30-gallon boilers for making soup, two ranges, a table, side table, and shelves for the necessary utensils. It was supplied with water from the hydrant. I do not know if this establishment was in any way remarkable. Like the barrack wards it had no ceiling, and as only a single thickness of canvas was used to close the opening under the eaves, the kitchen was always rather distinguished for the excellence of its ventilation. It was one of the first constructions erected, and was centrally placed—a matter of much importance, not only for convenience sake, but because the food sent from a kitchen so situated, is more likely to reach the patient in a proper state.

The service of our kitchen was well performed by a head cook, two aids, and several subordinates.

WINE ROOM.—This room (Plate 1, No. 7 G.), was used as a store room for the ordinary wine, which was here bottled for daily distribution and use.

¹ Michel Lévy, "Hygiène," tome i. p. 811.

PROVISION STORE.—(Plate I. No. 8 C.) The meat and provisions were here kept in store ; those for the day were also here weighed, and afterwards sent to the kitchen.

The supervision of this room and of the wine room were confided to the same person.

LINEN ROOM.—This room (Plate I. No. 10 A.) was in the extreme end of barrack No. 10, and separated from the office of the superintendent by a thin canvas partition, the door through which was almost constantly open ; it was thus kept warm and dry, while the character of the construction itself encouraged a free ventilation. No room connected with a hospital stands more in need of a well assured ventilation than that in which the linen is stored, and I could not better explain the reason than by translating a passage from a paper written by M. Émile Michel. "The linen room," says that writer, "was almost the only dangerous spot in the Polygon ; to have kept it from leaking, it should have been built more hermetically tight than the other barracks. The linen brought back imperfectly washed and not entirely dry, in spite of all the instructions on those points, kept up a muggy and insalubrious atmosphere, which the draughts of air established whenever the weather permitted, were powerless to change. Several *employés*, some female domestics, and the sister of charity charged with the superintendence, fell sick there one after the other. A young man attached to this service died a victim of his assiduity at this dangerous post.

"The same sad results showed themselves elsewhere—in several other ambulances—at Metz ; and it was frequently that we were compelled to regret the sickness or the death of persons appointed to a service which, being less exposed, seemed sheltered from every peril."¹

Our linen was washed principally at a laundry in the suburbs of Paris. In the month of December a washing-machine was established behind barrack No. 8, and certain articles were afterwards washed on the premises, employment being thus furnished for one woman.

¹ "Le Blocus de Metz." Publication du Conseil Municipal. Metz, 1871.

STORE ROOM.—(Plate I. No. 17 A.) This room was used principally as a dépôt for mattresses and bed sacks, and the moss (*crin végétal*) and sea-weed which were used to fill the bed sacks and pillows. But few hair mattresses were used in the ambulance, sea-weed and moss having been almost exclusively employed to fill both pillows and bed sacks. Whenever one of these articles became soiled, the contents were removed and burnt, either wholly or in part, while the sack, after having been washed, was refilled. One person was almost constantly employed in this room in preparing and refilling mattresses and pillows.

KNAPSACK ROOM.—Very soon after the opening of the ambulance, the need was felt of having some secure place where the effects of the soldiers could be stored. A room was set apart for this purpose in one of the first barracks erected, but, as the room was soon required for other uses, a larger room (Plate I. 17 B.) was especially arranged as a store room for knapsacks, clothing, arms, &c. The effects of each soldier were ticketed, and placed in separate compartments. The door of the room was kept locked, and the window was protected by a grating. Money, watches, and articles of special value were placed in a safe kept in the administration room.

OPERATING ROOM.—This room (Plate I. No. 7 A.) was in the southern end of barrack No. 7, and was well lighted by a large broad window, nearly as wide as the room itself, that fronted the south, as also by an ordinary window in the western side of the room. The entrance from without was through a door, guarded by a vestibule; a door also communicated with the adjoining ward, to which, after severe operations, the patients were frequently transferred. The furniture of the room consisted of a large heavy operating table, one or two small side tables, and two or three racks attached to the walls, to receive bottles, dressings, &c. The operating room was warmed by hot air, taken from the trench of pavilion No. 4. In describing the system of heating, I said that it was occasionally necessary to shut off the hot-air current, by closing the damper placed in the trench behind the furnace; whenever this was done, a quantity of heat was lost. Barrack No. 7 being near the furnace of pavilion No. 4, it was suggested

that it might be worth the trouble to place the trench in communication with the barrack, so that when the hot air was shut off from the pavilion, it might be turned on to the barrack and thus utilized. The suggestion was adopted, and proved to have been a valuable one.

DORMITORY.—A small building (Plate I. No. 19) was erected to serve as a dormitory for the male nurses. Most of the persons employed as nurses, whether males or females, slept out of the ambulance, but a few not having rooms in town, and that they might be accessible at any moment, were provided with quarters on the ground.

TRANSPORT SERVICE.—The *stable* (Plate I. No. 18 A.), the *shed* (Plate I. No. 18 C.), and the *salon* (Plate I. No. 17 C.), were created rather in the interest of the field transport service, than as dependencies of the ambulance proper.

BATHS.—If no bath room was established on our ground, it was not because we under-estimated the importance of baths in connection with hospitals. Our ambulance, at first an assemblage of a few tents only, was intended to be used as a field hospital; subsequent circumstances somewhat changed its character, until it was transformed into a sedentary ambulance. After the tents had been pitched it grew up gradually by the addition of constructions, one after the other, in an order determined strictly by necessity. First, the latrines were made, then the kitchen, next the rooms A, B, and C, in barrack No. 10; then barrack No. 7; afterwards the rooms C, D, and E, in barrack No. 8, were built; and thus additions were made until the middle of February, when the last construction—the kiosk over the coffee wagon—was completed.

The presence of a bath-house on the ground at no time seemed to be indispensable—1st, because the permanency of our occupation was never assured; 2ndly, because, with the existing scarcity of fuel, the expense and difficulty of keeping it constantly ready for use would have been great; and 3rdly and principally, because baths could be otherwise obtained.

In the house used as an annex to the ambulance—or rather, forming a part of it, were several bath rooms, which were at our service. Portable baths, prepared according to the French

custom, were also occasionally brought into the ambulance from a neighbouring *établissement de bains*.¹ A very large number of our patients—who, it will be remembered, were nearly all wounded—were most of the time not in a condition to take general baths. Recourse, therefore, was commonly had to local bathing, which was systematically practised in the case of each patient. Great attention was paid to the subject of personal cleanliness; and one of the first duties of the nurses, before putting the patient in bed, was to see that so much of his person was washed as the condition of his physical strength permitted. Together with frequent spongings of the surface of the body, such baths were daily repeated, and, while in a large number of cases the only kind of bath it would have been possible to have employed, they answered nearly every hygienic end that could have been secured in a bath room itself.

Perhaps I could not quote, in support of the truth of this opinion, a better authority than Miss Nightingale, who—(*retranslated* from French into English)—speaks upon the subject of baths as follows:—"The skin can be kept cleaner with a glass of warm water and a rough towel, than with soap, sponges, and the whole apparatus of a bath, without rubbing. The sick, even on a long journey, when they could not be removed from their beds, and a large quantity of water could not be obtained in a basin, have in this simple way been kept as cleanly as if they had had at their disposition all the conveniences of home."²

SINKS.—If cleanliness is of the greatest importance in all hospitals, by reason especially of sanitary considerations, it is perhaps a condition which should be regarded as still more indispensable in a field hospital. Here opportunities are constantly occurring where the rules of the administration may be violated with impunity, while the inmates of such a hospital always feel as if they were, to a certain extent at least, free to act without reference to laws of conventional propriety. Unless

¹ Nearly every one, however, of the public bathing-houses of Paris was closed before the end of November, from the impossibility of obtaining the necessary fuel.

² "Des soins à donner aux Malades; ce qu'il faut faire; ce qu'il faut éviter." Par Miss Nightingale. Paris, Didier et C^{ie}, 1869; p. 186.

a place for everything, as well as means for doing everything, are carefully provided, no amount of doctrinal instruction will prevent many things being done "which ought not to be done," or result in a service which is not, at least, inefficient—perhaps intolerable. In a word, it will never do to let the servants of a field hospital manage the police service themselves, on a simple order that the tents and grounds are to be kept constantly neat and clean. The refuse matter of various kinds, dirty water, &c., should all be disposed of regularly and systematically, each kind of refuse in its appointed place.

Among the things most likely to infect a hospital are soiled articles of clothing. These should be removed from the wards as quickly as possible. Linen that can be cleansed by washing should be taken to the dirty-linen room, from which it should be sent *without delay* to the laundry; all textile articles which may not be worth cleansing, or which may have been so soiled as to render them possible vehicles of contagion, should be *burned*. In the corner of our ambulance, near the latrines, a small *furnace* had been placed for the purpose of accomplishing the necessary incinerations. Near by, a deep trench was opened: here the dressings, and the water soiled during the dressings, were daily buried; protosulphate of iron was also thrown freely into the trench; when filled, another was opened by the side of it. In each ward there was a *metallic sink* immediately beneath the water-cock, into which it was permitted to throw soapy water, soiled by the washing of hands, etc.; this was conducted by pipes into the street whence it ran into the common sewers. Behind the kitchen was a deep square pit, which served as a *sink* for the kitchen; this was covered by a trap, and communicated through a pipe directly with the street sewer. All the garbage from the kitchen was removed regularly from the premises by the scavengers. To dispose of any kind of refuse, in any other way than that especially *provided* for it, was positively forbidden. The general police of the grounds was maintained by two men, charged solely with this work.

This service, if apparently simple, is one of the most difficult of execution connected with a camp or field hospital; it requires

of the servant some labour, but principally watchful care ; he must be constantly on the alert, and pretty nearly everywhere present, if he would not have the first "inspector," or chance visitor, unpleasantly anticipate him in his discoveries.

It is only justice to Mr. Meaks, who directed this service towards the close of our ambulance, to state, that he was the only person who ever succeeded in giving to it a practical efficiency which left absolutely nothing more to be desired.

LATRINES.—The difficulties connected with properly establishing and properly maintaining these offices in civil constructions are well known. If in camps and field hospitals the difficulties are less in certain respects, they are in other respects even greater. A proper sanitary condition must be maintained by constant disinfection, or by a frequent removal of the offensive accumulations, while the installation itself must necessarily be simple. Again, the careless habits of troops are to be taken into consideration, and effective measures employed to guard against them.

In American camps and field hospitals the custom has been to establish, at a point as far removed from the tents as convenient—generally at a distance of about two hundred yards—a trench ten or twenty feet long, two feet wide, and six or eight feet deep, before which is placed a bar resting on cross sticks. This installation is screened with shrubbery. Each day, during the time the trench is in use, a few shovelfuls of fresh earth are thrown into it, until it is filled up, when another similar trench is opened.¹ Very rarely have any so-called "disinfecting agents" been used in these camps and hospitals; nevertheless, the system adopted is really one of disinfection. Common fresh earth acts powerfully as a deodorant when thrown, even in small quantities, upon

¹ De Presle, in an essay preliminary to his translation of Munro's "Account of the Diseases which were most frequent in the Military Hospitals of Germany," says:—"The *fosse* should be dug deep and narrow, its length depending upon the number of troops in the camp; it should be 15 or 20 ft. deep, and 8 or 12 ft. wide; and one or two pieces of wood should be put up at the edges to prevent accidents. Every morning, a layer of earth, *about a foot deep*, should be thrown into this *fosse*, which, when thus filled to within 3 ft. of the surface, should be filled up entirely, and another *fosse* opened near by."

faecal matter, while it possesses the advantage over all other deodorants of being everywhere obtainable at little or no expense. The disinfecting properties of earth depend upon its power to absorb and fix gases. It acts in this respect precisely as charcoal does, and if not quite so effective, theoretically, as that agent, is much more so practically, as its use is less frequently limited by considerations of cost. It may be inferred from a certain Levitical ordinance that the special properties of fresh earth to which I allude were long since known.¹ It is very certain, however, that it is only recently that they have become so well known as to lead to any systematic effort to utilize them in the interests of public health and public comfort. The completeness of the deodorization obtained in the "earth-closets," so extensively used at the present time in private residences both in England and the United States, leaves really little to be desired. The special advantages of this system over the "water-closet" system, from an economical point of view, do not now concern us.

Fresh earth is certainly one of the best, if not the very best, disinfectant that can be used in a latrine trench;² hence the American system, which is also the one common to most armies, is a good one, and not only especially appropriate for field service, but one which fully responds to the object had in view, except when cholera or pestiferous disease in a camp or hospital may cause the trenches themselves to become sources of special infection. In this event recourse must be had to disinfectants, which, acting chemically upon the contents of the trenches, may destroy any existing germs of disease, or interfere with the conditions necessary to their development.

The employment of earth, however, as a disinfectant was not

¹ The ordinance referred to would scarcely seem to have been original with Moses. Injunctions quite identical are to be found in the Hindoo Shastras, from which some curious extracts relating to the subject may be found in Gordon's "Army Hygiene," pp. 486, 487.

² The capacity of a given quantity of earth to take up gases is very much increased by drying it. So the natural capacities of earths vary considerably. Soils which contain humus, clay, and marl, commonly known as loams, are in the highest degree absorbent, while sand and gravel are feeble absorbents of gases.

attempted at our ambulance, and if I have spoken at some length of such an employment, it is because, had our ambulance been established in the field, we should certainly have used the trenches described, and probably depended entirely upon the deodorant properties of the soil near by for their disinfection.

Trenches, however, could not be used, as the ground plot which was given to the Committee was small, as well as unsuitable, from its town surroundings, for such installations; while, had we adopted the "earth-closet" system, we should have incurred, in consequence, expenses for special apparatus, and expenses additional on account of the necessarily increased bulk of *vidanges*, to be removed at a fixed price per cubic foot—outlays of money which, at the time, we did not feel justified in making. We concluded therefore to adopt another plan—to employ a number of *fosses mobiles*, and maintain a proper sanitary condition of the latrines by frequent removal from the premises of all fæcal and urinary matter.

The place selected for the latrines, if determined to some extent by considerations over which we had no control, was nevertheless, perhaps, the best that could have been chosen. Partly shut in by trees and shrubbery, it was not in immediate proximity with any pavilion, and was yet not far removed from the court of the ambulance and the doors of the wards. It occupied a position at once central and out of the way. Its relation to the wards and principal offices may be seen by consulting the Ground Plan of the ambulance.

The cabinets, six in number, were arranged in a circle, and separated one from the other by partitions six feet high and five feet wide, all radiating from a central post; over the partitions was placed an hexagonal roof. In the angles formed by the partitions, cylindrical zinc boxes—the *fosses mobiles* of the Company Le Sage—each having a capacity of perhaps twenty gallons, were sunk into the ground the proper distance. These boxes, armed with handles to facilitate their removal, were also each provided with a funnel-shaped, wide-lipped basin. A resting bar was placed from partition to partition about sixteen inches from the ground, and a little above and in front of each basin. Fifteen inches above this bar, and two or three inches behind it, was

placed another bar, the importance of which will soon be explained.

A seat was substituted for the lower bar in two of the cabinets, which were reserved; in other respects, except in having been furnished with doors, they were arranged in a manner conformable with the description.

In front of the cabinets were placed screens, arranged in a double series, so as to serve the purpose for which they were erected, and at the same time leave the way open to the enclosures within.

A ground plan of the installation I have described is shown in Fig. 46, which will give a very correct idea of the position of the cylinders (*a a a a a*), of the angles (*b b b b b*), the partitions

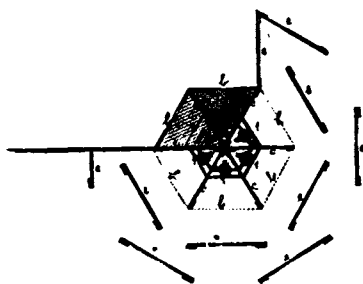


FIG. 46.—Ground-plan of the latrines.



FIG. 47.

(*c c c c c*), of the bars (1, 2), and of the screens (*e e e e e*). Figs. 47 and 48 show in perspective one of the cabinets. In these sketches the form of the *fosse mobile*, the mode of locating it, &c., will be seen, as also the relative position of the two bars. A more complete and general view of the kiosk and its surroundings is presented in Fig. 49.



FIG. 48.

The urinals were zinc cylinders capable of holding thirty gallons, and provided with side basins, as also with handles for their removal. They were three in number, and stood upon the ground, side by side, between the cabinets and the first line of tents, shel-

tered on three sides, and exposed on the fourth side, which fronted upon the path leading from the court of the ambulance to the cabinets. The exposed position of the urinals was intended to contribute to the propriety of the cabinets.

It is generally understood that whenever it is possible to separate the urinal from the cabinet this should be done. But it is of great practical importance, in order to secure the chief object of the separation, that the urinal should be at the same time the *nearest* and the most *visible* office. It is singular how frequently this simple rule is neglected in the construction of latrines. It is probably to be ascribed to the fact that the "*système diviseur*," as it is called, was originally proposed rather for the purpose of separating matters which possessed a certain intrinsic value from those possessing less, than from any influence it might have upon

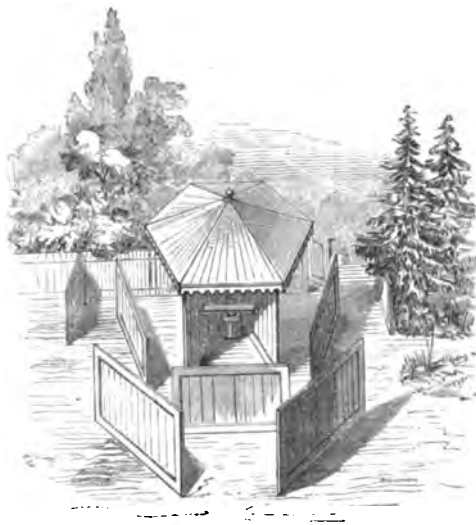


FIG. 49.—Perspective view of the latrines at the American ambulance.

conditions of salubrity and cleanliness. But a disposition of the urinal such as I have indicated protects the cabinet against its first and most frequent degradation. Whenever it is possible to place the cabinet at a distance considerably more remote than that of the urinal, it is very seldom that the two offices are misappropriated; and nearly equal security against misappropriate usage may be obtained by making it difficult to reach the cabinet

without passing by the urinal, so exposed as that it must attract attention.

The misappropriate use of the cabinet to which I refer, and the wet and uncleanly condition of the bar or seat, resulting from such a use, leads inevitably to another evil—that of climbing upon the bar or seat instead of sitting upon it, and thus still farther soiling and degrading a place which should always be kept most scrupulously clean, not more from sanitary considera-

tions than as an evidence of respect for the maxims of common decency and common courtesy. Standing upon the seat of the cabinet is even a graver abuse than the one to which I have just alluded, as it is utterly impossible to keep a cabinet in a cleanly state when daily used in this manner by a considerable number of persons. Without the most constant watchfulness on the part of the attendant it would become an abomination. Such a cabinet will always more or less be abandoned, with the result of most unpleasantly increasing the difficulties of policing the grounds around, and of maintaining the encampment itself in a state such as shall not do violence alike to the laws of propriety and of sanitary science.

Unquestionably the first cause of standing upon the seat is the evident uncleanness of the place; another cause is a fanciful fear lest a direct contact of the seat with a certain portion of the person may communicate specific forms of disease. Another cause is custom. The principal and practical cause is the facility with which the custom can be adopted when no mechanical measures are taken to prevent it. I regret to say that—so far as my experience may be taken as a guide—the causes I have mentioned are superior to all ordinances, whether general or special, which may be issued for the purpose of preventing this abuse in cabinets open to the public. Constant vigilance on the part of the attendants may remedy the evil, but it does not prevent it—indeed, I know of nothing which can effectually put a stop to this practice, which does not render any and every attempt to execute it physically impossible. One might almost be tempted to believe that if a round bar, two or three inches in diameter, was substituted for the conventional seat, it would be difficult to realize the position referred to. The difficulty, however, will be found to depend entirely upon the length of the bar and the absence of proximate support. In camp the long bar answers very perfectly its purpose in this respect. In town, or wherever it is for any reason desirable to restrict the limits of the latrine, the bar will speedily be discovered to be no insurmountable obstacle. Indeed, the only way to cause the seat or the bar to be used properly is to fill up the space behind it, to such an extent as to render standing upon the same, *à la turque*, impossible.

This may be done by sliding a shelf, or placing a bar between the lateral walls of the cabinet in such a way that a line between the anterior edge of this bar and the front of the seat or lower bar—fifteen inches below and two or three inches in front—shall form the base of an angle of 70° or 80° , the apex of which shall rest upon the posterior border of the basin. Such a disposition is shown in Fig. 47, which moreover exactly represents the system adopted in the cabinets attached to our ambulance.

When a bar is placed between the two sides of a cabinet, as represented in the woodcut, it will not be found to incommode in the least whoever may have occasion to sit upon the lower bar, while it will baffle the most persistent efforts to assume with the feet on the lower bar any half-standing, half-sitting position.

I consider that the use of this second bar or shelf furnishes one of the simplest as well as one of the most effectual methods of preventing the most frequent cause of the degradation of public cabinets. Indeed, almost the only objection which can be offered against the employment of the upper bar is that it forces whoever would use the cabinet to sit upon the seat even should it be soiled. But when the urinal is separated from the cabinet and located properly, as I have already indicated, the cabinet itself will rarely bear the marks of misuse; a very little attention on the part of the attendant will certainly be sufficient to constantly keep it in a state of irreproachable cleanliness.

I should hardly have alluded to the possible soiling of the bar in a specific way, or rather, to the apprehension said to exist in the minds of certain persons upon this subject, whenever compelled to make use of a public cabinet, but for an observation made to me by a French surgeon after he had examined the system adopted at our ambulance. "Yes," said he, "you keep your cabinets in this way very clean; but are you not afraid your system may occasionally be the means of transmitting disease?" My reply was:—"Not in the least. I am not aware if the diseases to which you refer are less frequent in my own country than in yours; but the idea that they may be *contracted* in the way to which you refer is considered absurd by our medical authorities, and so far as my knowledge permits me to speak, is rarely entertained by the people." But the observation

was nevertheless significant. I believe the opinion that specific diseases may be contracted in *cabinets d'aisance* is very much more generally entertained in France and Southern Europe than in England and the United States. If the too-frequently disgusting condition of these offices in French towns is in any way dependent upon this fact, I can only hope the people may soon be better informed. Well-founded fears of disease—those based upon a *connaissance de cause*—may exert a wholesome influence upon society; but absurd fears are, as in this case, generally productive of evils far more serious than those from which immunity is sought.¹

The installations which I have here described as those adopted for our cabinets and urinals, answered most satisfactorily the purpose for which they were designed. They were simple, they occupied little room, and the kiosk in particular always had a neat and tidy appearance on the outside which rarely failed to represent that on the inside. Outside respectability may be in itself of little consequence, but it usually exerts a reflex influence upon the state of things within too considerable to be neglected, even in the establishment of latrines.

An attendant was required to visit the cabinets and urinals several times each day, to see that they were in order, and to remove from them whatever might be offensive to the sight. Each forty-eight hours the cylinders were themselves removed by agents of the Company Le Sage, and replaced by empty and clean ones. This frequent removal of the contents of the *fosses*—which were scarcely in use except during a part of the year when the processes of decomposition were controlled by almost constant frosts—rendered systematic disinfection quite unnecessary, although from time to time a little chloride of lime or protosulphate of iron was thrown into the *fosses*, or upon the

¹ Since this portion of my Report was written I have seen a statement (in “L'Étude sur la Construction des Ambulances Temporaires”) that:—“In the Prussian barracks the latrines have seats with transversal bars above them to force those using them to sit down.” I never saw such seats in use in any barrack or hospital establishment previous to their having been adopted at the American ambulance. The paragraph quoted contains also the first written allusion to the use of the transverse bar which I have ever seen.

ground in the neighbourhood of them. The ground around was moreover every few days sprinkled over with fresh gravel, for the double purpose of keeping it dry and clean.

DEAD HOUSE.—This building was erected in an extreme corner of the grounds ; it was also shut off from the public by a screen. A single room (Plate I. No. 16) was set apart for the dead ; it contained a post-mortem table, and was lighted principally from above. The room adjoining (No. 15) was used as a dépôt for soiled linen. The two rooms were ventilated by long narrow windows, placed horizontally immediately beneath the eaves ; they were almost constantly open, and were protected by iron gratings.

The positions of several of the installations, which, if considered as necessary dependencies of the establishment, were still perhaps remarkable in no special respect, may be seen by referring to the Ground Plan accompanying this Report.



IN constructing an ambulance two important points are to be considered.

1st. The suitability of the construction for the purpose it is to serve.

2nd. The cost of the construction.

Whenever the word ambulance is restricted in its signification to those hospitals immediately attached to an army, and which are intended to follow it in its movements, the suitability of the construction—other things being equal—must be determined by its *transportability*. Our experience has shown us that results may be obtained when the wounded are placed under tents as satisfactory as those obtained in permanent and sedentary hospitals especially constructed for their treatment. The great advantage therefore which the tent hospital has over such hospitals, whether built of stone or of wood, is its transportability. It is far easier to move tent shelter sufficient for a thousand men

a certain number of miles, than it is to transport a thousand wounded men an equal distance. Moreover, as I have before observed, the transportation of the severely wounded is attended with such risks as render it one of those extreme measures which never should be had recourse to except in the absence of suitable shelter near the battle-field. Again, an *ambulant* hospital possesses a special advantage too important to be overlooked in this connection. It begins its work afresh on every new field.

After a hospital has been established a certain length of time, it becomes more or less impregnated with the specific exhalations attending the processes of decomposition, as well as emanating from the subjects of disease, and the hospital itself soon begins to act as a morbid agent upon its inmates. Sanitarians are quite unanimous in assenting to the truth of this statement when applied to permanent hospitals. If this special evil and cause of disease may exist in temporary hospitals in a less degree, it nevertheless exists. Generally in temporary army hospitals, the means and the organization for maintaining that irreproachable cleanliness required by the laws of sanitary science are much less complete than in permanent establishments; such hospitals are consequently likely to become much more rapidly insalubrious. Whenever tents are employed in the construction of such a hospital they form practically a camp; and it will be found impossible to entirely avoid those causes of pollution which it is notorious speedily render camping grounds unwholesome.

I believe that one of the principal causes of the success obtained in the United States, when the sick and wounded were treated under tents, is the fact that the tents seldom remained more than a few weeks upon the same ground. If they had been erected for the shelter of the wounded, when these had all been properly cared for, the tents were struck and sent away, leaving behind them nearly everything—the earth, the floors, the straw bedding, &c., that might have become a source of infection had the hospital been long maintained.

It should be particularly observed, that if our own tents were established on the Avenue de l'Impératrice *en permanence*, we always had it within our power to pitch them elsewhere, had it

for any reason seemed expedient; we also had taken special measures to protect our material as well as our grounds from the common sources of infection in hospitals and camps. And it should also be observed, that if in making our experiment it was an object to show that men could be successfully treated in the autumn and in the winter under tents, in maintaining them upon the same ground for more than six months, and in receiving within them convoys of wounded from September until February—thus mingling together the newly wounded and the convalescent, those whose systems were broken down by exposure and want of food, and those received when the vital power of the army of Paris was at its maximum—we subjected our tents to an unusual test.

The question of cost is one of great practical importance—is second only to that of suitableness in the construction of an asylum for the sick. I have remarked elsewhere that the use of public and private buildings for hospital purposes was apparently expedient for economic reasons. I am not able to say what the average cost of transforming such buildings into ambulances may have been in Paris during the siege. It probably was not great; but when compared with the expense of any special construction for the use of the sick, that incident to the purchase and installation of tents is very small.

The tent shelter we employed at our ambulance cost us *less than 100 francs per bed*; and by this statement I mean to say that the original outlay or first cost was less than 100 francs per bed. As, however, our system of hospitalization was a mixed one, since we used both tents and tent-barracks, and as our barracks were mostly erected for office purposes, and thus indirectly increased the capacity of the tents, it is better perhaps that I should present an estimate of the expenses incident to the establishment of a complete and independent hospital under American tents.

Suppose this hospital or ambulance to contain *fifty* beds. An American hospital tent is not overcrowded when it contains *five* beds—at least this number may be considered as a suitable average for each; we should consequently require ten hospital tents. We should also require for the attending surgeon a shelter—an “officer’s” tent; also for the stores and material of

the ambulance another tent of nearly or quite the same size; and for the attendants, two small common ("wedge") tents.

Such an allowance of shelter would be found to be quite sufficient for the establishment of an independent hospital of fifty beds.

The cost of such an installation may be approximately stated in francs as follows:—

	francs.		francs.
Ten hospital tents at 462·89 each, ¹ —		Amount	4,628·90
Two officers' ,,	400·00	,, ,,	800·00
Two common ,,	150·00	,, ,,	300·00
Total,			5,728·90

According to this statement, the average expense of the shelter for each bed would amount to 114·55 fr. If, however, floors are laid down in the tents, should it be necessary to purchase these, the expense will be increased about five francs for each bed. The expense of putting in a heating apparatus, should the season require one, if like the one employed by us, would involve an additional outlay of 7·27 fr. per bed. The maximum expense, therefore, necessarily incurred in the establishment of an ambulance of fifty beds, under such tents as we employed, would not exceed 126·82 fr. for each bed; while the minimum expense, should the surgeon and attendants be provided with quarters elsewhere, and should we be able to dispense with the purchase of floors and of a heating apparatus, would be but 92·56 fr. The average expense therefore incidental to the establishment of such a tent-hospital may fairly be estimated not to exceed the sum of 109·69 fr. per bed.

The economy to be effected by using tents in place of permanent constructions, in the establishment of a hospital, may be made perhaps more evident by a reference to the usual cost of such constructions. The Chestnut Hill Hospital at Philadelphia,

¹ Contract currency prices at New York, July, 1870, reduced to gold and to francs. These prices are in excess of present prices; and there is little reason to doubt that such tents could be now made in France at a cost 30 or 40 per cent. less than that which appears in the statement. The cost of manufacturing tent coverings has been quite fully discussed in Part II., to which I would refer the reader.

erected on the pavilion or barrack system, contained 3,320 beds. It cost the sum of 1,250,000 francs, an average of 376·50 fr. for each bed. The location of each bed in our own tent-barracks, although most economically constructed, cost over 200 francs. The barrack-hospital erected on the American plan at Passy, by the administration of the ambulances of the press, involved a total outlay—including that for a part of the furniture—of 540,000 francs; as there were 420 beds in the hospital, the cost of each was nearly 1,300 francs.

The tent barrack-hospital organized in the park of St. Cloud, in June, 1871, by the French "Société de Secours aux Blessés," involved an outlay of over 200,000 francs. It contained 200 beds. The shelter for each bed, therefore, cost over 1,000 francs.

An examination of the expenses incurred in the construction of the celebrated hospital Lariboisière, the model civil hospital of France, shows an average outlay for each bed of the enormous sum of 10,982·20 fr.—or more than *one hundred times* the sum expended in providing the shelter for a bed at the American ambulance—not including the expenses of *furnishing* the hospital, which involved an additional outlay of 990·09 fr. per bed.¹ But enormous as is the cost of a bed at the Lariboisière, it sinks into insignificance when compared with the estimated cost of a bed in the new Hôtel-Dieu of Paris. This building is intended to contain twenty-five wards, and to be occupied by 400 sick. Over 13,000,000 of francs have been already expended upon unfinished walls; the system of heating and ventilation is to cost 1,200,000 francs; and the total cost of the establishment, when completed, is estimated at 45,000,000 of francs—an average of 112,500 francs, or over 22,000 *dollars for each bed!* It is not surprising that a popular journal should have suggested that the

¹ L'Hôpital Lariboisière cost the administration of the city of Paris—

For the grounds	3,189,930.54 fr.
„ buildings and furniture	7,255,215.52 „

Total	10,445,146.06 „
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It contains 606 beds; the average cost of each was therefore	17,236.21 „
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See Husson, "Études sur les Hôpitaux." Paris, 1862; p. 344.

model of this hospital was designed for distressed millionnaires, and that the medical press should have never ceased to pronounce it "a detestable hospital." Notwithstanding the immense sums already squandered upon this building, it is evident that whatever the amount of money expended upon it, it never can, from its surroundings and the principles of its construction, serve but very imperfectly the purpose for which it was created.¹

It is hardly necessary, in advocating the general employment of tents in the construction of field hospitals and sedentary ambulances, that I should discuss further the economy of such a measure as compared with any which may have in view the construction of special shelter for the sick, since no one can deny that the tent affords, nearly everywhere, by far the cheapest means of establishing such shelter. No one can deny, moreover, that its transportability is an advantage in its favour of the greatest practical importance. Indeed, the only question which can be raised is this, viz., are the results obtained, when the sick and wounded are placed under tents, as good as those afforded when they are treated within the wards of a permanent hospital? As I have already considered this question at length, I can only express the hope, in closing my Report, that the facts bearing upon it which I have presented, derived partly from our own experience and partly from the experience of others, may have appeared so conclusive as to induce you to believe, as they have caused me to believe, that when the hospitalization of the sick and wounded under tents shall have become an accepted and general practice, a veritable reform will have been accomplished in the sanitary service of armies—a reform not greater, because it would diminish the suffering and mortality to which armies are frequently subjected, from the complete absence of suitable shelter,

¹ A commission of the Society of Physicians and Surgeons of the Hospitals of Paris, appointed to visit and report upon this hospital, after a careful inquiry and a long discussion, voted unanimously, on the 6th of January, 1872, the following resolution:—"The new Hôtel-Dieu, such as it has been built, is arranged in a manner absolutely contrary to the first principles of hospital hygiene." This monumental hospital is still unfinished, and it has been recently proposed to turn it over to the Government, to be converted into a General Post Office.

than because it would place the organization of the hospital under the control of the surgeon, and enable him to realize everywhere those hygienic and nosocomial conditions which a long experience has taught us are of the greatest importance in the treatment of the sick.





REPORT ON THE SURGICAL HISTORY
OF THE AMERICAN
AMBULANCE.

BY JOHN SWINBURNE, M.D.

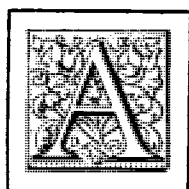




ON THE SURGICAL HISTORY OF THE AMERICAN AMBULANCE.

THOMAS W. EVANS, M.D., PRESIDENT OF THE AMERICAN
INTERNATIONAL SANITARY COMMITTEE.

SIR;



S the causes which brought us together have now no existence, and as the work of the American ambulance is nearly finished, and I am about to leave Paris, I deem it my duty and also my privilege to lay before you in as concise a manner as possible the surgical history of the ambulance, that through you, the general, and medical and surgical public may become possessed of all matters of moment which have occurred during my administration.

You may remember that my connection with the ambulance commenced on the 7th of September last. At that time all the tents were pitched in the position which they afterwards held; their location, surroundings, and the material of which they were manufactured, met with my hearty approval; and when the floors, drains, and heating apparatus were added, I considered that nothing more, in a sanitary point of view, was to be done. Barracks were subsequently constructed, adding two large airy wards for the reception of wounded men, while other portions were set apart for the dispensary, surgeon's office, operating-room, post-mortem-room, and many other offices which did not come under my supervision.

In short, when complete, the hospital was nearly perfect, leaving little to be desired either as a flying ambulance or a permanent institution.



RÉSUMÉ OF THE GENERAL TREATMENT OF WOUNDS IN
THE AMBULANCE.



AFTER the extraction of all the foreign matter possible—including such fragments of bone only as might have been detached from the periosteum—the wounded regions were covered with several folds of cloth, in the form of a compress, dipped in warm water. This was enveloped in some impermeable material, such as oil-cloth, cotton, or silk. In some instances, sheets of thin india-rubber, which is equally impermeable, were used as a substitute ; though this objection has been urged, that it is a good heat conductor, and hence becomes readily cold on moderate exposure to the air. If this objection has any weight, the difficulty can easily be obviated by covering the rubber with any non-conducting material. The dressings were made daily—when necessary, twice a day—care being taken that no part of the dressing was used a second time, if not thoroughly washed and purified.

The wounds were carefully washed, cleansed, or injected with dilute carbolic acid or the preparations of chlorine. Dilute alcohol was *sometimes* used. The first agent was also used in stronger solutions to deodorize the dressings.

The wounds when unhealthy, or not sufficiently active, were stimulated with nitric acid, of the strength of one hundred and twenty drops of strong acid to the quart of water. This solution was also applied to swollen and œdematous parts with seemingly good results. Sulphate of copper was also used—one to two drachms to the pint of water—the proportion depending upon the condition of the parts requiring stimulation.

Warm water applications, oil-cloth coverings, &c., either in the form above indicated or in the shape of linseed poultices, have

been used in inflammatory action, or when pus was forming, with great comfort to the patients.

In flesh wounds, after full suppuration had been established, the parts were properly supported by compresses and bandages, to prevent the accumulation of pus or other matter.

To keep the dressings still further free from offensive odours, the parts were constantly surrounded with oakum, which acted simultaneously as a compress, disinfectant, absorbent, and deodorizer.

Opium, morphia, and chloral, were given in various forms to assuage pain and to produce quiet and sleep; valerianate of zinc to allay nervousness; chloroform and ether were used as anæsthetics; desiccated alum, perchloride of iron, and ergotine were applied to arrest hæmorrhage; iodine was locally used to reduce any thickening, as well as in certain abnormal conditions; soap and water, or molasses and water, were generally employed for injections; laxatives consisted mainly of rhubarb, seidlitz powders, purgative lemonade, citrate of magnesia, castor-oil, and black-draught.

In compound and comminuted fractures, to avoid the accumulation of pus and other matters in the tissues surrounding the wounded parts, india-rubber drainage tubes were introduced and retained until the parts had so far healed as to obviate the necessity of their further use. Through these tubes, warm water, dilute nitric acid, dilute carbolic acid, dilute alcohol, weak chlorinated waters, or any other deodorizers, purifiers, or stimulants, can be easily injected, as the case may require. These have the double effect of freeing the parts from decomposed tissues, blood, pus, or other discharges, and of washing to the surface any *débris* of devitalized bone or other foreign matter, the presence of which might be prejudicial to fragments of bone still covered by and adherent to the periosteum.

There is nothing so destructive to newly-forming or formed plastic matter, or to a periosteum, the circulation of which is enfeebled by violence done in crushing the bone and tearing its blood-vessels, nerves, &c., as the presence of large accumulations of putrid, offensive, and acrid discharges, imprisoning as they do sloughs and other foreign matter. If to this are

added great shortening of the limb from spasmodic contraction of its muscles, and the compression and arrest of circulation at the seat of and surrounding the injury, frequently occasioned by the surgical appliances—those enveloping the entire limb, such as impermeable coverings of plaster of Paris, felt, pasteboard, &c., or any other surgical apparatus for restoring and maintaining even an approximation to the normal status of the fractured limb—we have, I apprehend, all the conditions necessary for delayed reparation of the injury, to say nothing of the almost constant bony necrosis which ensues, and which is a prolific cause of death.

In order that cleanliness might be properly effected and maintained, the clothing and bedding, when soiled, were immediately replaced by that which was clean and fresh.

The barracks and tents—in order to carry out as far as possible all hygienic measures—were from time to time emptied of their occupants, and thoroughly fumigated with chlorine gas, disengaged on an extensive scale, and somewhat in the following manner :—Several large vessels or dishes were placed at equal distances along the centre of the tent or barrack, as the case might be, containing equal quantities of peroxide of manganese and common salt moistened with water. The tent or barrack was then closed, and a sufficient quantity of *strong* commercial sulphuric acid was thrown simultaneously into the vessels. Immediately the ward was filled with thick vapours of chlorine gas.

After the chemical action had fully subsided, the board floors were taken up, the ground cleaned, swept, and covered with sulphate of iron, and the floor replaced.

The floors, when swept, were from time to time sprinkled with a mixture of sulphate of iron and sand, which was allowed to sift through the crevices to the ground ; occasionally a solution of permanganate of potash was used instead.

Ventilation was effected by a combination of means, but chiefly by a constant current of cold air passing over a heated surface, and thence along a trench under the floor of the tent, thus also keeping the ground and floor perfectly warm and dry. From this source the air re-absorbed moisture, of which it had

been deprived in its passage over the heated surface, and was then distributed to all parts of the tent, displacing the foul air.

GENERAL SURGICAL TREATMENT OF COMPOUND FRACTURES.—As injuries of the long bones and their joints are frequent and often of great gravity, it is not surprising that differences of opinion should have existed among eminent surgeons as to the most feasible plan of treatment which would save the most lives and give useful limbs.

The treatment adopted at our ambulance was in the main such as I have laid down in a report of surgical experience in the treatment of compound fractures during the Peninsular Campaign of 1862, read before the Medical Society of the State of New York in February, 1863, and again substantially reiterated in February, 1864, in an article discussing the proper mode of treatment of "compound and comminuted gunshot fractures of the thigh, and the means for their transportation." In the article referred to the treatment is stated as follows:—

Injuries which necessitate amputation.

"1st. In cases where the artery or arteries are destroyed, or so lacerated as to cut off circulation below the wound, and gangrene is the inevitable result.

"2nd. In cases where a limb is torn nearly or quite off, as by a solid shot or any other analogous missile, leaving an irregular or ragged stump.

"3rd. In cases of extensive injury to the soft parts alone, where gangrene would be likely to follow from the loss of the principal nerves or arteries.

"4th. In certain cases of compound and comminuted fracture of the knee and ankle-joints. The passage of small balls which do not shatter or open the joints do not necessitate amputation, and particularly is this true of the ankle-joint. Compound and comminuted fractures of the femur, or tibia, which extend into the knee-joint, require amputation."

Compound Fractures of the Shaft or Joints which are to be treated by Conservation.

"1st. Excision should be confined to the upper extremities—the shoulder and elbow-(joint) being the principal parts upon which that operation should be practised.

"2nd. If the head of the humerus is shattered by a gunshot, excision is the only remedy. If the comminution extends to the shaft, the loose portions only which are deprived of periosteum need be removed, the residue should be left to granulate. If the glenoid cavity is crushed, its loose spiculæ can be removed or its injured portion gouged out.

"3rd. If the elbow-joint is crushed or comminuted by a ball, excision is the only remedy. If the injury is confined to the articulating end of the humerus, remove it, but do not disturb the ends of the radius or ulna; if the injury be confined to the articulating ends of the radius, or radius and ulna, remove both, but not the humeral articulation.

"If the articulating ends of the humerus, radius and ulna are crushed, remove them all. What is meant in the books by partial excision is the removal of a portion of the joint, such as a part of the humeral articulation, or the articulating end of the radius or ulna only.

"The removal of the entire half of the joint results in a new articulation, and not in ankylosis, as is often the case in partial excision. If the comminution extends to the shaft of the humerus, or radius, or ulna, remove its loose spiculæ, and leave the rest to nature.

"4th. In comminuted compound fractures of the carpal end of the radius, or radius and ulna, excision of the articulating ends affords the most reasonable prospect of success. Leaving it to nature is far preferable to amputation. Never amputate for this injury.

"5th. Compound gunshot injuries of the carpus or metacarpus seldom, if ever, require either excision or amputation. Remove the loose bones, and treat as a simple wound.

"6th. In compound gunshot injuries of the phalanges, excision can be practised only with varied success, owing to the

size of the bullet and the smallness of the member. The rule is to save as much as possible. Injuries to these parts sustained by buckshot or pistol balls do not, as a rule, require amputation. On the contrary, most of them can be saved.

"7th. In compound and comminuted injuries of the humeral shaft, excision or amputation should never be performed. The loose spiculæ should be removed, and the case treated as an ordinary compound fracture. If, however, the comminution extends to the articulation, it (the articulation end) should be excised with the loose spiculæ, while the fragments of the shaft which still retain their periosteum should not be disturbed.

"8th. The same rule applies to the shaft of either or both bones of the forearm. In all cases avoid constriction by bandaging.

"9th. Cases of compound, or compound and comminuted gunshot fractures of a portion of the femur, not involving the knee-joint, ought to be treated as hereinafter detailed, viz., by simple extension and counter-extension—making the *stretcher* the *splint*.¹ (See Fig. 50.)

"10th. Cases of compound and comminuted gunshot fractures of the tibia, or tibia and fibula, not involving the knee or ankle-joint, should be treated as above stated for the femur.

"11th. Simple gunshot injuries of the ankle-joint do not necessitate amputation, while compound and comminuted fracture of this joint, and particularly when the arteries are much injured, may require amputation; though with proper support, water-dressings, irrigation, free incisions, &c., a great majority of these cases will recover without operative interference.

"The rule applicable to gunshot wounds of the hand is also applicable to those of the foot; and I can safely say that there is scarcely a bullet wound of the foot which requires amputation. I have seen the whole scaphoid bone carried away, and still a good recovery take place. So the destruction of the astragalus may occur, and still recovery go on favourably. See the case of Garibaldi, in whose ankle-joint a ball remained for some months without unfavourable results.

¹ This diagram is essentially the same as shown in Fig. 54.

"12th. In 'compound and comminuted gunshot injuries of the tarsal and metatarsal bones the same rule of action should be adopted as in like injuries of the hand, with the exception, that a slight deformity is not of such importance in the former as in the latter.

"13th. *No excision or amputation should be performed in the second or inflammatory stage.*¹ If the operation cannot be performed before this stage sets in, we ought to defer operation until the *truly* second, or suppurative stage, appears."

In military surgery, the necessities of war compel the surgeon to conform his treatment to the exigences of the occasion as much as possible. This is particularly true in cases of gunshot fracture of the leg and thigh. It is said that the transportation of soldiers *after* amputation of either of these members is less troublesome than before, whatsoever form of support is given to the limb. Insomuch, therefore, as active warfare requires the constant movement of armies, it behoves us, as surgeons, to improvise means whereby fractures can be placed under treatment while on the field, or as soon after as possible, before the soft parts are irreparably injured by being torn and cut by the sharp ends of the broken bone in the process of transportation. The treatment should be continued without any violent change which would endanger life or prejudice the results.

If this can be done without deranging or increasing the embarrassment attendant upon the transportation of wounded men; if means can be adopted by which compound fractures can be safely transported—no additional burden being imposed upon the ambulance trains; if, at the same time, the appliances necessary for the treatment of such fractures and those requisite for transportation can be so simplified as not to increase the labour of the surgeon, we have, I apprehend, the solution of the question at issue. For, in my opinion, the whole subject is summed up in the word *transportation*.

It is now proven beyond a doubt, that when wounds of this character are placed under treatment, before too much additional

¹ The second stage here spoken of is the true congestive, or one intermediate to the first and second stages of authors.

injury is done in the process of transportation, if proper surgical treatment is adopted, a larger number will recover than from amputations, and that, too, with sound and useful limbs.

By what plan, then, can all these ends be accomplished? The answer is simple, and the treatment is equally so. There are always supposed to be a sufficient number of stretchers on the field, and if not, a few additional ones can be supplied. Experience shows that the number of gunshot fractures of the thigh and leg not involving the knee-joint is very small in comparison with the great number of flesh wounds of the lower



FIG. 50.—Stretcher arranged for the transportation and treatment of a case of compound fracture of the leg or thigh. During treatment the foot of the stretcher can be elevated to make the weight of the body the counter-extending force, and thus temporarily release the groin from the pressure of the perineal belt.

extremities. During the War of the Rebellion in the United States, there were, up to a certain period, thirty thousand gunshot injuries of the lower extremities, of which less than five thousand involved the shaft and knee-joint.¹

Suppose that each fracture of the leg or thigh were represented by a stretcher, this would not materially add to the difficulty of transportation.

To the ordinary American or French stretcher I would add two semi-circular spurs of iron, each having at its end an iron ring, so made as to fit the handle of the stretcher, and provided

¹ See "Circular" No. 6, S. G. O., 1865, p. 30.

with a thumb-screw. One spur is slipped on the handle of the stretcher by means of the ring, and is fastened at the proper angle by the thumb-screw. From this spur, extension can be made by attaching a piece of cord to the sole of the foot. The loop is made by extending adhesive plaster from the knee down one side of the limb and around the foot. The other spur is placed on the other end of the stretcher. From this, counter-extension can be made by the perineal belt. In order that there may be no misconception of the plan proposed for the transportation and treatment of compound fractures, I append a sketch (Fig. 50) of a person under treatment on such a stretcher.

This stretcher, therefore, becomes the bed, the vehicle for transportation, and the splint for the treatment of the fracture.

The wounded man, after being properly dressed on the stretcher—extension and counter-extension having been made—need not of necessity be transported until the limb is consolidated. If thus dressed, the patient can be carried any distance, stopping as often and as long as circumstances may require.

On this stretcher the wounded man can be borne with perfect safety to the limb, by hand, in cars, in boats, or in ambulance waggons built to receive the litter, or even in common freight railway waggons, provided they are so arranged that the weight of the body may rest upon the extreme ends of the stretcher. In this way the elasticity of the wood from which the stretcher is constructed is utilized, and the bruises or injuries avoided which might ensue from the shocks and jolts produced by the roughness of the road over which the carriage passes. No number of consecutive stoppages, either for hours or days, could in any way interfere with the process of restoration, provided the man be as well cared for as at first, and not removed from the stretcher.

In the treatment of fractures by this method, all necessary sanitary measures can be employed. Without the least possible delay, trouble, or change in the surgical appliances, or derangement of the injured limb, the patient with his bed can be removed from whatever may be offensive or insalubrious to any place where the most approved sanitary and hygienic measures can be adopted ; while any soiling from discharges of blood,

pus, urinary, or faecal matter, can be washed from the canvas covering of the stretcher on which the man lies, without doing violence to the injured limb.

If at any time it becomes necessary to use the stretcher as a means of temporary treatment during the transportation of the fracture, the perineal belt can be dispensed with and counter-extension be continued by raising the foot of the stretcher.¹ This may seem paradoxical; but when the principle is examined it becomes undeniable. It is upon this plan that I have for many years treated fractures of the thigh, whether simple or compound, and at whatsoever point the fracture may have been located.

In 1849 an article was published by me in the "Transactions of the Medical Society of the State of New York," describing the manner and mode of treating fractures of the thigh by extension and counter-extension. The principles were the same as those indicated above, with the exception that in making the extension, when the bed was used, the head and foot of the bed were made use of in place of the semi-circular spurs described as applicable to the stretcher.

Again, about 1859, I published another article in the "Transactions" of the same Society, recommending the treatment of all fractures by simple extension. I have followed this plan of treatment with unvarying success, with such modifications as the circumstances required. The result has been that in simple fractures of the thigh the longitudinal and lateral distortion were so slight as to be with difficulty discovered on inspection, or even by measurement.

When wounds or excoriations existed which prevented the use of the perineal belt, I adopted the expedient of raising the foot of the bed, thus converting it into an inclined plane, against which the weight of the body would rest and act as a counter-extending force, obviating the necessity of a perineal belt.

Long after the publication of the articles referred to, and after this treatment of fractures had proved successful, Dr. Gurdon Buck, of New York, conceived the idea of carrying out this principle by using weights and pulleys as the extending

¹ See Cases 3 and 134, pp. 592, 596.

force, and of effecting counter-extension by means of a small elastic india-rubber perineal belt. He also encircled the thigh with short longitudinal strips of split deal, which were sustained by thin elastic india-rubber bands. This he called Gurdon Buck's method of treating fractures—a very delicate kind of professional plagiarism, since, unless the principles involved in this practice were new to him, he was hardly disposed to give credit to him to whom credit was due. I had the satisfaction, however, of seeing many persons treated in the New York Hospital by "Buck's method," and found that the results did not compare with those obtained by permanent extension; and that while no lateral distortion existed, the shortening from overlapping was too great to be consistent with a simple fracture. I have no doubt that this condition was due partly to the smallness and great elasticity of the perineal belt, which would allow the weights to rest on the floor, or the body to slip to the foot of the bed; partly to the impossibility of adjusting weights to various degrees of muscular strength and physical power; and partly to the interference of nurses and others, who, at the solicitation of the patient, would remove the weights temporarily, thereby retarding the efforts of nature towards reparation.

It was generally conceded that the principle involved in the treatment of fractures of the thigh, proposed by Dr. Gurdon Buck, was the same as that which I had advocated and practised—namely, extension and counter-extension—and which many surgeons at a meeting of the Medical Society of the State of New York declared could never be successful.

Dr. Buck, therefore, in deference to the general opinion, added a fanciful improvement for coaptation (the strips of split deal), which was of no more use towards effecting the result desired than would have been so much tissue paper encircling the thigh; it served only to satisfy the patient and his friends.

I must, however, do him the justice to say that in the treatment of *gunshot fractures of the thigh*, with loss of bony substance, the weight and pulley serve an excellent purpose for extension; but the weight should be so adjusted as to obviate the possibility of its finding support on the floor, and thereby becoming useless. Instead, however, of using the perineal belt for the counter-

extension in permanent treatment, we would advise the use of the body only, as in a case described further on.



GENERAL FACTS IN THE SURGICAL HISTORY OF THE AMBULANCE.

FROM the beginning of the siege to the 30th of November, 1870, above sixty wounded men were treated in the ambulance.¹ Of these but two died; and the immediate cause of *their* death was tetanus. Four of the above number were amputated through the thigh for wounds of the knee-joint; two compound fractures—one through the neck and one through the shaft of the femur—were successfully treated by conservation, and are now well, walking with crutches,² and possessed of good limbs; one compound fracture of the tibia, just below the knee, recovered, but afterwards received an injury in another part from which he died;³ two gunshot fractures of the wrist and two of the ankle-joint recovered with useful limbs; two comminuted fractures of the scapula, a number of gunshot fractures of the bones of the forearm, hands, feet, and fibula, one resection of the shoulder-joint—for compound fracture of the head of the humerus—in a soldier suffering from large pleuritic effusion, one wound through the chest—ball passing through the right lung, entering the third rib anteriorly, and passing out posteriorly under the scapula—besides several other serious cases, not particularly interesting in a surgical point of view, were successfully treated.

We now come to a period extending from the 30th of November, 1870, to the end of the siege, in which food and fuel in

¹ Including certain unofficial cases, and a few which appear in the table of medical cases.

² These patients have now (August 1st, 1871) each so far recovered as to be able to walk with only a cane. (J. S.)

³ See Case 8, p. 628.

sufficient quantity or of proper quality were not to be had, so that all the wounded whom we received, much exhausted from exposure and want of food and fuel, were in a condition unfavourable for surgical treatment. Many were suffering from the usual camp diseases, such as diarrhœa, dysentery of a typhoid character, and chills, and fever. Others had been lately discharged from hospitals, where they had been under treatment for the prevalent diseases bronchitis, pneumonia, and pleurisy, and sent to field duty, and were therefore still very feeble. Indigestion was the rule when food was taken ; while some were unable to eat even when suitable food was offered. Subsequently to this period the mortality was increased, owing to the causes above enumerated, and to the mortal nature of the wounds. For example, from *seventeen shell* wounds received from Drancy in one day, *eight* died in a short time from their wounds. Still later during the siege several died from acute pulmonary disease superinduced by deficiency of fuel. Some of the deaths, as will be seen by reference to the history of the fatal cases, occurred immediately on or a few hours after arrival, while others whose wounds were equally mortal shared the same fate at a later period. It is therefore scarcely necessary for me to add that the greatly increased mortality after the 1st of December was due to causes over which surgery had no control.

It is proper to state in this connection that all our wounded were brought to us directly from the battle-field, or had received temporary surgical attention only, prior to their transportation to the ambulance.

The gentlemen volunteer aids, whose duty it was to go to the field with the carriages to pick up the wounded, made it a point to seek and take in the most severely wounded, and particularly those having fractures, as it was believed that this class of wounded, especially, would suffer less under tents than in houses. In thus selecting the severely wounded, many would of necessity be brought in who were so gravely injured as to be amenable only to palliative treatment. An additional reason for our having obtained so large a number of this class of wounded, was that these gentlemen were generally in advance of all others.

These facts explain why among the 247 surgical cases treated

at the ambulance, there were 126 compound fractures.¹ Notwithstanding this great number of fractures and the causes previously enumerated, only 47, or a little over 19 per cent., have died of their wounds. The following table gives the number of fractures classified according to the region involved.

*Classification of the 126 compound and comminuted fractures
occurring in the 114 patients treated.*

Hip-joint	4
Thigh	3
Knee	7
Leg	7
Ankle	10
Head of humerus	9
Scapula and clavicle	12
Arm	6
Elbow	4
Forearm	9
Wrist	4
Hand	11
Head	10
Face	7
Chest	10
Back	9
Pelvis	4
Total	126

Notwithstanding the large number of fractures, conservative surgery was so extensively practised, that of the 126, only nine seemed to require amputations of the long bones.

The results of these cases, as a whole, in spite of the adverse conditions previously mentioned, will compare favourably with

¹ Of the 247 surgical cases treated in the ambulance, 114 soldiers had compound fractures; a few soldiers had sustained two or even more, so as to represent 126 distinct compound fractures.

those of a similar class in other wars, though the latter class may have been treated under much more auspicious circumstances.

Again, if we take into consideration the sixty cases received prior to the 30th of November, and treated before the depressing effects of the siege were felt, no results, either in public or private practice, could have been more satisfactory; for, with the exception of the accidental loss of two from tetanus, there were no deaths.

FRACTURES OF THE FEMUR.

Only three gunshot fractures of the shaft or neck of the thigh have been received in the ambulance suitable for conservative treatment; all the others have involved the knee-joint. The above-mentioned were treated by extension and counter-extension; two, (Cases 3 and 4,) without the pulley; and one, Case 134, with the pulley and weight alone. Case 3 was fractured in the neck of the femur, Case 4 in the middle, and Case 134 at the juncture of the lower and middle thirds.

All recovered with comparatively little shortening and no lateral distortion, as may be seen by reference to their histories, which contain much matter of interest.

CASE 3.—Corporal Jules Melchior, 2nd Company, 3rd Battalion, 35th Regiment of the Line, was wounded September 30th, 1870. A ball entered on the inner side of the left thigh, about one inch below the angle formed by the scrotum and the thigh, fractured the neck of the femur, passed upwards, outwards, and backwards, and had its exit through the gluteal muscles. On arrival he was weak from great loss of blood. The limb, which was greatly swollen, distorted, and shortened, was placed in a wire gutter padded with oakum, and covered with hot-water applications and oil-silk. It was then sufficiently extended and fastened to the foot of the bed. This was effected by placing strips of adhesive plaster on one side of the limb from the knee, around the sole of the foot, and up to the knee on the opposite side. These strips were held in place by bandaging the limb as in Case 134 (see Fig. 54). A cord was then passed through the loop of plaster on the sole of the foot, and fastened firmly to the

foot of the bed or stretcher. Extension and counter-extension were made by converting the bed into an inclined plane, by raising the foot of the bed. Against this the body rested, and thus effected the extension, sufficient to keep the limb and body in a normal line without impeding the circulation or confining the parts. The patient suffered no pain after the dressings, and continued to improve, and also to eat and sleep well. His only medicine was generous living. During the first twenty days several small fragments were discharged from the posterior wound; at the end of this time the anterior wound had closed, and the limb was found to have shortened about three-fourths of an inch. The limb continued to improve until November 10th, forty-one days after the injury, when union seemed very strong. November 20th, fifty-one days after the injury, there was great periosteal and interstitial thickening of the whole shaft of the femur—so much so, as to give it the appearance of having been fractured, with distortion. This was treated and reduced by the tincture of iodine, hot-water applications and oil-silk. At this time union seemed quite firm. Gradual improvement up to January 20th, one hundred and twelve days after the injury, when the patient was able to rise. Three days after, he began to walk with crutches, and continued to do so for six days, with no inconvenience on bearing the entire weight of his body on the injured limb. However, upon careful examination it was found that additional shortening had resulted. It was then thought best to remand the patient to bed and apply extension for several days. The periosteal thickening greatly diminished—the limb had been otherwise in excellent condition, and the patient was in enjoyment of perfect health. He was discharged entirely well on the 1st of March, 1871. On this day photographs of his limb were taken, woodcuts from which are here appended (Figs. 51, 52).

CASE 4.—Private Jules Hardy, 3rd Company, 2nd Battalion, 35th Regiment of the Line, was received September 30th, 1870. His injury was a fracture of the middle third of the right femur, the central portion of the shaft being shattered through a length of fully five inches. The ball entered posteriorly about the middle of the shaft, was split into two fragments by the fractured

bone, making two exits anteriorly. The patient on arrival was much weakened from loss of blood. The limb was shortened about five inches, and was distended to its utmost capacity by an effusion of blood within the fascia lata. The limb was placed in a gutter padded with oakum, and covered with hot-water appli-

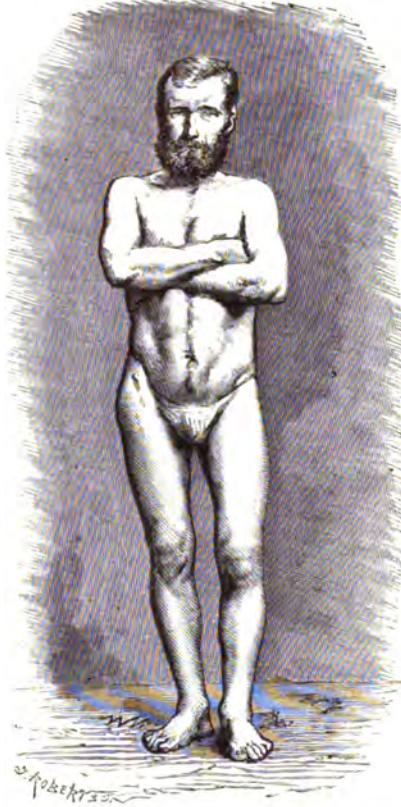


FIG. 51.—Appearance (front view) of the limb of Corporal Jules Melchior at the time of his discharge from the ambulance and five months after the injury.

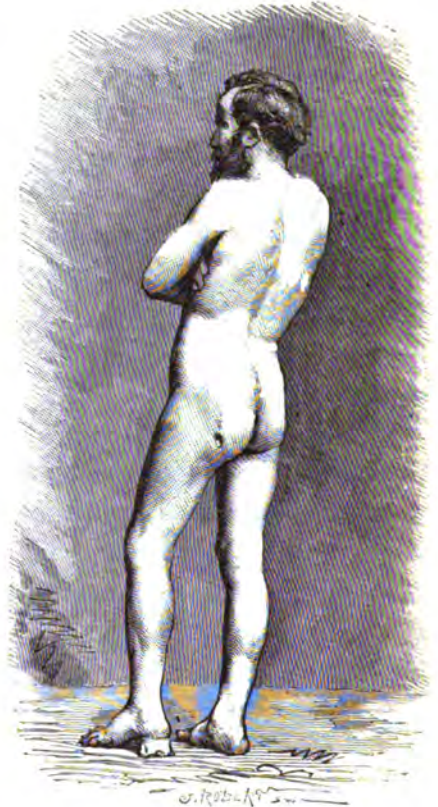


FIG. 52.—Appearance (lateral view) of the limb of Corporal Jules Melchior at the time of his discharge from the ambulance and five months after the injury.

cations and oil-silk, and extended and counter-extended, as in Case No. 3, before described. During the whole course of the treatment quinine and iron were given. October 20th, twenty days after the injury, a fragment of bone, constituting the entire thickness of the shaft, was removed. October 25th, a second piece, similar to the former one, was removed during supuration. The periosteal sides of both fragments were entirely

smooth, showing that they had just been detached from the periosteum, while the other presented a worm-eaten appearance. The bone was found to be consolidated about November 10th. November 17th, pretty firm union; no lateral distortion; fully two inches shortening; no thickening except the fragmentary consolidation. December 2nd, one of the anterior wounds closed. December 15th, the posterior wound closed, but re-opened December 26th, at which time, upon careful examination, pieces of dead bone were found firmly attached. January 15th, a small abscess formed and was opened near the seat of the fracture. January 20th, the limb was found to be firmly united, with about two and a-half inches shortening. At this time extension was taken off, and the whole limb and foot were bandaged to sustain proper circulation. January 25th, gastric irritation set in with severe vomiting; for three days the patient was unable to retain anything on his stomach except champagne and ice. After that attack his health returned, and he continued well up to the 5th of February, when there was more gastric irritation, but of a milder form. Stimulants and milk were then administered with success. February 10th, he was able to sit up for a few hours a day. February 14th, he was able to bear, without inconvenience, much weight on the injured limb. February 20th, his face and body were somewhat œdematous; his urine was examined and found loaded with albumen. Appropriate remedies were given to combat the disease. There was steady progress up to March 4th, the patient continuing to walk with crutches. Urine still albuminous, but limb well and strong. On the 7th there was very considerable œdema of the legs, giving to the wounded limb the appearance of deformity. A photograph was then taken of the patient, a woodcut from which is here appended (Fig. 53). On the following day the œdema had disappeared, though the urine was still heavily loaded with albumen, and he left for his home in the country, well, with the exception of the diseased action of the kidneys.¹

¹ July 26th: albuminous condition has disappeared; health good, limb strong, patient walks with a cane; anterior wound still open, and discharging moderately. Small fragments of dead bone still undischarged.—(J. S.)

CASE 134.—Private Zéphérin Vautier, 2nd Company, 1st Battalion, 7th Zouaves, was received November 30th, 1870; his injuries were a fracture of the left femur, and a flesh wound of the right thigh. A ball had entered through the rectus femoris, about

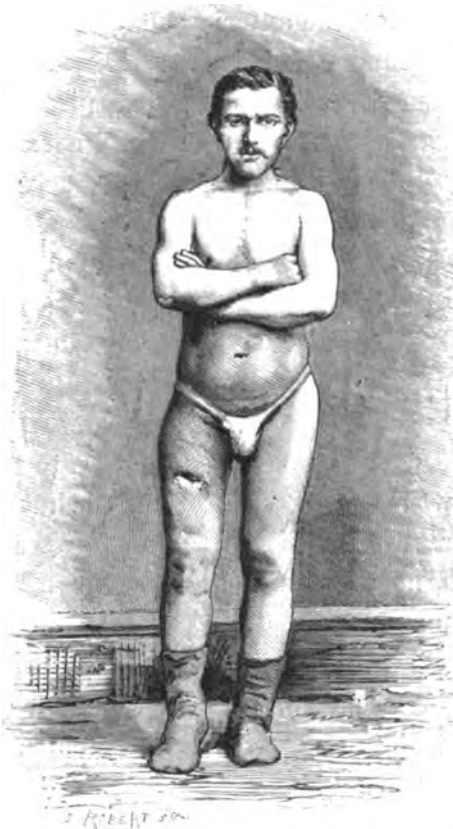


FIG. 53.—Appearance of the limb of Private Jules Hardy twenty-one weeks after his injury.

six inches above the knee-joint, and passing through the femur, had been divided into three pieces, one making its exit near the gluteal muscle; another was extracted on the posterior surface of the limb, nearly opposite the point of entrance; a third remained just under the skin, two inches above the exit of the last-named portion of ball. The limb was shortened about three inches, and enormously swollen from infiltration of blood in the fascia. The patient suffered little pain. His general condition, to all appearances, was good. The fractured limb was placed in a wire gutter or splint padded with oakum, dressed, and the

extension made as in Case 3, except that the pulley and weight were added, as shown in the accompanying sketch (Fig. 54). The limb was examined from time to time, and found doing well. January 4th, it was entirely redressed; it was then found that all the wounds were healed except at one point, where a splinter of the ball was being thrown out by suppuration. The general condition of the patient was always good. One of the remarkable features in this case was, that all the wounds, save the one in the gluteal region—from this there was a small discharge of pus and fragments of bone—

healed without any appreciable amount of suppuration. At this time there was about one and a-quarter inches shortening of the limb, some union, considerable bony enlargement, but no lateral distortion. The limb continued to improve, and by the middle of January the man was up. The evidences of fracture

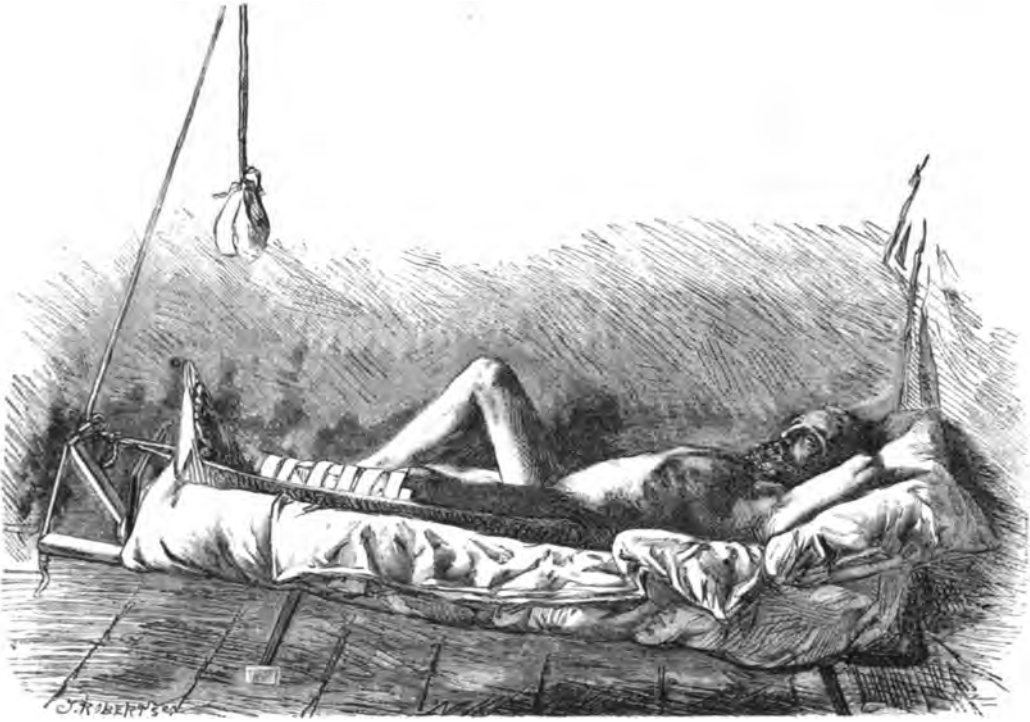


FIG. 54 shows Case 134 under treatment for compound fracture at the juncture of the lower and middle thirds of the left thigh ; the adjustment of the weight and pulley is also shown.

were these:—1. That the limb would bend freely at the point of fracture, notwithstanding the enormous swelling from the effusion of blood. 2. That there were fragments of bone imbedded in the pieces of ball. 3. That fragments of bone were discharged from the wound in the gluteal region. 4. That there was, and is, over an inch of shortening. 5. That the bone at the seat of the fracture was and is much thickened. 6. That there was great bony crepitation.

March 6th, this patient was discharged well, the fracture firmly consolidated, although at that date he walked with crutches. His appearance is shown in the accompanying sketches from photographs taken at the time (Figs. 55, 56).

To show further what has been done in this direction, I call attention to the report of the Surgeon-General of the United

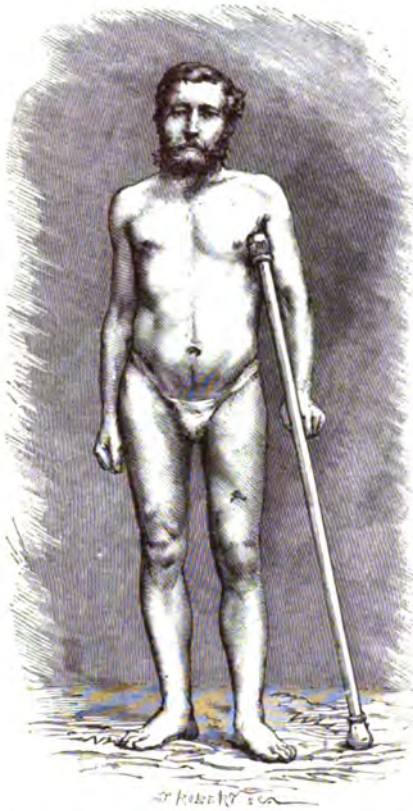


FIG. 55.—Appearance (front view) of Private Zéphérin Vautier thirteen weeks after his injury—a gunshot fracture of the left thigh.



FIG. 56.—Appearance (lateral view) of Private Zéphérin Vautier thirteen weeks after his injury.

States ("Circular No. 6," S. G. O., 1865), which is replete with interest, because of the vast number of gunshot fractures of the thigh and the knee-joint recorded.

“Table exhibiting the Results of 2,003 Terminated Cases of Gunshot Fracture of the Femur, or of Gunshot Wounds of the Knee-Joint, out of 3,106 Cases that have been entered on the Records.”

	Total terminated.	Amputation.				Excision.				Conservative measures.				Aggregate.
		Recovered.	Died.	Undetermined.	Mortality rate of determined cases.	Recovered.	Died.	Undetermined.	Mortality rate of determined cases.	Recovered.	Died.	Undetermined.	Mortality rate of determined cases.	
Gunshot Fractures of Femur, implicating Hip-Joint	82	0	2	0	100	2	10	1	83.33	0	68	14	100	97
Gunshot Fractures of upper third of Femur	287	8	24	11	75	7	18	6	72	93	237	199	71.81	603
Gunshot Fractures of middle third of Femur	346	42	51	47	54.83	2	13	10	86.66	106	132	148	55.46	551
Gunshot Fractures of lower third of Femur	413	131	112	117	46.09	1	1	0	50	72	101	137	58.39	672
Gunshot Wounds of the Knee-Joint, with or without Fracture	770	121	331	266	73.23	1	9	1	90	50	258	146	83.76	1,183
	2,003	302	520	441	63.26	13	51	18	79.68	321	793	644	71.26	3,106

“In examining the above table in detail, it is seen that the results are ascertained in 822 of the 1,263 cases treated by amputation, or 65 per cent.; in 64 of the 82 cases treated by excision, or 78 per cent.; and in 1,117 of the 1,761 cases treated by conservative measures, or 63 per cent.” It further shows, that of the 1,117 terminated cases treated by conservation, 71.26 per cent. died; while of the 822 terminated cases of amputation, 63.26 per cent. died; leaving 8 per cent. in favour of amputation. It must not, however, be forgotten that there were 644 of the former undetermined, while there were only 441 of the latter under treatment.

I doubt not that the results of the unfinished cases will change the balance-sheet in favour of conservative surgery.

The report further states, in way of explanation, “that the amputations include most of the bad cases, and those in which preservation of the limb was attempted and abandoned.”

I do not fully understand what the “Circular” means by “bad cases,” unless it is that they are all wounds which destroy the knee-joint, or so fracture the bone and lacerate the soft parts as to require amputation. In such cases there is nothing to be done but to amputate.

The writer of the above either forgets or fails to state that in these cases amputation is generally performed upon the field

and without much delay ; they are therefore mainly *good cases* for amputation.

The good results obtained under adverse circumstances in the treatment of the class of gunshot fractures, above referred to, and summed up in "Circular No. 6," convince me that the difference in the percentage of recoveries between amputations and conservations was due to the excessive inflammation occasioned by insufficient protection of the fractured limb during long and tedious transportations over bad roads, or no roads at all, and by the delays and breaking of communication by steam-boats and railway. Besides, the necessities of war, in some instances, compel leaving the wounded on the field of battle for days together. This was the case in the Seven Days' Battle of the Peninsular campaign, in the Battle of the Wilderness, and in many other instances. My opinion upon this subject is strengthened by reference to a report of the comparative results obtained in the Crimean War between amputation and conservative treatment. Professor Legouest there shows, that of 337 wounded, having compound fractures of the thigh, and treated without amputation, 117 recovered fit for service.

The fractures are thus divided as regards the seat of the injury and the results :—

Fractures.	Cases.	Died.	Recovered.	Percentage of Deaths.
Of the neck of the femur	17	10	7	59·
In the trochanters	7	4	3	57·
In upper third	48	30	18	62·5
In the middle third	43	21	22	50·
In the lower third	46	16	30	35·
Without indication of seat of fracture . .	176	139	37	79·
Totals	337	220	117	35·

In this connection he shows that, of 1,666 amputations performed, only 123, or 7·40 per cent., survived ; while of the 337 cases treated conservatively, 117, or 35 per cent., survived. In other words, the number of amputations of the thigh recovered, as compared with that of the recoveries by conservation, shows

that "there are four times as many recoveries" from the latter treatment as from the former:—"That in fractures of the lower part of the thigh, the number of recoveries from non-amputation exceeds that from amputation. And, finally, that in fractures located above the middle of the thigh, there are twenty-four non-amputated cases surviving and not one amputation."

He then proceeds:—"To give the relative results obtained from amputation and conservation in different parts of the shaft. For the upper third of the femur, as 31·50 is to 6; for the middle third of the femur, as 34·75 is to 6; for the lower third of the femur, as 42 is to 10. The ratio of these tables is as 35 is to 7·40; that is to say, there is very nearly five times more chance of recovery from a gunshot fracture of the thigh without amputation than there is with amputation."

In his concluding remarks on the conservation of the thigh he states:—"That the practice of amputating the thigh, in consequence of a gunshot fracture of the femur, which maintained its supremacy so long without contestation, seems destined to-day to give place to that of conservation of the limb."

Should it be argued that there must be other causes assigned for the great disparity in the comparative number of deaths from amputation and conservation in the Crimean War, I should answer that the general statement is, that of the 1,664 amputations of the thigh performed in the French army, 1,541, or 92·60 per cent., died. But a more careful analysis shows that of the 1,541 deaths

781, or 46·93 per cent., died in the Crimea;

278 „ 16·70 „ „ „ at Constantinople;

482 „ 29·00 „ „ „ on their way to France.

1,541

Thus it appears that only 46·93 per cent. died before removal, while 45·67 per cent., or about one-half, died *en route*, or in hospitals far removed. Also, that amputations cannot be removed, or even roughly handled at a very early period, without a fearful mortality resulting therefrom. I have shown conclusively, in a former part of this report, that compound fractures of the thigh can be removed any distance without

more encumbrance to ambulance trains than cases of recent amputations, and with greater safety, if we consider the results obtained in the French army as a criterion.

AMPUTATIONS OF THE THIGH.

There have been seven amputations of the thigh performed at the American ambulance.

Of these, five were wounded through the knee-joint.

The sixth was wounded just below the knee-joint. From this wound he had recovered, when he received an injury above the knee, which necessitated amputation at the upper third. From the effects of this second injury he died. The case is full of interest, and is given under the head of "*History of each case which terminated fatally.*"—Case 8.

The seventh was wounded just below the knee-joint. An india-rubber drainage tube was passed through the track of the ball. Two days afterwards, however, it was found necessary to amputate through the knee-joint, owing to great effusion in the tissues below the joint, which destroyed their vitality. The patient did well up to the twenty-fifth day, and was considered out of danger, when, on account of a deficiency in fuel, he suffered and died. (See Case 222.)

One of the above five cases, after he was considered out of danger, died of tetanus. (See Case 7.)

A second on arrival was unable to retain food. He reported that for several days preceding his wound he had suffered from vomiting and other symptoms of gastric irritability. He was wounded through the knee-joint, and the leg was completely infiltrated with blood and serum. Vitality had ceased, and amputation was performed without delay. But the patient failed to retain anything on his stomach, and though he lost little or no blood, either during the amputation or afterwards, he continued to sink, and died two days after the operation.

The histories of the three remaining cases are as follows.

CASE 5.—Private Alfred Doucet, 5th Company, 3rd Battalion, 35th Regiment of the Line, was received September 30th, 1870. His injury was a fracture of the articulating portion of the tibio-femoral end of the femur; the ball had entered poste-

riorly, and lodged between the condyles, crushing that portion of the femur into several pieces and opening the joint. Amputation was performed, by an anterior flap, at the lower portion of the middle third of the thigh. The limb was dressed with sutures, oakum, compresses and bandages, and covered with oil-silk. Subsequently, adhesive plaster was applied in addition to



No. 1.

No. 2.

FIG. 57 shows the appearance of the limb of Alfred Doucet at the time of his discharge (No. 2), as also the appearance of the shoulder of Clement Daumont, March 1st, 1871 (No. 1).

the above, to keep the edges of the wound in place. October 26th, twenty-seven days after the injury, the patient was able to rise and sit in his chair. Thirty-two days after the injury he was able to walk with crutches. Fifty-five days after the operation

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the wound was entirely healed. The limb has never since given any trouble, and the patient has been in good health. March 1st, the patient was discharged. At this date his photograph was taken, a woodcut from which is given in Fig. 57 (No. 2).

CASE 9.—Private Jean Buzier, 5th Company, 81st Regiment



No. 1.

No. 2.

FIG. 58 shows the appearance of the limb of Jean Buzier (No. 2) at the time of his discharge; as also the appearance of the limb of Edmond Vernatier at the time of his discharge (Fig. 1).

of the Line, was received September 30th, 1870. A ball had entered just above the joint to the left of the middle of the patella, and passed on, as far as could be discovered, externally to, and not involving the joint; it was removed from the

posterior aspect of the limb about the middle of the gastrocnemius muscle. On arrival, the patient was suffering severely from loss of blood and violent spasms in the leg. These spasms, due somewhat to the exertion of walking some distance after the receipt of the injury, were prevented by splints applied to the limb, so as to obviate any motion. The limb was then covered with hot applications and oil-silk. Opiates were given in moderate quantities to alleviate the pain. Soon after the receipt of the injury, severe inflammatory action ensued. Large abscesses formed below and above the joint. About the 26th of October, twenty-six days after the injury, the joint was found to be diseased, and discharging large quantities of pus and dead tissue through the openings of the abscesses. From that time up to November 1st large and repeated doses of opium were required to keep the patient easy. The condition of the joint showed that the cartilages were severely inflamed. After a consultation on the 1st of November, thirty-one days after admission, it was decided to amputate. Amputation was performed by a long anterior flap. The joint was found very extensively diseased; the cartilages and several portions of the articulating ends of the joint destroyed, the ball having chipped off a portion of the articulating end of the tibia in its passage downwards. After amputation, gradual improvement followed, the wound healing kindly—much of it by first intention. On the eighth day after amputation an undue disposition of the muscles to retract was counteracted by the weight and pulley, applied by means of adhesive plaster around the stump. At the end of thirteen days the patient was able to rise. On the twenty-sixth day after the operation he was able to walk with crutches, the wound being healed, except a space of one and a-half inches, the site of an old abscess. The patient continued to do well up to January 15th, when he injured the stump by a fall. An abscess formed in the neighbourhood of the bone. February 14th, a small piece of carious bone was discharged from the end of the shaft. Notwithstanding this the patient was in perfect health. March 8th, a photograph was taken, which is here reproduced (Fig. 58, No. 2).

CASE 23.—Private Edmond Vernatier, 1st Company, 1st Bat-

talion, 38th Regiment of Mobiles of the Seine and Marne, was received from Bourget, October 21st, 1870. A ball had passed laterally through the knee-joint, breaking the condyles of the femur. The patient was in good health on arrival. Amputation was performed on the 22nd of October, between the middle and lower thirds of the femur, by a long anterior flap. The flaps were brought together with sutures, the wound dressed with lint, covered with oil-silk cloth and enveloped in oakum. On the twelfth day the wound was nearly healed, and mostly by first intention. On this day he had stiffness of the jaw, constriction of the muscles about the throat, and all the symptoms of approaching tetanus. The free use of cigarettes, containing each four grains of opium, controlled these symptoms for a time. At their reappearance the same treatment was followed. They lasted during three days. On the sixteenth day the ligatures came away. On the twenty-first day the patient was able to sit up. Twenty-eight days after the operation he was able to walk with crutches. He continued to improve, and was discharged to the convalescent ward within thirty days after the operation. January 20th, he was entirely well, and could go anywhere on crutches.

March 8th, 1871, Vernatier was discharged perfectly well, and his photograph taken, which is here reproduced (Fig. 58, No. 1).

In this connection it seems proper to call attention to the comparative results obtained in our ambulance between amputation and conservation in gunshot fractures of the femur.

The percentage of deaths in amputations compared with the results of conservations was as follows: seven amputations of the thigh were followed by four deaths and three recoveries, or 42.86 per cent. Three gunshot fractures of the thigh treated by conservation were followed by three recoveries, or 100 per cent.

A reference to the history of the four deaths after amputations of the thigh will show, however, that in no case was the amputation the immediate cause of the death, and that, moreover, none of these cases could have been treated conservatively.

There was one resection of the knee-joint for compound

fracture, which proved fatal. (See case 116, under the head of "*History of each case which terminated fatally.*")

RESECTIONS, AMPUTATIONS, AND CONSERVATIONS OF THE SHOULDER-JOINT.

There have been eight injuries to the shoulder-joint ; of these six occurred on November 30th, 1870. Primary excision was performed in five cases, three of which recovered. Their histories are subjoined.

CASE 32.—Private Clement Daumont, 5th Company, 2nd Battalion, 35th Regiment of the Line (136th Marching Regiment), was received from Malmaison, October 21st, 1870. A ball had entered the left shoulder at the posterior border of the deltoid, and had made its exit at the anterior border. The patient was exhausted from loss of blood, and was, moreover, suffering from gonorrhœa and pleurisy. The chest was filled with a pleuritic effusion. The following day, October 22nd, excision was performed by a longitudinal incision of about five inches through the deltoid. The head and three inches of the shaft of the humerus were excised. The wound was filled with lint, and the parts covered with warm water applications and oil-silk. This treatment was continued until the fifth day, when suppuration commenced. The patient was supported by stimulants. Improvement was regular. The arm was supported from the neck and shoulders by diachylon and bandages until the 25th of November, when he was transferred to the convalescent hospital. Two small abscesses afterwards formed, but in no way interfered with the success of the operation. In the middle of January he was able to use his hand in the manufacture of baskets. Early in March he was quite well, and had good use of his hand and arm, working daily at his trade. At this time his photographs were taken, sketches from which are here appended. (See Fig. 57, No. 1, and Fig. 59.)

CASE 56.—Lieutenant Fénelon Barbier, 3rd Company, 1st Battalion, 114th Regiment of the Line, was received November

30th, 1870. A ball had entered at the anterior face of the left humerus, and had passed directly backward through the head of the bone, making its exit posteriorly. December 2nd, excision was performed by extending the opening longitudinally and vertically, and removing the head of the bone by sawing through



FIG. 59.—Appearance (front and back view) of the shoulder of Private Clement Daumont at the time of his discharge.

the surgical neck. The long tendon of the biceps was preserved. The wound was filled with lint, and the parts were covered with warm water applications and oil-silk. December 4th, healthy suppuration was established. On the tenth day, after excision, a drainage tube was inserted into the wound, and the edges brought together by strips of diachylon. The arm was supported by means of bands. December 21st, nineteen days after the operation, the wound was nearly closed. January 25th, the wound still closing and the shoulder resuming its normal condition. February 25th, the patient was entirely well. March 5th, a photograph was taken, which is reproduced in Fig. 60.

CASE 166.—Private Alphonse Tessier, 5th Company, 2nd Battalion, 112th Regiment of the Line, was received from the outposts at Bourget, December 24th, 1870. A ball had entered anteriorly to the shoulder-joint, and had passed through the head of the humerus, making its exit posteriorly. The head was crushed to atoms, many of which were carried out posteriorly, and remained in the deltoid. He was intoxicated on arrival. The skin around the entrance was burnt, the wound having been received from a point-blank shot. He arrived late in the evening. Excision was

performed immediately by lamplight. The posterior wound was extended in the long axis of the limb, and the head and about one inch of the shaft of the humerus removed. During the first twenty-four hours the parts were much swollen. Warm linseed poultices were used. For the first three days the wound was filled with lint, covered with compresses dipped in warm water,



FIG. 60.—Appearance (front and back view) of the shoulder of Lieut. Fénelon Barbier at the time of his discharge.

and enveloped in oil-silk cloth. After the fifth day, when pus began to form, the wound was dressed with nitric acid lotion. The inflammation at this time had begun to diminish. Up to the twenty-first day the patient did well; then fuel giving out, he suffered from the severe cold, and had a slight chill. The granulations disappeared, and his appetite became poor. On the twenty-third day he was somewhat better, and healthy pus was

again secreted in abundance, but exhaustive suppuration continued up to the twenty-fifth day, when the edges of the wound were brought together with adhesive plaster. On the twenty-seventh day he suffered from vomiting and diarrhœa, which



FIG. 61.—Appearance (front and back view) of the shoulder of Private Alphonse Tessier, at the time of his discharge.

were controlled in part by laudanum and brandy. The same day delirium supervened. Beef—horse beef—tea and brandy were given every hour. The quantity of pus decreased, and the granulations diminished. On the forty-first day the wound again opened, and discharged freely. The following day his diarrhœa was entirely controlled, and he began to improve. The day after he sat up, though vomiting again occurred in the course of the day. From this time he continued steadily to improve until February 21st, when the wound was nearly closed, and his health so far re-established that he could sit up all day without fatigue. March 3rd, he walked about and was considered as perfectly well. March 12th,

photograph taken. (See Fig. 61.)

The two remaining cases did well up to the nineteenth day, and were considered out of danger, but they died from the effects of cold, caused by a deficiency of fuel. (Cases 96 and 109, "*History of Fatal Cases.*")

Besides these, there were three other cases reserved for conservative treatment. They all did badly for days after admission, and it was found that unless amputation or excision were per-

formed they would die. The most favourable case was selected and excision performed; but, as was feared, it only hastened the fatal result. The patient died soon after the operation. (*History of Fatal Cases*, Case 83.) The two remaining cases were complicated. (*History of Fatal Cases*, Cases 59 and 120.)

There were no amputations at the shoulder-joint, and but one of the arm; the history of this case, No. 106, is given at length in another connection.

In the report of the Surgeon-General of the United States¹ the subject of shoulder-joint operations is carefully discussed, with the records of 1,033 cases which had been treated up to a certain date during the Rebellion.

The Report states:²—"It is creditable to the surgery of the war that the number of cases of amputation at the shoulder-joint reported is less than the number of cases of excision of the head of the humerus, and that the latter operation appears to have been adopted in nearly all the cases in which it was admissible. The reported cases of amputation at the shoulder-joint for the entire period numbered 458; of excisions of the head of the humerus there were 575. Of the 237 terminated cases of amputation, 93 died, a ratio of mortality of 39·2, which is 6·7 per cent. greater than the mortality in excisions."

And again:³—"Excisions of the Shoulder-joint.—Nearly all the cases that have been reported during the war have been recorded. The results are given in the following table:—

Table exhibiting the Results of Cases of Excisions of the Shoulder-joint for Gunshot Injuries.

	Primary Operations.	Secondary Operations.
Died	50	115
Recovered	160	183
Results undetermined	42	25
	252	323
Aggregate	575	

¹ "Circular No. 6," S. G. O., 1865.

² Ibid, p. 46.

³ Ibid, p. 55.

"The percentage of mortality is 23·8 in primary cases, 38·59 in secondary cases, or a mean ratio of 32·48. The ratio in amputations at the shoulder-joint is 39·24, a percentage of 6·76 in favour of excision. Of 36 cases of gunshot fracture of the head of the humerus, selected as favourable cases for the expectant plan, and treated without excision or amputation, 16 died, or 44·4 per cent., a ratio in favour of excision of 11·96 per cent. But it is superfluous to offer further proofs in behalf of this admirable operation."

It is scarcely necessary to say, in view of these results, that excision is the proper treatment for gunshot fractures of the shoulder-joint, and that amputation is only admissible when the soft parts are so injured as to destroy vitality or render the arm useless.

FRACTURES OF THE TIBIA AND FIBULA.

Of this class of injuries I append two cases, to show the results of the treatment.

CASE 36.—Corporal Anatole Menez, 5th Company, 3rd Battalion, 3rd Regiment of Zouaves, was received from Malmaison, October 21st, 1870. A ball had fractured the shaft of the right fibula, in the upper third. Warm water applications covered with oil-silk cloth were used until the sixth day, when warm linseed-meal poultices were substituted to accelerate suppuration and combat the pain produced by the formation of abscesses. The pain continued intense until several small scales of bone were discharged. A drainage tube was inserted after the tenth day, and opium cigarettes of four grains each were freely given to calm the pain. From this time the case proceeded favourably until the date of discharge, December 8th; the patient then returned to service perfectly well.

CASE 244.—Corporal Hippolyte Charpenet, 9th Regiment of Chasseurs, was received January 24th, 1871. He was thrown from his horse, which fell upon him and produced a transverse fracture of the middle third of the tibia and fibula of the right leg. When the patient was received, the limb was much swollen from inflammation and infiltration in the tissues. The limb was placed in a wire gutter, well padded with oakum, so as

to keep the bones in place. It was then covered with hot water applications and oil-silk, which were changed as often as the comfort of the patient would indicate. The limb continued to improve up to the 1st of March, when it was found to be firmly united, with no distortion. On the 6th of March the patient was discharged entirely well.

FRACTURES OF THE ARM.

There were eight gun-shot fractures of the forearm. Of these seven recovered; one died. The history of this case (No. 106) will be found under another heading.

CASE 130.—Private Pierre Lhéandre, 3rd Company, 3rd Battalion, 114th Regiment of the Line, was received with two wounds, from Champigny, November 30th, 1870. A conoidal musket-ball had entered at the anterior face of the ulna, fracturing the bone, and had passed out through it posteriorly, making a wound of three and a-half inches in length by two and a-half in breadth at entrance, and a large one at exit. A fragment of shell had struck the inner part of the left thigh, producing a flesh-wound extending from the inner condyle of the femur, 5 in. upwards and inwards. No apparatus was applied. The treatment was limited to warm water applications, covered with oil-silk cloth. The progress was very favourable. No untoward symptoms arose to retard recovery. January 6th, both wounds were healed, and the fracture firmly consolidated.

CASE 225.—Private Joseph Paya, 1st Company, 2nd Battalion, 109th Regiment of the Line, was received from Montretout, January 19th, 1871. A ball had entered the forearm a little above the carpal end of the ulna, breaking it at this point, and had passed obliquely upwards and outwards, making its exit posteriorly. There was paralysis of the little and ring fingers, caused by the destruction of the ulnar nerve. The parts were covered with compresses dipped in warm water and enveloped in oil-silk cloth, and the hand was supported by a splint. This treatment was continued for six days, when pus began to form freely; nitric acid lotion was used in addition as a stimulant. Several abscesses formed in the tendons of the anterior and internal muscles, which afterwards discharged through the wounds. On

the thirty-first day after admission an abscess formed and was opened in the middle of the anterior part of the forearm. March 3rd, the wound was healed; there was a little stiffening, but no ankylosis in the wrist-joint; the patient was discharged well.

CASE 31.—Private Jean Louis Pelletier, 6th Company, 1st Battalion, 38th Regiment of Mobiles of the Seine and Marne, was wounded at Malmaison, October 21st, 1870. A ball had entered the right forearm posteriorly, and passed obliquely downwards, fracturing the shaft of the ulna at the lower third. Warm water applications wrapped in oil-silk were used. On the sixth day, when suppuration commenced, warm flaxseed poultices were substituted. An artificial support was given to the arm by light wooden splints, retained by strips of adhesive plaster. Progress was continuous, and he was discharged on the 19th of December, perfectly well.

CASE 18.—Private Flouriselle Lecomte, 1st Company, 1st Battalion, 38th Regiment of Mobiles of the Seine and Marne, was received from Malmaison, October 21st, 1870. A ball had entered the right forearm, anterior to and a little above the carpal end of the radius, and had passed downwards between the carpus and the carpal end of the ulna, fracturing both. The arm and hand were supported by a splint extending from the elbow to the ends of the fingers, and fixed immovably by bands of adhesive plaster. The parts were kept moist by wet compresses covered with oil-silk. Fomentations were added when abscesses were forming or scales of bone were seeking an outlet. The healing of the wound was continuous, and the patient was discharged, December 19th, with a useful hand—having regained also the partial use of the wrist.

CASE 115.—Private Léon Filip, 1st Company, 3rd Battalion, 42nd Regiment of the Line, was received November 30th, 1870. A bullet had entered the inner side of the forearm, about 4 in. below the elbow, and had passed out just below the olecranon, breaking the same and opening the joint. The elbow was not swollen, and it was therefore determined to treat the case without operation. The wounds were dressed with compresses dipped in warm water, and covered with oil-silk. Suppuration began on

the seventh day, up to which time he had suffered no pain. On the 8th of December he had a chill, due probably to the forming of an abscess. On the same and following day there was great pain and slight swelling of the joint. Cold dressings, with laudanum, were now applied, and gave much relief. On the twelfth day he had slight constriction in the throat, which was relieved by cigarettes containing each four grains of opium. On the fourteenth day two or three little spiculæ of bone were discharged from the superior wound. The forearm and hand now began to swell considerably; there was a very free discharge of pus, and pain had entirely ceased. On the thirty-fifth day abscesses began to form in the upper third of the forearm. On the 12th of January, forty-three days after admission, a piece of the olecranon, about one-fourth of a cubic inch, was discharged. At the above date he had eight or ten abscesses in the upper third of the forearm. February 21st, the forearm was much less swollen, and the abscesses had begun to heal. The great number of small abscesses was probably due to the fact that he would not permit the first large abscess to be opened, and not to the presence of necrosed bone, as might have been supposed. There was much thickening about the elbow-joint, impeding the motion of the arm, but no bony ankylosis. March 11th, some pain and inflammation. March 12th, there was found to be some necrosis of the superior end of the ulna, which might require time to dispose of. The patient was discharged March 18th, quite out of danger, and with every prospect of having a useful limb.¹

CASE 14.—Private Dieudonné Boussinesy, 6th Company, 2nd Battalion, 45th Regiment of Mobiles of Hérault, was received October 17th, 1870. His injury was a fracture of the middle of the ulna—caused by a ball from a revolver—with an anterior and posterior wound. The parts were covered with hot water applications and oil-silk. The arm was supported by splints and bandages. After twenty days, perfect union had taken place, and the splints were removed. At this time there was great bony thickening,

¹ July 1st.—Patient is well, with good arm, and has nearly full use of the elbow-joint. (J. S.)

giving to the arm the appearance of distortion. By November 25th all the *débris* of bone had been discharged, the anterior wound, however, not being quite healed. There was steady improvement up to December 10th, when the patient was discharged well.

FRACTURES OF THE TARSUS AND ANKLE-JOINT.

I introduce the two following cases to show the mode of treatment and the general results in this class of wounds.

CASE 41.—Private Louis Godon, 5th Company, 3rd Battalion, 3rd Regiment of Zouaves, was received from Malmaison, October 21st, 1870. A ball had entered the sole of the foot, passing through the os calcis and astragalus, and making its exit anterior to the ankle-joint. For the first week the whole foot and limb were enveloped in compresses dipped in warm water and covered with oil-silk cloth. On the sixth day pus formed in such quantities that a drainage tube was passed through the wounds in the foot. From time to time *débris* of bone were removed. Several abscesses formed and were opened. Towards the end of February he appeared to be quite well. There remained however a little stiffness about the joint, but no bony ankylosis. He was not yet able to bear the weight of his body on his foot. March 25th the patient was discharged much improved.¹

CASE 45.—Private Michel Gaudry, 4th Company, 28th Regiment of the Line (36th Marching Regiment), was received October 22nd, 1870. He had several wounds. A ball had entered the right foot anteriorly to the external malleolus, and passed obliquely upwards, backwards, and inwards between this and the astragalus, cutting in its course the tendon Achillis. A second ball had passed through the left axilla, making in its course five flesh wounds. A third ball had passed through the second joint of the phalanx of the index finger of the right hand, crushing the joint. The patient was found in a small house in the outskirts of Rueil, where he had dragged himself the night after the battle. He was much exhausted from loss of blood, want of food, and exposure. His

¹ July 1st.—Patient well, and has full use of his limb. (J. S.)

nervous system was much affected, and for several days it was necessary to force him to take sufficient nourishment. He had several violent chills. Stimulants were freely given. Suppuration having commenced on the fifth day, the foot was rendered immovable by wooden splints and adhesive plaster, and dressed with compresses dipped in warm water and covered with oil-silk. Linseed-meal was used when abscesses were forming. Several of these formed on the inside and outside, and were opened. A drainage tube was passed through the joint. December 15th, the wooden splints were replaced by a pillow, which, when wrapped around the leg and secured by bandages, served the same purpose—viz., gave support. He continued to improve, and with the exception of an occasional abscess, his convalescence was steady.

At the end of February, there was a slight stiffness about the joint, but no ankylosis. The wound in the finger was dressed with warm water applications, and the finger made firm by bands of adhesive plaster. It is now healed, but shortened and ankylosed.

FRACTURES OF THE SCAPULA.

The following are two interesting cases of this class of injuries:—

CASE 43.—Captain Martin Ducos, 6th Company, 3rd Battalion, 3rd Regiment of Zouaves, was received October 21st, 1870. A ball had entered posteriorly to the middle portion of the clavicle, and passed obliquely downwards through the spine of the scapula. The wound was covered with warm water applications, poultices, and oil-silk. Scales of bone continued to be discharged from time to time up to the 20th December, when both wounds were healed. The patient was only confined to his bed for fifteen days. February 15th he was discharged well, with the exception of a little stiffness in the muscles surrounding the joint. Opium was given in small doses to combat the pain. He was well sustained by a generous stimulating diet.

CASE 6.—Barnole Gill, 2nd Company, 3rd Battalion, 35th Regiment of the Line, was admitted September 30th, suffering from a fracture of the scapula. A ball had entered just behind

the middle of the clavicle, and passed downwards and backwards through the middle of the scapula, fracturing the same, and making its exit at the apex.

The parts were covered with warm water compresses and oil-silk cloths. On the 6th day after admission there was a free discharge of pus. On the 9th, fragments of cloth and *débris* of bone accompanied the ordinary discharge. The above treatment was continued to the 25th of October, at which date the anterior wound had closed. Morsels of bone still frequently issued from this injury until November 25th. December 15th, the posterior wound had closed. December 10th, patient was discharged well.

FRACTURES OF THE CARPUS.

Of this class of injuries all recovered. I give the details of two cases, to show the mode of treatment adopted and the good results obtained therefrom. In case 215, the entire carpus was carried away, the wrist shortened about an inch, and still a good and useful limb resulted.

CASE 191.—Private George Goudelin, 6th Company, 3rd Battalion, 109th Regiment of the Line, was received from Buzenval, January 19th, 1871. A ball had entered the right hand at the centre of the carpus, on the ulnar side, making an opening of half an inch, and had passed obliquely downwards, carrying with it the greater part of the carpus, and having its exit just above the junction of the metacarpal bones of the thumb and forefinger, cutting the radial artery and palmar arch, and making an exit wound of three inches in diameter. He arrived at the ambulance much exhausted from loss of blood. His wound had a mushroom appearance. The hæmorrhage was with difficulty controlled during the first four days. It recurred repeatedly, and was as often checked by cold astringents, compresses, and bandages. On the 26th suppuration commenced, and several small pieces of bone were removed. A support of thin board, cushioned with oakum, was attached to the hand and forearm. The dressings consisted of compresses dipped in warm water and enveloped in oil-silk. This treatment was continued until February 5th, when linseed poultices were used to alleviate the pain caused by the forming of an abscess. Suppuration

continued abundant. February 13th, a second large abscess began to form between the two wounds. To relieve the excessive pain and nervousness, laudanum was freely added to the poultices. From this time to February 20th, the suppuration was profuse, but the swelling of the parts had subsided, and the patient's general condition improved.

March 8th, the patient was discharged with a useful limb.

CASE 29.—Private Charles Joseph Engel, 5th Company, 2nd Battalion, 36th Regiment of March, was received from Malmaison, October 21st, 1870. A ball had entered the left hand at the lower face of the carpus, anterior to the carpal end of the ulna, fracturing the carpus, and making its exit posterior to the carpal end of the phalanx of the index finger. On arrival the patient was anæmic. There was considerable hæmorrhage from the wounds, and also from the nose. He was at this time suffering from rheumatism. The hand and forearm were covered with warm water applications and oil-silk. Suppuration began on the fifth day, when poultices of linseed-meal were substituted. Several slight hæmorrhages were treated with burnt alum. Stimulating drinks were freely given. The arm and hand were placed on a large, soft pillow. During the interval between this time and November 15th several abscesses formed at different points over the carpus, and discharged freely both pus and bony *débris*. The hand and forearm were supported by splints padded with oakum and sustained by bands of diachylon. The progress was continuous, and November 25th the patient was transferred to the convalescent ward. February 25th, the wound was entirely healed, and the patient had recovered, in a great measure, the use of his wrist.

March 4th, the patient was discharged well, with a useful hand and arm.

FRACTURES OF THE MAXILLARIES.

There have been five gunshot wounds of the jaws. All recovered, and as they contain much of interest I give their histories.

CASE 62.—Captain Pierre Jardin, 1st Company, 3rd Battalion, 42nd Regiment of the Line, was received November 30th, 1870.

A ball had entered the left side of the face, one inch anterior to the angle of the left jaw, and had passed out immediately under the right ramus, destroying in its course the lower maxillary on the left side and the muscles of the tongue, and cutting into the fauces. He was weak from loss of blood, but otherwise in good condition. Being unable to take food, owing to the opening in the fauces, he was fed by the stomach-pump. On the 5th of December hæmorrhage occurred, which was arrested by liquid perchloride of iron. In the night it re-occurred. December 6th, six days after the injury, there was again hæmorrhage. It was arrested by laying open all the tissues between the wounds of exit and of entrance, removing all the *débris* of bone and tissue, and ligaturing the sub-lingual artery, which had been wounded. The facial artery was compressed by passing a silver wire through the tissue under the artery, and twisting the two free ends over a block of wood with a compress under it. The wound was then left exposed to the air until all hæmorrhage had ceased and the wound was dry. It was then treated by hot compresses and oil-silk. December 10th, four days after, the wire compression was removed, and suppuration fully established. In addition to the warm compresses, dilute nitric acid, 120 drops to the quart of water, was applied to the wound. This treatment was continued up to the 25th of January, when the wound was nearly closed. The patient was discharged February 15th, entirely well.¹

CASE 65.—Captain Louis Noëll, 1st Company, 3rd Battalion, 114th Regiment of the Line, was received from Champigny, November 30th, 1870. A ball had entered the face on the right side, about one inch outwards and downwards below the outer angle of the mouth, and had passed obliquely downwards and outwards, breaking the ramus of the inferior maxillary between the condyle and the inferior angle; re-entering just above the inner angle of the scapula, it passed out again through the lower angle, fracturing the same. The treatment consisted in the application of compresses dipped in warm water. The upper and lower jaws were fastened together with metallic wire by means of the

¹ July 28th.—The patient is in good health.—J. S.

teeth, the upper jaw acting as a splint to the lower. On the tenth day after admission a very small piece of bone was discharged from the lower wound of the scapula. Pieces of bone were also discharged from the jaw. An abscess formed in the neck and was opened. He was discharged on the 19th of February, well, except that a slight amount of suppuration continued from the scapula, evidently from some small fragments of bone not yet exfoliated. At this time the jaw had nearly resumed its normal position.

CASE 73.—Corporal Pierre Soulan, 3rd Company, 3rd Battalion, 114th Regiment of the Line, was received from Champigny, November 30th, 1870. A ball had entered below the malar bone on the right side, and had passed internally to the ramus of the jaw, and out through the middle of the neck; re-entering just above the scapula, it passed downwards through the spine of that bone. It was extracted at the ambulance on the same day. The parts were covered with warm water dressings enveloped in oil-silk. On the 5th of December, suppuration having commenced, warm fomentations were applied. The discharge of pus was at all times abundant and healthy. Small abscesses formed at different times from the 10th of December to the 3rd of January, anterior and posterior to the scapula along the line of the wound. Suppuration continued until the 10th of January. From this time until January 20th he convalesced rapidly, and was thought ready to be discharged. He was retained, however, until February 19th, awaiting an opportunity to return home.

CASE 129.—Private René Le Viément, 3rd Company, 3rd Battalion, 42nd Regiment of the Line, was wounded at Champigny, November 30th, 1870. A musket-ball had entered midway between the ramus of the jaw and the symphysis on the left side, and had passed obliquely forwards, frightfully crushing the jaw and dividing it into four portions, one at each angle, and one on each side of the symphysis. The whole front of the lower jaw and lip was torn into fragments. A cheiloplastic operation was performed. The lower lip was cut through and the splinters removed; the partially detached fragments were put back into position. The loosened teeth were left in—those alone which were forced from their alveoli being removed—and tied to the sound

teeth with silver wire. A simple apparatus, ordinary bandages, maintained the parts in place, fixed the chin and line of the teeth, and steadied the fragments. From the great comminution and splintering of the bone, followed a copious and fetid muco-purulent discharge. The fetid secretion was a source of great discomfort to the patient, by finding its way to the stomach. Scrupulous attention was paid to cleanliness by repeated injections of a solution of carbolic acid. The constitutional irritation was overcome by the administration of the hydrate of chloral and opiates. Moderate antiphlogistic regimen was employed, and the patient disturbed as little as possible. During a period of four weeks he was not allowed to masticate, but was sustained by fluid nourishment. Talking was likewise prohibited. Union took place slowly, and the fragments continued mobile for several weeks. January 6th, 1871, the wires were removed, and an apparatus of gutta-percha, having been soaked in warm water, was moulded to the part while soft; as soon as it had assumed the proper shape it was dipped in cold water and allowed to dry; its interior was lined with lint, and thus properly padded it was fixed in place by bandages. This apparatus, however, did not hold the parts in as close and accurate apposition as the more simple means employed at first. By the fourth week after admission the fracture had assumed a certain degree of firmness, enough to keep the fragments in apposition; it still, however, yielded at the points of injury. February 19th, 1871, the patient left the ambulance for his home. The teeth had contracted adhesions, and fixed themselves firmly. The jaw was solid, but the articulation somewhat impaired, although the face presented no appearance of deformity.

CASE 145.—Private Joseph Sebastian Chabrier, 4th Company, 2nd Battalion, 35th Regiment of the Line, was received from Champigny, December 2nd, 1870. A ball entered above the right malar bone, one and a-half inches from the angle of the eye, passed downwards and backwards in a line with the lower lobe of the ear, and had its exit 3 in. posterior to the ear, cutting in its course the facial nerve and producing paralysis of the left side of the face; re-entering one and a-half inches below in the neck, it passed down the muscles of the back, posterior to the

spine, as far as the middle of the dorsal region. It was extracted at the ambulance. The treatment consisted in the application of compresses dipped in warm water and covered with oil-silk cloth. On the fourth day, when suppuration commenced, hot poultices were substituted. Abscesses formed from time to time, and discharged by the wounds and by the ear. This treatment was continued up to February 21st, when suppuration was still going on in the ear. The wounds of the neck and back closed soon after the injury. February 27th, he sat up and walked about. March 7th, he was discharged in good health, although paralysis still continued, and the ear discharged slightly.

CASE 179.—François Roux, Sapper, 1st Company, 2nd Regiment of Engineers, was received from Buzenval, January 19th, 1871. A ball had entered the inferior maxillary to the left of the epiphysis, fracturing the lower part of the alveolus, carrying away several teeth on the left side, and lodging in the base of the tongue. The wounds were filled with lint and enveloped in warm water applications covered with oil-silk. When suppuration began warm poultices were used. Roux was discharged well, February 7th, 1871.

CASE 200.—Private Louis Hippolyte Cintrat, 3rd Company, 116th Battalion, 16th Regiment of National Guards, was received from Buzenval, January 19th, 1871. A ball had entered the face midway between the symphysis and the angle of the right lower jaw, fracturing the inferior maxillary, and had passed obliquely backwards, not displacing the teeth. Warm water applications were used, and when suppuration began, warm poultices covered with oil-silk were substituted. Progress was rapid and continuous, and on the 16th of February the patient was discharged, the wounds being healed, and the displacement of the jaw very slight.

WOUNDS OF THE ABDOMEN.

There have been several wounds of the abdominal and pelvic cavity. One of these recovered. An abstract of the case is subjoined. The histories of the fatal cases will be found under another heading. In the case, the report of which is here

appended, the direction taken by the ball would indicate a wound of the liver.

CASE 239.—Private Alphonse Barbier, 5th Company, 10th Battalion, Mobiles of the Seine, was wounded January 19th, 1871, by a rifle ball, which entered the right hypochondriac region at the junction of the anterior and inferior extremity of the ninth rib, passed obliquely across, and made its exit posteriorly, just above the crest of the ilium at the juncture of the eleventh and twelfth ribs near the spine. He was received in a very feeble state; great abdominal pain, tenderness on pressure, and symptoms of traumatic peritonitis, but no extra-abdominal extravasation. The entire body, from the armpits to the hips, was enveloped in warm water applications, covered with oil-silk. Opium was administered in full doses. January 31st, the pain on pressure was circumscribed. February 2nd, there was no abdominal pain or tenderness. February 27th, the patient's wounds were healed, and he was discharged perfectly well.

PENETRATING WOUNDS OF THE CHEST.

These have not been very numerous, but on account of the interest attached to them I append the histories of the four which terminated in recovery. Careful histories of the three which terminated fatally will be found in another section of this report. In two of these cases the wounded survived their injuries but a few hours.

CASE 13.—Private Jean Mondine, 5th Company, 4th Battalion, 100th Regiment of the Line (14th Marching Regiment), was received October 13th, 1870. A ball had entered just below the external end of the clavicle, crushed the third rib, passed down through the right lung below the inferior border of the apex of the scapula, crushing the seventh rib in its exit, and had lodged under the skin, from whence it was extracted on the same day. The patient was very weak from loss of blood, and had great difficulty of breathing. The wound was covered with silk plaster so as to constitute an elastic valve, permitting the egress of air and fluid, but not the ingress of either. The chest was supported firmly by bandages. The pain was combated by opium and chloral, and

the system sustained by a liberal use of stimulants, generous food, and quinine wine. The pleural cavity was filled with blood. The posterior wound closed at the expiration of ten days. The anterior wound continued to discharge pus and blood for about twenty days, when auscultation and percussion showed the cavity of the chest to be emptied of all fluid matter. November 10th the patient was able to rise. From that time he continued to improve, and was discharged December 19th entirely well.

CASE 55.—Captain Eugène Roché, 3rd Company, 2nd Battalion, 42nd Regiment of the Line, was received November 30th, 1870. A ball had entered and fractured the eighth and ninth ribs on the left side, on a line vertically under the axilla, opening the pleura, and producing intense suffering and great difficulty of breathing, followed by constitutional disturbance. He was naturally of a delicate constitution, and was greatly weakened by loss of blood. The ball, with several fragments of bone, was extracted at the ambulance on the evening of arrival. Some hæmorrhage followed the operation. The wound was covered with silk plaster to prevent the ingress of air and to allow the exit of fluid. Great local inflammation followed, which was treated with warm water compresses and oil-silk. Pain was combated by opiates. At the expiration of eight days full and healthy suppuration was established. Fifteen days after the injury an abscess formed, and was opened. For several days hot applications were applied. December 18th, eighteen days after the injury, nitric acid lotions and bandages were used in addition. The case then proceeded favourably, and the patient was discharged January 20th, entirely well.

CASE 64.—Lieutenant Louis Choley, 3rd Company, 3rd Battalion, 42nd Regiment of the Line, was received from Champigny, November 30th, 1870. A bullet had entered anteriorly between the sixth and seventh ribs, and had passed directly backwards through the right lung and out through the rib, fracturing the same. There had been but little hæmorrhage from the wounds. He discharged blood with his sputa, and had considerable difficulty in breathing. His chest was covered with compresses dipped in warm water, enveloped in oil-silk cloth, and tightly bandaged. Suppuration was fully established about the sixth day. From

that period the wounds were stimulated with nitric acid lotion. January 13th, 1871, they were healed. Two days afterwards he was discharged cured.

CASE 68.—Captain Jean-Baptiste Alliey, 5th Company, 3rd Battalion, 114th Regiment of the Line, was received November 30th, 1870. A ball had entered between the third and fourth ribs on a line below the middle of the clavicle, and had passed downwards and backwards through the right lung, and out of the chest through the apex of the scapula. He had, when admitted, a severe cough, was suffering from great difficulty of breathing, and expectorated large quantities of blood. There was a troublesome bleeding from the anterior wound. These conditions lasted up to the 13th of December, twelve days after the injury, when pus mixed with blood was discharged from the anterior wound. The conditions remained the same until January 1st, when he began to improve. On the 19th the anterior wound was entirely healed, the posterior wound being still open and discharging healthy pus. Upon percussion it was ascertained that there was considerable thickening of the lung tissue, and that effusion had taken place within the cavity of the pleura, producing much pain and dulness. The chest was painted with the tincture of iodine from December 13th to January 25th, forty-three days, when it resumed its normal condition. The remaining wound healed soon after, and on the 19th of February he was discharged in perfect health. Besides the application of iodine, the chest was bandaged so as to prevent pain and the disposition to hæmorrhage from the movement of the respiratory muscles. To prevent the introduction of air into the chest through the openings, the wounds were covered with isinglass plaster. This acted as a valve, allowing the egress of air and fluid matter, but not the ingress of either. Pain and extreme nervousness were combated by the use of morphia, chloral, and the valerianate of zinc. The patient was sustained by liberal nourishment, iron and quinine.

WOUNDS OF THE NERVES.

I give the two following cases as illustrative of the general condition following this class of injuries. In one case there can be no doubt that the sciatic nerve was wounded.


CASE 108.—Private Pierre Bretenaud, 6th Company, 2nd Battalion, 124th Regiment of the Line, was received from Champigny, November 30th, 1870. A ball had penetrated the left thigh, passing posteriorly to the femur, about four inches above the knee-joint, in the line of the sciatic nerve. On arrival there was entire loss of motion and sensation below the knee-joint, except in the anterior part of the leg and around the heel. There was great pain in the foot and ankle-joint. This was combated with warm compresses saturated with laudanum. The wounds healed rapidly. On the thirty-first day raised blisters filled with blood were perceived on the upper surfaces of the four small toes of the left foot. The cuticle was removed and the toes dressed with nitric acid lotion. Subsequently the great toe became affected in the same manner, and was similarly treated. On the thirty-eighth day after admission it was found that sensibility had returned to the skin of the foot. Pain in the foot returned at intervals of a few days, but was much diminished in degree. February 3rd, the sixty-sixth day, all but the fourth toe were entirely healed, and that was nearly so. The paralyzed condition of the muscles of the leg remained. The patient was discharged February 19th, cured of his wounds, and directed to use the limb as much as possible.

CASE 128.—Sergeant Laurent Arraquin, 2nd Company, 3rd Battalion, 35th Regiment of the Line, was admitted November 30th, 1870. He was wounded in the right thigh. The ball had entered on the inner side of the rectus muscle, about the middle of the thigh, and had passed downwards and backwards, and out, just above the popliteal space, at a point near the sciatic nerve. For some time his condition improved. Warm water applications, covered by oil-silk, constituted the dressing. December 18th, a slight inflammation supervened near the wound. December 20th, it had increased, the excessive tenderness of the parts was greater, and the secretions had become unhealthy. The inflamed parts were bathed in a liniment of chloroform, sweet oil and laudanum, and the wounds covered with linseed poultices. Laudanum and chloral were given internally. December 21st, he was attacked with general spasms, which returned at intervals until the 23rd, when the inflammation began to diminish, the

spasms to subside, and the secretion of healthy pus was restored. January 21st, his wounds were healed. He walked with crutches until February 28th, when he was discharged well.



HISTORY OF EACH SURGICAL CASE WHICH TERMINATED FATALLY
WHILE UNDER TREATMENT AT THE AMERICAN AMBULANCE.

ASE 7.—Private Ernest Grevin, of the 35th Regiment of the Line, was wounded the 30th of September, 1870. He was suffering, when brought to the ambulance, from a gunshot fracture of the condyles of the right femur, the missile having destroyed the knee-joint in its course through the limb. October 1st, amputation was performed at the junction of the lower and middle thirds. Circular flaps were made. To the 9th of the month the progress of the patient was good. On that day he was attacked with tetanus. Opium in large doses was administered frequently during the day. This failing to relieve him, chloral (hydrate) was added—5 grammes dissolved in 250 grammes of syrup; the solution was given in tablespoon doses every hour; this produced considerable prostration, but little relaxation or decrease of rigidity or spasm. The dose of chloral was then increased to 15 or 20 grammes in twenty-four hours, but even this failed to afford any apparent relief. About the 11th of October the patient was taken with severe spasms, which continued to increase until the following day, the 12th of October, when he died.

CASE 8.—Private Joseph Edet, 5th Company, 2nd Battalion, 35th Regiment of the Line, was wounded September 30th, 1870. A ball had passed through the epiphysis and femoral end of the tibia, destroying nearly two inches of the bone below the joint, but not opening the joint. The wound was covered with hot water applications, enveloped in covered oil-silk cloths, and the limb placed in a wire gutter. After

twenty days a great quantity of bony *débris* was removed. At the end of thirty days more was removed, at which time several abscesses formed and were opened, on each side below the injury. At the end of fifty-five days the joint was in good condition, the wound suppurating freely ; a large amount of bony matter was being deposited, and the bone becoming firmly united. Until the seventy-second day the limb improved and the general condition of the patient was good. Edet was now directed to get up. He continued to improve for seven days, when, whilst sitting with his leg extended on a second chair, a nurse fell heavily upon the unsupported portion of the limb. Great swelling and inflammation followed, immediately after the accident, extending from the knee to the hip. Enormous abscesses formed under the quadriceps muscle and around the femur, extending from the middle of the femur to the knee, and appearing to involve the joint. On Tuesday, the 27th of December, a puncture was made, with Dieulafoy's apparatus, on the inner face of the tendon of the quadriceps muscle, about an inch above the patella. One and one-half fluid ounces of pus were removed; two days afterward two fluid ounces were removed; two days after this three and a-half fluid ounces; on the 3rd of January fourteen fluid ounces. On the 6th twelve fluid ounces were removed from a corresponding point exterior to the quadriceps. Finding that such large quantities of pus were constantly forming, and that a small opening existed at the seat of the first puncture, through which pus was constantly flowing, it was thought advisable to insert an india-rubber drainage tube, through which large quantities of pus (not less than sixteen fluid ounces) continued to flow daily. The limb was then placed in a wire gutter, at such an angle as would be most useful for locomotion in case of a stiff limb. During all this time the leg remained in its former healthy condition, except the swelling incidental to interrupted circulation of blood, and dependent upon inflammation and swelling of the thigh. A collection of pus, seemingly independent of the other, now formed externally to the tendon of the quadriceps muscle. An opening was made about an inch above the patella (externally), and a drainage tube introduced, through which several ounces of pus were immedi-

ately discharged, and through which large quantities of pus continued to flow daily. The inner abscess continued to extend upwards on the inner face of the thigh, and subsequently broke six inches above the first opening. From this time large quantities of fluid and blood were discharged daily from these openings. At this time, January 25th, one hundred and seventeen days from the first injury, and thirty-nine days from the second, the thigh had diminished in size, so as to be smaller than the healthy one. On the 28th of January a consultation was held, and it was decided to amputate, as the last chance for recovery. From the receipt of the first injury up to the time of amputation, the pus was always healthy. When the amputation was performed, over a quart of pus and clotted blood was discharged, coming from around the femur and the soft parts of the thigh as high up as the upper third. The condition of the soft parts and the denuded state of the bone rendered it therefore necessary to amputate through the upper third of the femur. The destruction of muscular and soft tissue on the anterior part of the thigh rendered it impossible to obtain a flap from that source. It was deemed best to make a long flap from the posterior part of the limb. The amputation was therefore performed after the method of Teale, except that the long flap was taken posteriorly instead of anteriorly. In order to avoid the mischief which might arise from involving the nerve in the cicatrice, the main trunk of the sciatic nerve was removed from the posterior flap. Not more than two or three ounces of blood were lost in the operation. The limb was dressed with sutures, bandages and supports. Full reaction soon took place. The patient was seemingly doing well. There was complete union by first intention through the whole extent of the limb, except at the points left for drainage and at a small slough, of the size of a five-franc piece, over the seat of the old abscesses, to which was applied dilute nitric acid as a stimulant. The slough was entirely discharged at the end of six days, leaving a healthy granulating surface, with secretion of healthy pus. Notwithstanding this the patient died on the 5th of February, evidently exhausted by the repeated drain from the system incident to the long-continued processes of suppuration. Examination of the amputated limb showed that the knee-joint,

as well as the entire leg and foot, were in a healthy state ; that the portion of the tibia involved in the comminuted fracture had discharged all the *débris* of bone ; that the cavity was so nearly filled up with a new deposit of bony tissue, as to render it as strong as the other limb ; and that the abscesses, instead of involving the joint, had destroyed many muscles and their connections with the femur, and had extended from near the knee-joint to a distance of eight inches above, producing the condition of the bone previously described. It is thus evident that, so far as the results of the treatment of the fracture were concerned, it was all that could have been desired ; and that the cause of the fatal result was due entirely to the second injury, and its effects upon the involved parts which, prior to the accident, were entirely healthy.

CASE 10.—Private Henri Tribouillard, of the 35th Regiment of the Line, was wounded on the 30th of September, 1870. A ball entering the left thigh, externally, opposite the junction of the lower and middle third of the femur, had passed obliquely upward and inward posterior to the femur, making its exit posteriorly twelve inches above the knee (not involving the artery, nerve, or bone), and had again entered the heel of the right foot just below the internal malleolus. These wounds continued to do well up to the 6th of October, when the thigh wound had healed. The heel injury still remained open. Toward night, on the 6th, without any warning symptoms or apparent cause, the patient was attacked with tetanus. Large doses of laudanum were hourly administered, but with little effect. On the succeeding day, the patient not improving, a large dose of chloral was given every two hours, while during the intervals the potion of opium was increased. He was seized with spasms soon after, which continued to exhaust him gradually until the 10th of October, when he died.

CASE 53.—Lieutenant-Colonel Adrien Prevault, of the 42nd Regiment of the Line, was wounded at Champigny, November 30th, 1870. The ball entered two inches externally to the ensiform cartilage, passed obliquely backward through the abdominal cavity, and made its exit posteriorly, wounding the spine. When admitted he was much exhausted from shock, hæmorrhage,

and intense pain. Palliative treatment was adopted. The patient vomited profusely, had frequent chills, with a feeble circulation, and died ten hours after admission.

CASE 54.—Commander Rhodolphe Mowat, of the 114th Regiment of the Line, was wounded at Champigny, November 30th, 1870. A ball had entered and passed through the lower part of the right lung. On admission he was much exhausted from loss of blood, and greatly depressed in spirits. He sank into a state of great irritability; his mind wandered continually, and on the 2nd of December, thirty hours after admission, he expired. In consequence of there being no post-mortem examination, it was doubtful whether or not the projectile had entered the abdomen.

CASE 58.—Captain Alexander Bourson, 2nd Company, 3rd Battalion, 42nd Regiment of the Line, was wounded November 30th, 1870. A ball had passed through the fleshy part of the arm, just above the elbow joint anterior to the humerus. Another ball had entered the left gluteal region, making its exit posteriorly through the middle part of the thigh. The patient was prostrated by habitual intemperance, by bad food, and from great exposure to cold. The wounds were covered with warm-water applications and oil-silk. The case proceeded favourably for ten days, when profuse secondary hæmorrhage occurred. This was arrested by compression and astringents for six hours, when it again occurred, but was arrested by increased compression and astringents. Eighteen hours afterward, there was again hæmorrhage. The wound in the arm was then extended in the line of the artery upwards and downwards, and the artery tied on both sides of the opening. The wound did well for five days, when hæmorrhage again occurred from the cardiac side of the humeral artery. The artery was again exposed some two inches above in the healthy tissue, and again ligatured. From this time there was no more hæmorrhage. The great loss of blood, added to the bad condition on arrival, produced an extremely feeble circulation. Prior to the last operation the patient's health had declined, his appetite had become very poor, and his general circulation feeble; so much so, that it was deemed advisable not to amputate. Three days afterwards abscesses formed in the arm. These were opened, and discharged healthy

pus freely. As these abscesses extended lower down, other openings were made. Circulation became more and more feeble; and the patient, not having retained any nourishment for several days, sank and died December 25th.

CASE 59.—Lieutenant Joseph Chéon, 5th Company, 3rd Battalion, 42nd Regiment of the Line, was wounded November 30th, 1870. A ball had entered the right shoulder anterior to the glenoid cavity, passed thence through the shoulder, and made its exit posteriorly, injuring the head of the humerus so slightly, that it was considered advisable to preserve the joint. The patient was of a scrofulous temperament, and had suffered much from cold, as also from insufficient and bad food. The wound was covered with warm water applications and oil-silk cloth. Moderate inflammation ensued. On the ninth day the suppuration was free, with discharge of fragments of bone. The patient remained for the following eight days without any improvement, gaining no strength from the little food and stimulants he was able to take. A passive secondary hæmorrhage occurred about this time, evidently from the capillary vessels. He grew weaker daily until the 10th of January, when he died. All this time the pus remained healthy, except when mixed with blood, when it became offensive. Post-mortem revealed the fact that the head of the humerus was carious, and entirely deprived of its covering.

CASE 63.—Senior Captain Hippolyte Proal, 2nd Battalion, 35th Regiment of the Line, was wounded at Champigny, November 30th, 1870. A ball had fractured the condyles of the femur and destroyed the knee-joint. On arrival it was found that he was suffering from gastric irritation, had vomited on eating for a week prior to his being wounded, was emaciated, and had lost a large quantity of blood on the battle-field. Blood was also effused within the fascia lata, distending the skin to its fullest capacity. Circulation had entirely ceased below the knee, and his vomiting continued. Amputation was performed the morning after admission by a long anterior flap. The loss of blood from the operation did not exceed three ounces. He rallied soon afterwards, and for some hours improved, evidently from the removal of the source of irritation. During the second and third day he continued very nervous, with feeble circulation and no

appetite, the vomiting continuing. Diarrhœa now intervened, and on the third day retention of urine was superadded; this was relieved by the catheter. He died, however, the same evening from the exhaustion induced by the causes above enumerated.

CASE 72.—Private Jacques Viallard, of the 42nd Regiment, was wounded at Champigny, November 30th, 1870. One ball had entered the left pectoral one inch external to the nipple, passed across the chest, fractured the rib and crushed the sternum, making its exit by the right pectoral, one and a-half inches beyond the nipple, and opening the pleural cavity. A second ball had entered the right arm near the elbow, fractured the ulna, opened the elbow-joint, and lodged near the coronoid process, from which it was extracted at the ambulance. Still a third ball had entered the body near the posterior portion of the crest of the ilium, crushing the crest and the transverse processes of the lumbar vertebræ, and then lodged deep in the muscles. On admission he was much exhausted from hæmorrhage and from the oft-mentioned causes incident to the siege. The injured parts were covered with warm water applications and oil-silk cloths. Subsequently linseed-meal poultices were substituted; the arm was properly supported, and stimulants were freely administered. December 10th, the wounds discharged a large amount of offensive matter. This rapidly weakening him, he sank, and died on the 11th.

CASE 82.—Private François Moinet, of the 14th Regiment of Artillery, was wounded at Champigny, November 30th, 1870. The left hip was struck by a fragment of shell, which crushed the ilium, destroyed the gluteal muscles and periosteum over a space of four square inches, and exposed the peritoneum. Owing to the shock, improper food, and loss of blood, he was very faint and much exhausted on arrival. The wounds were at first dressed with warm water applications, and subsequently stimulated with dilute nitric acid; extensive sloughing of the soft parts followed, but no healthy suppuration or granulation; a large portion of the ilium became necrosed soon after the injury; the patient grew delirious, and gradually sank until the 13th of December, when death ensued.

CASE 83.—Private Martin Knittel, of 119th Regiment, was

wounded at Champigny, November 30th, 1870. A ball had entered the deltoid at the junction of the middle and upper thirds of the left humerus, and had passed diagonally upward and inward, fracturing the head of the humerus in its course. The arm and shoulder were so much swollen as to prevent the immediate discovery of the ball. The case was diagnosed as a compound fracture of the shaft of the humerus very close to the head of the bone, and was regarded as one suitable for conservative treatment. Little motion was perceived at the point of fracture upon any movement of the arm. The wound never granulated, but discharged unhealthy matter; the parts became more swollen; and the patient's condition growing worse, a more careful exploration of the parts disclosed the fact that the joint was involved, when it was deemed advisable to resect it, in order to afford the only means of recovery. Prior to the operation, while the subject was under the influence of chloroform, it was found that the missile had passed into and along through the medullary cavity, splitting the bone into fragments above the insertion of the deltoid, and had lodged in the glenoid cavity of the scapula. The operation was followed by moderate re-action; still great exhaustion remained. Stimulants failed to produce the desired effect. From the first, the stomach was unable to receive and digest food, but after the operation the appetite improved, and the patient responded more readily to stimulants. The wound was cleansed and stimulated with a solution of carbolic acid, and dressed with lint dipped in nitric acid lotion. On the 15th the patient's condition was worse; he seemed more exhausted and more disposed to sink; same treatment continued. In the evening the wound was re-dressed, and he appeared better. December 16th, Knittel had passed a quiet night, and seemed to be rallying under the influence of stimulants until near evening, when he suddenly began to sink, and died during the night.

CASE 85.—Private François Theoli, of the 6th Regiment of Artillery, was wounded at Champigny, November 30th, 1870. The ball had entered the left leg at the inner side of the middle third, passed diagonally downward and forward, fractured the tibia, and lodged close to it without entering the bone. The

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result was a fracture without comminution. The ball was extracted on the evening of the day of admittance. The patient was exhausted from loss of blood, from cold, sickness, and want of food. His circulation was feeble. He stated that he had been under treatment in a hospital for syphilis, and that he had more recently been discharged from a hospital for diarrhœa. On the day of arrival he complained of pains in the head, back, and in the loins; while at times there was mental aberration. December 2nd, rheumatic inflammation having ensued, the body, from the leg to the arm, was covered with warm water compresses and oil-silk cloths, and the adjoining painful parts painted with the tincture of iodine. The injured limb was placed in a wire gutter well padded with oakum, and linseed-meal poultices were substituted for warm water dressings. December 8th, an abscess formed three inches above the wound, and was opened and allowed to discharge freely. December 12th, a second abscess formed, and was opened below the fracture. The patient at this period being unable to sleep, from fifty to seventy-five drops of laudanum were administered every night. December 20th, there was severe diarrhœa accompanied by colic. Opium and bismuth pills were given for this, but without much effect. December 21st, a casual visitor accidentally fell against and displaced the gutter, violently shaking the wounded limb, and producing a hæmorrhage which, though temporarily checked by burnt alum, perchloride of iron, &c., frequently re-occurred during the three following days. December 23rd, diarrhœa again became very troublesome. We had recourse now to the *mistura cretæ* and large doses of laudanum (given alternately every two hours, both day and night). December 24th, circulation feeble; diarrhœa continues. Stimulants used, and tannic acid added to the doses of yesterday. Passages now consisted of a dark green bilious matter. December 26th, injections of starch and laudanum temporarily arrested the diarrhœa. December 28th, syphilitic nodes appeared, accompanied by great pain, swelling, and tension behind the ears. Attacks of diarrhœa re-occurred, followed shortly by delirium. December 29th, constant evacuations both of fæces and urine. Chloral given hourly. Patient died about 3.30 A.M. the follow-

ing day. The suppuration from the wounds and incisions was at all times abundant and healthy. Diarrhœa was undoubtedly the immediate cause of death, accelerated by his previous condition and the character of his injury.

CASE 96.—Private Jean-Baptiste Buisson, of the 116th Regiment, was wounded at Champigny, November 30th, 1870. A ball had entered near the humeral insertion of the left pectoralis major, producing a comminuted fracture of the head and a portion of the shaft of the left humerus. A piece of the ball also lodged and was embedded in the glenoid cavity, the remainder, as was subsequently discovered, entering the cavity of the chest. The patient was faint from loss of blood, and suffering from insufficient food and from exposure to the cold, which was at that time intense. December 2nd, excision was performed by a longitudinal incision in the deltoid, removing the head of the humerus and a portion of the shaft, which was comminuted. On the fifth day the wound was beginning to granulate, and was suppurating fully. On the sixth, the wound appearing indolent, was covered with lint dipped in nitric acid (sixty drops to a pint of water), and this was again covered with warm water compresses and oil-silk cloth. From this date healthy pus continued to be secreted. December 13th, a caoutchouc drainage tube was inserted, and the wound was gradually closed by strips of adhesive plaster. The patient sat up daily and continued to improve until December 21st, when he was considered convalescent. At this time the supply of coal gave out, and it was impossible to renew it before the expiration of twenty-four hours. The cold was then intense, and the patient, together with others in the same tent, suffered severely. He also began to complain of pains in the loins, of great difficulty in respiration, of loss of appetite, followed by severe vomitings and a distressing cough. December 22nd, he was taken with a chill. During several days the bad symptoms continued to increase, though the discharge of pus was healthy until the 25th, when it became watery. The patient continued to sink, and died on the 27th, twenty-five days after the operation.

CASE 105.—Private Felix Castet, of the 114th Regiment of the Line, was wounded at Champigny, November 30th, 1870. The

ball entering the middle of the right gluteus, had passed directly into, and was lodged in, the pelvis. The patient was a man of strong constitution, and apparently healthy. From the date of admission to the date of the formation of an abscess, the practice of drawing off his urine twice a day was uninterrupted. Up to the 10th of December the progress of the wound was as good as could be expected. On that day pus was found to have been secreted in the rectum. December 14th, being constipated, his bowels were relieved by an enema. An enormous quantity of pus was discharged from the wound. An abscess was found to be forming also in the perineum. Notwithstanding these depressing influences patient continued cheerful. During the night of the 14th about two quarts of blood issued from the wound. After this he became very weak and irritable. December 16th, another hæmorrhage. About a quart of blood lost. December 17th, a third hæmorrhage, followed by death. A post-mortem showed that the ball had passed through the ischium, across the pelvis, and had lodged on the left side of the rectum, where it was found embedded in the soft parts. An enormous abscess had formed in the pelvis, breaking into the rectum and perineum, and carrying with it also fragments of bone.

CASE 106.—Private Pierre Lambolez, 2nd Company, 3rd Battalion, 42nd Regiment of the Line, was wounded at Champaigny, November 30th, 1870. The ball had entered the right forearm posteriorly, three inches below the elbow-joint, producing a fracture of the radius and ulna, and had passed out anteriorly lower down the forearm. On admission to the ambulance the patient was in a typhoid state; previous exposure, want of nourishment, and hæmorrhage had completely exhausted him, and what little strength remained availed little, owing to his habits of intemperance, which had left his stomach in such a condition as to be unable to respond to food or to alcoholic stimulants. Great swelling followed, owing to infiltration of blood and serum in the tissues, and to such an extent that loss of vitality of the parts was threatened. Extensive incisions were then made to relieve the tension of the parts, which served, however, to afford only temporary relief. The vitality of the arm continued to decrease until December 7th, when amputation

at the upper third of the arm was performed. The alleviation was manifest. The patient's appetite, which prior to this operation had been poor, now became much better. He also partook freely of cognac and wine, while before he had refused any drink but vinegar. Notwithstanding this apparent improvement the typhoid condition grew upon him day by day, the stump assumed an unhealthy gangrenous appearance, and he continued to sink until the 18th of December, when he died.

CASE 109.—François Renaudie, 114th Regiment of the Line, was wounded at Champigny, November 30th, 1870. The ball entered the left arm near the pectoralis major—one inch below the acromion process, and fracturing the head of the humerus, made its exit through the superior parts of the deltoid, a little below the spine of the scapula. December 3rd, the head of the humerus, with about one and a-half inches of the shaft, was removed. The longitudinal incision was employed, and the long head of the biceps was consequently preserved. The warm water and oil-silk applications, which were at first employed, were in a short time accompanied by dilute nitric acid lotions. December 7th, the surface of the incision had granulated, and was apparently secreting an abundance of healthy pus. The edges were brought together as far as possible by strips of adhesive plaster. The condition of the patient and of the wound continued good until the 21st of December, when the appetite of the patient began to fail, and the little that he partook of to distress him. December 23rd, the discharge became less creamy; appetite failed entirely. December 26th, patient became sick at the stomach, and vomited matter of a bilious nature. December 27th, the surface of the wound seemed less healthy, and was accordingly stimulated with the solution of sulphate of copper alternately with dilute nitric acid. December 28th, patient's indisposition so far decreased that there was an evident improvement both in the appetite and in the appearance of the wound. December 29th and 30th, he sat up for a short time. December 31st, the former symptoms returned with severity, while he became hourly weaker, until the following day, January 1st, life gradually and painfully ebbed away. From the day of the receipt of the injury to the day of his death there had been no period,—save

indeed that period above mentioned,—when the injured parts did not discharge an abundance of healthy matter. The post-mortem showed that a little bony reparation had ensued, but no abnormal conditions were observed.

CASE 116.—Private Louis Rancy, 2nd Company, 1st Battalion, 113th Regiment of the Line, was wounded at Champigny, November 30th, 1870. A ball had passed through the middle of the patella, thence through the knee-joint, passing out just above the inner tuberosity of the femur, and crushing the same. From the moderate amount of injury done it was deemed a good case for resection. The knee was resected on the 3rd of December, the femur being removed just above the condyles, and the patella being enucleated from the under surface of the flap. A drainage tube was also passed laterally through the knee. The operation was performed by an anterior circular flap, and the wound reclosed by silk sutures. The limb was then placed in an iron-wire gutter well padded with oakum. The first dressings consisted of oakum and compresses wrapped around the limb, the whole being enveloped in oil-silk. More than half of the wound united by first intention. On the sixth day some inflammation supervened, which was combated by warm water applications. This treatment was continued till the 14th of December, eleven days after the operation, when pus was found burrowing in the muscles of the thigh. On the 15th of December he had slight rigors, then attributed to the considerable formation of pus. After its removal a re-accumulation was prevented by heavy compresses and bandages. On the thirteenth day after the operation his appetite failed and slight fever supervened. The wound, however, continued to look well, and secreted healthy pus. Up to the nineteenth day his condition remained about the same, and although the pus was not quite as laudable, the wound always maintained its healthy character. He then had a slight secondary hæmorrhage, and died soon after. A post-mortem examination showed the head of the tibia covered with good granulations, and one-fourth of the cut end of the femur denuded of its periosteum, presenting a nearly white appearance, from incipient necrosis. The residue of the femur exposed was not only healthy, but had thrown out a large quantity of healthy granulations.

CASE 117.—Private Jean-Paul Baizand, 35th Regiment of the Line, was wounded at Champigny, November 30th, 1870. A splinter of shell had entered the left lumbar region, and had passed obliquely upwards into the cavity of the chest, wounding in its passage the abdominal viscera, fracturing the ribs and spine, and lodging under the skin. He had lost blood largely on the field and during transportation. On admission at the ambulance he was dying from excessive hæmorrhage; he expired two hours after his arrival.

CASE 120.—Private Laurent Villiet, 3rd Company, 3rd Battalion of the 123rd Regiment of the Line, was wounded at Champigny, November 30th, 1870. A ball had entered the right side of the neck, and gliding on under the skin, had its exit about two inches from its entrance, making only a flesh wound. A second ball entering posteriorly just above the right shoulder, passed through the spine of the scapula, and out, eight inches below the same shoulder, in the back. A third ball penetrated the right shoulder, injured and opened the joint without crushing the humerus, sped down between the skin and the bony tissue, and had its exit just above the crest of the ilium. The wounds were immediately covered with warm water applications enveloped in oil-silk cloths. At the expiration of five days pus had formed freely. In about thirty days several of the wounds had healed, but those immediately connected with the joint and scapula still remained open. The pus becoming thin and offensive, much similar to what would be discharged from a necrosed bone, and the wounds showing no disposition to cicatrize, the parts were stimulated by the officinal solution of nitric acid. About this time the patient began to suffer from headaches, thirst, stiffness and soreness of all his limbs, rigidity of the jaw, and fever. These conditions continued until two days prior to his death, when he was taken with chills induced by deficiency of fuel. From this moment he gradually sank, and on the 25th expired. The autopsy revealed the fact that there was necrosis of the head of the humerus and of the spine of the scapula.

CASE 122.—Private Jean-Baptiste Granger, 2nd Company, 2nd Battalion, 42nd Regiment, was wounded at Champigny, November 30th, 1870. On admission he was in an extremely exhausted condition from loss of blood, exposure, and difficulty

of breathing. A ball had passed through the neck, wounding the pharynx and the larynx, causing great swelling of the parts, general emphysema, and much difficulty in respiration. A second ball had entered the middle of the right arm, fracturing the shaft of the humerus, and making its exit posteriorly. The arm was properly supported in a wire gutter; the wounds were dressed with warm water applications enveloped in oil-silk. Great effusion, inflammation, and profuse suppuration ensued, succeeded by considerable necrosis of the broken ends of the shaft. On the 5th, breathing better, the effused air had mostly disappeared; but a distressing cough had set in. The air still continued to pass out and in at the openings in the neck during expiration, inspiration, and during the efforts to cough. On the 6th, swelling decreased, cough worse, and an abscess formed above the elbow; this was opened, and discharged freely. From this time until the 10th patient improved, though his cough was constantly troublesome; on that day several spiculæ of hard bone were removed from the arm; the suppuration was abundant. It was now found that both ends of the broken bone were necrosed. The patient continued, however, to eat and sleep well; his wounds discharged freely, and his breathing was good—except from an occasional disposition of the glottis to spasm—until the afternoon of the 17th, when the pus began to decrease, and the breathing to suffer from œdema of the glottis. He was placed in a steam-bath room, and his respiration was greatly relieved by twelve o'clock of the same night. On the 17th respiration better. Continued improving up to the 18th, when he became delirious—tearing off his dressings. On the 19th cough nearly gone—breathing better. On the 20th tore off bandages and bed-clothes during the night—pulse 130. Condition remained about the same, with good breathing, until the 23rd, when an abscess formed in the arm, and was opened. On the 24th, appetite failing, refused food, breathing good, pulse feeble. During the night, fever, delirium, and high pulse. On the following day delirium increased, breathing unobstructed. Died on the 26th at 1 o'clock.

CASE 126.—Private Victor Manne, 1st Company, 2nd Regiment of Engineers, was wounded at Champigny, November 30th,

1870. A large fragment of shell had passed through the spine and abdomen. He was insensible on arrival, and continued so up to the moment of his death, which occurred twenty-four hours after admission.

CASE 127.—Private Charles Maurice Arnaud, of the 125th Regiment of the Line, was wounded at Champigny, November 30th, 1870. A rifle ball had struck the left side of the skull obliquely, causing a depressed fracture of the left parietal bone, near its articulation with the occipital. Owing to the impossibility of removing the pieces of the inner table, which were depressed and rested heavily on the membranes of the brain, the skull was trephined, and the depressed portions elevated. During the operation the patient was nearly insensible. He rapidly, however, regained his consciousness, but never the complete use of his mental faculties. Cold water dressings were applied for four days, when there were no further signs of cerebral disturbance. On the fifth he had a severe chill, severe pains in the head, and nervous twitchings, accompanied by vomiting. Drowsiness and stupor set in, followed by partial paralysis of the left side. He was never afterwards fully rational. On the sixth he became delirious. On the seventh he was seized with convulsions. These continued until the next day, December 8th, when coma succeeded, and he died. No autopsy.

CASE 131.—Private Emil Bruno Saübe, of the 106th Regiment of the (German) Line, was wounded at Champigny, November 30th, 1870. The ball had entered about an inch below the middle of the spine of the ilium, and passed thence into the pelvis. On admission he had paralysis of the left leg, complete retention of urine, and great constipation. The wounds were dressed with warm water applications and with oil-silk coverings. The retention of urine was relieved twice a day by the use of the catheter. This treatment was continued until the discharge of fœtid matter compelled the use of oakum and carbolic acid to absorb and disinfect the secretions. Constipation was relieved by enemas. The condition of the patient continued with little variation until December 14th, when severe inflammatory fever intervened, succeeded by diarrhœa, neuralgic pains, and increasing inability to sleep. Large doses of chloral and opium

failed to produce any relief. There was but little change in these symptoms up to December 19th, at which date he died. A post-mortem examination revealed the fact that the ball had passed obliquely downward and backward into the pelvis, thence through the *psoas magnus* and *iliacus internus* muscles, and had entered the sacrum, lodging in the sacrum externally to the right ilium, just at the right ilio-sacral junction. In its course the ball had destroyed a portion of the *cauda equina*, thus explaining the cause of the paralysis above-mentioned.

CASE 132.—Private Michel Hulard, 2nd Company, 3rd Battalion, 4th Regiment of Zouaves, was wounded at Champigny, November 30th, 1870. He lay nearly twenty hours on the field of battle. He was received at the Ambulance December 1st, with a fracture of the occipital and the two parietal bones. The missile had removed the superior angle of the occipital and *dura mater* beneath, and literally comminuted and carried away the whole top of the skull, including a large portion of the brain. On admission the brain substance protruded and was oozing out; but notwithstanding the loss of nearly half of the cerebral substance, he lived on until the 5th, taking food, though wholly unconscious, when convulsions supervened, followed by death, five days after the injury.

CASE 133.—Private Guillaume Paule, of the 123rd Sharpshooters, was received from Champigny, November 30th, 1870. He was mortally wounded through the spine, shoulder, and lungs, and died thirty hours after arrival.

CASE 135.—Private Gustav Schürig, a Saxon, of the 108th Regiment of the (German) Line, was received from Champigny, November 30th, 1870. A ball had passed through the left thigh; another had passed through the pubis. On admission to the ambulance he had retention of urine, and was exhausted from hæmorrhage, and vomited freely bile and stercoraceous matter. The bladder was emptied by the use of the catheter twice a day. His wounds were covered with warm water applications and enveloped in oil-silk. Constant vomiting of food and fæcal matter continued until death. Inflammation of the peritoneum was manifested by great tenderness and distension of the abdomen. Great constipation existed, and could not be wholly relieved by enemas.

Chloral and opium were given to combat the pain, but without effect. These conditions continued without much variation until the fourth day, when he died. A post-mortem revealed the fact that the first ball had passed near the trochanter major, and through the gluteal muscles, having its exit through the middle and anterior part of the thigh. The second ball had passed under the skin, externally to the spine of the right pubis, thence obliquely downward and backward into the gluteal region, opening, in its course, the abdominal cavity over Poupart's ligament, about one inch from the spine of the pubis. The abdominal cavity was filled with serum, and the intestines glued together from the extensive peritonitis above alluded to.

CASE 147.—Private Joseph Coupé, a Mobile of Isle and Vilaine, was wounded at Champigny, November 30th, 1870, by a large fragment of shell. The projectile crushed his left leg so badly as to leave it hanging by the posterior muscles. He lay twenty-four hours on the field. December 1st, he was received at the ambulance, and was almost immediately put under the influence of chloroform; the amputation was performed at the upper third of the leg, by a short anterior and long posterior flap. He had lost blood so largely on the field that he was nearly pulseless, and did not lose more than three ounces of blood during the operation. The flaps were brought together by adhesive plasters, and the stump dressed with oakum, and covered with dry compresses and oil-silk. Delirium intervened, and continued for five days; pulse 190. December 1st, 2nd, and 3rd, he repeatedly tore off his dressings; and on the 2nd, in the absence of the watcher, he left his bed and fell heavily upon his stump, terribly bruising it. So great was the shock caused by this injury, that it seemed as if the patient would succumb to it, but, under the influence of proper nourishment and stimulants, his general condition improved, though the delirium continued. On the 5th a large slough appeared on the upper and outer angle of the wound. This extended gradually downward until the 9th, when it separated, leaving a healthy granulating surface. The delirium passed off on the 6th, leaving him greatly reduced in strength, without appetite, and suffering from a severe pain in the stump, probably

caused by the fall above spoken of. Profuse discharges from the stump tended still further to reduce his strength. The local pain was relieved by opium and chloral; the wound was stimulated by diluted nitric acid; the appetite was restored by tonics and stimulants; the limb was painted with iodine; suppuration was favoured by warm water compresses alternately with poultices enveloped in oil-silk; and the parts and dressings were deodorized with dilute carbolic acid, as often as necessary. It was soon found that in addition to the large slough of the soft parts, the exposed end of the tibia had become carious. The profuse discharge caused by the inflammation following the injury, the large amount of blood lost prior to the accident, the shock from the fall, the severe pain following the accident, and the fearful exertions during the five days of delirium, left but little hope for his recovery. Notwithstanding, his cheerful, buoyant nature—under vigorous stimulative and tonic treatment—aided in his rapid improvement from the 9th, when the slough separated, until the 15th, when, upon consultation, it was deemed advisable to remove the necrosed tissue of the bone. December 15th, an exposed portion of the extremity of the tibia ($1\frac{3}{4}$ of an inch) was sawn off. The operation was borne well, and the patient appeared to be progressing favourably. The bone granulated kindly, and the whole surface of the wound became healthy. December 26th, the stump was uniting finely, but there was still a small discharge of pus from the surface near the tibia. December 31st, it became evident that the knee-joint was involved. January 3rd, an abscess was opened below the knee, and from this opening pus discharged daily in increased quantities. The prostration occasioned by this suppuration prevented all hope from farther operative interference. January 10th, another abscess formed, and was opened, and a small portion of the femur became visible. On the 14th this abscess had granulated; but a large bed sore had in the meantime formed on the patient's back. An india-rubber drainage-tube was passed into the opening in the thigh, and maintained there. By means of this the wound was frequently washed out with dilute nitric acid. January 12th, diarrhœa. January 14th, was much weakened, though rallying somewhat under free application of

stimulants. On the morning of the 15th the stump looked perfectly healthy and was rapidly healing; while the seat of the abscess above had granulated, and was discharging moderately. January 16th, sinking fast; tongue clean, teeth white, pulse feeble, no febrile symptoms, stump presents the same healthy appearance—fine suppuration and granulation; at 5 P.M. rallied a little under repeated doses of brandy. On the 17th the stump looked well. The patient died at 5 P.M. on the 18th. There is no doubt that had he had strength to hold out a few more days the tibia would have sloughed out from the joint; nor can there be any doubt that death resulted from the continual drain on his system, induced by the increased suppuration from the violence of his fall, and the shock, and constitutional irritation occasioned by it, together with the great prostration ensuing from the quantity of blood lost during the twenty-four hours he lay upon the field of battle.

CASE 148.—Private Prosper Chrétien, of the 120th Regiment, was received from Bourget, December 21st, 1870. A shell had fractured the pelvis and the hip joint. Several large fragments of shell and of lead (nearly 30 ounces), with a mass of cloth, were extracted from the wound, which was some eight inches in diameter. Another fragment of shell had crushed the opposite knee-joint. When admitted, he was in a dying condition. Died one and a-half hours after arrival.

CASE 150.—Private Sylvain Johais, of the 120th Regiment of the Line, was wounded the 21st of December, 1870, at Bourget. A fragment of shell had entered the right arm at the external border of the biceps, at the junction of the middle and lower thirds, and passed obliquely downward and backward between the triceps and the humerus. The patient was much exhausted, and had a feeble circulation, caused by hæmorrhage, insufficient food, and exposure to intense cold. On admission, warmth was applied to the extremities; hot drinks were given, and stimulants were freely used. Warm water dressings covered with oil-silk were used up to the 26th, when poultices of linseed-meal were substituted. December 31st, the large orifices of the wounds began to decrease, and healthy granulations in abundance had formed. The wounds continued to heal, and the patient became conva-

lescent, when on the 4th of January he complained of stiffness of the muscles of the jaw, of pains in the glands of the neck, of difficulty in digestion, and of colics. Chloral, of the strength of one part to fifty of water and syrup, was given in doses of one tablespoonful per hour. January 5th, spasmodic action, and rigidity of the jaws, muscles of the mouth, and throat ensued. The spasms lasted about a quarter of an hour, and were succeeded by nausea and pains in the abdominal region. Doses of chloral were continued alternately with opium cigarettes of two grains each. January 6th, less rigidity of the muscles of the upper part of the body, but increase in rigidity of those of the trunk and lower members. Opium pills of one grain each were given every two hours in addition to the chloral and cigarettes. January 7th, retention of urine ensued, which was relieved with the catheter. The doses of chloral and opium were then increased. January 8th, increased rigidity and hardness of all the muscles; had great difficulty in swallowing. Muriate of morphia, of the strength of one grain to six drops, was given in doses of ten drops every three-quarters of an hour. Cigarettes of the increased strength of four grains each, together with the regular doses of chloral, and of opium pills, were also smoked by the patient. Linseed-meal fomentations were applied to the neck, chest, abdomen, and legs; treatment seemed to lessen the permanent muscular rigidity. January 9th, several spasms occurred during the day and night, and the jaws became firmly closed. Liquid food and anodynes were given through the space afforded by a missing tooth. January 11th, subcutaneous injections of sulphate of morphia (one grain to twenty drops) were administered every eight hours in addition to the doses of laudanum, chloral, and opium, by cigarettes. This day the patient was enabled to urinate freely and without assistance of catheter. The jaws relaxed and his appetite returned. January 12th, spasmodic action again became very violent. Anodynes were re-administered in increased doses. The spasms continuing, anodynes were used at discretion, their frequency and strength being diminished toward the end in proportion to the strength of the patient and the severity of the spasms. Throughout the whole period the patient was plied with as much of food and

stimulants as could be taken. January 15th, spasms with increased opisthotonos re-occurred. The entire body became stiff and rigid; patient's respiration was laboured, he foamed at the mouth and bit his tongue as one with epilepsy. Excessive debility and profuse perspiration followed. The wounds still remained healthy, and continued to heal; the mind and memory were at all times clear and good; urination now was frequent and free; simple injections kept the bowels open; perspiration was most profuse from all the upper parts of the body, while fomentations were applied to such parts as exhibited excessive hardness or tension. This condition continued, with but slight variation, up to the 29th of January. Then syphilitic eruptions appeared over the entire body, for which iodide of potassa in five-grain doses was given every four hours. Subcutaneous injections of iodide of mercury (ten drops every two days) were commenced, and continued to the 6th of February. The patient, we subsequently learned, had been under treatment in a military hospital for nearly a year for syphilitic disease. January 31st, a troublesome cough supervened, with a secretion of tenacious mucus; had difficulty in expectoration and swallowing. Diarrhœa and vomiting now set in, followed by great weakness, which continued until February 4th, when the muscles became so relaxed that the patient was able to sit up for a short time, complaining, however, of oppression of the chest, cough, and constant expectoration. From February 5th to the 9th his weakness gradually increased, profuse perspiration ceased, the muscles and limbs relaxed, and stimulants of any kind failed to produce re-action. He coughed incessantly, and vomiting having recommenced, accompanied by frequent evacuations, he became thoroughly exhausted, and died on the 10th of February, at 3.30 A.M., remaining conscious to the last. The disease did not interfere with the healing process, since, when death occurred, the wounds had entirely healed.

CASE 153.—Captain Émile Dassonville, commanding the 21st Artillery, was wounded at Bourget, December 21st, 1870. A large fragment of shell had struck the back just below the left scapula and entered the pleural cavity. The soft parts of the back were fearfully bruised. On admission he was exhausted,

weak and nervous. Rapidly sinking, he died within forty-eight hours after arrival.

CASE 155.—Private Ernest Guilbert was wounded at Bourget, December 21st, 1870. A splinter of shell, about a cubic inch in size, had entered just above the left nipple, passed obliquely upward across the chest, and had made its exit about three inches vertically above the right nipple. It had thus caused a jagged wound of some ten inches in length. In its course three large openings were made in the skin, while the sternum had been crushed and depressed so as to rest upon the thoracic viscera. On admission to the ambulance the patient was suffering considerably from his wound, previous exposure and insufficient food, but had lost little blood. Three hours after admission, when full re-action had taken place, hæmorrhage supervened so severely, that it was only arrested by plugs and compresses of lint saturated in perchloride of iron, covered by large compresses, and bandaging of the chest. On the fifth day a piece of shell was found near the point of exit. On the sixth, slight hæmorrhage of the left side occurred. Compression, tight bandaging, and an astringent application again controlled the bleeding until the 29th of December, when pus was fully secreted. Subsequently to this date the dressings consisted of warm water applications with dilute nitric acid. January 1st, the broken portion of the sternum showed evidence of necrosis. January 2nd, it had a more honeycomb appearance, and was rapidly dissolving by the secretions. January 3rd, diarrhœa set in, which continued two days, when the patient died, worn out by the great drain from a system much enfeebled by exposure and want of food, and an inability to take it after admission. Diarrhœa probably accelerated the fatal issue, though the exhaustion produced by such a severe suppurating wound, and in such close proximity to vital parts, was the more direct cause of death.

CASE 156.—Adjutant Ferdinand Barbier, 15th Battery, 7th Regiment of Artillery, was wounded at Bourget, December 21st, 1870. He had received two wounds. A piece of shell, about two inches long by one inch broad, had entered the middle of the right gluteal muscle, crushing the neck of the femur and

trochanter; it was extracted just over the right trochanter major. A piece of shell had entered the opposite knee, crushing the whole joint. Treatment consisted of palliatives only. Patient died twenty-four hours after his arrival at the ambulance.

CASE 162.—Private Edward Hedouin, 5th Battalion, 50th Regiment of March of the Lower Seine, was wounded at Bourget, December 21st, 1870. A ball had struck his head under the right ear, near the mastoid process, fracturing the skull but not entering the brain. On admission the patient was in a state of semi-consciousness. This state continued to exist with little or no variation until December 26th, five days after arrival, when symptoms of inflammatory action having appeared, bags of ice were applied to the head, while ice was also given internally. December 27th, delirium set in accompanied by diarrhœa. For the former the ice treatment was continued; for the latter *mistura cretæ* was administered. Chloral was freely used to arrest spasmodic action and to produce quietude. The diarrhœa was checked, but the cerebral symptoms and spasms continued unabated until January 11th, when patient died. A post-mortem disclosed a fracture through the base of the skull and the presence of meningitis, with the formation of pus within the cranium.

CASE 164.—Private Rhodolphe Pierre Breillot, 2nd Company, 1st Regiment of the Scouts of the Seine, was received from Bourget, December 21st, 1870. A ball had entered the skull between the frontal and temporal bones, fracturing and depressing the bone. The ball was extracted on the field. He was unconscious on admission. This condition continued, with more or less variation, until the 29th. During this period he ate little. On the 29th, eight days after admission, inflammatory action with great local heat, restlessness, and delirium ensued. For these conditions bags of ice were applied to the head; ice was also given internally. From this date to the day of his death, a period of four days, he continued unconscious and delirious. Towards the last his pulse became very quick and hard, his respiration short and laboured; convulsions followed, and continued until the 2nd of January, when he died.

CASE 168.—2nd Lieutenant Jules Michel, of the Scouts of the

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Seine, was wounded January 13th, 1871. A ball had entered the left chest, about three inches from the sternum, fractured the third rib, traversed the lung, and passing out through the ninth rib, with fracture of same, was found lodged in the muscles of the back about $2\frac{1}{2}$ inches from the spinous process of the vertebra. The patient was very weak on admission, from loss of blood, exposure, deficient nourishment, &c. He continued to sink, notwithstanding stimulants and nourishment were freely given, until the 24th, ten days after admission, when he died.

CASE 169.—Corporal John Charles Bruneteau, 8th Company, 90th Battalion, Paris National Guards, was wounded January 14th, 1871. He had sustained, from a fall on a large pointed picket, a compound and comminuted fracture of the left fibula, just below the articulation with the tibia, with great destruction of the muscles of the anterior part of the leg—a badly lacerated wound. He was in a low typhoidal state of health, and very feeble on arrival, having for many days been deprived of a proper quantity of food and fuel. His wound was dressed with lint and alum, to arrest hæmorrhage. At the end of six days a slight amount of pus was discharged. The limb was then covered with cold water applications and oil-silk, and properly supported. At the end of ten days inflammation extended to the knee-joint, where pus formed, and was removed from time to time by Dieulafoy's apparatus. The pus from the wound was offensive, and mixed with blood. From his entrance into the ambulance the patient continued in a typhoid, soporific state. He took some food and stimulants, but to no avail. He became weaker day by day, and finally died January 31st, seventeen days after the injury.

CASE 178.—Private Simon Goudrier, 1st Company, 211th Battalion, 18th Regiment, National Guards, was wounded at Montretout, January 19th, 1871. A ball had entered the left foot at the junction of the tarsus and the metatarsal bone of the great toe, and, passing obliquely upwards and backwards through the superior part of the arch of the tarsus, had its exit anterior to the external malleolus, cutting in its course the anterior tibial artery, but not opening the ankle-joint. The patient was much exhausted from loss of blood and from intemperate habits. Hæmorrhage occurred at intervals for some days after arrival, but

this was arrested by astringents and cold water applications. When admitted he was greatly enfeebled from want of proper nourishment and from inability to receive or digest food. This feeble state continued until February 9th, when his appetite completely failed. The wounds were enveloped in compresses covered with oil-silk cloth. Subsequently linseed-meal poultices were added. January 24th, suppuration commenced. January 28th, several small spiculæ were removed from the wound of exit. February 5th, an abscess formed near the external malleolus, and was opened. There was a copious discharge of healthy pus. February 8th, the suppuration from wounds and flow of pus and discharge from the abscess were healthy and abundant. February 9th, brandy, with eggs and milk-punch, were added to the other stimulants, but without effect, the patient refusing food altogether. Death ensued February 12th.

CASE 184.—Private Henri Molin, of the 136th Regiment, was wounded at Montretout, January 19th, 1871. A ball had entered the left leg, on the inner side, about one inch below the knee-joint, between the epiphysis and the shaft, and near the posterior angle of the tibia, and passed obliquely backward through the posterior face of the tibia, having its exit posteriorly to the fibula. As it was doubtful whether or not a fissure had been made in the joint, it was deemed to be a suitable case for conservation. On arrival the patient was unable to eat, and was therefore sustained as far as possible by stimulative and concentrated liquid food. Ice and other cold applications not sufficing to reduce the inflammation, recourse was had to irrigation. This treatment was continued to the 23rd, when, the inflammation having in a measure subsided, and the patient having experienced a feeling of discomfort therefrom, it was discontinued, and warm-water dressings with oil-silk cloth substituted. From the first the man did not rally, nor did he even respond to food and stimulants; his strength gradually failed until the 27th, when he died.

A post-mortem examination revealed the fact that the bone was fissured extensively into the joint, and for a distance of almost three inches. The joint had also freely secreted healthy pus.

CASE 188.—Private Jean de Menitroux, 4th Regiment of

Artillery, was wounded at Montretout, January 19th, 1871. A ball had entered the left arm near the insertion of the deltoid, and had passed through and made its exit at the posterior face of the triceps, fracturing in its course the humerus in the upper third below the head, but not involving the joint. The patient was much exhausted from loss of blood on the field. This condition was aggravated by a severe cough and by a pulmonary disorder, which disorder was probably occasioned by long exposure anterior to the date of the injury. The patient was also suffering from rheumatic pains and swelling in both legs and the right arm and hand, to such a degree that the day after arrival he could not move without assistance. The wounds were enveloped with warm water dressings and covered with oil-silk cloths. January 25th, suppuration began; a caoutchouc drainage-tube was inserted, and the wounds were syringed with a weak solution of carbolic acid. Immobility of the arm was obtained by splints and bandages and compresses, which were removed and cleaned daily. On the 7th of February the discharge of pus was free and healthy; granulations appeared around the edges of the wounds. There was no inflammation in the arm. The cough still continued, violently racking patient's whole frame, and causing suffering as well as exhaustion. February 10th, the appearance of the arm and of the wounds was favourable; the appetite and spirits of the patient had improved; the discharges were abundant and healthy. At 6 o'clock P.M. of this day a violent fit of coughing was the cause of a sudden hæmorrhage, which lasted some ten minutes before it was effectually arrested. The arrestation was effected by compression. The loss of blood had been so considerable that it was thought most advisable to ply the sufferer with stimulants. At 2 A.M. of the night of February 11th, a second hæmorrhage, induced by the same cause, took place with such violence that, prostrated by loss of blood, the patient died in about fifteen minutes, and before the arrival of the surgeon. A post-mortem showed that the pointed inferior end of the fractured humerus had cut the tissues, and thereby caused the hæmorrhage. It was apparent, however, that death had been caused by hæmorrhage in a subject already much enfeebled by previous disease.

CASE 189.—Private Louis Seppe, 3rd Company, 78th Battalion, 16th Regiment, National Guard, was wounded January 19th, 1871. A ball entering the right foot at the centre of the tibio-tarsal articulation, had passed obliquely backwards and inwards, and out through the internal malleolus, injuring the posterior tibial artery. A second ball entering the nates near the os sedentarium, had passed obliquely down through the thigh anterior to the femur, a distance of ten inches, before making its exit. A third ball entering the right forearm two inches below the external condyle of the humerus, had passed obliquely downwards and backwards, and out on the inner side of the middle of the forearm. The patient had just been discharged from a hospital as convalescent from small-pox. He was much exhausted from loss of blood, exposure and insufficient food. The first wound was enlarged and all loose spiculæ removed, and covered with compresses saturated in cold water, to arrest hæmorrhage and inflammatory action; and subsequently with ice to effect the same end. When inflammation had subsided, the ankle was enveloped in warm water applications covered with oil-silk. The leg and foot were placed in a wire gutter well padded with oakum. From the first there was disinclination to take food and wine. There was no general re-action of the system. Though the wound of the ankle-joint supplicated freely, neither of the upper wounds secreted pus. The patient never fully rallied, though stimulated liberally, but gradually sank, and died February 2nd.

CASE 204.—Private Edward Baudette, of the 120th Regiment, was wounded at Montretout, January 19th, 1871. A ball had lodged in the frontal bone, about two inches above the right eye; had crushed in the entire skull, and had also torn the dura mater from its attachments. Several large fragments of both the outer and inner tables were removed. A second ball had passed between the thumb and index finger of the left hand. On arrival the mental powers of the patient were apparently unimpaired. Cold water compresses were the only dressings for the first two days. January 21st, severe re-active inflammation having ensued, accompanied by delirium, bags of ice were substituted. January 24th, the delirium increased during the

day; violent spasmodic action followed, and at 10 P.M. of this day, and four days after the injury, death terminated his sufferings.

CASE 205.—Private Victor Auger, a Sharp-shooter of the 120th Regiment, was wounded at Montretout, January 19th, 1871. A ball entering the left shoulder about the middle of the external surface of the deltoid muscle, had passed obliquely downward to the right, and entered the chest, fracturing the fourth rib in its passage; thence through the lung and out of the chest, fracturing the tenth rib, speeding along in the soft parts under the skin to the lumbar region, where it made its exit. On admission, the circulation of the blood was so far arrested as to produce lividity of the countenance. The patient expectorated blood and mucus freely. Circulation was soon fully restored by the application of hot water, and stimulating drinks. Difficulty of breathing, severe cough, and expectoration of blood continued; delirium and fever soon followed, and continued until death. On admission the patient was much exhausted from exposure and want of food, and when compelled to take food, notwithstanding his loathing for it, the stomach did not respond. He continued to sink until the 25th, when he died. The post-mortem revealed pleuritis, with effusion of blood and pus in the pleura.

CASE 222.—Private René Delaunay, 1st Company, 1st Battalion, 109th Regiment of the Line, was wounded at Montretout, January 19th, 1871. A ball had entered the external and superior part of the leg, and passed out on the internal side of the calf, breaking the fibula in its passage. On arrival at the ambulance, the patient was suffering from a cough and the effects of bad food. The limb was much swollen, and the circulation below the knee very feeble. A rubber drainage-tube was immediately passed through the wounds to relieve effusion. On the day after admission less vitality was manifested in the limb, and on the following day vitality had entirely ceased. This was probably due to the destruction of the arteries in the passage of the ball, the leg being more or less gangrened from the knee down. Immediate amputation was performed above the knee by a long anterior and a short posterior flap, the patella being enucleated after it had been raised and the flaps were united with sutures. The patient

received the chloroform well, and lost no appreciable quantity of blood. The stump was covered with oakum and a large compress, oil-silk covering the whole. The same dressing was re-applied forty hours after. On the third day, in addition to the other treatment, the thigh was bandaged from the groin down, to give better support to the stump. On the fifth day healthy pus was secreted in abundance. A lotion of nitric acid was used to increase the action of the wound. No union was obtained by first intention. On the twelfth day the whole wound was covered with healthy granulations. The parts were carefully drawn together with diachylon. The same treatment was continued, and by the twentieth day after the operation the wound was nearly closed. On the twenty-fifth day, when he was considered entirely out of danger, he suffered from the great cold occasioned by want of fuel, and was seized with severe chills. Fever and loss of appetite ensued. From this time he rapidly sank, *dying on the twenty-seventh day after the operation*, evidently from general congestion produced by exposure to cold. During the whole treatment the pus continued healthy, and on the day of the patient's death the wound was about closed.

CASE 223.—Private Jules Alluard, 2nd Company, 2nd Battalion, 136th Regiment of the Line, was wounded at Bougeval, January 19th, 1871. On admission he was suffering from pneumonia. It was found that he had been wounded through the lungs, diaphragm, liver, and intestines. The ball had entered on the left side of the chest, three inches below the nipple, and passing obliquely downward to the right, made its exit just above the centre of the crest of the ilium, fracturing the ribs. Warm water applications were spread over the whole abdomen and chest. Stimulants were freely administered, and anodynes were given to assuage pain. Little or no re-action took place. He continued to sink from the combined effects of pneumonia and the severe character of his injury, and died January 24th, 1871.

CASE 229.—Private Léon Combin, 4th Company, 3rd Battalion, 109th Regiment of the Line, was admitted January 19th, 1871. A ball had entered the shoulder, passing through and


fracturing the scapula, and lodging behind it. It was extracted on the field. Combin had been also struck by splinters of shell on the right side of the face. One of these penetrated the left eye and lodged in the brain. On admission he was exhausted from previous hæmorrhage; on account of exposure, he was suffering from cold and cough. His shoulder and chest were red and swollen; breathing laboured, and pulse quick. Warm water applications constituted the dressings. He daily grew feebler, though plied with stimulants. Ice was applied to the head, and given internally. He gradually sank, and died unconscious, January 27th.

CASE 240.—Private Adolphe Warocquier, 3rd Company, 78th Battalion, National Guard, was wounded January 19th, 1871, to wit: a fracture of the left ankle-joint—a ball had entered at the junction of the tarsal and metatarsal bones, passed obliquely through the anterior face of the tarsus, cutting in its course the anterior tibial artery; a seton of the thigh—a ball had entered the middle of the thigh, passing obliquely upwards posteriorly to the femoral artery; a slight shell wound in the right nostril at the aperture. The general condition of the patient was unpromising. He was very delicate, of a highly nervous temperament, anæmic, emaciated, and had much irritative fever. The treatment was limited to warm-water dressings. The joint was very sensitive when handled. There was much pain, which was greatly increased on moving the limb. The limb was maintained in an easy position, and attention directed to improve the general condition of the patient by a nourishing diet and stimulants, which he refused. Notwithstanding these unfavourable circumstances, the case progressed favourably until January 30th, when secondary hæmorrhage supervened, from ulceration of the anterior tibial artery. The usual local remedies were applied to guard against its return. February 1st, there was again profuse hæmorrhage. From this time onwards he steadily lost ground. He became much emaciated. Daily his powers of resistance failed. From the 5th of February his wounds presented no active appearance. His strength had been so exhausted by loss of blood and his previous condition, that recuperation was impossible. The febrile symptoms increased,

accompanied by nausea ; on the night of the 7th there was delirium. Death took place on the morning of the 8th.



SPECIAL POINTS.

T is a noticeable fact, that up to the 1st of December, about the time the battle of Champigny was fought, the wounded suffered little, if any, from surgical diseases. Up to that date there was nothing notable in the condition of any of the wounded that would lead to the belief that causes were at work which would in any wise deteriorate the blood, and thereby jeopardize our surgical results.

Notwithstanding this, the wounded from that battle presented from the very first an appearance unlike that with which we had been previously familiar. The wounds were mainly of a very grave character, and many proved fatal. Besides this, the greater number of the men were suffering, more or less, from the effects of insufficient and improper food ; from vitiated air in close and ill-ventilated sleeping apartments ; from insufficient cooking facilities for those who had always been accustomed to the best ; from camp accumulations of filth ; from wet, exposure, and cold : in short, the whole course of their lives had been suddenly and violently changed, either from proper camp conveniences to such as their systems had not yet become accustomed to, or from civil life, where they had enjoyed, in a gastro-nomic, sanitary, and hygienic point of view, all that science demands.

And to these causes of disease should be added the fact, that enclosed within a cordon of five hundred thousand soldiers was a city of nearly two millions of people suffering from the causes above enumerated, and the additional fact, that this city had become one vast hospital for the reception of the sick and wounded, not only from within, but from the great army without.

The whole story would not be told were I to neglect to state

that, outside of the cordon of soldiers, there still existed the enemy's numerous hordes, with such surroundings as an army only can create, poisoning the air from whatsoever point of the compass it might come to us ; mingling also with the already excessive accumulation of starving animal, fæcal, and other offensive and deleterious exhalations of the thousands of sick and wounded, who were already suffering from blood-poison, excreta which fouled even the beautiful stream that winds through the city, and which, in rendering putrescent even the sources of our water supply, became a potential source of poison.

Thus by the presence of two such armies as the world has rarely seen before, together with the local city causes, including insufficient and improper food, overcrowding of apartments, insufficient clothing, and insufficient fuel, during one of the most inclement winters known in Paris, is it surprising that buildings, clothing, and bedding became foul, and pestilence should stalk abroad in the shape of blood-poison, so that every individual, whatever his condition in life or facilities for obtaining food, felt the evil influences of the extreme times ? A moderate cold became typhoid fever, or a low species of bronchitis, pneumonia, pleurisy, peritonitis, or some other inflammatory disease of a typhoid form ; indicating clearly that every system had been insensibly and insidiously invaded by an unseen foe.

There is now no difference of opinion among intelligent students of medicine as to the fact of there being a condition of the system under which can be grouped a large number of diseases treated of as distinctive, but which, in fact, are due to some uniform, abnormal state of the circulating medium, although the condition may vary in intensity according to circumstances. From this condition comes erysipelas—whether of the skin, internal organs, tissues, membranes or veins—or low forms of cellular inflammation, low types of fever, traumatic, spreading, or other forms of gangrene, and a multiplicity of affections described and known as closely allied to, if not the sequels of, the so-called pus-poisoning. There can be little doubt that this cause, whatever its distinctive character may be, is in the blood ; and that it may remain dormant an indefinite period, *or* until eliminated, unless some great, exciting cause,

such as severe cold, insufficient and improper food, serious injuries, wounds, or surgical operations, arouse it into activity.

It is not my intention here to discuss the manner and mode of the introduction of this poison into the system, the particular form in which it exists prior and subsequent to its introduction, or whether it is animal, vegetable, gaseous, or a simple change in the constituents of the blood; but I shall rather endeavour to present a correct summary of the conditions which have existed among those treated at the American ambulance, and the conclusions which I have drawn from them.

1. The records show one case *only* of erysipelas, and this presented itself in a patient suffering from a slight wound in the scalp, in whom, the third day after his arrival, the disease was at its height; on the sixth the patient was well.

2. There have been no fevers of a typhoid, or of any other type, except as are detailed in the Report.

3. There has occurred one case of traumatic gangrene *only*, and *this* was developed within forty-eight hours after the patient's admission. The details of this case are given on the following page.

4. There have been no well-marked cases of pus-poisoning; but in order that the public may rest fully satisfied on this point, I have given a detailed history of every death.

5. During the last part of December, and during January and February, there was a want of recuperative power in nearly all the wounded who were received; and this was most perceptible among the more severely wounded, and those having compound comminuted fractures. By a careless observer, this peculiar condition of the system, with its sequels—imperfect recuperative action followed by more or less bony necrosis—might be confounded with the condition commonly known as pus-poisoning. But a more careful analysis of the whole report will show that, if any such poison were present, it existed in the patient's system *prior* to his admission into the ambulance, and was not due to any causes that lurked therein.

Viewing the question from *any* point, there were but four deaths as to the causes of which there could be any discussion. In my mind there is no doubt that those, together with several

others, were due to the *extreme cold*—at a time when we were unable to procure fuel and proper food—acting upon systems already impaired by causes above enumerated.

Before proceeding further, I deem it proper, that you may fully appreciate what follows, to give a synopsis of the only case of the four above alluded to, which is really worthy of an especial consideration.

CASE 106.—Was treated in barrack No. 5, which, together with its furniture, bedding, and clothing, was entirely new, and *into which no sick or wounded had before been admitted*. The patient came into the building in a typhoid state, suffering from a gunshot fracture of the radius and ulna. Great infiltration of the parts ensued; forty-eight hours after arrival traumatic gangrene of the cellular tissues commenced in the forearm. Free incisions, warm applications, disinfectants and dilute nitric acid, gave only temporary relief, and did not prevent the extension of the disease or the continuation of the unfavourable symptoms. Amputation was performed through the superior third of the humerus, where the parts were entirely free from disease. The cut surface soon granulated finely, and secreted an abundance of healthy pus. Yet the stump soon after assumed an unhealthy appearance, became hard and inflamed, and presented a dusky hue, similar to that of the forearm prior to amputation. This condition subsequently extended to the adjacent soft tissues of the chest, and continued to extend to the moment of his death.

If this disease had declared itself at a much later period after admission, and if the building had been used prior to his entrance, and had not been entirely new, as it was, or if any local cause had existed to which he was immediately exposed, one might be induced to believe that it was a case of blood-poisoning, superinduced by the influences surrounding him. But as the case now stands, there can be no doubt that his disease was contracted *before* his entrance into the ambulance; and that the wound was only an exciting cause. In confirmation of this view, Mr. Erichsen, in his work on surgery,¹ states that:—"The

¹ "The Science and Art of Surgery," by John Erichsen, vol. i. p. 123; London, 1869.

constitutional condition of the patient is undoubtedly the main cause of the supervention of spreading traumatic gangrene. However severe an injury may be, and however certainly it may kill those tissues or that part of a limb which are directly and immediately exposed to the operation of the external violence, the rapidly spreading form of the disease will not supervene unless the constitution be in an unsound state; and this remark applies necessarily with especial force to its occurrence after the slighter forms of injury. The supervention of spreading traumatic gangrene will occur in circumstances similar to those which dispose to pyæmia, erysipelas, or sloughing phagedæna; and, in fact, to the low and diffuse inflammations generally. They consist of imperfect and faulty hygienic conditions, and an impure state of the blood, arising either from long-continued exposure antecedent to the injury, to such conditions, or to chronic disease of the eliminatory organs, more particularly of the kidneys. Defective depuration of the blood, consequent on chronic kidney-disease, is a most fertile cause of this as of the other forms of gangrene. Indeed, I believe that the true spreading or traumatic gangrene cannot occur unless the blood is, *previously* to the receipt of the injury, in a depraved and disordered state, the result of the conditions, singly or combined, above mentioned. *Hospital miasmata, and exposure to faulty hygienic conditions after the receipt of the injury, do not appear to me to exercise so marked an influence on the occurrence of this form of gangrene as of the low inflammatory diseases of the erysipelatous type.* In fact, the patient is rarely, if ever, exposed to these influences sufficiently long after the occurrence of the injury for them to have much effect on his constitutional condition, had that been in a sound state previously. Spreading traumatic gangrene occurs only in recent wounds, and usually manifests itself within the first three days after their occurrence, while they are still in their first stage, and before suppurative inflammation has set in. . . . I cannot, therefore, but look upon this *formidable disease as a truly constitutional affection*, depending *more* upon the state of the patient's blood at the time of the reception of the injury than upon the *severity of that injury* or upon the *circumstances* to which he has been exposed immediately after the receipt of it."

We now come to the question, whether any one treated in the ambulance had any of the sequels of blood or pus-poisoning; and if so, from what source it arose.

Up to December, as I have before stated, all the wounded remained healthy. Subsequently, the tents were not more crowded, and the same scrupulous observation of all the hygienic laws was continued with regard to the patients, tents, beds, clothing, &c.; but, as in the case of traumatic gangrene, before commented on, other cases of compound fracture resulted unsatisfactorily.

Still there was no observable specific disease; but the patients' stomachs, at the time of admission, failed to respond to food and stimulants, or were unable to digest what was taken: in short, there was no recuperative power in the system. Necrosis of the fractured shaft or joint and a low form of suppurative inflammation would ensue. The discharges became offensive, and the patient would generally sink—eating more or less to the last—but not relapsing into a typhoid condition, and except when exposed to severe cold, as occasionally happened when fuel failed, and the fires were extinguished for many hours at a time, never suffering from *chills* or fever.

Whence came this change? The cause was evidently not from conditions special to the ambulance, but from the morbid condition existing in the system on arrival; as in the above-mentioned case of traumatic gangrene, which was nothing more than the representative of a large family of conditions each having a specific name, depending upon the part or tissue involved, but *all* depending upon a depraved state of the circulating medium commonly denominated blood-poisoning.

When the blood is thus poisoned, disease is far more prevalent. In proof of this I may instance the enormous increase of mortality among those not wounded who sickened in and around Paris from pneumonia, bronchitis, pleurisy, and typhoid, after the 1st of December, 1870. In fact, all diseases had assumed a low typhoid grade, few recovering from a severe attack of any of the graver disorders. If disease, in those who were unmaimed, proved so fatal in constitutions impaired by blood loaded with effete material, should we not expect that the mortality among

the severely wounded would be materially increased, particularly when suffering from the want of proper food and fuel?

There were those among our wounded, however, who were more fortunate, notwithstanding the severity of their wounds; namely, Zouaves and soldiers of the line. For example, Case 134, a compound and comminuted fracture of the thigh, received from the battle-field of Champigny, November 30th, 1870, recovered without an unfavourable symptom, and is possessed of a perfect limb with only one and one-fourth of an inch shortening. Case 166, in which the head of the humerus was crushed to atoms, and the soft parts severely lacerated and burned by an accidental shot from patient's own gun, recovered also. Other cases occurred with similar histories and results. The good results here obtained were due conjointly to good constitutions and to their having been quartered in the country, where they were enabled to obtain a greater variety and a larger supply of food, and where they were not exposed in the same degree to the obnoxious influences previously mentioned.

If any further arguments were needed to prove the position I have taken, namely, that the disease from which our patients suffered existed in the system, and only required a sufficient development, or a grave injury, to render what was once a passive condition an active disease, I would again refer to Mr. Erichsen's work, in which this matter is summed up tersely and to the point. In speaking of the necessary preparation of patients for an operation, that writer says:¹—"Closely allied to pyæmia, frequently co-existing with it, having the same predisposing causes, and associated with febrile disturbance of an asthenic type, are *the various low and diffuse inflammations*, whether assuming the form of erysipelas, of phlebitis, or of inflammation of the absorbents, which are the dread of surgeons and the scourge of hospitals. It is to pyæmia, and to these various allied erysipelatous and low inflammations, with their attendant asthenic constitutional disturbance, that at least three-fourths of the deaths after operations are due. It is in the production of these diseases that an impure blood, loaded with effete materials

Op. cit. vol. i. p. 8.

retained through habitual disregard of the ordinary rules of health, or through defective elimination by the kidneys and skin, acts as a potent predisposing cause, requiring but some injury or wound to call into activity a most dangerous amount of local inflammation and of constitutional disturbance. In these circumstances, it is not the extent or size of the wound that determines the dangerous results. The mere fact of a breach of surface, however trivial, is sufficient to excite these morbid processes, the materials for which have been previously stored up in the system. In such conditions of the system, the amputation of a toe may be as fatal as that of the thigh, or the removal of a small scalp-atheroma as the ablation of the breast; the only additional danger essentially connected with the greater operations being the increased risk from shock and hæmorrhage."

This "*low and diffuse* inflammation" of the tissues surrounding compound fractures was exactly what was to be found at our ambulance during the months of December, January, and February. It was evident that its presence, which manifested itself immediately after admission, was due to the causes mentioned in the above quotation, namely, to blood loaded with effete material and retained therein, and requiring but some injury or wound to call into activity a most dangerous amount of local inflammation; and in case death were to result under such circumstances, the verdict would be death from pyæmia; and the chances are that the hospital, or the place where such persons were treated, would be considered the unfortunate executioner. Whereas Mr. Erichsen, and all other good authorities, advise deferring any surgical operation during an epidemic of erysipelas, low forms of diffuse inflammation, low forms of fever, or where any condition exists in the atmosphere which has a tendency to foul or deteriorate the blood. In these circumstances, as Mr. Erichsen states, "the amputation of a toe may be as fatal as that of the thigh." If that is true under the circumstances of which he speaks, I assume that it would be so in the case under consideration; for in addition to the exciting cause spoken of, we have to superadd the fact that after arrival these men continued to suffer more or less from insufficient and improper food and from insufficient and improper fuel, the obtainable fuel not being adapted to

the furnaces. The manufactured coal emitted large volumes of sulphureous gases; at one time fuel gave out for the space of forty-eight hours; and at other times, during the most inclement part of the winter, we were compelled to drag along with a temperature so reduced as to produce great suffering. Several deaths are directly traceable to the want of fuel. Several were due, apparently, to exhaustion from cold during the night preceding and the day of the battle of Bourget, fought December 21st, 1870. Others, during the latter part of the siege, had a like history, followed by the same melancholy result.



THE MEDICAL AND SURGICAL STAFF.



I CANNOT, with justice to others, and with conscientious satisfaction to myself, close this Report without paying a tribute to the faithfulness, zeal, and intelligence of those who were so intimately associated with me, during the siege of Paris, in a humane work.

It affords me unwonted pleasure to state that my associate, William E. Johnston, M.D., has rendered invaluable services to the sick who, from the latter part of December to the middle of February, were in constant need of the care which he, in the most skilful and generous manner, bestowed upon them. I would refer you to his report, which will be read with much interest. By a reference to the table on page 687, it will be seen that all such cases as were not purely of a surgical character were treated by him. You will also observe that a small proportion of the medical cases had been wounded, but had either been discharged or had been sent to the convalescent hospital, where their disease was brought on by the causes previously enumerated as incident to the siege.

The gentlemen who have acted as my assistants have rendered valuable services, and were assiduous in their care and attention

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to the wounded. They assisted at the operations and dressings, and were charged with the especial superintendence of the wounded, each one being held responsible for the care of the patients and the cleanliness of the ward under his supervision.

The following named gentlemen were received as assistants in the order in which they here appear:—

William J. Brewer,	V. E. Du Bouchet,
Emile Brewer,	Frank M. O'Connell,
J. B. B. Cormack,	Joseph K. Riggs,
Lewis Wingfield,	Louis J. Swinburne.
Gilead Peet,	

Of the above-named gentlemen only three were regular students of medicine, and at the time pursuing their studies. Two had paid especial attention to chemistry and pharmacy, and performed the duties appertaining thereto. Owing to sickness and other causes, there were never more than six on active duty.

In conclusion, and in taking leave of you, I desire to express to you and to the Committee my sincere regret at parting, and to thank you for the many acts of kindness manifested to me a stranger in a strange land, and for the unbounded confidence reposed in me in the management of the surgical department of an institution of such importance in a national-representative point of view—an institution expressing the sanitary, hygienic, and surgical principles involved in the treatment of gunshot injuries as practised in the United States, and within which those principles were first to be put into operation in a foreign but friendly country.

In consideration of this expression of confidence, I am only too happy to know that the result of my labour is such as to meet with your approval. It is the only reward that I have sought.

While my connection with you and the American ambulance extends through an eventful period of over six months, I am pleased to state that the first difference of opinion, or unpleasantness in our intercourse, has yet to arise. In fact, I am happy to say that it has been the pleasantest six months of labour I have ever been called upon to perform, notwithstanding the fearful suffering we have witnessed among a proud but unfortunate people,

struggling to maintain the honour of their arms and the integrity of their territory.

I say pleasant, because conscious of the good we were all striving to do in a humanitarian work, we still wished to remind our ancient friends and allies that we had not forgotten and would not ignore the relief extended to us during our struggle for independence—that the great and good work of La Fayette and his *confrères* was still fresh in the memory of all true Americans. Hoping that you will convey to this warm-hearted and appreciative nation, with whom I am unable to confer in their own tongue, my fullest expressions of gratitude for their continued marks of approbation, esteem, and confidence—that if you are again called upon to act in any official capacity, you may be enabled to perform the duty as faithfully, as conscientiously, and as well as you have this, and that our relations may continue to be as pleasant in the future as they have been in the past,

I remain,

Very respectfully yours,

JOHN SWINBURNE.

PARIS, *July 1st*, 1871.



TABLE OF SURGICAL CASES ADMITTED TO THE AMERICAN AMBULANCE during the siege of Paris, 1870-71, with the name, corps, and rank of each case, the nature of the injuries, and the dates of admission, discharge, or death.

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
1	Sept. 29	Roche, Joseph	Guard. Nat. Versailles	Sergt.	Dislocation and fracture of the ankle	Dec. 8	
2	" 30	Rambeaut, Jean	14th Regt. Art.	Priv.	Contusion of the foot	Oct. 2	
3	" "	Melchior, Jules	35th Regt. of the Line	Corp.	Fracture of the femur: treated conservatively	Mar. 1	
4	" "	Hardy, Jules	35th Regt. of the Line	Priv.	Fracture of femur: treated conservatively	Mar. 8	
5	" "	Doucet, Alfred	35th Regt. of the Line	"	Fracture of femur (knee-joint): amputated	Mar. 6	
6	" "	Barnole, Gill	35th Regt. of the Line	"	Fractures of clavicle and scapula	Dec. 10	
7	" "	Grevin, Ernest	35th Regt. of the Line	"	Fracture of condyles of right femur: amputated		Oct. 12 of tetanus
8	" "	Edet, Joseph	35th Regt. of the Line	"	Fracture of tibia: secondary amputation performed		Feb. 5
9	" "	Buzier, Jean	81st Regt. of the Line	"	Fracture of the right knee-joint: amputated	Mar. 25	
10	" "	Tribouillard, H.	35th Regt. of the Line	"	Fracture of right heel: flesh wound of left leg		Oct. 10 of tetanus
11	Oct. 4	Magler, Jules	Franc-Tireur, Seine	"	Fracture of ribs and contusion of chest	Oct. 10	
12	" 13	Lascombes, G.	28th Regt. of the Line	"	Fracture of ribs and contusion of chest	Oct. 24	
13	" "	Mondine, Jean	100th Regt. of the Line	"	Fracture of ribs: wound of right lung	Dec. 19	
14	" 17	Boussinesy, D.	Mobile d'Hérault, 45th Regt.	"	Fracture of ulna	Nov. 10	
15	" 18	Ollivier, Chas.		Civilian	Flesh wound of forehead	Oct. 22	
16	" 20	Rhopiteau, C.	Mobile of the Seine and Oise, 45th Regt.	Priv.	Fracture of fibula: partial dislocation of ankle	Nov. 7 to small-pox hospital	
17	" 21	Faule, Emile	3rd Zouaves	Quarter-Master Corporal	Flesh wound of thigh	Nov. 15	
18	" "	Le Conte, Flou-riselle	Mobile of the Seine and Marne, 38th Regt.	Priv.	Flesh wound of wrist	Dec. 19	
19	" "	Negrier, Edouard	4th Regt. Art.	"	Flesh wound of thigh	Nov. 7	
20	" "	Clement, Gustave	3rd Zouaves	Sergt.	Flesh wound of both thighs	Jan. 17	
21	" "	Aubert, Pierre	3rd Chasseur à Pied	Priv.	Fracture of scapula: flesh wound of shoulder	Dec. 9	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
22	Oct. 21	Ricard, Hippolyte	36th Regt. (marching)	Priv.	Flesh wound of thigh	Dec. 8	
23	" "	Vernatier, Edmond	Mobile of the Seine and Marne, 38th Regt.	"	Fracture of tibio-femoral articulation : amputated	Mar. 8	
24	" "	Labasse, Eugene	3rd Zouaves	Sergt.	Flesh wound of arm	Oct. 28	
25	" "	Plumpercher, Auguste	10th Regt. of the Line	Priv.	Partial dislocation of ankle	Oct. 24	
26	" "	Lebrun, Emile	3rd Zouaves	"	Flesh wound of ankle	Oct. 28	
27	" "	Beauton, Denis	9th Regt. Art.	"	Flesh wound of lumbar region	Dec. 10	
28	" "	Caulier, Chas.	9th h Regt. Art.	"	Fracture of ribs : contusions of chest and head	Dec. 19	
29	" "	Engel, Charles	36th Regt. (marching)	"	Fractures of carpus and ulna	Mar. 4	
30	" "	Bidault, A.	Mobile of the Seine and Marne, 38th Regt.	Corp.	Fracture of scapula	Nov. 26	
31	" "	Pelletier, Jean-Louis	Mobile of the Seine and Marne, 38th Regt.	Priv.	Fracture of ulna	Dec. 19	
32	" "	Daumont, Clement	35th Regt. of the Line	"	Fracture of the head of humerus : excision performed	Mar. 9	
33	" "	Goix, Hubert	Mobile of the Seine and Marne, 38th Regt.	"	Flesh wound of arm	Oct. 24	
34	" "	Noble, Henri	3rd Zouaves	"	Fracture of phalanges	Jan. 27	
35	" "	Holtz, Jean	3rd Zouaves	"	Flesh wound of thigh	Dec. 8	
36	" "	Menez, Anatole	3rd Zouaves	Corp.	Fracture of shaft of fibula	Dec. 8	
37	" "	Frederick, Ferdinand	3rd Zouaves	Priv.	Flesh wound of thigh	Dec. 10	
38	" "	Demay, Louis	Tirailleurs of the Seine	"	Fracture of toe of right foot : amputated	Dec. 9	
39	" "	Dabary, Francois	51st Regt. (marching)	"	Contusion of thigh	Oct. 22	
40	" "	Ronflet, Louis	36th Regt. (marching)	"	Fracture of foot	Dec. 7	
41	" "	Godon, Jules	3rd Zouaves	"	Fracture of os calcis and astragalus	Mar. 25	
42	" "	Turon, Francois	3rd Zouaves	"	Flesh wound of thigh	Dec. 10	
43	" "	Ducos, Martin	3rd Zouaves	Capt.	Fracture of scapula	Feb. 15	
44	" "	Lantelme, Octave	3rd Zouaves	Lieut.	Fracture of spine of ilium	Feb. 15	
45	" 22	Gaudry, Michel	28th Regt. of the Line	Priv.	Fractures of ankle-joint and of finger : flesh wound of shoulder	Mar. 4	
46	" "	Schmidt, Mathieu	Fr.-Tireur 14th corps	"	Flesh wound of right shoulder	Dec. 19	
47	" 22	Gauthier, Louis	83rd Regt. of the Line	"	Flesh wound of thigh	Oct. 28	
48	" "	Moine, Joseph	73rd Regt. of the Line	"	Fracture of finger	Dec. 6	
49	" "	Commell, Emile	87th Regt. of the Line	"	Flesh wound of left arm	Dec. 19	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
50	Nov. 15	Bourson, Guillaume	125th Regt. of the Line	Priv.	Strangulated hernia	Nov. 19	
51	" 18	Rhopiteau, Chs.	Mobile of the Seine and Oise, 51st Regt.	"	Readmitted, having sustained further injury to ankle-joint	Dec. 8	
52	" 29	Lemonnier, J.	119th Regt. of the Line	Sergt.	Contusion and partial dislocation of ankle	Dec. 10	
53	" 30	Prevault, Adrien	42nd Regt. of the Line	Lieut. Colonel	Fracture of spine: wound of liver and intestines		Dec. 1
54	" "	Mowat, Rhdolphe	114th Regt. of the Line	Commander	Fracture of ribs: wound of lungs		Dec. 2
55	" "	Roche, Eugène	42nd Regt. of the Line	Capt.	Fracture of ribs	Jan. 20	
56	" "	Barbier, Fénelon	114th Regt. of the Line	Lieut.	Fracture of head of humerus: excision performed	Mar. 5	
57	" "	Duroux, Armand	42nd Regt. of the Line	Capt.	Fracture of left radius	Feb. 18	
58	" "	Bourson, Alexandre	42nd Regt. of the Line	"	Flesh wounds of arm and thigh		Dec. 25
59	" "	Chéon, Joseph	42nd Regt. of the Line	Lieut.	Fracture of spine of right scapula		Jan. 10
60	" "	Didry, Louis	42nd Regt. of the Line	"	Shell wound anterior to tibia: contusion of arm	Feb. 27	
61	" "	Pernet, Charles	35th Regt. of the Line	2nd Lieut.	Flesh wound of hip	Feb. 28	
62	" "	Jardin, Pierre	42nd Regt. of the Line	Capt.	Fracture of lower maxilla	Feb. 15	
63	" "	Proal, Hippolyte	35th Regt. of the Line	Capt. Adjutant-Major	Fracture of knee-joint: amputated		Dec. 3
64	" "	Choley, Louis	42nd Regt. of the Line	2nd Lieut.	Fracture of ribs: wound through right lung	Jan. 15	
65	" "	Noell, Louis	114th Regt. of the Line	Capt.	Fracture of scapula and lower maxilla	Feb. 19	
66	" "	Lapierre, Jean-Baptiste	114th Regt. of the Line	Lieut.	Flesh wound of thigh	Mar. 1	
67	" "	Holger, Edouard	116th Regt. of the Line	2nd Lieut.	Flesh wound of forehead	Dec. 15	
68	" "	Alliey, Jean-Baptiste	114th Regt. of the Line	Capt.	Fracture of ribs: wound of right lung	Feb. 19	
69	" "	Seland, Jean-Vincent	115th Regt. of the Line	Priv.	Flesh wound of left leg	Jan. 7	
70	" "	Sol, Guillaume	114th Regt. of the Line	"	Fracture of spine of ilium	Jan. 7	
71	" "	Fritz, François-Joseph	42nd Regt. of the Line	"	Flesh wound of right thigh	Feb. 1	
72	" "	Viallard, Jacques	42nd Regt. of the Line	"	Fracture of sternum and arm		Dec. 11
73	" "	Soulan, Pierre	114th Regt. of the Line	Capt.	Fractures of maxillas	Feb. 19	
74	" "	Girourd, Augusto	114th Regt. of the Line	Sergt.	Fractures of ribs and spine	Jan. 27	
75	" "	Pralong, Eugène	42nd Regt. of the Line	Capt.	Fracture of phalanges of big toe of right foot	Jan. 18	
76	" "	Ravoux, Jacques	42nd Regt. of the Line	Priv.	Flesh wound of thigh	Dec. 19	
77	" "	Blaineaud, Louis	Mobile of la Vendée	"	Flesh wound of right thigh	Dec. 19	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
78	Nov. 30	Damideaux, Leon	35th Regt. of the Line	Priv.	Flesh wound of right thigh	Jan. 7	
79	" "	François, Joseph	Mobile of la Vendée	"	Flesh wound of left leg	Mar. 20	
80	" "	Picotin, Jean	114th Regt. of the Line	"	Flesh wound of left foot	Feb. 19	
81	" "	Chaduc, Jean	42nd Regt. of the Line	Sergt.	Flesh wound of left leg	Mar. 20	
82	" "	Moinet, François	14th Regt. of Art.	Priv.	Fracture of pelvis		Dec. 13
83	" "	Knittel, Martin	119th Regt. of the Line	"	Fracture of head of humerus. Secondary excision performed		Dec. 16
84	" "	Anfray, Louis	114th Regt. of the Line	"	Flesh wound of scalp and right leg	Jan. 31	
85	" "	Theoli, François	6th Regt. Artillery	"	Fracture of left tibia		Dec 30
86	" "	Lesachet, Jean	Mob. d' Isle et Vilaine	"	Fractures of the bones of the face	Feb. 6	
87	" "	Herbel, Jean	Mob. d' Isle et Vilaine	"	Flesh wound of left calf	Feb. 19	
88	" "	Garnier, François	Mob. d' Isle et Vilaine	"	Flesh wound of left thigh	Jan. 31	
89	" "	Padelec, Louis	118th Regt. of the Line	"	Fracture of finger: amputated	Dec. 19	
90	" "	Vignec, Eugène	116th Regt. of the Line	"	Flesh wound of thigh	"	
91	" "	Cieutat, Louis	116th Regt. of the Line	"	Flesh wound of thigh	"	
92	" "	Agostine, Felix	116th Regt. of the Line	"	Fracture of scapula	Feb. 19	
93	" "	Marinier, Etienne	115th Regt. of the Line	"	Flesh wound of right thigh	Jan. 7	
94	" "	Janin, Joseph	115th Regt. of the Line	"	Flesh wound of left thigh	Feb. 1	
95	" "	Lebars, François	115th Regt. of the Line	"	Flesh wound of side	Jan. 18	
96	" "	Buisson, Jean-Baptiste	116th Regt. of the Line	"	Fracture of head of humerus: excision performed		Dec. 27
97	" "	Baudinez, Pierre	118th Regt. of the Line	"	Flesh wound of left thigh	Dec. 19	
98	" "	Alasseur, Etienne	116th Regt. of the Line	"	Shell wound of left hand	"	
99	" "	Souavin, Jean-Baptiste	16th Regt. of the Line	"	Flesh wound of right thigh	Jan. 31	
100	" "	Marigny, Lamartine	115th Regt. of the Line	Corp.	Flesh wound of hand	Dec. 6	
101	" "	Pappenet, Jean-Baptiste	115th Regt. of the Line	Priv.	Flesh wound of thigh	"	
102	" "	Morin, Jean	118th Regt. of the Line	"	Flesh wound of thigh	Dec. 19	
103	" "	Cordier, Philibert	115th Regt. of the Line	Sergt. Major	Flesh wound of left thigh	Dec. 10	
104	" "	Lesenne, Jeaufroy	115th Regt. of the Line	Priv.	Flesh wound of right thigh	Jan. 7	
105	" "	Castet, Felix	114th Regt. of the Line	"	Fracture of pubis		Dec. 17
106	" "	Lamboleze, Jean Pierre	42nd Regt. of the Line	"	Fracture of right radius and ulna		Dec. 18
107	" "	Bluem, George	114th Regt. of the Line	"	Flesh wound of right shoulder	Dec. 6	
108	" "	Bretnaud, Pierre	124th Regt. of the Line	"	Flesh wound of left thigh	Feb. 19	
109	" "	Renaudie, François	114th Regt. of the Line	"	Fracture of humerus: excision performed		Jan. 1

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
110	Nov. 30	Taucuit, Marceilleuil	114th Regt. of the Line.	Priv.	Flesh wound of hip	Jan. 31	
111	" "	Heraudeau, Jean	116th Regt. of the Line	"	Flesh wound of right leg	Dec. 19	
112	" "	Plumeret, Emile	42nd Regt. of the Line	"	Flesh wounds of both thighs	Jan. 2	
113	" "	Lisle, Mare	35th Regt. of the Line	"	Flesh wound of thigh	Feb. 19	
114	" "	Cooren, Victor	35th Regt. of the Line	"	Flesh wound of right thigh	Jan. 7	
115	" "	Filip, Léon	42nd Regt. of the Line	"	Fracture of elbow-joint	Mar. 18	
116	" "	Rancy, Louis	113th Regt. of the Line	"	Fracture of knee-joint : re-section performed		Dec. 21
117	" "	Baizand, Jean-Paul	35th Regt. of the Line	"	Fracture of spine and ribs		Nov. 30
118	" "	Rhodolphe, Louis	8th Regt. Art.	"	Fracture of os calcis	Dec. 19	
119	" "	Ferrand, Louis	3rd Regt. Art.	"	Fractures of the fingers	"	
120	" "	Villiet, Laurent	123rd Regt. of the Line	"	Fractures of humerus and scapula		Dec. 25
121	" "	Collet, Jerome	42nd Regt. of the Line	"	Flesh wound of chest	Dec. 19	
122	" "	Granger, Jean-Baptiste	42nd Regt. of the Line	"	Fracture of right humerus: wound of epiglottis and pharynx		Dec. 6
123	" "	Pierre, Etienne Alfred	42nd Regt. of the Line	Sergt. Major	Flesh wound of right thigh	Jan. 31	
124	" "	Finiels, Gustave	114th Regt. of the Line	Corp.	Fracture of tarsus	"	
125	" "	Leperric, Jos.	114th Regt. of the Line	"	Flesh wound of chest	"	
126	" "	Manne, Victor	2nd Regt. of Engineers.	Priv.	Fracture of spine: shell-wound of abdomen		Dec. 1
127	" "	Arnaud, Chas. Maurice	125th Regt. of the Line	"	Fracture of cranium		Dec. 8
128	" "	Arraquin, Laurent	35th Regt. of the Line	Sergt.	Flesh wound of thigh	Feb. 28	
129	" "	Le Viément, René	42nd Regt. of the Line	Priv.	Fracture of inferior maxilla	Feb. 19	
130	" "	Lheandre, Pierre	114th Regt. of the Line	"	Fracture of left ulna	Feb. 27	
131	" "	Saübe, Emil Bruno	106th Regt. of the Line	German soldier	Fracture of ilium and sacrum		Dec. 19
132	" "	Hulard, Michel	4th Zouaves	Priv.	Fracture of skull		Dec. 5
133	" "	Paule, Guillaume	Franc - Tireur, 123rd Regt. of the Line	"	Gunshot through lungs: compound fractures of ribs and scapula		Dec. 2
134	" "	Vautier, Zepherin	7th Zouaves	"	Fracture of right femur: wound in left thigh	Mar. 6	
135	" "	Schürig, Gustav	108th Regt. of the Line	German soldier	Fracture of pelvis		Dec. 4
136	" "	Geay, Eugène	119th Regt. of the Line	Priv.	Flesh wound of thigh	Dec. 19	
137	" "	Querfures, Guillaume	35th Regt. of the Line	"	Flesh wound of thigh	Dec. 6	
138	" "	Rebillat, Jos.	35th Regt. of the Line	"	Flesh wound of hand	Dec. 10	
139	" "	Mermond, Pierre	119th Regt. of the Line	"	Flesh wound of leg	Dec. 7	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
140	Nov. 30	Lebert, Celestin	Mobile of Loiret	Priv.	Flesh wound of arm	Dec. 7	
141	" "	Brochard, Constant	Mob. of la Vendée	"	Flesh wound of leg	" 6	
142	Dec. 2	Lebertre, Jean	121st Regt. of the Line	Sergt.	Flesh wound of right thigh	Jan. 17	
143	" "	Mutot, Alexis	121st Regt. of the Line	Priv.	Fracture of metatarsus: wound of left leg	Feb. 23	
144	" "	Maurizi, Jules	113th Regt. of the Line	Corp.	Flesh wound of left thigh	Jan. 7	
145	" "	Chabriet, Jos.	35th Regt. of the Line	Priv.	Fracture of the bone of the face	Mar. 7	
146	" "	Aviron, Antoine	6th Regt. Artillery	"	Flesh wounds of right side and left leg	Feb. 19	
147	" "	Coupé, Joseph	Mob. d'Isle et Vilaine	"	Fracture, by shell, of tibia and fibula		Jan. 18
148	" 21	Chrétien, Prosper	120th Regt. of the Line	"	Fractures of pelvis and hip-joint		Dec. 2
149	" "	Lamoue, Jean	Artillery (Marine)	"	Shell wounds of face and back	Jan. 27	
150	" "	Johais, Sylvain	120th Regt. of the Line	"	Flesh wound, by shell, of right arm		Feb. 10, of tetanus
151	" "	Dupont, Auguste	119th Regt. of the Line	"	Flesh wound of left thigh	Jan. 18	
152	" "	Gouay, Lucien	7th Regt. Artillery	"	Contusion of left side by shell	" "	
153	" "	Dassonville, Emile	21st Regt. Artillery	Capt.	Fracture of ribs: shell wound of lungs		Dec. 23
154	" "	Fouratier, Jean	13th Regt. Artillery	Priv.	Contusion of left arm by fragment of shell	Dec. 24	
155	" "	Guilbert, Ernest	7th Regt. Artillery	"	Fracture of sternum and ribs: shell wound of lung		Jan. 5
156	" "	Barbier, Ferdinand	7th Regt. Artillery	Adjut.	Fracture of head of right femur: fracture of left knee-joint		Dec. 22
157	" "	Huissou, Théophile	13th Regt. Artillery	Quarter Master	Flesh wound of left thigh	Dec. 24	
158	Dec. 21	Michel, François	6th Regt. Artillery	Priv.	Flesh wound of left parietal bone: flesh wounds of calf and leg	Feb. 19	
159	" "	Bernard, Louis	Artillery (Marine)	"	Flesh wound of right ankle-joint: contusion in superclavicular region	Jan. 4	
160	" "	Plat, Constant	21st Regt. Artillery	"	Contusions of right shoulder, chest, and left ankle	Jan. 17	
161	" "	Farges, Jules	120th Regt. of the Line	"	Contusions of right shoulder and left arm	" "	
162	" "	Hedouin, Edouard	Mob. la Seine Inférieure, 50th Regt. Artillery (Marine)	"	Fracture of skull		Jan. 11
163	" "	Roache, Jean	Artillery (Marine)	"	Flesh wound of hand	Dec. 24	
164	" "	Breillot, Rhodolphe	Tirailleurs of the Seine, 1st Regt.	"	Fracture of skull		Jan. 2
165	" "	Lecat, Henri	121st Regt. of the Line	"	Flesh wound in hip	Feb. 6	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
166	Dec. 24	Tessier, Alphonse	112th Regt. of the Line	Priv.	Fracture of head of humerus : excision performed	Mar. 25	
167	Jan. 9	Millery, Edouard	Tirailleurs of the Ternes	Sergt.	Flesh wound of right thigh	Feb. 13	
168	" 13	Michel, Jules	Tirailleurs de la Seine	2d Lieut.	Fractures of ribs and scapula : wound of lung		Jan. 24
169	" 14	Brunoteau, J. Charles	Garde Nat. of Paris	Corp.	Fracture of articulation of fibula, involving knee-joint		Jan. 31
170	" 19	Malignon, Augustin	109th Regt. of the Line	Capt.	Contusion of right side	Jan. 23	
171	" "	Tallandier, Armand	109th Regt. of the Line	Adjut.	Flesh wound of right arm	Feb. 23	
172	" "	Pallardy, Adolphe	Mob. of la Vendée, 35th Regt.	Priv.	Fracture of finger of left hand	Jan. 31	
173	" "	Richard, Jean	120th Regt. of the Line	"	Flesh wound of left forearm	Feb. 19	
174	" "	Mirambeaut, Pierre	190th Regt. of the Line	"	Flesh wound of left thigh	"	
175	" "	Peyruqueau, Henri	120th Regt. of the Line	"	Contusion and flesh wound of neck	"	
176	" "	Fremery, Victor	Guard Nat. of Paris	"	Flesh wound of right foot	Feb. 23	
177	" "	Madomier, J.	109th Regt. of the Line	"	Flesh wound of left gluteal region	Mar. 25	
178	" "	Goudrier, Simon	Guard Nat. of Paris	"	Fracture of tarsus		Feb. 12
179	" "	Roux, François	2nd Engineers	Pioneer	Fractures of lower maxilla and alveolus	Feb. 7	
180	" "	Neveu, Aimable	Guard Nat. of Paris, 18th Regt.	Priv.	Flesh wounds of left hand and right thigh	Feb. 6	
181	" "	Oquez, Alcide	Guard Nat. of Paris, 18th Regt.	"	Flesh wound of right thigh	Feb. 20	
182	Jan. 19	Marcel, Henri	Guard Nat. of Paris, 16th Regt.	Sergt. Major	Flesh wound of gluteal region	Feb. 7	
183	" "	Guillouet, Ferdinand	110th Regt. of the Line	Sergt. Major	Flesh wound of right leg	Feb. 5	
184	" "	Molin, Henri	136th Regt. of the Line	Priv.	Fracture of tibia (knee-joint) and condyles		Jan. 27
185	" "	Caron, Henri	Guard Nat. of Paris, 16th Regt.	Lieut.	Contusion of right calf	Jan. 22	
186	" "	Baduel, Jean	Guard Nat. of Paris, 18th Regt.	Priv.	Flesh wound of left leg	Feb. 22	
187	" "	Gagneux, C.	109th Regt. of the Line	"	Flesh wound of arm and chin	Feb. 19	
188	" "	De Menitroux, Jean	4th Regt. of Art.	Quarter-Master	Fracture of left humerus		Feb. 11
189	" "	Seppe, Louis	Guard Nat. of Paris, 16th Regt.	Priv.	Fracture of tibia, fibula, and tarsus : flesh wounds		Feb. 2
190	" "	Vitoz, Augustin	120th Regt. of the Line	"	Flesh wound of scalp	Feb. 19	
191	" "	Goudelin, Geo.	109th Regt. of the Line	"	Fracture of carpus	Mar. 8	
192	" "	Fauret, Noel	109th Regt. of the Line	Sergt.	Flesh wound of left hand	Feb. 19	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
193	Jan. 19	Bar, Jean	Guard Nat. of Paris, 16th Regt.	Priv.	Flesh wound of left foot	Jan. 22	
194	" "	Couturieux, Charles	109th Regt. of the Line	"	Flesh wound of chest	Feb. 23	
195	" "	Ghibert, Auguste	120th Regt. of the Line	"	Contusion of chest	Jan. 24	
196	" "	Robillard, Eugène	Guard Nat. of Paris, 18th Regt.	"	Flesh wound of shoulder	Feb. 15	
197	" "	Deroy, François	110th Regt. of the Line	"	Contusion of left calf	Jan. 22	
198	" "	Cosson, Paul	Mob. of the Loiret, 37th Regt.	"	Flesh wound of left foot	Jan. 22	
199	" "	Chazal, Jean	110th Regt. of the Line	Corp.	Flesh wound of right lumbar region	Feb. 24	
200	" "	Cintrat, Louis	Guard Nat. of Paris, 16th Regt.	Priv.	Fracture of inferior maxilla	Feb. 16	
201	" "	Vauvillier, P.	Guard Nat. of Paris, 18th Regt.	"	Flesh wound of right hand	Feb. 11	
202	" "	Cazalens, Pierre	Guard Nat. of Paris	"	Flesh wound of left arm	Jan. 19	
203	" "	Janvier, Victor	Mob. of the Loiret, 37th Regt.	"	Flesh wound of right foot	Jan. 24	
204	" "	Baudette, Edouard	120th Regt. of the Line	"	Fracture of skull: flesh wound of hand		Jan. 24
205	" "	Auger, Victor	Franc-Tireur	"	Fracture of ribs: wound of lungs		Jan. 25
206	" "	Ecard, Théophile	Guard Nat. of Paris	"	Fracture of scapula		Feb. 18
207	" "	Bernard, Benjamin	4th Zouaves	"	Contusion of back	Jan. 24	
208	" "	Barge, Philip	7th Regt. Art.	Quarter-Master	Contusion and partial dislocation of right knee	Jan. 7	
209	" "	Trichaud, Théophile	120th Regt. of the Line	Priv.	Fracture of right index finger: amputated	Feb. 19	
210	" "	Chanal, Adolphe	Guard Nat. of Paris, 16th Regt.	Corp.	Flesh wound of right hip	Feb. 13	
211	" "	Aubonnet, Denis	59th Regt. of the Line	Priv.	Fracture of ribs: contusion of chest	Jan. 31	
212	" "	Baral, Henri	Guard Nat. of Paris, 16th Regt.	Quarter-Master Sergt.	Fracture of ribs	Jan. 20	
213	" "	Buatois, Théodore	109th Regt. of the Line	Priv.	Flesh wound of head	Feb. 19	
214	" "	Vigier, François	Guard Nat. of Paris	"	Flesh wound of shoulder	Feb. 6	
215	" "	Laplace, Henri	Guard Nat. of Paris, 18th Regt.	Drummer	Fracture of bones of the hand	Mar. 5	
216	" "	Pommier, Léopold	136th Regt. of the Line	Priv.	Flesh wound of left arm	Jan. 24	
217	" "	Giraud, Ernest	Mob. of the Loiret, 37th Regt.	"	Fracture of fibula	Mar. 24	
218	" "	Hartout, Gustave	109th Regt. of the Line	"	Flesh wound of scalp	Feb. 6	
219	" "	Gauthier, Antoine	Guard Nat. of Paris,	"	Flesh wound of thigh	Mar. 7	

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
220	Jan. 19	Thomas, Chas.	16th Regt. Guard Nat. of Paris,	Corp.	Flesh wound of arm	Feb. 15	
221	" "	Latin, Lucien	16th Regt. Guard Nat. of Paris,	Priv.	Fracture of scapula	Mar. 6	
222	" "	Delaunay, René	109th Regt. of the Line	"	Fracture of fibula: amputated		Feb. 17
223	" "	Alluard, Jules	136th Regt. of the Line	"	Fracture of ribs: wounds of lungs, liver, diaphragm, and intestines		Jan. 24
224	" "	Fournière, Eugène	Guard Nat. of Paris, 18th Regt.	"	Fracture of fingers: amputated; flesh wound of forearm	Mar. 24	
225	" "	Paya, Joseph	109th Regt. of the Line	"	Flesh wound of left arm	Mar. 7	
226	" "	Conjou, Antoine	136th Regt. of the Line	"	Fracture of finger: resected	Mar. 24	
227	" "	Couder, Jean	Guard Nat. of Paris, 16th Regt.	"	Fracture of superior maxilla	Jan. 20	
228 ¹	" "	Dine, Aurélien	109th Regt. of the Line	"	Fracture of scapula	Feb. 6	
229	" "	Combin, Léon	109th Regt. of the Line	"	Fracture of scapula: wound of eye and brain		Jan. 27
230	" "	Jouissaint, Joseph	109th Regt. of the Line	"	Flesh wound of left thigh: contusion of right	Feb. 2	
231	" "	Perrin, Jean	Guard Nat. of Paris, 18th Regt.	"	Flesh wound of right arm	" "	
232 ¹	" "	Chartier, Louis	109th Regt. of the Line	"	Fracture of right humerus	Jan. 24	
233	" "	Coulot, Delphin	119th Regt. of the Line	"	Fracture of fingers: resected	Feb. 19	
234	" "	Neveu, Auguste	Guard Nat. of Paris, 17th Regt.	"	Flesh wounds of left hip and thigh	Mar. 16	
235 ¹	" "	Gaspar, Eugène	Mobile of the Seine	"	Flesh wound of left thigh.	" "	
236	" "	Vie, Auguste	109th Regt. of the Line	"	Flesh wound of hand	Feb. 19	
237	" "	Leproust, Chas.	4th Regt. of Zouaves	"	Contusion of back	Feb. 24	
238	" "	Devillard, François	70th Regt. of the Line	"	Flesh wound of finger	Jan. 31	
239	" "	Barbier, Alphonse	Mobile of the Seine	"	Wounds of diaphragm, liver, &c.	Feb. 27	
240	" "	Warocquier, Adolphe	Guard Nat. of Paris, 16th Regt.	"	Fracture of left ankle-joint		Feb. 8
241	" "	Assezat, Pierre	119th Regt. of the Line	"	Flesh wound of arm	Jan. 31	
242	" 21	Merle, Henri	4th Regt. Zouaves	"	Flesh wound of left arm	Feb. 21	
243	" "	Commell, Emile	120th Regt. of the Line	"	Fractures of fingers of left hand: amputated	Feb. 19	
244	" 24	Charpenet, Hippolyte	9th Regt. Chasseurs à Cheval	Corp. of Cavalry	Fracture of tibia & fibula of right limb	Mar. 6	

¹ For subsequent history, see Report of Dr. Johnston.

No. of Case.	Date of Admission.	Name of Case.	Corps.	Rank.	Injury.	Date of Discharge.	Date of Death.
245	Jan. 25	Montgomery, Adolphe	Mob. of the Seine and Marne, 38th Regt.	2nd Lieut.	Flesh wound of thigh	Jan. 27	
246	Feb. 2	Leconte, Floriselle	Mob. of the Seine and Marne, 38th Regt.	Priv.	Fracture of ulna	Feb. 21	
247	Feb. 4	Plat, Louis Désiré	21st Regt. Artillery	,,	Caries of nasal bone	Feb. 19	

Total number of cases, 247 ; discharged, 200 ; died, 47.





ON THE MEDICAL HISTORY
OF THE AMERICAN
AMBULANCE.

A REPORT BY WILLIAM E. JOHNSTON, M.D.

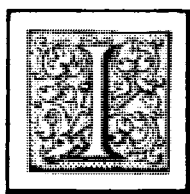




ON THE MEDICAL HISTORY OF THE AMERICAN AMBULANCE.

THOMAS W. EVANS, M.D., PRESIDENT OF THE AMERICAN
INTERNATIONAL SANITARY COMMITTEE.

SIR;



T is the first time in the history of sieges that medical men have had an opportunity of observing the influence on health of so large an agglomeration of human beings as that now present at Paris.

The ordinary sanitary condition of the city has been so much improved by the efforts of the last twenty years, that comparative safety was felt against the attacks of any of the usual forms of pestiferous disease. But no calculations had been made on a sudden addition to the population of nearly 300,000 soldiers and poor people from the outside, with their old furniture, their cattle and their swine. Much less had they taken into consideration the aggravating circumstance of the influence on the atmosphere of a large number of sick and wounded soldiers, of the want of food and fuel, and the excessive and prolonged cold weather.

It was not without the most serious apprehension, therefore, that we watched the fluctuations of the mortality bill during the progress of the siege, and the concordance in the variations of the public health with the condition of our ambulance tents. It was the first time this system of hospital had been tried in France on a large scale, and the first time it had ever been tried in a besieged city of such a size.

Y Y

We not only watched with deep interest the effects of these various pernicious influences on our patients, but we were naturally anxious to seize upon some testimony bearing upon the difficult question of the comparative healthfulness of the climates of the two hemispheres, and of the power of resistance and of recuperation of the two races.

Much light was thrown, we think, upon some of these points by the results obtained.

Thus, it may be said that, from the moment of installation in the month of September till the middle of the month of December, that is to say, while it was still possible to obtain regular supplies of food and fuel, and while the men who came in were not too much prostrated by the privations of the siege, there was an almost complete exemption from disease in the 157 wounded men received up to that time. A few cases of ephemeral fever from gastric derangements; a few cases of diarrhœa of a mild type; and one case of light variola—in fine, hardly more disturbance of the system than would have been observed in the same number of men in active duty in the field; the gravity of the wounds, moreover, apparently bearing no relation to the nature or the force of the malady. These were the only manifestations of disease we were called on to observe.

While bronchitis, pneumonia, typhoid fever and small-pox were on the increase in the barracks, and among the civil population; while the bill of mortality in the city was rising from 981 a week to the enormous figure of 4,671—a figure which would have carried off one-eighth of the entire population in a year, and which killed from six to eight times more people than the war—the inmates of our tents, notwithstanding their apparently crowded state, continued to enjoy a perfect immunity from any grave form of disease.

Up to this point in the history of the ambulance, that is to say, till about the middle of December, there had been no great difficulty in obtaining a sufficiency of food and fuel; and the results, as will be seen by this and the surgeon's report, were in the highest degree satisfactory. But after this period several seriously wounded men died whose symptoms were clearly traceable to the effects of cold or a want of proper nourishment;

and toward the middle of January it was evident that a certain typhoid condition had invaded the tents, and, in an insidious way, was furnishing a slight increase to our mortality ratio.

Thus, in the second fortnight of January, a man with a contused wound of no special gravity died after a week's illness from typhoid symptoms of a well-marked form.

Another man with a flesh wound of the shoulder was attacked with a pleuro-pneumonia in an insidious way, and died at the end of four days. He had a slight cough, with a light mucous crepitation for a few days, without fever, and was not considered in any danger, when all his symptoms suddenly grew worse, both lungs filled up rapidly, the expectoration changed to orange colour, there was tympanitis, sordes in the mouth, and delirium. He was treated with an expectorant mixture, brandy, blisters, and abundant nourishment.

Another man attacked about the same time, and in the same way, with pleuro-pneumonia, and who had also a flesh wound of the chest, died even more rapidly than the preceding one. His disease had also lain latent for several days.

Eight other cases of pneumonia and two of bronchitis were treated in the period between the middle of January and the middle of February, three only of which were wounded men. All of these cases recovered but one—a man who was brought in from without the walls in a hopeless condition with bronchitis. The treatment of these cases consisted generally in Todd's brandy mixture, blisters, poultices, nourishing diet, and sometimes, when the cough was too violent, an expectorant mixture.

A very young man who came in with a flesh wound of the thigh had several epileptic fits after his entrance, and was finally seized with scarlet fever, although it was the only example of this disease in the ambulance, and died.

Another man with a contused wound of the back was seized five days after his entry with confluent small-pox, and got well. He was isolated at once, but communicated the disease in a lighter form to the aid-surgeon charged with his nursing.

The other attacks of disease in the ambulance, independent of purely surgical conditions, were of the most ordinary and

accidental kind, without special bearing upon miasmatic or atmospheric influences.

The foregoing is in brief the medical history of the ambulance; and we think we are authorized in drawing from it the following conclusions:—

1. That so long as the exterior conditions were normal, that is to say, for a period of three months, the sanitary condition of the ambulance was most remarkable.

2. That, after this period, several deaths and several attacks of disease were directly traceable to the influence of cold and the want of food, at a moment when the supplies of food and fuel were irregular and insufficient.

3. That the condition of the men on entering was, after a certain period, generally bad, from insufficient nourishment and the fatigues of the siege.

4. That the soldiers of the line, who most frequently occupied the outposts and had fresh vegetables to eat, resisted the fatal effects of wounds better than those fed on a less healthful diet.

5. That the scorbutic or typhoid condition, which manifested itself in the ambulance towards the close, depended on the condition of the men on entering, and on the bad medical constitution of the city at the time.

6. That notwithstanding these pernicious exterior influences, which operated equally on all, the number of deaths in this ambulance, as the statistics will show, did not reach the ratio of mortality, depending upon the same influences, elsewhere.

7. That as regards the comparative healthfulness of the two climates and the two races, the experiment was too limited to admit of a positive indication; but that to the medical men who had been in the habit of treating the same accidents in the Western hemisphere, the general physiognomy of the ambulance was most striking, and left the conviction that, whatever the cause or causes, the power of resistance and of recuperation was inferior to that which they had been in the habit of observing.

W. E. JOHNSTON, M.D.,

Physician to the Ambulance.

March 1, 1871.

TABLE showing the name, corps, rank, disease, and the date of admission, discharge, or death, of each case treated medically at the American Ambulance during the siege of Paris, 1870-71.

No. of case.	Date of admission.	Name of case.	Corps.	Rank.	Disease.	Date of discharge.	Date of death.	Observations.
1	Sept. 20th	Louis Demer	14th Regt. of the Line	Private	Syphilis	Sept. 21st	...	Sent to Military Hospital.
2	" "	Jean-Auguste Baudard	12th Regt. Artillery	"	Exhaustion	" 22nd	"	
3	" "	François Briffoteau	2nd Guard National	"	"	" "	"	
4	" "	Edouard Arnould	21st Regt. of the Line	"	"	" "	"	
5	" "	Octave Demotte	Mobile Cote d'Or	"	"	" "	"	
6	" 22nd	Jean-Baptiste Bocquet	" "	"	Syphilis	" "	"	
7	" "	Henri Blin	" "	"	Exhaustion	" "	"	
8	Oct. 21st	Louis Bevalot	Eclaireur Guard National	"	Bilious fever	" 24th	"	
9	Nov. 30th	Emile Plumeret	42nd Regt. of the Line	"	Scarlet fever	Nov. 4th	"	
10	Dec. 21st	Louis Bernard	11th Bat. Art. (Marine)	"	Peritonitis	" "	Jan. 4th	Sent to Military Hospital.
11	Jan. 13th	Frédéric Galland	Amis de France	"	Epilepsy	" "	" 10th	
12	" 14th	Henri Tolza	Engineer Corps	"	Rheumatism	Feb. 22nd	"	
13	" 15th	Edward Free	Tirailleur (Seine)	"	Rheum. (art.)	March 1st	"	
14	" 19th	Charles Leproust	4th Zouaves	"	Small pox	Feb. 23rd	"	Condition ameliorated.
15	" "	Aldice Oquez	18th National Guard	"	Peritonitis	" 24th	Feb. 27th	
16	" "	Aurélien Diné	109th Regt. of the Line	"	Pneumonia	" "	" 9th	
17	" "	Louis Chartier	" "	"	"	" "	Jan. 29th	
18	" "	Eugène Gaspard	Mobile of the Seine	"	Pericarditis	" "	Feb. 1st	
19	" 20th	Dominique Rocca	35th Regt. of the Line	Captain	Gastritis	Jan. 25th	"	
20	" 23rd	Antoine Brunet	42nd Regt. of the Line	Lieutenant	Pneumonia	March 14th	"	
21	" "	Léon Fontenoy	38th Mobiles	"	"	Feb. 10th	"	
22	" 26th	Jean Ameline	Mobile Cote d'Or	"	Pleurisy	" 6th	"	
23	" 31st	François Lucas	" "	"	Rheumatism	" "	"	
24	Feb. 2nd	Pierre Labbé	" "	Private	Bronchitis	" "	Feb. 11th	



APPENDIX.





LIST OF THE PERSONS WHO SERVED IN THE
AMERICAN AMBULANCE,

ESTABLISHED IN PARIS DURING THE SIEGE

OF 1870-71.



URGEOIN-CHIEF—John Swinburne.

Physician—William E. Johnston.

Surgeon's Aids—Emile Brewer, Gilead Peet,
M. V. du Bouchet, Mr. Frank O'Connell, William
Brewer, Joseph K. Riggs, J. B. B. Cormack, Louis

Wingfield.

Chemist—Mr. O'Connell.

Aids Volunteer—Transport Corps—Captains of Squad—William
B. Bowles, Joseph K. Riggs.

Corps Members—Messrs. E. H. May, Gratiot Washburne,
Charles J. Rilliet, William C. Dreyer, C. B. Gunther, E. B.
Beylard, Auguste Meslier, Victor Meslier, W. A. S. Dick, Jules
Dupré, G. W. Kidder, M. Whittaker, Thomas O'Flinn, E.
Malherbe, Oswald Murray, M. Pollock, M. Ablet, C. Hansen,
Frank Riggs, Geo. B. M'Farland, Major Hutton, Lewis Swin-
burne, M. Ranzi.

Secretary of the Aid Volunteer Corps—Albert Piperno.

Book-keeper—Harper Hugo.

Lady Volunteers—(Nurses)—Mrs. George B. M'Farland, Mrs.
William B. Bowles, Mrs. Koch, Mrs. Demming, Mrs. Ward,
Mrs. Howland, Mrs. Moulton, Mrs. Meslier, Mrs. Huggard,

Z Z

Mrs. Ricker, The Marquise de Bethisy, Miss K. Cammeron, Miss Maas, Miss Wissembourg, Miss Jenny Castri, Miss Bewick, Miss Chandor.

Director of the Linen Department, &c. &c.—Mrs. Conkling.

Superintendent of the Kitchen and Special Diet Department—Miss Rachel Castri.

Superintendent of the Grounds—Mr. Benjamin Meakes.

Assistant—Mr. Beasel.



GROUND PLAN (PLATE I.)
OF THE AMERICAN AMBULANCE
ESTABLISHED ON THE AVENUE DE L'IMPÉRATRICE, DURING THE
SIEGE OF PARIS, 1870-1871.

EXPLANATION.

- | | |
|--|--|
| <p>1. Entrance.
a a, gates.</p> <p>2. Sentry box.</p> <p>3. Administration.
A, reception bureau.
a, step.
b, stove.
B, committee room.</p> <p>4. Tent-Pavilion, No. 3.
a a, portals.
b b b b b, tent-poles.
c, stove pipe.
d d d, registers.
e e e, dressers.
f, water-cock.
g g g g g g, beds.
h h h h, tent walls.
i i i i, border of fly.
k k k k k k k k, cords and tent pins.
l, roof for furnace.</p> <p>5. Hose-room.—Fire Department.</p> <p>6. Hydrant.
a, box.
b, filter.</p> <p>7. Pavilion, No. 4.
A, operating room.
b, operating table.
c, register.
D, ward.
e, stove.
f f f f f f, beds.</p> | <p>G, wine room.
l, stove.
H, bottle room.
i i, portals.
k, water-cock.</p> <p>8. Pavilion, No. 6.
A, servants' dining-room.
B, kitchen.
C, officers' dining-room.
D, surgeons' salon.
E, pharmacy.
F, coal bin.
a a a a a a a, tables.
b b b, stoves.
c c, ranges.
d d, soup cauldrons.
e e e e e, shelves.
f, alcove and bed.</p> <p>9. Covered passage way.</p> <p>10. Pavilion, No. 5.
A, linen room.
B, office of the superintendent.
C, provision room.
D, ward.
a a a a, tables.
b b b, stoves.
c c c, shelves.
d d d, sofa and fauteuils.
e e, ventilators.
f f, air pipes.
g g g g, beds.</p> |
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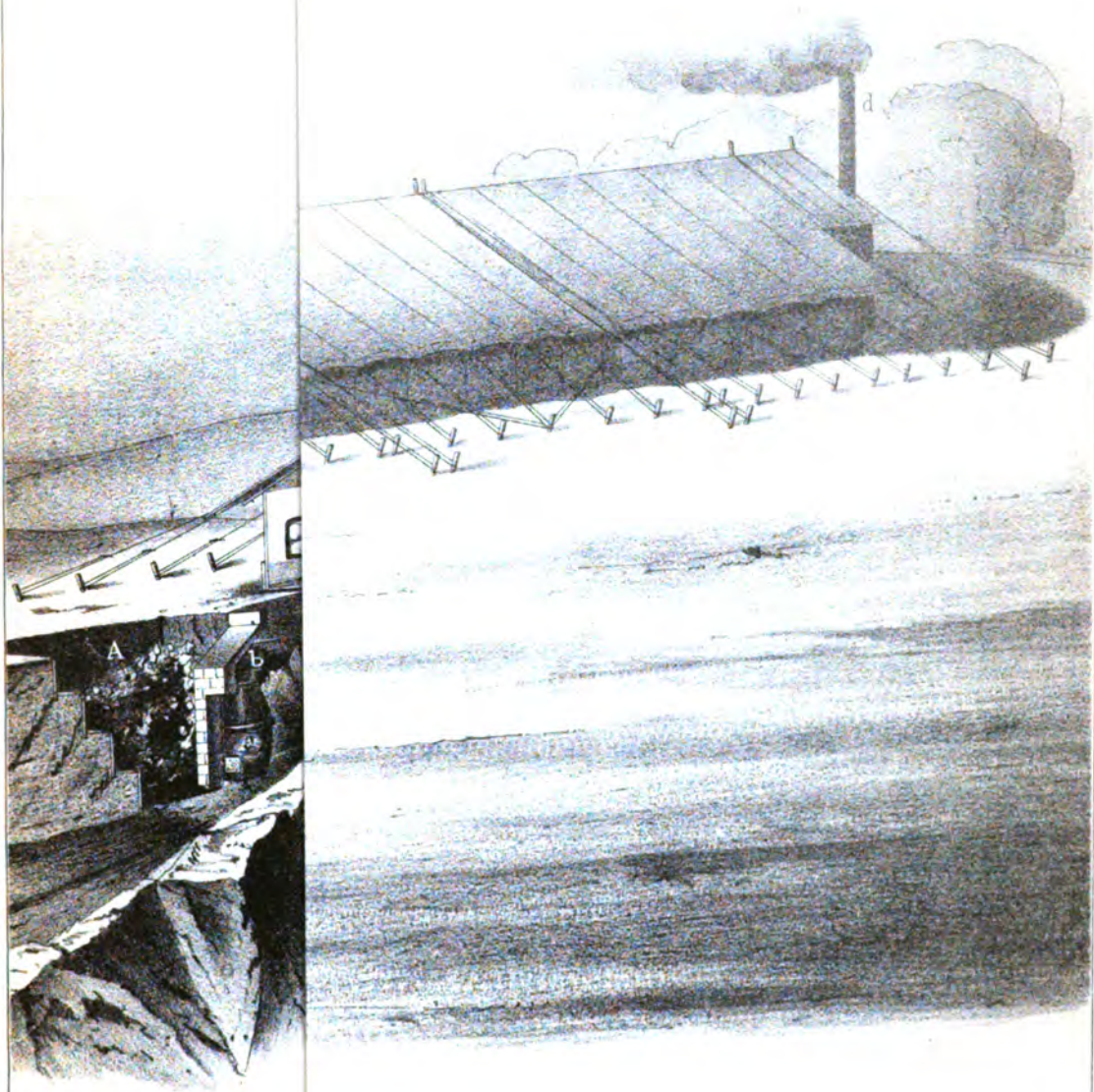
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|--|--|
| <p>11. Cabinets.
 a a a a a a, cabinets.
 b b b b b b, screens.</p> <p>12. Urinal.</p> <p>13. Coal yard.</p> <p>14. Tent-Pavilion, No. 1.
 (See detail under No. 4.)</p> <p>15. Dirty Linen Room.</p> <p>16. Dead House.
 a, post-mortem table.</p> <p>17. Pavilion, No. 7.
 A, store room.
 B, knapsack and gun room.
 a, shelves.
 C, salon of the aids volunteer.
 a, table.
 b, stove.
 c, piano.</p> <p>18. Pavilion, No. 8.
 A, stable (horse).
 a a a a, stalls.
 B, stable (cow).
 a a a, stalls.
 C, carriage shed.</p> | <p> a a a a, ambulance waggons.</p> <p>19. Nurses' dormitory.
 a a a a a a a a a a, beds.
 b, stove.</p> <p>20. Tent for the watch and chief of
 service.
 a, stove.
 b, bed.</p> <p>21. Circular Tent.
 a, portal.
 b b b b b b, beds.
 c, stove.
 d d, dressers.</p> <p>22 22 22. Reserved lots.
 x x x x, railings.
 y y y y y y y y y y, trees.
 s s, sinks.</p> <p>23. Washing Apparatus.</p> <p>24. Tool Box.</p> <p>25. Flagstaff. (Red Cross.)</p> <p>26. Flagstaff. (American).</p> <p>27. Coffee Waggon.</p> <p>28. 29. Ambulance Waggons.
 z z z z z z, plank walks.</p> |
|--|--|





Shows a pavilion of
American ambulance

The earth has be
to show the system



P. BECQUET & PARIS.

1. 2. 3, 4 3 Tents.
 A. Cellar.
 B, B, B. Trench.
 C. Portal.
 D. Roof of

PLATE . III.

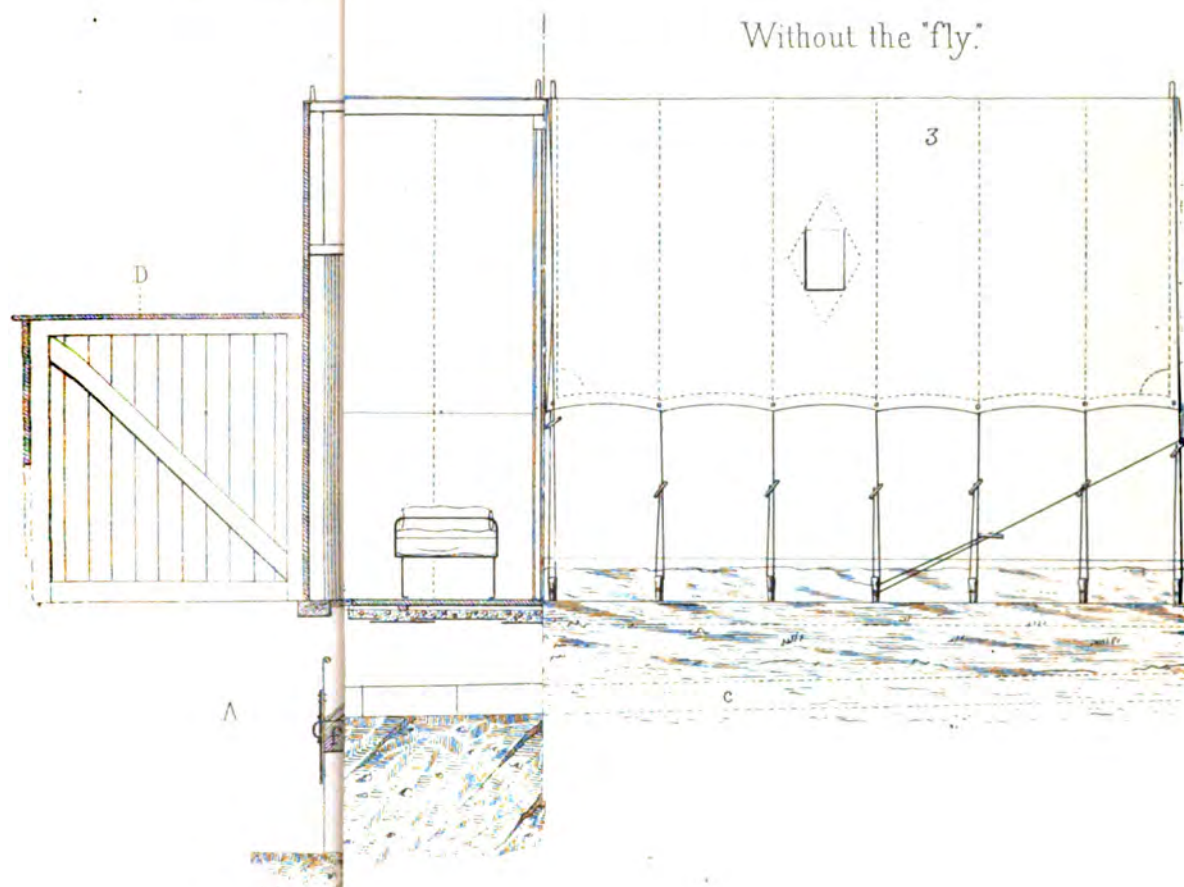
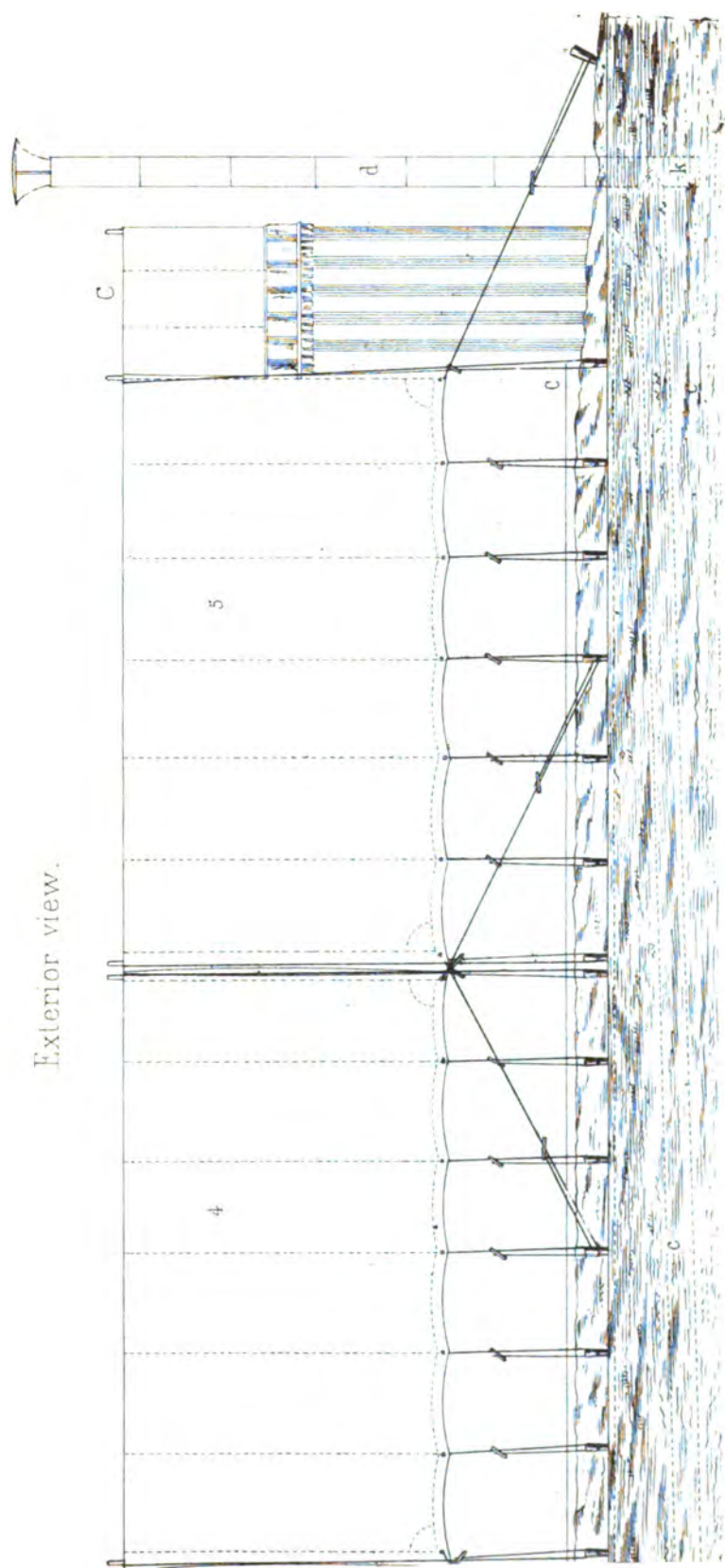


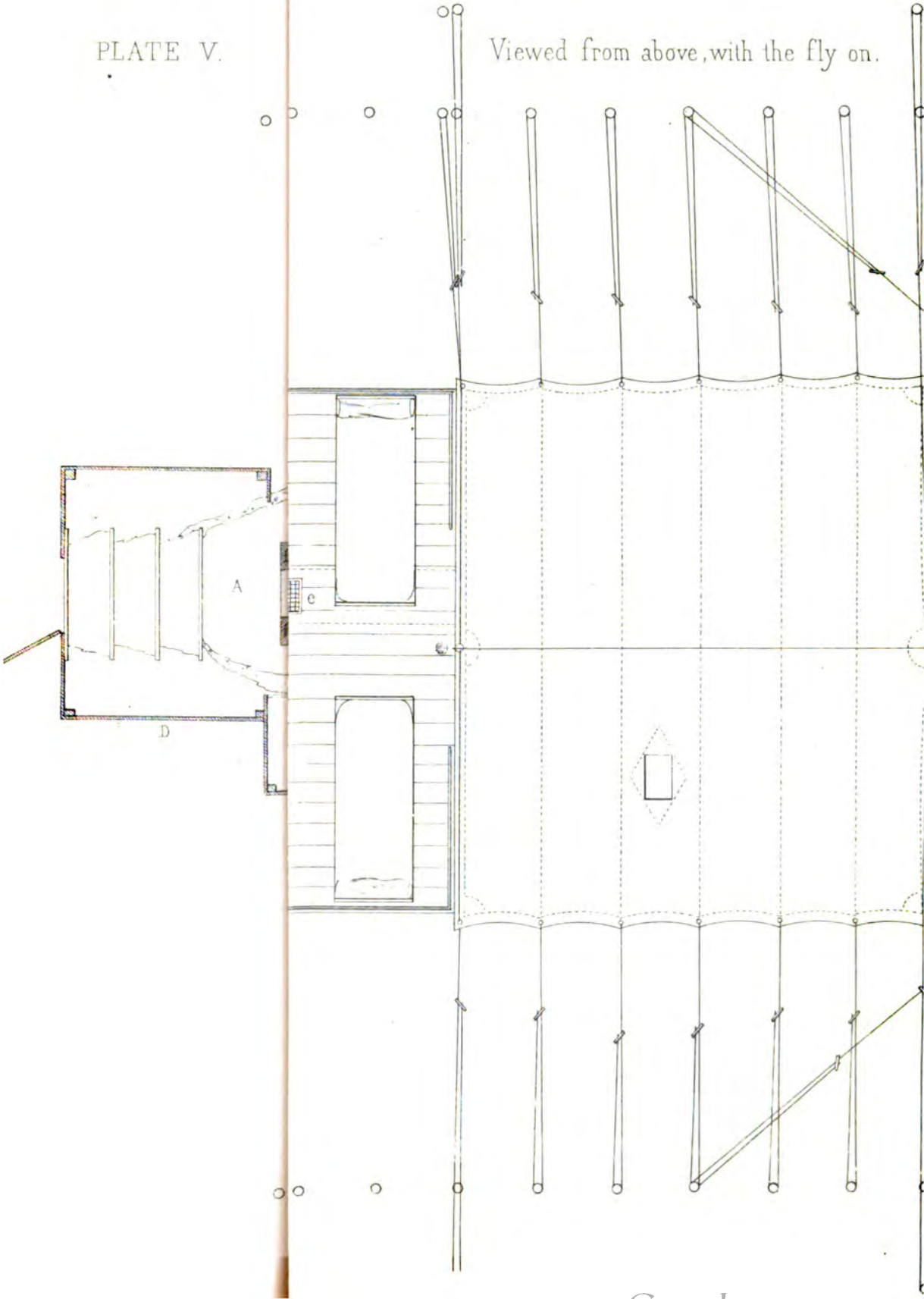
PLATE IV.
(Supplement of plate III.)



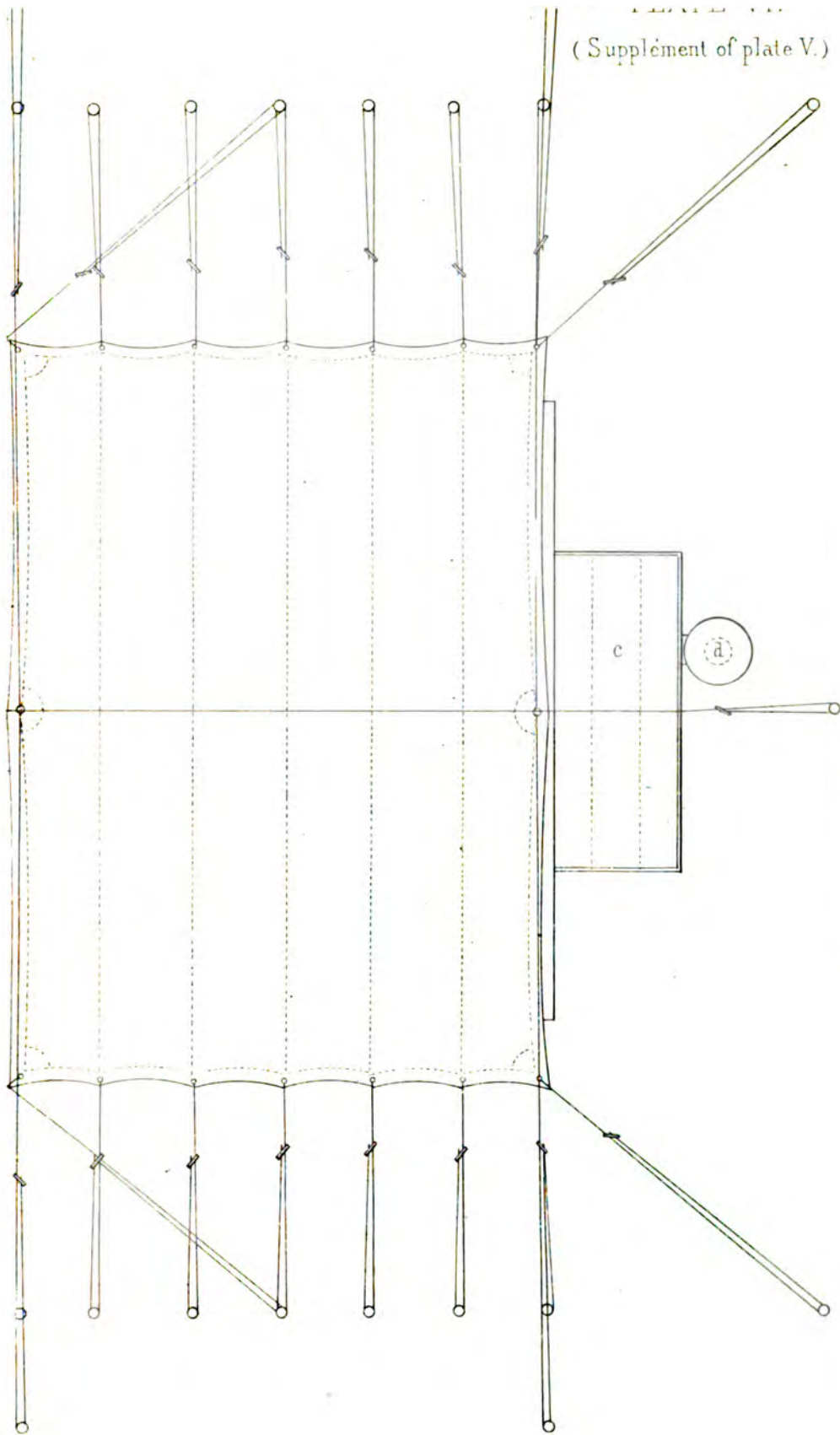
Fritz Hequet à Paris

PLATE V.

Viewed from above, with the fly on.



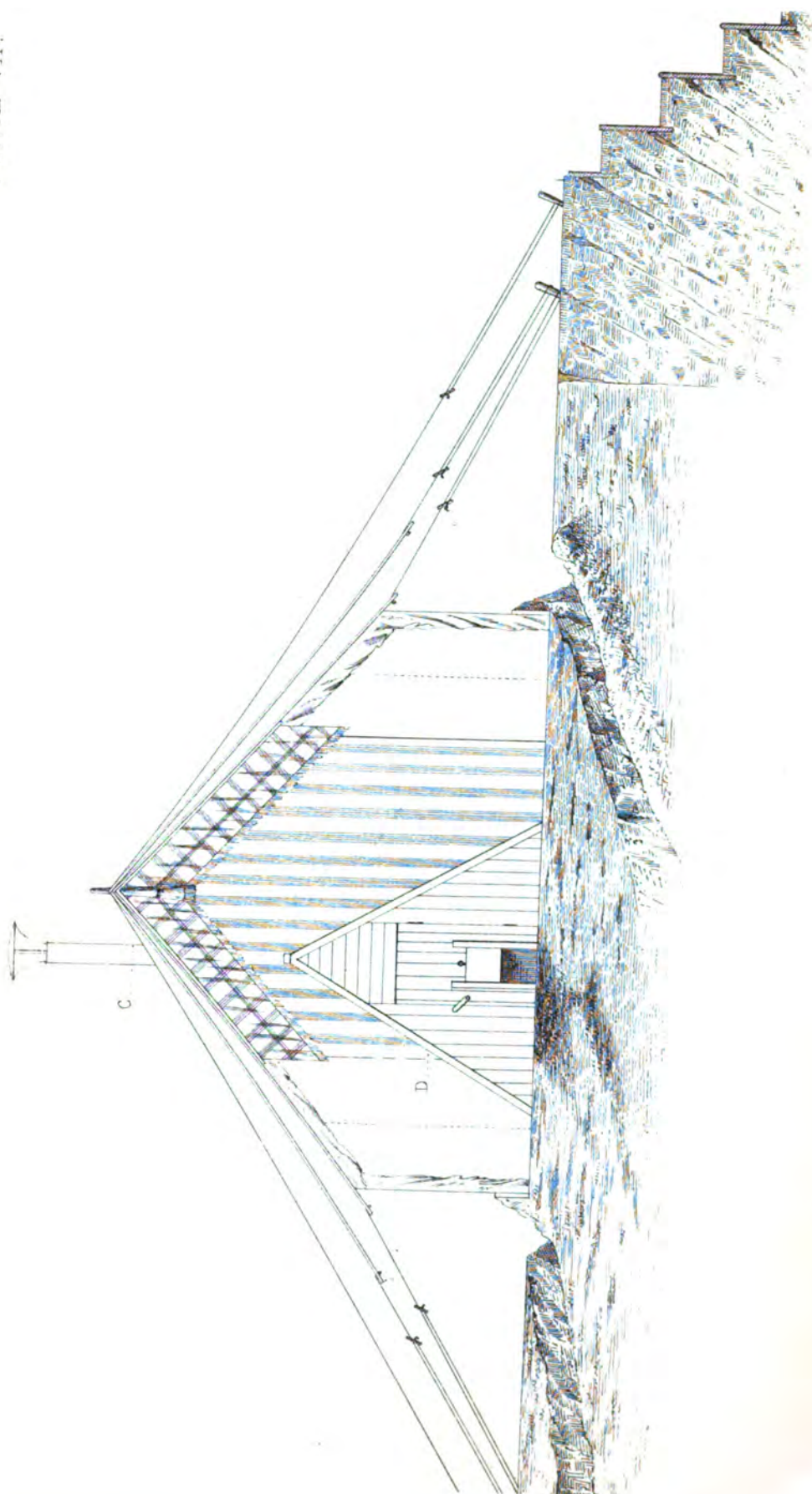
(Supplément of plate V.)



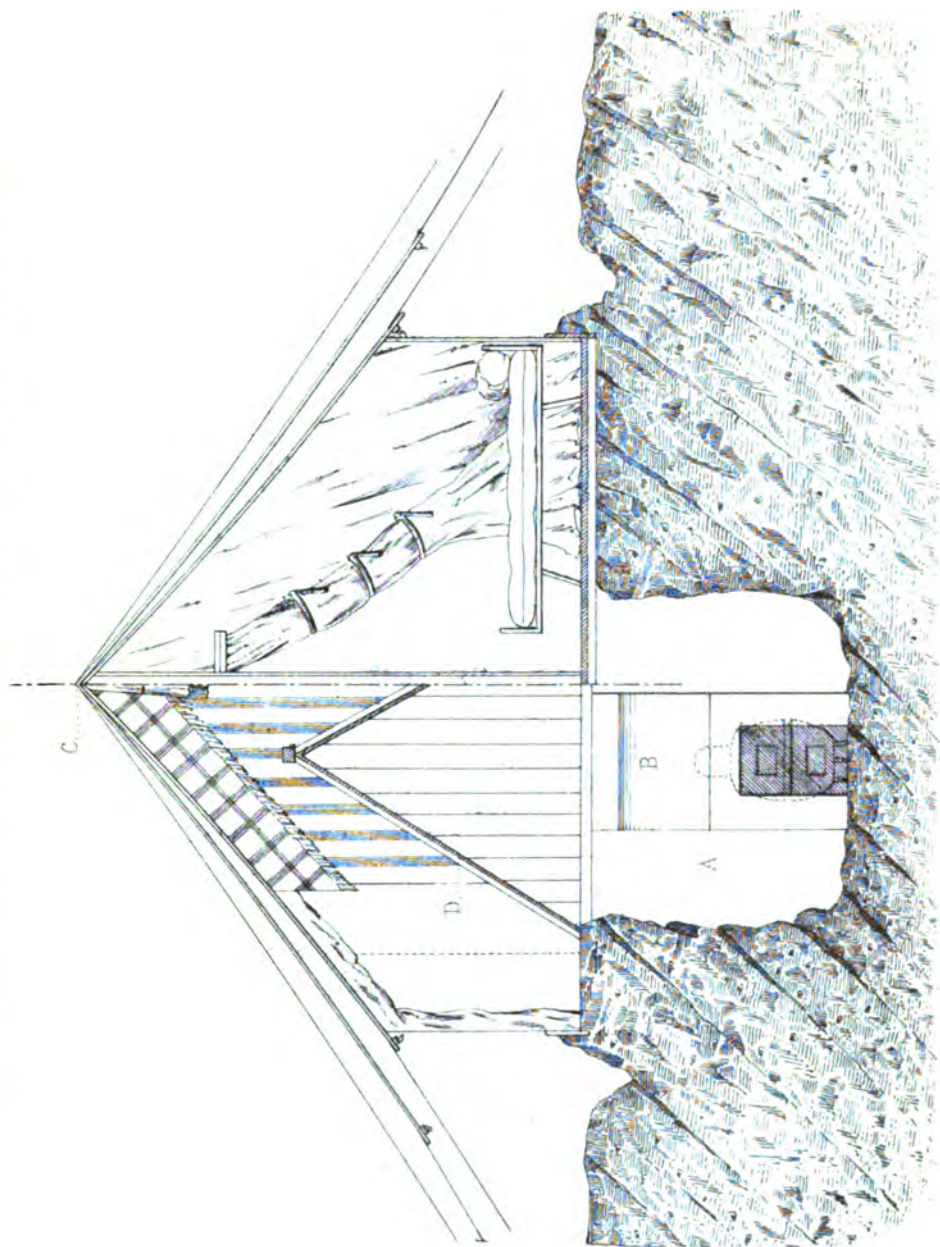
Section with the fly on, viewed from above.

Front view.

PLATE VII.



Front view, with sections showing (the interior of the cellar and of the tent.)



B,B,B. Trench.

PLATE IX.

c,c,c. pipe.

e. register.

g. iron plate.

i,i,i. floor.

k. earth between iron plates and floor.

Figure 1.

Sections
of the
Trench.

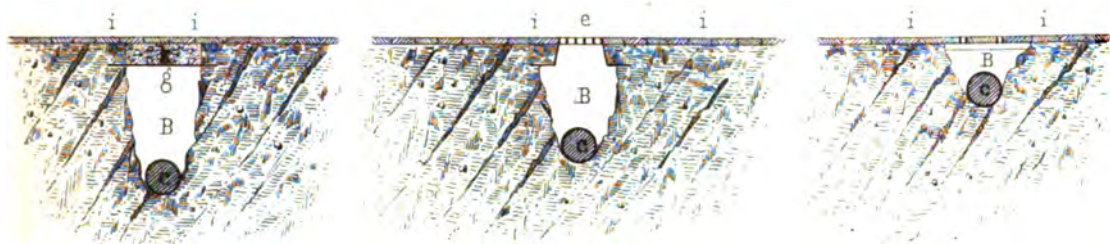


Figure 2.

Stay Ropes.

a. tent wall.

b. roof of tent.

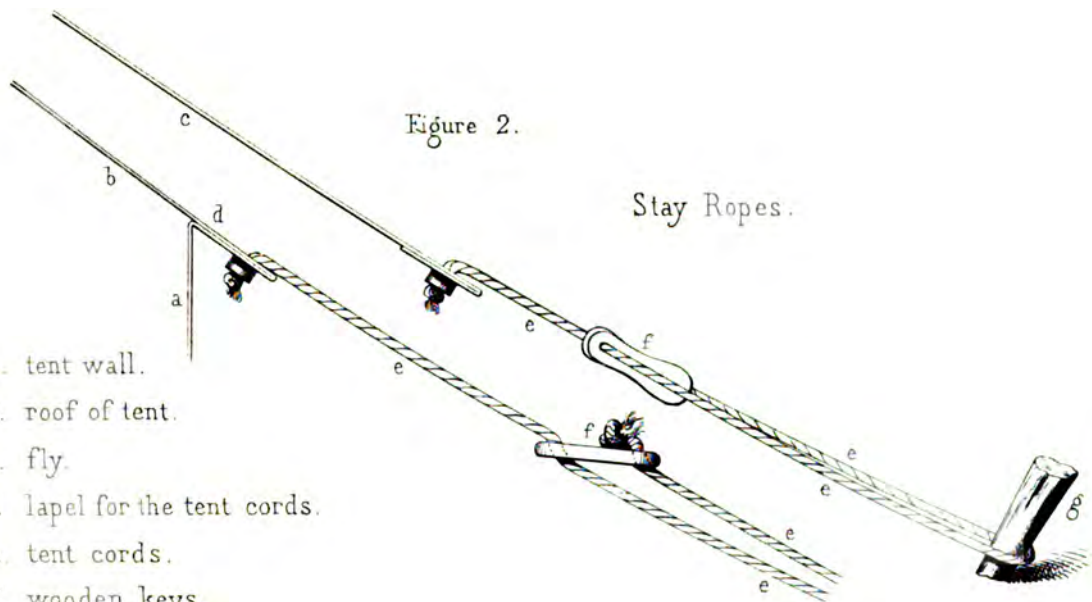
c. fly.

d. lapel for the tent cords.

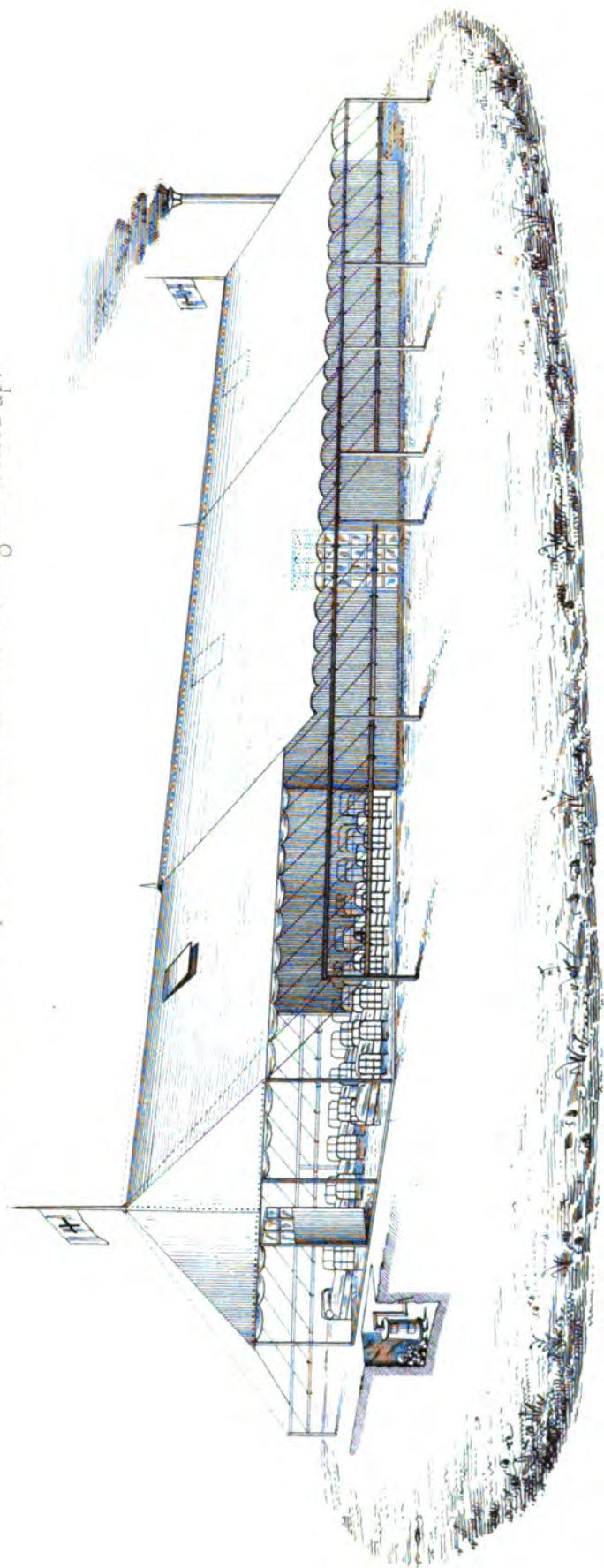
e,e,e,e,e. tent cords.

f,f. wooden keys.

g. picket.



Shows in perspective a large canvas pavilion, proposed as a sedentary hospital tent. The pavilion is sixty feet in length, twenty feet in width, and sixteen feet high. The front section is open, the end and side curtains having been rolled up.



ERRATA.

- Page 62, line 5, for "Hotel Dieu," read "new Hotel Dieu."
" 62, " 18, " "Laripoisière," read "Lariboisière."
" 80, " 22, " "enrol," read "enroll."
" 110, " 14, " "which has," read "having."
" 111, " 21, " "rites," read "rights."
" 126, " 11, " "which," read "that."
" 127, " 15, " "seventh year," read "year VII."
" 202, " 5, " "induced," read "led."
" 240, " 3, " "that a want," read "that want."
" 253, " 16, " "as regards either," read "with regard either to."
" 262, " 26, " "Platæ," read "Platæa."
" 267, " 10, dele "that."
" 268, " 16, for "these," read "them."
" 279, " 18, " "ante," read "in."
" 280, " 17, " "expeditis substrictis," read "expeditis et substrictis."
" 326, " 20, " "excepting," read "accepting."
" 338, " 29, " "Ballinglal," read "Ballingall."
" 340, " 17, " "who refers," read "who refer."
" 343, " 21, " "from practice," read "from a practice."
" 404, " 10, " "the waste," read "and the waste."
" 433, " 23, dele "now."
" 434, " 3, dele "now."
" 498, " 37, for "provision," read "prevision."
" 512, " 34, " "upon," read "from."
" 547, " 17, " "condition," read "constitution."
" 607, " 3, " "resections," read "excisions."



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